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RESEARCH INSTITUTE OF SPINE AND JOINT DISEASES" UNDER
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JOINT REPLACEMENT WITH UNIPOLAR IMLANTS WITH DOUBLE MOBILITY IN TRANSTROCHANTERIC FRACTURES
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Relevance

Currently, active surgical tactics for the treatment of trochanter fractures is generally recognized (Golubev 2013). The conservative surgery operation technique (reduction and internal fixation with intramedullary nails, plates, and rod apparatus) is a method of choice in young people. In middle-aged and elderly patients, however, the greatest number of complications associated with the migration of metal structures, inflammations of postoperative wounds, and orthopedic disorders are observed.

We developed and introduced into clinical practice the patent of Ukraine No. 101 594 of 09/25/20 "Method for the treatment of comminuted proximal femoral fractures". The development of the optimal method of joint replacement is also under way abroad, and it is still at the stage of optimization of the method.

Research objective: Improving the results of treatment of comminuted trochanteric fractures in primary unipolar arthroplasty with double mobility systems.

Матеріал методи: We followed up 13 patients (12 women and 1 man), aged 70 to 86 years (M 77.8) within the 2014 to 2016 period; with patients distributed in accordance with the type of fracture as per ao/asif and Evans (1949) classifications.

Evans classification of fractures	Type 3	Type 4	Type 5
Number of patients	6	6	1

AO/ASIF classification of fractures	31A2.1	31A2.2	31A2.3	31. A3.3
Number of patients	3	7	2	1

All the patients were operated on as per our method: 2 patients were operated on the first day after the injury, 10 patients were operated within the first 7 days after the injury, and 1 patient was operated within a remote period of 6 months after the primary injury. All the patients were verticalized on the second day of the postoperative period, with a full load on the injured limb. The inpatient period lasted up to 12 days. Control examinations were performed in 2, 6, and 12 months after the surgery.

Research findings: The results were evaluated as per the Harris hip function scale: 8 patients have been questioned to date.

The average Harris hip score was 86.4 (within the range of 78 to 94). The average duration of hospital stay was 15 days. All the patients were verticalized on the second day of the postoperative period, with a full load on the injured limb. No cases of implant instability and infection-triggered inflammation were registered.

Conclusions

The method applied allows us to restore the early function of the hip joint and the injured lower limb; it provides early activation of patients with a full load on the lower limb operated; it reduces the time spent in hospital and improves the quality of life of middle-aged and elderly patients.

DISTENSIBILITY OF THE SKIN OF ANTERIOR FEMORAL SURFACE AND KNEE JOINT IN EXTENSION CONTRACTURES

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When examining patients with extension contractions of the knee joint, the attention is drawn to the condition of the extensor tibia muscles and to the knee joint structures. At the same time, little attention is paid to the condition of the skin, except for the presence of scars and their adhesion to underlying tissue. No attention is paid to the distension ability of the skin of the anterior hip surface and the knee joint. The academic literature available to us (more than 100 domestic and foreign sources), which is devoted to extension contractures of the knee joint, has no data on the distensibility of the hip and knee joints in normal condition and in the presence of stable extension contracture.

Research objective: Investigating the distensibility of the skin of the anterior surface of the hip and knee joint in normal conditions and in extension contractures of the knee joint.

Materials and methods

The distensibility of the skin in the longitudinal and transversal directions to the body axis was determined by stretching the skin of the anterior hip surface and knee joint with researcher's fingers and measuring the distance between the two marks applied before stretching and when stretching the skin. The assessment was carried out at 20 limbs of healthy people (12 men and 8 women) aged 27 to 54 years, and also in 7 patients with stable post-traumatic extension contractures of the knee joint: duration of contractures was within a period of 1 to 6 years (1 woman and 6 men). Measurements of skin stretching were performed at the same levels like in longitudinal and transversal stretching.

Research findings

When carrying out the examination, it was found that the skin distensibility in the area of the knee joint (over the patella) and the hip (from the upper patella pole to the upper third of the hip) is significantly different in normal conditions. The largest longitudinal distensibility of the skin was observed in the segments located immediately above the upper patella pole and within 7-10 cm. When stretching, the distance between the marks increased by 150-160%, and the distance over the patella increased by 140-145%. The transversal skin distensibility, on the contrary, was greater in the middle and upper third of the hip. In transversal stretching, the distance between the marks increased here by 120-125%. In the group of patients with stable post-traumatic extension contractures of the knee joint, the longitudinal distensibility of the skin over the patella and above

the upper pole of the patella was 7-10 cm less than that of healthy limbs by 15-40% and transversal distensibility was by 12-17%.

When studying skin distensibility in bending the knee joint to 90°, normally the skin stretched out more often in the areas over the patella and 7-10 cm above the upper pole of the patella, with the distance between the marks increased by 125-148%. In a complete flexion in the knee joint, the distance between the marks was almost unchanged when compared with the distance between the marks when bending the knee joint at an angle of 90°.

Conclusions

Thus, the data obtained indicate that in preparation for operative restoration of flexion in the knee joint with stable extension contractures, it is necessary to restore not only the strength of the extensor tibia muscles, but distensibility of the skin of the anterior surface of the hip and the knee joint, especially in the lower third the hip, wherein the tensile strength of the skin is usually the highest; and in the presence of stable extension contracture, it decreases to 40%. It is important to take into account prevention of postoperative complications, such as marginal skin necrosis, and recurrence of extension contracture, as well as removal of stiffness in the knee joint.

A NEW BIODEGRADABLE MAGNESIUM-BASED CASTING ALLOY FOR OSTEOSYNTHESIS

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Millions of surgeries for bone fractures are carried out in this country and abroad every year, with most of them involving fixation with surgical implants. Titanium or steel implants are used in traditional osteosynthesis methods. Such durable implants represent foreign bodies, which carry a high risk of local inflammation. Moreover, they permanently block the bone from mechanical exposure, making it difficult to stabilize bone tissue, which is necessary under mechanical loads. To avoid such negative consequences, implant removal surgeries are carried out. These surgeries are very expensive and do not rule out the risk of recurring fractures, as well as require additional time for retreatment. Using biocompatible magnesium implants able to degrade in the human body is a solution to this problem.

Carried out by domestic and foreign scientists, the clinical studies showed positive effects of magnesium on the human body. Magnesium was established to be a natural body element, therefore it is well absorbed. This element optimally corresponds to the skeleton properties, ensures well consolidation of bone fragments, and quickly restores them at the fracture site. However, with regard to manufacturing metallic magnesium structures, metallic magnesium does not provide the required level of mechanical properties and biodegradability. Therefore, studies that focus on improving the physico-mechanical and special properties of magnesium alloys through the development of new ones are very relevant. Alloying and modification processes play a significant role in the formation of the structure and properties of magnesium alloys. Combined with melting

and refining, the alloying and modification determine the nature of crystallization, the degree of structure granularity, and the variety of properties of the alloy.

The effect of alloying elements on the formation of the magnesium alloy structures, mechanical properties, and biodegradability was investigated.

A magnesium alloy was smelted in induction crucible and dispensing furnaces where a melt specimen may be sampled with a ladle. An increasing amount of corresponding alloying elements (0; 0.05; 0.10; and 1.0%) were introduced into a liquid metal; then, it was heated to cast specimens, with the specimen subjected to heat treatment as per the T6 mode. Mechanical properties of the test specimens were determined as per standard methods. The metallographic analysis of the alloys under test was carried out under "Neophot 32" and "OLYMPUS IX 70" microscopes. The qualitative and quantitative assessments of the alloy structural components were carried out by "L" and "P" methods as per GOST 1778-70. The microrentgenospectral analysis of structural components of magnesium alloys under test was carried out under JSM-6360LA electron microscope. The biodegradability of magnesium alloys was tested in Gelofusine, while their mechanical tests were carried out after a prolonged exposure to this drug. Such a technique made it possible to bring the simulated biodegradability of the structural elements of magnesium alloys to the real one as close as possible.

Based on the electronic structure of metal atoms, we studied the effect of alloying elements on the structure formation and mechanical properties of the castings made of magnesium alloys. The possibility to control of degradation rate of magnesium-based alloys by alloying and modifying them was investigated. A comparative analysis of the rate of biodegradability of magnesium-based alloys alloyed with various elements was carried out, and the influence of various metallurgical and technological factors on the structure formation and properties of magnesium alloy castings.

Based on the researches conducted, a biodegradable magnesium-based alloy with higher mechanical properties was developed for osteosynthesis (Patent of Ukraine No. 66702); the alloy contains Zr, Nd, and Ag in a certain ratio and is capable to degrade in the human body at a rate equal to the rate of bone growth in fracture consolidation (i.e. up to 3 months). Medical experiments on animals found that this alloy was non-toxic and provided a reliable bone healing in fracture consolidation. Numerous experiments on rabbits and rats showed that this alloy had a good biodegradability, sufficient corrosion resistance, and elastic modulus which are as close as possible to those of the cortical bone layer. The mechanical properties of the developed magnesium alloy make it possible to manufacture various metal fixing elements (screws, mini plates, rods, etc.). Magnesium-based implants have a number of advantages over bioinert metal alloys, polymers and bioceramics. They are nontoxic, non-carcinogenic, with their mechanical properties being closer to the structure of the bone cortical layer; moreover, they also have an antibacterial effect.

ARTHROSCOPY ROLE IN DIAGNOSTICS AND TREATMENT OF PIGMENTED VILLONODULAR SYNOVITIS (PVNS) OF THE KNEE JOINT

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Introduction

Pigmented villonodular synovitis (PVNS) is a rare exudative proliferative pseudotumoral disease that affects the synovial membrane and, as a rule, has a benign clinical course. There are a number of versions of PVNS etiology, but the cause of this disease remains unknown. It is also unclear whether these changes in the joint are a neoplasm or inflammation. This is a rare pathology that occurs more often than it is thought to be, however, it is usually not well diagnosed. First, the PVNS term was proposed by Jaffe and co-authors in 1941. Fisk argued that changes in the synovial membrane, characteristic of PVNS, are the result of an injury, after which, according to Fisk, synovitis appeared. Young and Hudeck created changes in joints, which were similar to changes in PVNS, by introducing repeatedly blood into the joints of dogs. It was their assumption, but these changes in the experimental conditions were difficult to compare with changes in patients with PVNS of the knee joint: they resembled more to changes characteristic to hemophilia. It is believed that PVNS develops in less than 1% of patients suffering from joint diseases, with incidence in women being higher than in men. According to the publication data, the annual incidence of PVNS is about 1.8 cases per 1 million population. The disease onset occurs at the age of 4 to 75 years, but most often such synovitis is diagnosed in patients aged 16 to 30 years. As a rule, changes occur in one joint, very rarely in 2 or 3 joints. The most common PVNS localization is the knee joint (about 80% of patients). Other localizations are much less common: the hip joints, the talocrural joints, the joints of the hand, elbow and shoulder mucous synovial bags and tendon sheaths. PVNS of the knee joint may be divided into 3 forms: local (nodal), diffuse and mixed.

Research objective: Studying and analyzing the possibilities of diagnostics and treatment of pigmented villonodular synovitis; determining the role of arthroscopy in the diagnostics and treatment of pigmented villonodular synovitis of the knee joint.

Materials and methods

31 patients with pigmented villonodular synovitis of the knee joint were assessed and treated over the past 5 years in Department of Joint Diseases in Adults of Scientific Research Institute of Traumatology and Orthopedics of Ukraine under National Academy of Medical Sciences of Ukraine, Kiev, Ukraine. Patients aged 6 to 75 years: the youngest patient was 6 years old, while the oldest patient was 75 years old. The average age of the patients was 31.4 years. Male patients were 5; female patients were 26.

A diffuse form of the disease was in the majority of patients (25 patients), while a local form of the disease was in 6 patients. A thorough preoperative assessment of the patients was carried out. The following assessment methods were used: general clinical assessment, laboratory tests (general and biochemical blood tests, general and biochemical urine tests, microbiological tests of blood and synovial fluid, immunological tests of synovial fluid and membrane, pathological tests of synovial fluid and membrane, biochemical test of synovial fluid), instrumental assessment (MRI, ultrasound examination, radiography examination). The diagnostic value of X-ray, ultrasound examination, and MRI was evaluated retrospectively, taking into account data of arthroscopy and further pathomorphological examination.

Research findings

Pigmented villonodular synovitis was detected clinically in 6 patients (25.8%) only, which is suggestive of both the complexity of clinical diagnosis and lack of clinical tests specific to this disease. We used both standard symptoms (the "dancing knee" symptom and more specific tests, such as Zolen and Babka tests, "traction of a quadriceps muscle" test, test of "painfulness of facets" of the patella, etc. After a clinical examination, the diagnostic puncture of the knee joint was usually performed, but not always the color of the punctate may indicate a classical diffuse PVNS form; and a laboratory study of evacuated synovial fluid also does not significantly contribute to the diagnostics. According to the ultrasound examination, the previous diagnosis of PVNS was established in 15 patients (48.3%), with the majority of the patients having a localized form of the disease. The coincidence of MRI and arthroscopy data was in 87% of cases (27 patients). Radiography was the least informative; 2 patients (6.4%) were diagnosed with a knee joint PVNS after X-Ray. Thus, MRI is the most informative method among non-invasive assessment methods. All the patients were operated: a total or subtotal synovectomy was performed using arthroscopic techniques. Biopsy of the synovial membrane was carried out intraoperatively in all the patients; the biopsy material was investigated in the pathomorphology department. No complications were observed in the postoperative period. All the patients underwent workout and rehabilitation in special rehabilitation departments. All the patients were followed up in 1, 3, 6, and 12 months after the surgery, and once a year for the next 5 years later on. The longest follow up period for operated patients was 5 years, while the shortest follow up period was 3 months. The long-term surgical results are considered to be good and excellent. No relapses were observed in the patients. No radiation therapy was used in the preoperative, early postoperative and late postoperative periods. Revision arthroscopy of the knee joint was carried out in one patient in 4 years for the medial meniscus tear. The long-term result of the arthroscopic subtotal synovectomy was evaluated as excellent, no signs of disease were found.

Conclusions

MRI is among the non-invasive methods of research in patients with pigmented villonodular synovitis. Arthroscopy plays a crucial role in the treatment and diagnostics of the pigmented villonodular synovitis of the knee joint. The number of relapses after arthroscopic synovectomy is significantly lower than in patients who underwent open total synovectomy. Arthroscopy is a "golden" standard in the diagnosis of PVNS of the knee joint; it allows simultaneous implementation of the necessary therapeutic manipulations, including targeted (under visual control) biopsy. In the postoperative period, all the patients require rehabilitation in specialized departments, which improves functional results and accelerates patient recovery.

USING POLYPROPYLENE A MESH TO PREVENT DISLOCATION OF THE HIP JOINT IMPLANT HEAD

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Dislocation of the hip joint implant head remains one of the most frequent complications of the total hip joint replacement. According to various authors, the incidence of dislocation of the hip joint

implant head is within the range of 1.5 to 11% after the primary hip joint replacement, and it is within the range of 4 to 25% after the revision hip joint replacement. Despite the correct orientation of the components of the hip joint implant, a high risk of dislocation of the hip joint implant head remains due to muscle weakness and significant hypermobility of the joint in cases of revisions and the lower extremity lengthening. In such cases, acetabular double-sphere implants and fixed-head inserts are used, as well as a prolonged bed rest to form scars in the hematoma, which fills the missing joint capsule.

Research objective: Improving the results of the hip joint replacement by using polypropylene mesh to prevent dislocation of the hip joint implant head after revision joint replacement and operations for dysplastic coxarthrosis with limb lengthening.

Materials and methods

A retrospective analysis of the treatment results of 9 patients who underwent revision joint replacement and 6 patients after primary joint replacement for hip dysplasia with a hip lengthening of about 4 cm (within a period of 2009 to 2015) was carried out. The plastic of the joint capsule defect with a polypropylene mesh was carried out for all the patients. The mesh was installed under the soft tissue in the projection of the joint capsule, with the mesh fixed with vicryl sutures. The correct position of the implant components was achieved in all the cases.

Research results and discussion

The main reason for the use of polypropylene mesh was a large defect in the capsule of the hip joint against the background of muscular atrophy. It was associated with lengthening of the lower extremity up to 4 cm, as well as with revision hip joint replacement, which found marked cicatricial changes of the capsular apparatus.

Using a polypropylene mesh for the hip joint capsule plasty is a controversial issue. Given the small amount of material, it cannot be said that the mesh is the main factor that prevents dislocation of the femoral head. However, the absence of infectious complications and repeated dislocations of the hip joint implant head shows positive results in all the patients operated on as per this method. In our view, the use of a polypropylene mesh accelerates the scarring of the soft tissues around the hip joint and contributes to the formation of a tight cicatricial capsule complex around the implant.

Conclusions

Using polypropylene mesh to prevent dislocation of the hip joint implant head when carrying out hip joint replacement made it possible to prevent dislocations of the hip joint implant head in all the patients operated on as per this method. However, the existence of controversial issues with regard to the process of soft tissue regeneration requires further research.

TENODESIS OF THE TENDON OF LONG HEAD BICEPCE IN CASE OF ITS PATHOLOGY: OUR EXPERIENCE

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Key words: long biceps head, tenodesis, fixation method.

Injuries and diseases of the shoulder joint are a relevant issue of traumatology and orthopedics. One of the causes of pain and dysfunction of the shoulder joint may be inflammation and / or injury of the intra-articular and extra-articular part of the long biceps head (LBH). Clinical manifestations are the same, but the cause of the pain syndrome associated with the pathology of the long biceps head may be different: inflammatory changes (tendonitis), dynamic disposition of the tendon in the inter-tubercular sulcus (instability of the tendon in the tubercular sulcus, and, as a result, dislocation of it on the small humeral tubercle); traumatic or degenerative tears, both complete and partial, of the biceps tendon along its length and in the place wherein the tendon is attached to the glenoid labrum (SLAP lesion). The options of the pathology of the long biceps head above described are indications for surgical treatment, namely, for tenodesis or tenotomy of the tendons of the long biceps head. The variety of methods and places of fixation of the LBH tendon and lack of consensus in the rationale of using those methods served as a basis of the analysis of various methods of fixation of the LBH tendon.

We carried out a retrospective analysis of the results of treatment of 37 patients with various diseases of the tendon of the long biceps head, which were treated in Department of Orthopedics, Arthrology, and Sports Injury of Zaporozhye Regional University Hospital from 2009 to 2015. The patients included 26 men and 11 women (74.3% and 25.7% respectively); the average age was 47.8 ± 3.2 (from 18 to 79 years).

In the preoperative period, the patients were assessed in the scope as follows: clinical examination with the obligatory provocative stress tests, such as Speed, O'Brien, Yergasson, shoulder X-Ray and MRI scans.

The patients underwent surgical correction of the pathology of the LBH tendon.

After the surgery, the arm was fixed with a triangular bandage for 4 weeks. The patient was prohibited from active contraction of the biceps and extension in the elbow joint to more than 90° and recommended limiting external rotation up to 40° .

Restriction of movements in the elbow joint was recommended for a period of 4 weeks. Then, a course of therapeutic exercises was carried out to restore the full range of motion. The full exercise stress was allowed in 3 months after the surgery. Control clinical assessment with provocative loading tests (Yergasson, Speed, O'Brien) to evaluate the results as per the *Constant* scale, and X-Ray of the shoulder joint were carried out within a period of 3 to 12 months after the operation (the average follow-up was 5.7 ± 2.6 months).

The choice of surgical treatment was individualized. The factors that influenced the choice of the method of surgical correction of the pathology of the LBH tendon were as follows:

- Morphology of tendon lesion;
- Patient's age;
- Level of physical activity;
- Particularities of work;
- Concomitant pathology of the shoulder joint.

In the presence of concomitant pathology of the shoulder joint, an additional surgical correction was carried out in addition to the LBH tenotomy / tenodesis. Thus, in case of associated lesions of the rotator cuff (6 patients, 16.2%), re-fixation of the supraspinatus tendon with the anchor clamps was carried out in all the cases under the arthroscopic control. In case of concomitant subacromial impingement (5 patients, 13.5%), a bursectomy, subacromial decompression, and, if necessary, acromioplasty were performed.

In case of SLAP lesion (8 patients, 21.6%), LBH tendon tenotomy was carried out (followed by tenodesis), as well as re-fixation of the main body of the glenoid labrum to the glenoid by using interference anchor clamps.

It should be noted that in patients with associated rotator cuff lesions, the function of the shoulder joint and the indicators of the *Constant* scale were significantly lower than in patients with isolated pathology of the LBH in 4 weeks after the surgery. However, when assessed in 3 months after the surgery, no statistically significant difference was detected (patients with isolated LBH pathology: 80.2 ± 2.9 scores; patients with an associated lesion of rotator cuff: 75.6 ± 1.4 scores).

When choosing a method of surgical treatment of biceps pathology, patient's age, level of physical and labor activity, as well as associated lesion of the shoulder joint should be taken into account in addition to the morphology of tendon injury. Using biceps tenotomy in patients over 50 years of age with low physical and labor activity allows reducing the duration of surgery, reducing intraoperative trauma, and obtaining good results with no significant reduction of the functional treatment results. In case of tendonitis of the extra-articular part of the LBH tendon, it is necessary to perform subpectoral tenodesis of the biceps with preliminary excision of the modified tendon tissue. In patients with signs of osteoporosis, the fixation of the LBH tendon in the proximal humeral head should be avoided; subpectoral tenodesis is the method of choice. For degenerative changes in the LBH tendon, the use of the Endobutton system or transosseus suture fixation eliminates tendon lesion at the time of its fixation.

PARTICULARITIES OF ARTHROERESIS OF PLANO-VALGUS FOOT IN ADULTS

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Introduction

Arthroeresis: "ereisis" means "lifting up", stabilization of pathological motions. In relation to plano-valgus foot deformity, it is the subtalar joint stabilization and correction of the instability of the subtalar and talonavicular joints with a special screw inserted into the tarsal sinus. The sliding of the talar bone from the heel bone is prevented without blocking the normal foot motions. Arthroeresis has been used for many years in the treatment of children and adolescents. In recent years, the interest of orthopedists worldwide in the use of this low-impact technique in adults has increased again.

Materials and methods

Since 2013, arthroeresis has been carried out in 23 patients (32 feet) in Center of Joint Replacement in Kiev City University Hospital No. 12, Kiev, Ukraine. A subtalar screw of a combined cone-

barrel type was used. Results were evaluated on 30 feet (22 patients): 19 women, 3 men, 5 adolescents, 6 young patients, 7 middle-aged patients, and 4 elderly patients (WHO). Right feet were operated in 6 patients; left feet were operated in 8 patients; both feet were operated in 8 patients (16 feet). 4 patients (i.e. 8 feet (26.6%)) were treated without additional procedures. The following procedures were additionally carried out in the remaining 73.4% of feet: transcutaneous lengthening (as per the Hoke method) of the Achilles tendon - 14 feet; navicular-cuneiform arthrodesis – 2 feet; tarso-metatarsal corrective arthrodesis – 1 foot; Cotton osteotomy – 6 feet; Hallux valgus correction – 18 feet. Gradual metered load was applied on the 5th day after the surgery. For evaluation, radiography, AOFAS VAS scores were used.

Resewarch findings

The patients reported results as good and excellent in 26 cases (86.6%): the average VAS score was of 8 ± 1.9 ; the average AOFAS score was 88 ± 3 . The patients returned to a normal life on average in 5 ± 2 weeks. The rehabilitation period increased due to concomitant surgeries, which themselves require a longer recovery. The screws were removed in 4 feet (of the 30 feet) because of persistent pain syndrome in 2 feet or because of hypercorrection in 2 feet (in 3 month-, 1 year-, and 1 year and 2 month-patients), in 3 feet in elderly patients of 60-64 years), and in 1 middle-aged patient of 55 years. Discomfort remains in 4 patients, but the patients refuse to remove the screws. 4 patients (from the 14 patient who underwent unilateral intervention) want to be operated on the second foot.

Conclusions

The best results are observed in the group of young patients. As a rule, these patients do not require additional surgeries to correct the foot. Lateral pain or pain in the area of sinus tarsi is a relative contraindication to arthroresis. When planning arthroresis, it is required to take into account the localization of the point of the main deformity: the talonavicular joint, 1 cuneonavicular joint and 1 tarsometatarsal joint. Most patients require additional surgeries for full integrated correction of foot deformities, since it is also necessary to correct the various consequences of children's planovalgus foot deformity in adults. Accordingly, the use of additional techniques extends the arthroeresis rehabilitation terms in accordance with the terms planned for these techniques.

SYSTEMIC FUNCTIONAL APPROACH IN FORECASTING THE DEVELOPMENT OF PATHOLOGY AND COMPLICATIONS IN OPERATIONAL ARTHROLOGY. PREVENTING POTENTIAL COMPLICATIONS

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The body is a self-sufficient and self-regulating system. This principle is indisputable. Regardless of the system components, systemic laws function in any system; and it is rather unreasonable to ignore those laws. Medicine, as a science, recognizes it, as a fact. In practice, unfortunately, the question of the practical application of the principles of consistency and functionality in the body, in particular in predicting the development of pathology of the musculoskeletal system and the

possible risk of maintaining a deficit of function after professional surgical treatment and other functional complications remains open.

Based on the principles of functional neuromechanics (FN), we wanted to help see the human body through completely different eyes; to show the static and dynamic particularities of the body functioning as a single stable and functional biomechanical system; to study the dysfunction formation mechanisms; and show the versatility and consistency of the processes occurring in the body, and in the musculoskeletal system in particular. It, in turn, will optimize the quality of the provision of treatment and rehabilitation care to our patients.

A brand new understanding of the principles of human body formation as a single biomechanical controlled system is reflected and applied in practice in an interdisciplinary approach, such as functional neuromechanics (FN), combining anatomy, physiology, neurology as theoretical constituents, and biomechanics, psychology, osteopathy, kinesiotherapy as practical constituents. Theoretical rationale of FN was obtained in works by N.A. Bernshteyn who substantiated the mechanisms of formation of motor skills, levels of building motions in health and pathology. He showed that motions were much more complicated than the relationship between bone levers: it was a controlled process, like any process in the body, by the way. The issue of control is fully within the competence of the central nervous system (CNS). It depends only on the central nervous system: where and what kind of signals it sends. It, in turn, is depends on how the central nervous system “sees” itself, i.e. its periphery (proprioceptors and other analyzers). Moreover, we must remember the effect of gravity: when the central nervous system adapts to gravity, it builds itself (it is a structuring role of gravity). Winner N., one of the founders of cybernetics, plays an equally important role in the development of this vector. The main scientific FN bases are Massachusetts Institute of Technology, Brown University and Michigan Osteopathic College.

How to put it into practice? Let us think. In particular, let us take the hip joint. In the narrow sense, we see the acetabulum and the femoral head and their structural conflict. However, if you look wider and more functional, then the acetabulum itself is built into a dynamic system whose dynamics is determined by the sacroiliac joint. The dynamics of the sacroiliac joint is determined by the musculoligamentous apparatus, as well as by an individual stereotype of motions. Now, I would like to highlight the piriform muscle, since it determines the dynamics of both the sacroiliac joint and the hip joint. It is the only structure that creates compression and presses the hip joint head into the acetabulum. It is this compression that creates a conflict, i.e. functional discongruence, which serves as one of the leading prerequisites for launching degenerative processes. Changing the angles of gravitational load leads to the restructuring of the trabeculae of bone of the femoral neck, thus, forming the prerequisites for the development of the risk of hip fracture and coxarthrosis. The increasing lack of function, up to its complete absence, forces the body to seek compensation for this function at the expense of other structures. Work of the whole musculoskeletal system is restructured. These dysfunctions (local and systemic) are fixed in the system.

Further, the functional shortening (and structural shortening later on) of the piriform muscle leads to a torsion in the sacroiliac joint, and we get functional shortening of the limb, and compensatory “over-bending” in the knee joint, external rotation of the hip joint, the tension of the quadriceps of the hip joint with compression in the femoropatellar joint. Also, prerequisites are forming for the

traumatic meniscus tear and trauma of cruciate ligaments at functional loads, plus the launch of degenerative processes. It turns out that the structures located in the anatomical proximity of the hip joint determine the statics and dynamics of the knee joint.

Functionally-determined lesion of the structures of the foot may be incorporated into the same dynamics (plantar fasciitis, Hallux valgus, hammer-like fingers, osteoarthritis of the foot joints, achillobursitis, etc.)

As we have already started talking about the sacrum and its structural and functional relationships, and knowing that the entire vertebral column stands on the sacrum, we can guess what will happen “higher”.

It does not matter how good and modern surgical treatment is, it eliminates only the structural component; however, the system dysfunction remains. The latter may substantially reduce the quality of life and functionality of the patient, as well as it may serve as the risk of degenerative processes in remote places. Also, we may assume that disregarding these systemic processes may less or more serve as the risk of complications such as instability of the prosthesis, recurrence of ligament ruptures after arthroplasty, plate fractures, local osteoporosis in the projection of the fixture (as a process of the remodelling of the bone that lost its function of support), recurrence of foot deformities after surgery for Hallux valgus, etc. It is a challenging issue requiring further study.

Thus, if we are able to see not the diagnosis and a separate joint, but rather the whole system, to see its functionality with existing structures affected by injury or degenerative process; following this logic, we will try to increase the system functionality as much as possible against this background, operate, and correctly rehabilitate the patient. The most stable and functional system will have a much more resource, therefore, the surgery itself will be perceived by the system as a minimal act of aggression, and we will deal with a smaller number of the complications mentioned, and may be even septic. It, in turn, will make our work as competent and professional as possible, and improve the quality of life of our patients.

DIAGNOSTICS OF OSTEOPOROSIS WITH MEDIX DR DOSITOMETER

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Relevance

Osteoporosis is the most common systemic skeleton disease characterized by a decrease in bone mass and structural changes in the bone tissue, which are so pronounced that even with a minor injury, fractures may occur. According to the WHO, when doing densitometry in people aged 50 years and older, osteoporosis was revealed in each 3rd woman and each 5th man. The growth rate of the disease is increasing both in Ukraine and worldwide: so in 1990, 1 million 66 thousand femur fractures were registered in the world due to osteoporosis, according to experts, in 2050, this figure will increase up to 6.5 million. As a result, osteoporosis with expenditures for its treatment and rehabilitation of fractures will occupy one of the leading places in the healthcare budget. X-ray densitometry is a global standard in the diagnostics of osteoporosis.

Objective: Analyzing diagnostic modes of X-ray densitometer and its technical performances; and identifying patients at risk of developing osteoporotic fractures.

Materials and methods

Medix DR X-ray densitometer, Medi Link, France, with 3D DXA brand new technology. The densitometer has the following study modes: Standard Mode (the whole body, hip joints, with simultaneous examination of lumbar spine, straight DVA, lateral DVA, and forearm); Pediatrics Mode; Orthopedics Mode (the mode allows exploring the bone mineral density in the area of the implant for further monitoring); 3D Mode allows calculating 3D structures on a 2D plane, providing the full picture of the state of trabecular tissue and bone geometry.

Research findings

Since August 2015, 570 studies were carried out in our clinic in the standard mode (lumbar spine and hip joints): 98 male and 472 female patients, with average age being within the range of 45 to 70 years in women and of 55 to 75 years in men. A decrease in bone mineral density and T indicator in the female group was found within the range of -1.0 to -2.5 in 152 (osteopenia) patients; and within the range of -2.5 to -4.5 in 247 (osteoporosis) patients. The normal indicators of -1.0 were found in the 73 patients examined.

Conclusions

X-ray densitometry is the Gold Standard in the diagnostics of osteoporosis as it provides the possibility of studying the axial skeleton, good sensitivity and specificity, high accuracy, and low error in reproducibility, low radiation dose (less than 0.03 mSv), relative cheapness and high speed of research.

EXPERIENCE IN USING INTRAOPERATIVE MONITORING IN SURGERIES ON THE VERTEBRAL COLUMN

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Introduction

One of the most unfavorable complications of spinal surgeries is the neurological deficit that can occur in a patient, both intraoperatively and in the postoperative period. The diagnostics of neurological complications allows minimizing the consequences of lesion of the nervous structures of the spinal cord, as well as taking therapeutic measures in time. This condition may be fulfilled due to the use of multimodal intraoperative monitoring of the spinal cord.

Research objective: Conducting a retrospective analysis of the application of intraoperative monitoring of the spinal cord in patients with injuries and diseases of the spine.

Materials and methods

A retrospective analysis of the protocols for the intraoperative monitoring was carried out in 104 patients treated in State Institution "Professor M.I. Sitenko Scientific Research Institute of spine and joint diseases" under National Academy of Medical Sciences of Ukraine, Kharkov, Ukraine, within a period of 2013 to 2015. The study group included 92 patients with scoliotic spinal deformity aged 5 to 18 years and 5 patients aged 24 to 43 years. Also, surgery was performed for traumatic spinal injury in 4 patients, and for tumor masses of the spinal column in 3 patients. The study was carried

out on the NIM Eclipse (Medtronic) device. Transcranial electrical stimulation (TcES) was done by electrical pulses at C3 and C4 points. Motor induced potentials (TcMIPs) were recorded on m. abdominis obliquus, m. abdominis rectus, m. vastus lateralis and m. tibialis anterior. TcMIPs were analyzed as per the following criteria: the fact of the presence or absence of motor potentials; amplitudes of potentials and threshold of inducing. Statistical analysis was performed using the Kruskal-Wallis test. Transcranial electrical stimulation (TcES) was done by electrical pulses at C3 and C4 points. Motor induced potentials (TcMIPs) were recorded on m. abdominis obliquus, m. abdominis rectus, m. vastus lateralis and m. tibialis anterior. TcMVPs were analyzed as per the following criteria: the fact of the presence or absence of motor potentials; amplitudes of potentials and threshold of calling. Statistical analysis was performed using the Kruskal-Wallis test.

Research findings

The average surgery time was 5 hours and 56 minutes. The number of transcranial stimulations performed during one intervention was from 4 to 35 (an average of 14.3 + -6.49 transcranial stimulations).

Potentials remained stable throughout the surgical intervention in 47 patients. The amplitudes at the end of the surgery were comparable to baseline values in 57 patients after a significant decrease. At the same time, the amplitudes of induced potentials were restored in 9 patients after the medical measures were taken (normalization of blood pressure, transfusion of blood-derived products, dismantling the structure). A statistically significant increase was found in the amplitudes of TcMIPs on m.abdominis obliquus, m. abdominis rectus in 2 or 3 hours in the course of the surgery. Irreversible loss of signals was observed in one patient postoperatively, which was followed by further manifestations of lower paraplegia.

Conclusions

The use of a multimodal intraoperative monitor allows the timely diagnostics of a dysfunction of the spinal cord, both during the surgery and in the early postoperative period.

The diagnostics of a dysfunction of the spinal cord made it possible to take timely therapeutic measures and avoid the development of neurological deficit in the studied patients in most cases.

ANALYSIS OF THE EFFICIENCY OF ARTHROSCOPIC REMPLISSAGE OF HILL-SACHS LESIONS IN TREATMENT OF SHOULDER-SLIP

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Introduction

The shoulder-slip treatment method was introduced in 1923 by Bankart; since then, orthopedists have encountered a high percentage of unsatisfactory results, especially in the presence of lesions in the bones that form the shoulder joint. One of the lesions described in 1940 by Hill and Sachs is a compression fracture of the humeral head as a result of collision of the soft cancellous bone of the humeral head with a dense front edge of the articular surface of the scapula. This lesion contributes to the recurrence of shoulder instability, which is described in academic literature on the subject, with its incidence being up to 80%.

Research objective: Studying the efficiency of the combination of the arthroscopic remplissage of Hill-Sachs lesions with standard arthroscopic restoration of the integrity of the labrum glenoidale in

the shoulder-slip treatment.

Materials and methods

52 patients with shoulder-slip aged 17 to 48 years were operated in Center of Orthopedics, Traumatology and Sports Medicine of Feofania University Hospital for a period from 2011 to 2015. 22 patients (18 men and 4 women) of them were included in the study. The patients included had a depressed Hill-Sachs lesion of the humeral head; and the remplissage procedure was performed on them, i.e. remplissage of the m. infraspinatus tendon was performed in addition to the standard Bankart plastic of the anterior labrum glenoidale scapulae or Kaspary modification. The following patients were not included into the study: patients with a defect of the scapular articular surface of more than 25%; patients with symptoms of osteoarthritis or aseptic necrosis; and patients with additional lesions of the tendons of rotator cuff or subscapular muscle.

Preoperative assessment included standard clinical examination, X-Ray examination, MRI, and CT to evaluate bone defects.

All the patients were operated by using arthroscopic methods: the patient was in the lateral position, with the operated limb extended at an angle of 35°; the standard Bankart plastics was performed by using 2 or 3 anchors; modified Kaspary plastics was performed in the presence of a bone defect of the anterior inferior scapular margin up to 25%. All the patients were additionally operated: capsulotenodesis with two ligatures of the m. supraspinatus tendon in the Hill-Sachs lesion zone on the humeral head was performed on them.

The patients were followed up for one year (in 3, 6, and 12 months after the surgery), the evaluation was done as per ASES Shoulder score and modified Rowe Score for instability.

Research findings

We obtained 7 excellent results, 12 good results, and 3 unsatisfactory results (13.6%): a recurrent shoulder dislocation was found in 1 patient; and a stable postoperative combined shoulder joint contracture was found in 2 patients. Four patients were re-operated: the anchor was removed from the humerus in 1 patient (an athlete of catch style) because of complaints of incomplete range of motion of the upper limb, which prevented him from performing special exercises; elements of redressement and arthroscopic debridement were performed in two patients with contractures; and repeated Kaspary plastics of the anterior section of the capsule of the shoulder joint was performed in one patient. No other minor or serious complications were noted. All the patients returned to their previous daily loads in 6 months after the surgery. 9 men and 3 women (54.5%) continued exercising with previous loads.

The evaluation as per two scores above mentioned showed a statistically significant improvement in comparison to the pre-operative evaluation. The average ASES score was increased in a year to 81.7 ± 18.7 (preoperative score was 65.3 ± 19.3). The average Rowe Score was increased in a year to 94.7 ± 13.3 (preoperative score was 37 ± 16.3).

Research findings

The restoration of the shoulder joint stability by means of arthroscopic plastics of the anterior labrum glenoidale scapulae was considered efficient in combination with the remplissage of Hill-Sachs lesion.

A small percentage of external rotation restriction is observed; it is considered the main disadvantage of this surgery technique. At the same time, the patients had no restrictions in the daily or sports loads in 6 months after the operation. In general, this procedure is performed on soft tissues; combined with minimal invasiveness, the procedure provides the optimal treatment for shoulder-slip and good mid-term functional results.

SYNDROMOLOGICAL APPROACH TO DIAGNOSTICS AND TREATMENT OF DISPLASTIC PATHOLOGY OF THE HIP JOINT IN CHILDREN

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Introduction

We consider the syndromes of hip joint dysplasia to be a pathological process characterized by a cyclic, stereotype, and staged flow. They are underlain by the structural genetically determined anomalies of the hip joint, creating conditions that disturb the load, leading to the destruction of the joint, triggering the reactive process. The syndromes of hip joint dysplasia (SHJD) are manifested as various clinical forms that have their diagnostic, therapeutic, and prognostic particularities.

Research objective: Substantiating the differential approach to the diagnostics and treatment tactics for the syndromes of hip joint dysplasia in children.

Materials and methods

We limited our study to the most common dysplastic diseases of the hip joint, which was based on congenital genetically determined anomalies and environment factors. The main of these anomalies are: dysplastic hip instability syndrome (DHIS), dysplastic necrosis of the femoral head syndrome (DNFHS), epiphyseal dysplasia of the femoral head syndrome (EDFHS).

Research findings

Recognition (diagnostics) of a dysplastic disease is based on the principle of syndromological diagnostics on the basis of four-dimensional characteristics of a joint (structure, load, destruction, reactive process) as a four-staged dynamic process.

Stage One: Screening aimed at identifying persons with possible orthopedic pathology of the musculoskeletal system, in particular, with dysplastic anomalies (detection of risk group).

Stage Two: Establishing clinical and X-Ray diagnosis (ultrasound examination in infants), with its objective being the detection, if possible, of all dysplastic anomalies and the description of the corresponding dysplastic syndrome with its graphic (text) expression.

Stage Three: Determining an individual integral diagnosis that is the basis for the planning of surgical intervention.

Stage four: Prognostic expert diagnosis.

In case of the dysplastic hip instability syndrome (DHIS), the main etiological factor is the anomalies of the development of hip joint components. As the pelvic component of the hip joint system is less mobile, the development of the joint in general is determined by the adaptation of a more mobile component, i.e. the proximal femur, to the form and position of the acetabulum.

The dysplastic necrosis of the femoral head syndrome (DNFHS) is a consequence of the pathological loading of the hip joint with increasing pressure on both articulation surfaces with the development of dystrophic changes of various degrees and localization.

The epiphyseal dysplasia of the femoral head syndrome (EDFHS) also occurs on the basis of a dysplastic set of symptoms, first of all, "coxa retroverta" or various combinations of placement of hip joint elements against the background of hormonal changes.

A new interpretation of these syndromes significantly influenced their understanding, which has a special therapeutic and tactical value.

The uniformity of the origin of the syndromes of hip joint dysplasia (SHJD) determines the possibility to construct general and special principles of their therapeutic tactics. The general principles of the treatment include the consideration of biomechanical and reactive changes developing in the joint.

When building a common therapeutic tactic, it is necessary to take into account the role of environment factors. They complicate, aggravate, and accelerate the clinical course.

In all the cases of the dysplastic hip joint pathology, the double nature of the lesion should be taken into account. It is necessary to pay attention to the possibility of dysplastic changes in other joints and organs, which complicates the process of diagnostics and treatment of the underlying disease, as well as simultaneous or step-by-step treatment of a concomitant disease. In this case, it is pertinent to plan therapeutic tactics within the limits of the change in the biomechanical system formed by the pelvis and the proximal femur.

Special treatment principles include methods for conservative and surgical treatment in accordance with each dysplastic syndrome. Conservative methods are considered as auxiliary; they are aimed at reducing deformity and preventing deformity progression.

In case of heterogeneous structural and force deformities inherent to the syndromes of hip joint dysplasia (SHJD) and genetically determined, the main method is surgical treatment. It is aimed at correcting structural and force deformities in the joint, eliminating the effects of destructive factors and optimizing regeneration processes in places of destruction.

Principles of therapeutic tactics for the genetically determined hip dysplastic instability syndrome (HDIS)

The therapeutic tactics principles include:

- Achieving the alignment (conservative, surgical) of the femoral head (FH) and eliminating structural changes in the hip joint (spatial and volume discrepancies);

- Procedures aimed at improvement of articulation and removal of decompression in the joint, and the prevention of dystrophic processes (decompressive tenomyoplasty);

- Holding the femoral head (FH) in the acetabulum. For this, depending on age, degree of dislocation, and the intervention performed, it is useful to use a plaster cast, cuff traction, external fixation devices and abduction orthotics;
- Stimulation of the hip joint osteogenesis. For this purpose, the tunneling of the hip joint and the femoral neck is performed; calcium supplements, multivitamins, and physiotherapy procedures are prescribed;
- Rehabilitation measures. They are aimed at restoring muscle strength and range of motions in the joints by using known techniques.

Principles of therapeutic tactics of the genetically determined dysplastic necrosis of the femoral head syndrome (DNFHS)

The principles of therapeutic tactics of this syndrome are considered in accordance with the peculiarities of its appearance. The main tactical methods of DNFHS treatment are: removal of compression factors (structural and force disturbances). At the first stage of the disease, in the presence of reactive synovitis, the treatment is aimed at dehydration, anti-inflammatory therapy, unloading of the joint(s), improvement of blood circulation, and decompression methods of surgical intervention: myotomy of adductors, hip flexors, iliopsoas muscle, wide femoral fascia (fascia lata); tunneling femoral neck; decompression with external fixation devices.

Principles of therapeutic tactics for the genetically determined epiphyseal dysplasia of the femoral head syndrome (EDFHS)

The principles include:

- Reduction and restoration of the anatomical conformity of the femoral head and neck in the acute stage of the disease by skeletal traction;
- Stabilization of the femoral head (FH) (epiphyseodesis) at Stages I-II;
- Corrective osteotomy at Stage III and in cases of residual displacements;
- Stimulation of osteogenesis.
- Therapy regimen (diet therapy, unloading the joint);
- In cases of endocrine status disturbance (obesity), appropriate pathogenetic therapy is administered.

Conclusions

Using the results of theoretical researches and our own experience, we have constructed algorithmic schemes of diagnostic and therapeutic tactics for the genetically determined hip joint dysplasia syndromes (HJDS). The proposed methodological therapeutic and diagnostic principles are to specify the particularities of the syndromological diagnostics, taking into account the destructive effect of each sequential syndrome and its surgical elimination.

OUR EXPERIENCE IN GAMMA NAIL OSTEOSYNTHESIS OF PROXIMAL FEMORAL FRACTURES

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Reserch objective: Showing the experience in using gamma nail osteosynthesis of trochanteric femoral fractures.

35 patients (11 men (31.4%) and 24 women (68.6%)) with trochanteric femoral fractures were operated with a gamma nail in Traumatology Department for the period from 2015 (3 and 4 quarters) to 2016 (1 quarter). The average age of patients was 68.5 years (46–91 year).

The gamma nail for osteosynthesis was used in case of transtrochanteric fractures, intertrochanteric fractures, subtrochanteric fractures of the femur, and fractures of the upper third of the diaphysis of the femur. Made by Chm, Orthocom, and Motor Sich companies, the implants were used. The patients were operated on the first day after admission to hospital, once standard examinations have been performed.

The surgery was carried out on the operating table by using an orthopedic technique: the patient was positioned on the operating table in supine position with a slight rotation to a healthy side. The standard access was used: we make a longitudinal skin incision up to 4 cm long, with the incision passing above the top of the greater trochanter along the long axis. Once the greater trochanter (the nail insertion point) has been localized, we introduced a guide wire into the medullary canal with a drill. We open the medullary canal along the wire with a cannulated awl; then we ream the place of the gamma nail insertion. The gamma nail is inserted in such a way that its axis approximately coincides with the femoral axis. The nail is inserted by using only manual technique. Then we insert the drill guide into the hole of the target guide, with the target guide inserted into the drill guide.

Then, we insert the wire into the femoral neck through the target guide to avoid breaking through the femoral head. At this stage, we perform X-ray in front and axial views to control the wire position by using Armand X-ray apparatus.

Should the wire position be favorable, a cortical layer of the femur is passed through with a cannulated drill. Further, we pass the canulated drill through the femoral neck and head along the guide wire, using the drill marks indicating the length of the cervical nail. We screw in a fixation cannulated cervical screw of the appropriate size into the femoral neck with a key guided along the wire that passes through the hole in the intramedullary nail. Then, we carry out X-ray control in 2 views.

To dynamically block the fixation cervical nail, we insert a compression sleeve into the gamma nail channel; we screw in the compression sleeve up to complete compression and turn it back by a

quarter of a turn. We produce distal blocking only in the dynamic opening of the gamma nail by means of the navigation system.

Patients' activation starts on the first or the second day after the surgery. We started applying a metered load on the second day after the surgery. Elastic bandaging of the two lower extremities was used. The treatment to prevent thromboembolism was administered up to one month after the operation. All the patients received calcium supplements up to two months.

Outcomes for the period described

All the patients operated were activated, and move independently. There were 3 complications: migration of the fixation cervical nail in 2 cases and postoperative hematoma of the soft tissues in the region of surgical wound in 1 case.

Conclusions

This surgical technique is minimally invasive; it allows patients to be activated early. The surgery is performed with minimal blood loss.

The micromobility of the medial fragment of the trochanteric fracture of the femur, as well as the metered functional compression makes it possible to migrate in the lateral direction, which provides better fusion.

This nail provides the maximum stability.

UNCOMPLICATED SPINAL FRACTURES COMBINED WITH SKELETAL TRAUMA: EXPERIENCE OF SURGICAL TREATMENT

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The mutual overburdening of multiple mechanical lesions of the skeleton and unstable spinal lesions requires a step-by-step differentiated and gentle approach. In case of unstable spinal fractures, the vertebrae may be displaced as a result of disturbance of the integrity of the supporting elements, which is accompanied by the threat of compression of the spinal cord vessels and requires strict bed rest. At the same time, early physical activation of the patient prevents respiratory and hemodynamic complications, and is the key to early functional recovery.

Research objective: Improving the results of treatment of patients with multiple skeletal lesions.

Materials and methods

There were 24 patients (19 men and 5 women) aged 16 to 78 years with uncomplicated unstable spine fractures combined with fractures of the costal framework, pelvis, and bones of the extremities. Traffic accidents predominated among causes of lesions, including pedestrian lesion (15 cases), falls from a great height (6 cases), and falls at the same level (3 cases). The choice of treatment tactics was determined by the degree of instability of spinal fractures according to Dennis (1981). The method of decompression of the spinal canal and stabilization of the affected segment

was determined by the minimum volume of invasion at the greatest strength of the system to implant. The necessary condition for submersing osteosynthesis was a compensated state of hemodynamics and respiration, which was achieved by intensive therapy within a period of 5 to 10 days after the lesion. Spinal fractures were most often combined with fractures of the lower limbs (12 cases). Such a liaison option included early (up to 10 days) spinal fusion at the first stage of treatment, and osteosynthesis of the limb followed by patient activation at the second stage (up to 12 days). Fractures of the cervical and thoracic spine were combined with lisions of the costal framework in 7 cases. The combination of anterior and posterior spinal fusion supplemented with vertebroplasty in 4 cases allowed the patient to be activated in the bed and transferred to a vertical position within a period of the first 3 to 5 days, which was the essential condition for the prevention and treatment of pulmonary complications. Combined spine and pelvis fractures were the most difficult to choose surgical tactics. The optimal tactics was submersing osteosynthesis of the pelvic bones and spinal fusion made in one step, which made it possible to reduce the periods of bed rest and to increase the range of active motions in the patient within a period of 5 days. In 3 middle-aged and elderly patients, spinal fractures occurred against the background of osteoporosis when falling from patient's own height and were combined with fractures of distal extremities. In these cases, transcuteaneous vertebroplasty was performed; and the terms of bed rest were reduced up to a period of 1 to 5 days. In our practice, the anterior interbody fusion with cylindrical cages was complemented with implantation of hydroxyapatite, which reduced the time of segment consolidation.

Research results and discussion

4 cases of pneumonia were noted among 24 patients with multiple and combined injuries of the skeleton and spine in the early period of traumatic disease. Early stabilization of spinal fractures made it possible to reduce the time to resolve pneumonia to an average of 10 ± 2.5 days. Gastric bleeding was noted against the background of stress stomach ulcer in one case. In the remaining cases, no infectious, hemodynamic, and respiratory complications were observed. The duration of bed rest was 22 ± 4.2 days in the patients followed-up; while the duration of hospital stay was 24 ± 6.4 days.

Conclusions

The selected surgical tactics made it possible to reduce the number of somatic complications in multiple skeletal and vertebral injuries by 20%, and to reduce hospital stay to the terms of the healing of uncomplicated postoperative wounds.

SURGICAL TREATMENT OF LESIONS OF THE PROXIMAL FEMUR

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Summary

Fractures of the femoral neck are described in academic literature on the subject as a real epidemic: in 1990 about 1.3 million such fractures were recorded worldwide, and by 2050 this figure is expected to increase up to 4.5 million (K. Heithoff, 1990; Koval, K., 1994).

Lesions and diseases of the musculoskeletal system ranks second among the causes of temporary disability and third among the causes of disability and mortality of the population (N. Kornilov and K. Shapiro, 1993).

K. Koval and J. Zuckerman (1994) note that mortality among older people with hip fractures during the first year ranges from 14 to 36%. Moreover, patients with fractures of the femoral neck become disabled in 20–50% of cases. These facts show the enormous social significance of this problem.

The only modern well-reasoned and most efficient method of treatment of diseases and injuries of the hip joint is the total hip joint replacement. This surgical intervention relieves the patients from pain, claudication, false installations and shortening of the limb, and restores motions in the hip joint. Hip joint replacement is a surgical procedure whose aim is to return a mobile painless joint, which allows the patient to get back to normal.

Introduction

Surgical treatment of patients with lesion of the femoral neck and head should be used in accordance with strict indications, taking into account patient's performance status and age, degree of joint deformity, and the presence of concomitant diseases.

The fracture of the femoral neck is a lesion of the thinnest femur part that connects the bone shaft (diaphysis) with the bone head. The fracture of the femoral neck is 6% of all types of fractures. Statistics shows that most often the fracture is pathological, resulting from a minor injury in a person with **osteoporosis**. The pathology is most common among women after menopause. 90% of cases occur in people over 65 years. This type of lesion is characterized by the fact that the healing of fracture fragments is always bad, and it takes a long time (the reasons will be discussed below).

As the lesion in most cases occurs against the background of osteoporosis, a severe trauma is unnecessary to produce the fracture. A femoral neck fracture may occur when falling from one's own height, e.g. if a person slipped or stumbled when walking. The most severe complication of this fracture is **aseptic necrosis** of the femoral head: the femoral head is absorbed, and it leads to the need of prosthetic assistance.

The following are the factors predisposing to pathological fractures of the femoral neck in older age:

- Oncological diseases;
- Visual impairment;
- Sedentary lifestyle;
- Overweight;
- Malnutrition, fasting;
- Menopause in women;
- Nervous system diseases accompanied by motor disorders;
- Atherosclerosis, obliterating endarteritis and other vascular diseases.

Young people, whose bones have normal strength, need a strong, high-energy traumatic effect for this type of fracture to occur. The most common causes of femoral neck fractures at a young age are:

- Traffic accidents;
- Occupational injuries;
- Falls from a great height;
- Battle wounds in places of military conflicts.

A bone is able to live only when blood flows to it. The blood is supplied to the femoral head by the three main ways:

- * Vessels going to the bone through the joint capsule;
- * Vessels going inside the bone itself; and
- * Vessel passing inside the femoral head ligament. This vessel works well in young patients, but in adulthood, this blood vessel usually becomes thinner and closes.

In femoral neck fracture, the bone is damaged and the vessels are broken; and the bone fragment (the head and a part of the femoral neck), which is deprived of blood supply, may be absorbed and gradually disappears. This condition is called osteonecrosis or avascular necrosis of the femoral head and neck. Moreover, deprived of blood supply, the bone fragment of the femoral head and neck may not be healed, i.e. non-union of the fracture or a so-called false joint may appear. A non-union risk after the femoral neck fracture is especially high in older people: the vessel passing inside the ligament of the femoral head is closed in them. Older people with a fracture of the femoral neck or the femoral head suffer from lack of blood supply to the bone fragments, and the fracture cannot heal at all.

Due to the anatomical features described above, the femoral neck fractures usually heal poorly and the healing takes a long time, within a period of 6 to 8 months, with the patients immobilized and underactive for this time. It leads to high mortality from complications in the first year after injury or to disability. Therefore, surgical treatment should be carried out as soon as possible after the injury to early activate the patient and save his life.

Materials and methods

Over the past 1.5 years, 67 hip joint replacement operations were performed in traumatology department of Zaporozhye University Hospital of Urgent and Emergency Medical Aid. Among them: 48 women and 19 men aged 26 to 96 years. Patients were divided by age in the following way: 26-29 years - 2 patients, 30-39 years - 5 patients, 40-49 - 9 patients, 50-59 - 15 patients, 60-69 - 29 patients, 70 and older - 7 patients. Patients were operated for various types of coxarthrosis - 17, aseptic necrosis of the femoral head - 8, pseudarthrosis of the femoral neck - 6, medial fracture of the femoral neck - 34, chronic traumatic dislocation of the femur - 1, ankylosing spondyloarthritis (ankylosing spondylitis or Bekhterev's disease) - 1.

Their average implant service life is within a period of 15 to 20 years, while in many cases, patients use them for even 30 years. When the hip joint implant is worn out, it is replaced with a new one.

The hip joint replacement is an efficient radical treatment method for severe diseases and injuries of the hip joint. A differentiated approach to each case gives positive results.

Surgical treatment

In the total hip joint replacement, the damaged bone and cartilage are removed and replaced with implants. The damaged femoral head is removed and replaced with a metal rod that is placed in the

hollow center of the femur. A metal or ceramic ball is placed on the top of the rod. This ball replaces the injured femoral head. The damaged cartilage surface is removed and replaced with a metal one. Screws or cement are sometimes used to hold a structure in place. Plastic, ceramic or metal gaskets are inserted to ensure a smooth sliding surface.

Postoperative period

Antibiotics, painkillers, symptomatic treatment are administered in the postoperative period. An orthopedic pillow is placed between the legs, keeping the operated limb in the correct position. Activation in bed is allowed already on the 1st day after the surgery. From the second day, the patient may sit down in bed, begin static exercises for the muscles of the limb, and perform breathing exercises. Walking with a controlled load on the operated limb and additional support (crutches or other supporting device) is possible already on the 3^d day after the surgery.

Discharge from hospital

The patient is discharged from hospital in 10-12 days after the surgery. Rehabilitation activities should be continued; the patient must strictly follow recommendations of the surgeon who operated him. If necessary, the patient may be admitted to rehabilitation center for rehabilitation under the guidance of rehabilitation specialists. Limitations in physical activity on the operated limb should be observed within a period of 6 to 8 weeks after the surgery, with the use of an additional support recommended for this time.

Conclusions

Hip joint replacement is an accurate surgical procedure; its aim is to return a movable painless joint, which allows the patient to get back to normal. Due to the technical progress, brand new materials were obtained, which allows the replacement of an affected joint with an artificial one. Like a normal hip joint, an artificial one consists of a round head and a concave hollow in which the joint head rotates, allowing normal range of motion. For each case, an appropriate implant is selected.

ASSESSMENT OF REVISION INTERVENTIONS RISK AFTER THE HIP JOINT REPLACEMENT WITH ORTEN SYSTEMS IN GERIATRIC PATIENTS

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Introduction

Geriatric patients represent a group of higher risk of revision surgeries after the hip joint replacement because of comorbidities and osteoporosis, which requires the orthopedist to have a rational approach to choosing the implant design as well as the method of fixation that allows the best primary and long-term results. There is a need to systematize and analyze data on the incidence of revision surgeries after using various types of structures used for hip joint replacement in geriatric patients to improve clinical results and the quality of life of the patients.

Research objective: Improving the results of hip joint replacement in geriatric patients on the bases of the analysis of incidence of revisions of the structures implanted.

Materials and methods

The results of the use of various designs of the hip joint implants of the ORTEN system in 419 patients (312 women, 107 men; in total 462 implants) of a geriatric group, which were operated within a period from 2008 to 2015 in I.I. Mechnikov implantation assistance regional university hospital, Dnepropetrovsk. The total hip joint replacement was performed. The average age of patients in the group was 68.8 ± 6.94 years (age range of 60 to 94 years). The following groups were selected in accordance with the WHO age range: the group of middle-aged patients (60-75 years); the group of elderly patients (75-90 years); and the group of long-livers (more than 90 years). The incidence of revision surgeries because of the structures to implant and their survival were analyzed as per the Kaplan-Meier method in 3 and 5 years after the primary surgery separately for each age group, taking into account the implant type and the method of its fixation.

Results

The results of hip joint replacement in the middle-aged group

The middle-aged group included 379 clinical cases of hip joint replacements (in 111 men and in 268 women). The total cementless hip joint replacement prevailed - 79.8% (302 joints). The proportion of screwed in acetabular components was 80.9%. The total hybrid hip joint replacement involved implantation of a combination of structures: Cementless screw-in cup / cemented conical stem (23 joints), cementless screw-in cup / cemented stem with metaphyseal-diaphyseal fixation (6 joints) and cemented cup / cementless stem with metaphyseal fixation (1 joint).

Table 1

Incidence of revision surgeries for implant structures in the middle-age group

Type of implant design	Incidence of revisions, a 3-year follow-up (%)	Incidence of revisions, a 5-year follow-up (%)
Total cementless implants (302)	2.8 ± 0.04	3.1 ± 0.06
Total cemented implants (58)	6.9 ± 2.03	11 ± 2.15
Total hybrid implants (31)	4.7 ± 2.71	7.3 ± 2.89
Unipolar implants (1)	0	0

Excellent and good survival rate of all types of the implants was noted in this age group. In the subgroup of cemented structures, a sharp drop in their survival rate (about 7%) in 3 years after the primary total hip joint replacement was revealed, mainly due to the instability of the acetabular component. Revision surgeries in the hybrid implant subgroup are mainly associated with the aseptic instability of the cemented fixation stem, which correlates with the survival rates of the cemented implant group.

The results of hip joint replacement in the elderly subgroup

The group of elderly age (75-90 years) included 80 clinical cases of hip joint replacement (in 21 men and 59 women). The prevalent nosology in this group of patients was a closed medial femoral neck fracture - 51.3% (41 joints).

Table 2

Survival of implant structures in the elderly group

Type of implant design	Incidence of revisions, a 3-year follow-up (%)	Incidence of revisions, a 5-year follow-up (%)
Total cementless implants (49)	1.3 ± 1.6	2.7 ± 2.3
Total Cemented implants (16)	7 ± 6.4	8.9 ± 7.1
Total hybrid implants (4)	$4,3 \pm 10,1$	$7,9 \pm 13,5$
Unipolar implants (11)	$0,8 \pm 2,7$	$0,8 \pm 2,7$

The survival rates in each subgroup are comparable to those of middle-aged patients ($p > 0.05$). The similar trend of an increasing number of revision surgeries in the subgroups of cemented and hybrid fixation implants is observed. The best performances were demonstrated by unipolar implants, which is caused both by technological advantages and the specific character of the cohort of patients.

The results of hip joint replacement in the group of long-livers

The group of long-livers included 3 patients (2 men and 1 woman) aged 94 to 95 years, which underwent 3 primary surgeries. Unipolar hip joint replacement was performed in all the cases for a closed medial femoral neck fracture. In 3 and 5 years after the primary intervention, 2 patients remained under follow-up without clinical symptoms requiring revision surgery. The results obtained are comparable with those obtained for unipolar hip joint replacement of other age groups, which supports the opinion of the majority of researchers concerning the feasibility of this type of intervention among seniors and long-livers because of technological advantages, reduction of the risk of postoperative complications, reduction of revision surgeries and improvement of the quality of life.

Conclusions

Analysis of the results of hip joint replacement with the ORTEN systems in the geriatric group of patients made it possible to assess the risk of revision surgery depending on the type of construction, method of fixation, and the age of patients. Excellent and good results of 3- and 5-year survival of all types of implants were found. Total cementless fixation implants and unipolar implants demonstrated the best survival in middle-aged and elderly patients. Cemented and hybrid fixation implants showed an increase in the number of revision surgeries in 3 years after the initial surgery. The ORTEN screw-in cups provide more reliable anchoring stability and survival of endoprostheses in conditions of osteopenia and osteoporosis. The ORTEN stems with the metaphyseal-diaphyseal fixation type provide sufficient long-term rigid fixation of the implant, which allows an early full load on the limb operated. One-piece unipolar hip joint implants have a removable head and a double sphere of rotation; they should be in the orthopedic surgeon's arsenal for total hip joint replacement in patients with a severe concomitant disease as the implants can reduce the surgery time and surgical injury. The results obtained make it possible to objectify the choice of the implant design for hip joint replacement in patients of older age groups.

ASSESSMENT OF THE RESULTS OF SURGICAL TREATMENT OF INTRA-ARTICULAR FRACTURES OF THE DISTAL META-EPIPHYSIS OF THE HUMERUS

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Introduction

Treatment of fractures of the distal meta-epiphysis fractures of the humerus is an urgent problem of traumatology, which is caused by the severity of the injury, possible consequences, and a rather high incidence. According to academic literature on the subject, the incidence of humeral condyle

fractures is within the range of 0.7 to 2.5% of all injuries of the musculoskeletal system and up to 15% of all humeral fractures. Non-union is noted in 2% of the cases followed up. Moreover, the number of unsatisfactory treatment outcomes remains significant, especially when it comes to intra-articular fractures (B and C types according to AO classification). Surgical methods dominate in the treatment of patients of this group. Currently, the most common surgical method is extracortical osteosynthesis with various types of fixtures.

Research objective: Evaluating the results of surgical treatment of intra-articular fractures of the distal meta-epiphysis of the humerus.

Materials and methods

We studied the immediate results of treatment of 37 patients with intra-articular distal metaphyseal humeral fractures (C type as per AO classification). Osteosynthesis with conventional reconstructive plates was performed in 16 patients in the first group. In the second group, 21 patients underwent internal osteosynthesis with previously bent medial and lateral condylar plates with angular stability of the screws. Dorsal access was performed with the chevron osteotomy of the olecranon process was performed in 31 patients (83.8%); Bryan-Morrey access was performed in 6 cases (16.2%). In the postoperative period, local compression hypothermia of the operated segment was performed. Controlled early passive motions in the elbow joint began once the acute postoperative pain was relieved; further clinical and X-ray examinations were performed in 4, 8, and 12 weeks and in 6 and 12 months after the surgery. The functional result was evaluated by using the Mayo Elbow Performance Score (MEPS) system.

Research findings and discussion

In the first group, the following complications were noted: loss of reposition in 2 cases (12.5%), non-union of the fracture in 1 case (6.25%), infection of the surgical area in 1 case (6.25%), and neuropathy of the ulnar nerve in 1 case (6.25%). In the second group, the following complications were noted: nonunion of the fracture in 1 case (4.8%) and neuropathy of the ulnar nerve in 1 case (4.8%).

Functional results were reliably better in patients of the second group. The average range of flexion / extension (range of motion, ROM) in the elbow joint in the first group was 108 degrees and 126 degrees in the second group. The average value of the results as per Mayo Elbow Performance Score (MEPS) 83.6 scores in the first group and 89.5 scores in the second group.

Conclusion

Evaluation of the results of surgical treatment of patients with fractures of the distal meta-epiphysis of the humerus by means of internal osteosynthesis with previously bent external plates with angular stability of the screws showed a high efficiency of the method, and the method may be the method of choice in the surgical treatment of C type fractures.

COMPARISON OF THE RESULTS OF SURGICAL TREATMENT OF LESIONS OF THE TIBIOFIBULAR SYNDESMOSIS IN ANKLE FRACTURES

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Research objective: Comparing the results of surgical treatment of injuries of the tibiofibular

syndesmosis in case of ankle fractures.

Materials and methods

The results of surgical treatment of the ankle fractures complicated by a lesion of tibiofibular syndesmosis were studied in 80 patients, with 56 patients having B type fractures and 24 patients having C type fractures as per AO / ASIF classification. All the patients underwent surgical treatment: osteosynthesis of ankle fractures and fixation of the intetibial syndemosis. The first group patients underwent treatment as per the AO technique with fixation of the syndemosis with a positional screw. The second group patients underwent a surgical treatment as per the method developed by using the original external bone fixation blocked plates and the fixation of syndesmosis with tight loops. The treatment results were evaluated in 3, 6, and 12 months after the surgery as per the AOFAS and Olerud-Molander scores.

Moreover, the basometric control of the restoration of the lower extremities supporting ability was carried out with Bazometer software-hardware complex developed by Ukrainian Scientific Research Institute for Prosthetic Assistance, Prosthetic Device Development and Vocational Rehabilitation, Kharkov, Ukraine

Research findings and discussion

In 3 months, the average values as per the AOFAS score were better in patients who had dynamic fixation of the syndesmosis with a tight loop than in pateints who had fixation of the syndesmosis with a screw, both in B type fractures and in C type fractures. Indicators remained reliably better in the group with the fixation with a tight loop, and when measured in 6 and 12 months after the surgery, although with a slightly smaller difference in average values. The average values on the Olerud-Molander score were also better in the group where the dynamic fixation of syndesmosis was performed using a tight loop.

The average values of the factor of supporting ability of an affected limb and the rotation of the centers of gravity remained reliably better in the group with the fixation with a the tight loop ($p \leq 0.05$) in 3 months and when subsequently measured in 6 and 12 months, albeit with a slightly smaller difference in average values. The average values of the supporting ability of an affected limb, in case of fixation with a tight loop, remained reliably better than in the group with fixation by the AO methodology.

The following complications were observed in patients of the first group: migration of the position screw in 1 case (2.38%), secondary displacement of the bone fragments in 1 case (2.38%), and fracture of trhe position screw in 2 cases (4.76%). In the second group, a local inflammation in the projection of the oval plate of the tight loop was observed in 1 case (2.63%), which did not require a surgical intervention.

Conclusions

Comparison of the results of using a position screw or tight loops to fix the tibiofibular syndesmosis in surgical treatment of ankle fractures made it possible to conclude that the use of dynamic fixation of syndesmosis by tight loops had advantages over fixation with a position screw, which is confirmed by the estimation of generally accepted scores and the data of the basometric and stabilometric researches. At the same time, the greatest difference between the two methods of

fixation of syndesmosis is observed in the earlier period (within 3 months); further, by 12 months, the difference between the clinical and hardware evaluation in both groups was less pronounced. The use of tight loops to fix syndesmosis does not require additional surgical intervention and is characterized by a minimal number of complications.

HIP JOINT ARTHROSCOPY AS THE MODERN METHOD OF MINIMAL INVASIVE TREATMENT OF LESIONS OF THE ACETABULAR RIM

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Injuries of the acetabular rim are among the most common causes of the syndrome of inguinal pain; their incidence is within the range of 18 to 24% of all inguinal pain cases (Byrd). The most common causes of injuries of the acetabular rim are injuries, hypermobility exercises, femoroacetabular conflict, and degenerative lesions. The acetabular rim rupture type is classified in the following way according to M. Phillipon: radial, transverse, longitudinal, tongue-like ruptures, as well as hypermobility of the acetabular rim, with the radial rupture being the most often, which usually has a degenerative nature. At the same time, McCarthy divided injuries of the acetabular rim in accordance with an arthroscopic picture into the following stages:

Stage 0: Contusion of the acetabular rim without a lesion of the articular cartilage;

Stage 1: Simple local rupture of the acetabular rim with an intact articular cartilage.

Stage 2: Rupture of the acetabular rim with a local defect of the articular cartilage of the femoral head;

Stage 3: Rupture of the acetabular rim with a local defect of the articular cartilage of the acetabulum;

Stage 4: Massive rupture of the acetabular rim with a lesion of the articular cartilage of the acetabulum and the femoral head.

86 arthroscopic interventions were performed for patients with injuries of the acetabular rim in Clinic of Sports and Ballet Trauma of the Institute of Traumatology and Orthopedics under the National Academy of Medical Sciences of Ukraine for the period from 2010 to 2016; the treatment tactics depended on the type and location of the acetabular rim rupture. Thus, in radial, transverse, and degenerative ruptures, the affected portion of the acetabular rim was partially resected, while in case of rim hypermobility, as well as in case of rim longitudinal rupture, the red zone was sutured and refixation with anchor fixtures was performed. In case of injuries of the acetabular rim combined with lesion of the articular cartilage (Stage 2-4 as per McCarthy), surgical debridement was performed or osteoperforation of the defect zone of the articular cartilage depending on the depth of the injury; and in case of a femoroacetabular conflict, resection of osteophytes of the acetabulum or the femoral head was also performed.

In case of a combination of lesion of the acetabular rim with a femoroacetabular conflict, resection of osteophytes of the acetabulum or the femoral head was performed.

The results of arthroscopic treatment were evaluated in 6 months after the surgical treatment, with excellent and good results recorded in 74% of patients, satisfactory results recorded in 21% of patients, and unsatisfactory results recorded in 5% of patients who had a concomitant total defect of the articular cartilage of the femoral head and/or the acetabulum in addition to injuries of the acetabular rim. Those patients underwent the total hip joint replacement.

TREATMENT OF INJURIES OF TALOCRURAL JOINT IN ATHLETES

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Introduction

The term "injury of athlete" is quite young. This kind of injury began to be distinguished among other types of injuries about 30 years ago, which was due to the great popularization of sports and an increase in the intensity of loads, which was an unconditional cause of an increase in the number of injuries. The talocrural joint injury ranks first in the prevalence in all sports, and it ranks second after knee injury in terms of anatomical localization. The existing International Classification of Diseases (ICD-10) does not reflect all nosological forms of the pathology of the talocrural joints.

Research objective: Establishing nosological forms and diagnostic criteria of injuries of the talocrural joint in athletes, and analyzing the early results of treatment.

Materials and methods

Clinical follow-up of 44 patients who were on treatment from 2014 to 2015

The criteria for selecting patients were pain in the talocrural joint area in the patients who practiced jogging or jumping loads in their history, and the presence/absence of acute injury. The following indicators were clinically determined: range of motions, localization of pain when walking, when palpated, and in stresses, presence of instability. The study did not include patients with fractures of the talocrural joint bones. Instrumental examination methods: X-ray, MRI, CT, ultrasound. Treatment in all patients was conservative / rehabilitation and in 19 (43.2%) patients treatment was surgical. A functional result was established in 3, 6, and 12 months after treatment by means the AOFAS score.

Research findings

X-ray was performed in two standard views in the group of patients, as well as ultrasound examination. Of the additional survey methods, MRI and CT were used as additional diagnostic methods. After the medical assessment, the following nosological diagnostic units were established: lesions of the lateral ligament group of the talocrural joint (ATFL, PTFL, CFL); lesions of the Achilles tendon, tendons of the short tibial muscle; lesion of distal tibiofibular syndesmosis (DTFS), anterior and posterior talocrural joint impingement; chondral / osteochondral lesion of the tibia and talar bones, retro- and preachilar bursitis, chondromalacia of the talocrural joint. In terms of the lesion duration in patients, the lesions were divided into acute - 13 (29.5%), subacute - 7 (15.9%) and chronic - 24 (54.5%).

In the group followed up, there were 6 patients with an ankylosing spondylitis; in 5 of them, the ankylosing spondylitis developed against the background of a chronic overload. According to ultrasound examination and MRI data, the changes of the tendon and a so-called insertionitis were detected, which in the vast majority are associated with Haglund's deformity, retro-and pre-Achilles

bursitis. It was established that ultrasound examination and MRI make it possible to see the structure of the tendon and the presence / absence of blood flow in it.

Lesions of the lateral group of ligaments of the talocrural joint (ATFL, PTFL, CFL) were divided into three stages: distortion, partial and complete tears, which correspond to Stages I, II, and III of the lesion of the ligament. There were 16 patients in the group followed up: 6 patients had distortion, 8 patients had a partial tear, and 2 patients had a complete tear. The latter had a combined injury of the distal tibiofibular syndesmosis (DTFS).

The tendons of peroneus muscles can have both inflammatory changes and lesions of epy structure of tendons or tendon holders. MRI diagnostics allows visualization of pathological changes of the tendon; it is especially valuable in case of subluxation or longitudinal rupture of the tendon. 4 patients were treated: tenosynovitis was in 2 patients, a longitudinal rupture was in 1 patient, and a rupture of the holder of tendons with their dislocation was in 1 patient.

Traumatic cartilage defects arise as a complication in case of lesion of the lateral ligaments of the talocrural joint; this defect arises in connection with the injury mechanism, i.e. plantar flexion and foot inversion. At the total rupture of the anterior talofibular ligament or in a combination with a lesion of the syndesmosis or the calcaneofibular ligament, the talar bone block rotates inside the tibia and fibula fork, which leads to a characteristic cartilage lesion of the talocrural joint. In the group followed up, there were 11 patients: 3 patients had chondral talar bone injury, 1 patient had osteochondral injury of the tibia, and 3 patients had chondral injury of the tibia, with subchondral cyst formed in 4 patients. The latter had injuries of the same area in their medical history within a period of 1 to 3 years (~ 1.8 years).

A relatively new nosological unit, the anterior or posterior tibiotalar conflict, is manifested by hyperplasia of the synovial membrane of the articular capsule, formation of an osteophyte on the talar or tibial bone, or by a combination of both pathological changes. The following causes are distinguished in terms of the etiology: chronic prolapse of the joint capsule and chronic joint injury. In the group followed up, there were 5 patients with anterior and 2 patients with posterior impingement of the talocrural joint.

Free chondromal bodies were detected in 1 patient, the clinical presentation was characteristic for degenerative changes in combination with the locking of the talocrural joint. Retrocalcaneal bursitis and pre-Achilles bursitis were observed in 5 patients. When carrying out instrumental studies, degenerative changes in the Achilles tendon and Haglund's deformities were diagnosed along with bursitis.

The following methods of conservative treatment were used: Non-steroidal anti-inflammatory drugs (NSAIDs) were used locally and per os; immobilization; taping; elastic fixation with orthosis; physiotherapy; and electrical procedures (magnetic therapy, pretherapy, laser therapy, electrotherapy, and ultrasound therapy), autologous plasma rich in growth factors (PRGF), and rehabilitation treatment. It should be noted that the PRGF treatment was administered along with other methods of conservative and operative treatment in 24 patients (54.5%), which made it possible to improve the functional results in all the cases.

In operative treatment, open and arthroscopic accesses were used. The open surgical intervention was used in case of Achilles tendon rupture (6), longitudinal injury of the tendon of the short

peroneal muscle (1), dislocation of the tendons of peroneal muscles (1), injury of the anterior talofibular ligament (1), and removal of pre- and retrocalcaneal bursas (1).

Arthroscopic intervention was used in patients with cartilage defect (3), loose chondroma joint bodies (1), anterior and posterior talotibial conflict (5).

The functional result on the AOFAS score changed towards the mean increase in the whole group from 35.6 scores prior to the treatment ($p \leq 0.1$) to 69.7 scores in 3 months, 82.3 scores in 6 months ($p \leq 0.1$), and 89.2 points in 12 months after the treatment.

Conclusions

The follow up of 44 patients with talocrural joint pathologies, which were etiologically associated with sports trauma, distinguished some nosological units. The integrated treatment was carried out; vectors of further research and methodology of therapeutic protocols were established.

The treatment protocol of the talocrural joint pathology included the autologous plasma rich in growth factors (PRGF) for the first time. Classification of the anterior and posterior impingement as a separate nosological unit makes it possible to administer an etiotropic treatment, which gives a more stable functional and therapeutic effect. Using PRGF showed the best effect in patients with degenerative changes in the Achilles and peroneal tendons, as well as in traumatic defects of the cartilage of the talocrural joint.

EARLY DIAGNOSTICS OF COMPLEX REGIONAL PAIN SYNDROME OF TYPE I IN FRACTURES OF ANKLES AND FOOT BONES

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Relevance

Complex regional pain syndrome Type I (CRPS I, Sudek neurodystrophic syndrome) is a set of conditions accompanied by a persistent regional pain (spontaneous and / or triggered); it is unbalanced in terms of time and degree with respect to the normal course of the post-traumatic period or other injury; it does not correspond to zones of innervation of certain nerves or nerve roots, dermatoms; it is not associated with injury of large nerves; and it manifests itself, as a rule, in the distal limb parts as sensory, motor, sudomotor, vasomotor and / or trophic disorders. Over time, the syndrome can vary progressively. Fractures are most common reason for the development of CRPS (M. Z. Kiralp *et al.*, 2009). The development of CRPS I after fractures may resemble a variant of the normal course of the posttraumatic process, and only the duration of the persistence of symptoms indicates the development of CRPS I. Therefore, early detection of CRPS symptoms is of critical importance. The detection of early symptoms of CRPS I is a complicated problem. This complexity is proportional to the severity of the trauma causing the disease: the development of symptoms of CRPS after minor injuries is noticeable much better. Numerous proposed criteria of

CRPS I (IASP, Bruhl, Atkins, Velman, etc.) rarely makes it possible to diagnose an early stage of the disease. At the same time, there is a direct correlation between the early beginning of treatment and its efficacy (Shaikh M. F., Shenker N. G., 2010, S. M. Maillard et al. (2004).

Research objective: Detecting early signs of CRPS I in fractures of the ankles and/or bones of the foot.

Materials and methods

We assessed and analyzed the results of the assessments of 46 patients with early CRPS after closed fractures of the ankle and / or foot bones. We identified a group of the most specific symptoms that allow differential diagnostics between the development of CRPS I and the normal course of the post-traumatic period. The presence of symptoms was evaluated in patients with these injuries within a period of 4 weeks.

Research findings and discussion

The symptoms of the disease and its incidence were distributed as follows. The absence of positive dynamics of the pain syndrome or an increase in the intensity of pain over time was observed in 39.13% of cases as per VAS and in 47.83% of cases as per the McGill pain score; thermal asymmetry of more than 1°C within a period more than 7 days after the injury in 69.57% of cases; the progression of thermal asymmetry in 34.78% of cases. Moreover, a decrease in temperature of the injured limb (compared with the healthy one) is a more specific, however, a more rare, symptom. Detection of hypothermia usually clearly indicates CRPS, but the cold form is only 10% of all CRPS cases. An increase in edema or absence of its positive dynamics in 7 days after the injury occurred in 86.96% of patients. This symptom, on the one hand, is rather specific and sensitive, and, on the other hand, it depends a lot on other factors, in particular, on an increase in the activity of the patient with crutches and a shorter duration of holding the injured limb in an elevated position. This fact reduces the specificity of this symptom. Changes in the limb color are observed in 91.30% of patients at early stages, however, they are often associated with the stage of the development of subcutaneous hematoma, and therefore require more precise wording for early use. The specificity of this symptom increases at later stages of the disease. Enhanced sweating is a rather specific symptom, however, only 26.09% of patients see this symptom at the onset of the disease, but over time this percentage increases. Sensory disturbances (hyperalgesia, hyperpathy, allodynia, hypoesthesia, etc.) occur in 71.74% of cases (however, in most cases, they require detailed examination to find them), often it is related with a partial release of the injured limb from the bandage (it may require to change a circular immobilization dressing to a splint). Reduction of the muscular strength of the bad limb and the loss of the range of active and passive motions do not have a diagnostic value in the early post-traumatic period after fractures of the bone of the foot or the tibia because they can not be adequately investigated.

Early spotted osteoporosis developing within a aperiod of 4 weeks after the injury, was observed on X-ray patterns at 36.96% of cases; the incidence of this symptom increased over time, however, its specificity decreased as this phenomenon may develop as a consequence of trophic disorders in bone tissue as a result of a prolonged immobilization, and in patients without development of clinical signs of CRPS I with a long enough immobilization. Symptoms of dissociation of the bad limb were observed in 17.39% of patients.

Even in 8 weeks after the fracture, many symptoms occur in patients with normal post-traumatic period and in patients with CRPS I with a similar frequency, which complicates the differential diagnosis. Therefore, for many symptoms, we propose to determine not only the presence of them, but to study their dynamics and certain properties. In particular, the properties of edema in a part of patients with CRPS I differ from edema in the post-traumatic period.

The most common symptom of CRPS I after the fractures of the ankle and / or the foot bones are increasing edema or lack of positive edema dynamics in 7 days after the injury (however, it is impossible to differentiate the development of CRPS at early stage for these symptoms in the case of fractures of the legs and / or foot bones) and sensory disturbances, and the most specific were sensory disorders, progression of pain syndrome over time, hypothermia of the injured limb and early spotted osteoporosis. The detection of subclinical symptoms may be facilitated by the use of thermography, X-ray and quantitative assessment of sensitivity. Some symptoms of CRPS I are observed only at certain hours of the day in some patients, so clinical examination is carried out several times a day in case of need. Particular attention should be paid to the detailed study of various types of sensitivity. In case of lack of objective data for the diagnosis of CRPS, however, in the presence of appropriate complaints or suspicion of CRPS, it is advisable to apply additional research methods. Apart from the local studies conducted, it is necessary to evaluate the degree of dissociation of the bad limb and central disorders.

Conclusion

Complex regional pain syndrome Type I (CRPS) is a disease with a complex pathogenesis. Therefore, the modern approach to the diagnosis of this disorder is both in its early detection and in the identification of the leading elements of the pathogenesis in a particular patient for a differential treatment. Evaluation of the dynamics, severity and time when some symptoms appear is also needed to determine the relevance and choice of the optimal method of their treatment.

**ENVIRONMENTAL AND HEALTH PROBLEMS IN ZAPOROZHYE REGION:
WHO WILL SOLVE THEM AND AND HOW**
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Introduction

Highlighting environmental problems is associated with a dramatical increase in a mutual negative impact of human and the environment, and negative consequences of scientific and technological progress. The relevance and the multifaceted aspect of the problem, which is caused by the exacerbation of the global environmental situation, are also characteristic for the city of Zaporozhyye as more than 160 large industrial facilities work in Zaporozhyye Region. Zaporozhyye Region is among the most loaded areas in terms of industrial potential due to a high concentration of steelworks and smelters, heat and power facilities, nuclear power plants, chemistry plants and engineering industries.

Research objective: Showing the structure of environment-associated morbidity of the population and possible ways of preventing diseases (on the bases of the statistical analysis of the environment status of Zaporozhye Region and medical documentation).

Materials and methods

We analyzed the state of public health on the bases of statistical data provided by the Regional Sanitary Epidemiological Station, as well as on studies carried out by the Chairs of General Hygiene and Social Hygiene of Zaporozhye State Medical University under Zaporozhye Department of Healthcare. 350 tons of pollutants are released into the atmosphere of Zaporozhye Region, with 230 tons emitted by stationary / local sources and 20 tons emitted by the road transport sector annually. In total, 631 tons of harmful particles are thrown into the air in Zaporozhye Region annually. Emissions increase at a rate of 2-2.5% per year. Thus, in 2015, about 260 thousand tons of pollutants were emitted into the air by stationary sources of pollution. In 2006, pollutant emission was 9.6 tons per square kilometer and 205.9 kg per capita in the region. The most unfavorable effects on the internal organs and systems are as follows:

- Respiratory organs (hazard quotient, HQ) due to copper and its compounds, chromium and its compounds, and formaldehyde;
- CNS due to sulfate acid, nickel and its compounds;
- Blood due to nickel and its compounds, and lead and its compounds.
- The immune system due to benzaperin, benzene and toluene.

The morbidity structure as per the systems (in descending order): diseases of the cardiovascular system (29.6%); diseases of the respiratory system (22.6%); diseases of the digestive system (7.4%); injuries and poisoning (3.2%); endocrine system diseases (2.5%).

Conclusions

The environmental and economic problem in Zaporozhye Region is obvious and the state of public health depends on its solution. The solution of this problem depends primarily on the solution of organizational issues aimed at improving the legislative and regulatory framework for payment of damages caused to the state as a result of excessive emissions of harmful substances into the atmosphere. The city and the region authorities should develop methods of economic viability of payment for enterprises for harmful emissions into the atmosphere, which are the source of diseases of the population of the region.

STAGES OF RENDERING MEDICAL ASSISTANCE WITH ELEMENTS OF PRIMARY REHABILITATION FOR INJURED PERSONS WITH POLITRAUMA

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Introduction

Assistance to injured persons with polytrauma is provided at 4 stages: pre-hospital, intensive care, clinical and rehabilitation. The composition of the injured persons differs significantly at each stage by the nature of the prevailing injuries, the severity of patient's condition, complications, tactics and methods of treatment.

At the prehospital stage, about 20 to 25% of the total number of the injured persons die, and 20% die in the intensive care unit; so only 55 to 60% of those who were injured are left by the time of transferring them to a relevant clinical department. This fact must be taken into account: polytrauma should be considered not in general but it should be considered specifically at each stage of assistance. Meanwhile, the health care institutions, which selectively transfer the patients survived after polytrauma from other hospitals for rehabilitation, are not competent to give any recommendations.

Research objective: Showing the terms and methods of providing effective medical care to persons with polytrauma at the pre-hospita stage and in hospital settings.

Materials and methods

We analyzed medical histories of 731 patients treated in Regional Clinical Hospital for the period from 2010 to 2015. The patients had multiple, concomitant, and combined injuries (polytrauma). The staged medical assistance, time frames, amount of medical assistance, and outcomes were analyzed.

Stages of treatment of concomitant injuries:

- Pre-hospital (duration: 2 hours; mortality: 20%)
- Resuscitation (duration: 3 days; mortality: 20%)
- Clinical (in specialized clinic) (duration: 26 days; mortality: 2%);
- Rehabilitation (duration: 6-8 months; mortality: 0%).

We noted that the pre-hospital stage, along with the resuscitation stage, determined the immediate outcome of concomitant injuries. At the pre-hospital stage, we meet with such patients and with such conditions and complications, which in the final stages can be observed only as casuistry. These include the following:

In some cases, the emergency physician finds the injured person at a so-called “**golden hour**”, i.e. in the period of a relative compensation, when an active internal bleeding is present; the blood loss, however, does not exceed 700-1,000 mL, and the blood pressure remains normal. Similarly, the “golden hour” in a closed cranio-cerebral injury may also be a bright period when the injured patient is conscious. Within this period, bleeding from the cerebral vessels has just begun, and intracranial and intracerebral hematomas are not yet large and do not squeeze the brain. Asphyxia due to airway obstruction, bradypnea and apnea are observed more often at the resuscitation stage. Airway obstruction occurs as a result of regurgitation and aspiration of gastric contents, blood aspiration in a basilar skull fracture, foreign bodies (dentures) in the sub-pharyngeal space and trachea, retraction of the tongue impaction. Severe maxillofacial trauma may also cause asphyxia. Bradypnea and apnea are observed in severe cranio-cerebral injury with injury of the lower portion of the brain stem and high spinal cord injuries. They may also occur in shock of grade III-IV. Severe maxillofacial trauma may also cause asphyxia. Bradypnea and apnea are observed in severe

cranio-cerebral injury with injury of the lower portion of the brain stem and high spinal cord injuries. They may also occur in shock of grade III-IV.

A high dynamics of all the processes is observed at the pre-hospital stage. The condition of the injured person may deteriorate at any time, and at the same time, a competent assistance may quickly stabilize the injured person.

Resuscitation stage

The injured persons who are in the intensive care unit have a number of syndromes which have a significant impact of the immediate and long-term outcome. These symptoms include hemorrhagic shock, respiratory failure of central genesis due to a cranio-cerebral injury and/or an injury of the respiratory apparatus in case of a chest injury, failed oxygen transport function of the blood due to hypoproteinemia and anemia, adult respiratory distress syndrome (ARDS), disseminated intravascular coagulation (DIC), multiple organ failure and reduced immunity.

36.4% of those with concomitant injury died within the first 3 days after the injury. The main cause of death at the first day was acute blood loss (73.7%): 64.5% of these patients died in the first 3 hours, including 21.5% died within the first hour after admission. As for the localization of the main source of bleeding, the injured persons were distributed in the following way: trauma of the musculoskeletal system - 31% (traumatic amputations, fractures of the pelvis, multiple fractures of the lower extremities), closed chest injuries - 27% (large hemothorax, often bilateral, due to multiple fractures of the ribs with lesion of the intervertebral arteries), closed injury of the abdomen (hemoperitoneum due to ruptures of the liver and spleen) - 15%, combination of closed injuries of the abdomen and closed injuries of the chest -27%. None of the patients who died within a period of 1 hour after admission to the intensive care unit were operated on; 22% of those who died in a period of 1 to 3 hours were operated on; 18% of those who died were operated on within a period of 3 to 12 hours; and 14% of those who died were operated on within a period of 12 to 24 hours. The rest of the injured persons (to whom the operation was indicated) were operated on within a period of more than 1 day after the injury. This is explained, on the one hand, by the relatively fast internal blood loss rate (20-30 mL/min), on the other hand, by the difficulties of diagnostics of the injuries requiring an urgent surgery, and on another hand, by a significant exsanguination of the injured persons in the pre-hospital stage when they were admitted to the intensive care unit later than 1 hour after the injury

A number of factors do not make it possible to provide surgical treatment earlier after the injury. Formalization of patient's admission documents and diagnostic measures take about 1 hour, therefore, with few exceptions, operations to stop intra-abdominal bleeding were performed within more a period more than 2 hours after the injury. It creates strong imperatives to develop a new treatment for severely injured people in the acute period, which would allow us to achieve a temporary stop of intra-abdominal bleeding and bleeding into the adipose tissue and muscles of the pelvis and lower extremities; to stabilize hemodynamic indicators at a satisfactory level for a time sufficient for a full examination of the injured person in hospital setting; to administer an emergency infusion and transfusion therapy; and to prepare for the provision of a specialized medical care using the diagnostic equipment used in modern medicine.

Conclusions

Arranging a round-the-clock anti-shock center within the structure of the reception and diagnostic department of a multidisciplinary hospital, with the intensive care unit, X-ray examination,

ultrasound, CT, MRI, angiography, endoscopy, and diagnostic laboratories located in one block, will reduce mortality in the injured persons with polytrauma by 15.7%.

The injured person should be transferred from unspecialized hospitals to regional multidisciplinary hospital for early specialized care as early as possible, provided the elimination of the life-threatening consequences of the injury; the transfer terms depend on the dominant injury syndrome; compliance with the terms and conditions of the transfer contributes to a decrease in mortality by 19.9%.

The diagnostic and treatment tactics in the injured persons with severe and extremely severe dominating injuries is underlain by scientifically grounded principles and algorithms of actions.

ROLE OF LOGISTICAL, SCIENTIFIC, AND PEDAGOGICAL SUPPORT IN TRAINING FAMILY PHYSICIANS

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Research objective: Substantiating the role and importance of the logistics base and scientific and pedagogical support in the preparation of family physicians.

Introduction

Specialized medical care acquired a priority development in the structure of the out-patient hospital services over the past few decades, which hindered the development of primary health care (PHC) to a certain extent, especially at the level of arrangement of work of the district primary-care physicians. As a result, the transfer to the competence of other specialists gradually took place.

Gradually the conviction emerged that the visit to a district primary-care physician was not always efficient, but the visit to a highly specialized doctor, a so called "narrow" specialist, did not get regularity and prevalence, and became sporadic.

No comprehensive, universal, and ideal system of doctor's training has been established yet in the world, both for graduate and for postgraduate students. Family medicine, as a specialty, was recognized in Ukraine in the early 90s. Significant progress in the field of medicine was achieved through the deepening of scientific knowledge and the specialization of practical medicine.

In that regard, there was a need in the formation of a brand new scheme to provide primary health care (PHC) services to the population, and formation a brand new specialist, a general practitioner or a family doctor, whose authority would be to resolve the majority of medical issues along with the provision of qualified recommendations on social, legal, preventive, and rehabilitation assistance. The family doctor should use the knowledge he has acquired over the years of studying at medical university, internship, and medical residence in highly specialized medical institutions more often than other specialists.

Materials and methods

We analyzed the questionnaires (116) and abstracts (90) written by students of the graduation course, internship doctors, and medical residents of departments of Zaporozhye Medical Academy of Postgraduate Education of the Ministry of Healthcare of Ukraine and Zaporozhye Medical University. The main issues in the questionnaires and abstracts were as follows:

1. Prospects for the development of family medicine in Ukraine;
2. Problems in the preparation of family doctors;
3. Are family doctor carrier prospects attractive for you?

The research used passports data obtained from the Regional University Hospital and data on hospital staff, the number of the hospital departments and their equipment, the number of Medical University chairs that prepare students to be future family physicians. The research characterises the clinical base of the chairs of Zaporozhye Medical Academy of Postgraduate Education and Zaporozhye Medical University, logistical support and staffing of university chairs and hospital departments, and the relationship between the staff of the higher medical education establishments and doctors of the Department of Healthcare. The research included comments of students, internship doctors, and medical residents about professional competence of teachers and chiefs of practical health care institutions.

Conclusions

The physician of the future must be trained both at the university hospital bases with modern logistical support and by specialists of the highest professional category. Only extensive and deep knowledge of modern methods of diagnostics and treatment are the fundamental factors underlying the preparation of modern physicians.

Mutual understanding and cooperation between chiefs of practical medical facilities and the directors of higher medical education establishments are required.

SOME DIFFERENCES IN PROPERTIES OF PLATELET RICH PLASMA AND PLATELET RICH FIBRIN. PARTICULARITIES OF THEIR CLINICAL APPLICATION

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Since the establishment of the role of autologous platelets in post-traumatic reparation processes, an intensive scientific search has been conducted worldwide in the field of the use of autologous platelet growth factors in diseases and lesions of the musculoskeletal system. Platelet Rich Plasma (PRP) is an autogenous source of growth factors obtained as a result of the separation of whole blood by density gradient. Unlike PRP, Platelet Rich Fibrin (PRF) is a fibrin matrix with a high content of activated platelets that are carriers of growth factors. Despite a significant number of researches of the clinical efficacy of PRP and PRF, a number of unclear issues remain. Therefore, this research is relevant in modern traumatology and orthopedics.

Research objective: Introducing certain clarification into the problem of using blood fractions saturated with active biological substances.

Materials and methods

The material for obtaining PRP and PRF is blood, but the method to obtain them is different, depending on the clinical application. To obtain PRP, blood is taken with addition of an anticoagulant, citrate or sodium heparin, which binds calcium ions by blocking the entire

coagulation cascade. The next stage is centrifugation, which is carried out in one or two stages, depending on the degree of erythrocyte sedimentation. The optimum centrifugation mode is 115 g for 20 minutes. To obtain PRF, anticoagulant is not used, since it is necessary to obtain a fibrin clot. 250 g of blood is centrifuged for 10 minutes.

The biological characteristics of PRP and PRF are associated with their properties. PRP stimulates angiogenesis and mitosis of cells involved in the regeneration process; and it is also an autogenous source of growth factors. Autologous PRP may be used as a source of anabolic growth factors to stimulate chondrocytes in cartilage tissue-engineering structures due to increased synthesis of proteoglycans and collagen. However, unlike PRF, PRP does not have osteoinductive properties as it cannot initiate the formation of a new bone without the presence of bone cells.

PRF has osteoinductive properties, since the growth factors contained in it effectively influence on the quick start of the mechanism of the formation of a new tissue. Until fibrin binding, PRF is injectable Platelet Rich Fibrin (i-PRF). Injectable Platelet Rich Fibrin not coagulated after centrifugation for several minutes is used in a mixture with a bone material. After mixing i-PRF with a loose bone material, the fibrin, which is formed, binds loose particles, which makes it possible to give the desired shape to the material. Also clots may be crushed and mixed with larger bone fragments.

Using PRP is the most efficient in tendinitis, epicondylitis, fasciitis, arthritis, periartitis, gingivitis, localized parodontitis, alveolitis, surgical implantation and extraction of teeth, xerophthalmia, neurotrophic keratopathy, corneal ulcer, infectious keratitis, rehabilitation after laser keratoectomy and layered and penetrating keratoplasty, and post-traumatic conditions of the eye.

PRF is used in combination with grafts made on the basis of composite materials imitating a three-dimensional bone, which allows PRF to be used in surgical orthopedics. PRF is also used to build up soft and bone tissues, periodontal therapy, implantation of teeth, and gum regeneration after tooth extraction.

Thus, platelet rich plasma and platelet rich fibrin have a number of similarities and differences. The advantages of using them are the lack of risk of disease transmission possible in case of using non-autogenous blood, and the introduction of growth factors and cytokines directly into the wound area. At the same time, differences in their properties determine the scope of their application.

CAPABILITIES OF ULTRASONOGRAPHY IN DIAGNOSTICS OF STABLE AND UNSTABLE INJURIES OF THE SHOULDER JOINT

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Introduction

Recently, ultrasound diagnostics is increasingly used in orthopedic practice. Ultrasonography has established itself as an alternative method for the radiological diagnostics of stable and unstable injuries of the shoulder joint. The undeniable advantage of this method is the possibility to study the shoulder joint function.

Research objective: Establishing the priority of the use of methods of radiological diagnostics to identify rupture of the rotator cuff (RC), instability of the shoulder joint, and impingement syndrome (IS) of the shoulder joint.

Materials and methods

312 patients with injuries of the shoulder joints were investigated. The patients were divided into three groups: the first group included 134 (42.9%) patients with injured rotator cuff; the second group included 86 (27.6%) patients with the shoulder joint instability; and the third group included 92 (29.5%) patients with the impingement syndrome. Patients underwent radiological examinations, such as X-ray, ultrasonography (US), computed tomography (CT), magnetic resonance imaging (MRI), direct magnetic resonance arthrography. Surgical treatment was performed in 142 (45.5%) patients.

Research findings

When determining the priority method of radiological diagnostics, the diagnostic value of the method, the cost of the study, and patient's radiation load were taken into account. The diagnostic value of radiological methods of examination were determined on the basis of comparison of the data of radiological examination and surgical intervention with the calculation of statistical indicators of sensitivity, specificity and accuracy. When the soft tissue structures were injured, the diagnostic values of the US, MRI, and direct MR-arthrography were calculated; these calculations were not performed for X-ray methods (X-ray and CT) as the soft tissues have a low radioopacity.

Ultrasonography and MRI had the same diagnostic value in complete and partial tears of the rotator cuff. Indicators of sensitivity, specificity, and accuracy in complete tear of the rotator cuff for ultrasonography were 97.6%, 96.7% and 97.2% respectively, for MRI the indicators were 100%, 95.8% and 97.1% respectively. Indicators of sensitivity, specificity, and accuracy in a partial tear of the rotator cuff were 84%, 95.6%, 91.4% respectively for ultrasonography and 83.3%, 95.5%, 91.2% respectively for MRI. Considering the lower cost of the examination, we determined the ultrasonographic diagnostic method to be a priority method for injuries of the rotator cuff.

In tears of the glenoid labrum of humeral joint (which is the cause of the shoulder joint instability in 85% of cases), the following indicators were obtained: sensitivity, specificity, and accuracy for ultrasonography were 19%, 42.9%, and 35.7% respectively; for MRI - 90.5%, 84.6%, 88.2% respectively; for direct MR arthrography 98.2%, 100%, and 99.3% respectively. Considering the fact that ultrasonography has a low diagnostic value, and MRI is slightly inferior to direct MR arthrography, but much cheaper, the priority method to diagnose instability of the shoulder joint is MRI.

In impingement syndrome (IS), it is to determine the priority method of radiation examination as, on the one hand, a substantial part of the shoulder girdle elements is involved in the pathological process: the clavicular-acromial joint, the acromion, the large tubercle of the humerus, structures of the subacromial space (subacromial subdeltoid bag, rotator cuff), acromioclavicular ligament, blood flow changes and motor disturbances appear in the shoulder joint; and on the other hand, radiation methods have different capabilities to detect the pathology of the structures above mentioned and motor abnormalities. For example, motor abnormalities and changes in blood flow are detected only in ultrasonography, while the subacromial space is inaccessible for ultrasound examination due to the presence of a bone screen of the acromion, but is well visualized by MRI; small calcinates,

changes in the structure of bone tissue and arthrosis of the clavicular-acromial joint are best defined by CT.

In this regard, we consider the integrated radiation research to be the best for diagnostics of the impingement syndrome, and it is advisable to apply the “from simple to complex” principle. The examination is carried out in stages: X-ray – ultrasonography - MRI - CT, with each subsequent method used only in case of insufficient information content of the previous one. Expensive methods – MRI and CT – are used only in case of insufficient information obtained from ultrasonography. Computed tomography (CT), which delivers a big radiation dose, is applied last.

Conclusion

The priority method is:

- Ultrasonography to detect rotator cuff tears;
- MRI to detect the shoulder joint instability; and
- Integrated radiation examination to detect the shoulder joint impingement syndrome.

THE USE OF A DOUBLE ROW SUTURE IN MASSIVE LONG-STANDING TEARS OF THE ROTATOR CUFF

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The presence of chronic pain and a sharp decrease in the range of active and passive motions in the shoulder joint are the most common complaints of patients with a disorder of the shoulder joint. According to our observations, the complaints are most often associated with various types of injury of the rotator cuff (RC), which are approximately 59.3% of the total number of disorders of the shoulder joint.

Research objective: Analysing the results of treatment of 115 patients with a past history of an isolated the rotator cuff injury; identifying the most common types of the lesions of the rotator cuff; and proposing the optimal surgical technique for each individual type.

Materials and methods

The treatment of 115 patients aged 20 to 74 years with a past history of an isolated injury of the rotator cuff was analyzed. The patients were treated in Traumatology Department of Comunal Institution "Municipal University Hospital No. 16", Dnyepyr, Ukraine, within a period from 2009 to 2015, with 73 (63.5%) man and 42 (36.5%) women among them. The vast majority of patients 87 (75.7%) associated their complaints with a trauma of varying intensity, which was caused in most cases by falling to the shoulder or by a sudden sharp axial load when lifting a cargo, pulling out or flapping patient's arm. The period from the injury or occurrence of complaints to the surgery treatment was from 2 to 18 months. The patients underwent clinical, radiological, and ultrasound examinations; in addition, magnetic resonance imaging (MRI) was performed in 28 patients. Also, the patients were consulted by a neurologist to rule out a neurological disorder. The treatment

results were analyzed as per UCLA Shoulder Score and Constant-Murley Score. The follow up period lasted from 5 months to 6 years.

Research findings and discussion

When performing a surgical intervention, partial and full tears of the rotator cuff (RC) tendons were found. Partial tears (n = 18) were transverse in direction, and they affected both the middle part (n = 6) and the lower (n = 12) portion of the tendon in the depth. Such lesions are not accompanied by a retraction of the tendons, or had the minimal defect (less than 1 cm - C₀) filled with a connective tissue. When performing ultrasound examination, it was often impossible to reliably visualize the site of the rotator cuff injury, especially if more than 3 months passed after the injury. That is why in such cases, MRI was performed. In operative treatment of partial transversal lesions of the rotator cuff tendons, the operative intervention included the restoration of the normal tonus of the rotator cuff, tenolysis with mobilization of tendons, and their decompression in the subacromial space.

The full tear formed the overwhelming majority of cases (n = 97) among the test group of patients. The prevailing injury types were lateral sickle-shaped tears over the entire thickness of the rotator cuff (n = 36), and combined cross-length breaks with deep U-shaped, L-shaped, G-shaped, and W-shaped defects (n = 51). Combined injuries cause the greatest difficulties both surgical intervention and in the next rehabilitation plan. These injuries were accompanied by retraction of the rotator cuff tendons: a medium retraction of 1 to 3 cm - C₁ (n = 16), a substantial retraction of 3 to 5 cm - C₂ (n = 31), and a massive retraction of more than 5 cm - C₃ (n = 4). The surgical intervention for such injuries included mobilization of the rotator cuff tendons to counteract the retraction force and reconstructive restoration of their integrity by suturing the existing defects, and subsequent restoration into the bone bed by using anchor fixators. According to literature data, in the presence of a large and massive retraction, it is not always possible to perform a sufficient mobilization of the tendons, which would have been appropriate before the implementation of the typical reinsertion. That is why in such cases we used a modified two-row stitch of the rotator cuff tendons, which included mobilization of the tendons to the maximum possible level, and introduction of the anchor fixators in the humeral head at this level, which is followed by the reinsertion of the tendons into the anchor fixators. The second stage included plastics of the rotator cuff defects, which was performed by using ligatures remained from the anchors of the first row of sutures, with their subsequently minor II-like transossal suture. The operation was completed by performing the decompression of the rotator cuff tendons, which included the cutting of the coracoacromial ligament and the partial lower osteotomy of the acromial process.

Conclusion

The analysis of the results of surgical treatment showed that the rotator cuff injuries were heterogeneous in its morphological manifestations. This is the injury type that determines the technique for the rotator cuff reconstruction, which will finally determine the efficiency of the treatment of this disorder.

ULTRASONOGRAPHIC DIAGNOSTICS OF FIXED AND NON-FIXED POSTERIOR SHOULDER DISLOCATION

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Introduction

Posterior dislocations, which are about 2% of all shoulder dislocations, are difficult to diagnose. It is related to a number of the factors as follows: an atypical injury mechanism; a barely noticeable deformity of the shoulder joint in muscular-type individuals or individuals with a pronounced subcutaneous fatty tissue; the absence of a typical position of the limb with “springy fixation” and a dislocation shortening; low informativeness of X-ray images of the shoulder joint (SJ) in frontal view.

Research objective: Studying the ultrasonography capacities in the diagnostics of fixed and non-fixed posterior shoulder dislocations.

Materials and methods

The study involved 10 male patients aged 38 to 76 years with posterior shoulder dislocation. All the patients underwent radiography in two views and ultrasonography (USG); spiral computed tomography was carried out in 7 patients, and magnetic resonance imaging was carried out in 7 patients. Ultrasonography was carried out on Voluson 730 Pro Ultrasound Machine with a linear sensor at frequency of 6 to 12 MHz, as per the standard method. All the patients underwent surgical treatment, and the diagnoses were confirmed.

Research findings

All the patients who applied to the hospital had a shoulder joint injury in their histories for a period of 7 days to 4 months. In the integrated clinical and radiation study, posterior shoulder dislocation combined with a depressed fracture of the anterior surface of the humeral head and its insertion into the posterior margin of the glenoid cavity (of the scapula) was found in 8 patients. Posterior shoulder dislocation (without compromising the integrity of the humeral head) combined with a fracture of the posterior edge of the glenoid cavity (of the scapula) was found in 2 patients. All the patients underwent open reduction of the shoulder dislocation and suturing of the posterior glenoid labrum with anchor fixtures.

Comparative static ultrasonograms of the shoulder joints, when scanning from the anterior access with the transverse position of the sensor, showed a greater distance between the coracoid process and the humeral head in the injured joint in comparison with the opposite healthy joint. The distance between the humeral head and the coracoid process was within the range of 3 to 5 mm in the healthy joint, while it was within the range of 11 to 17 mm in the injured joint. The difference between the distances above mentioned was within the range of 7 to 13 mm in the shoulder joints, the average difference was of 9.6 ± 2.31 mm. Made in 8 patients with an impacted posterior dislocation, the functional ultrasonograms showed that no active and passive motions were possible in the joint, that is, the dislocation was fixed. Active and passive motions were limited in 2 patients with the dislocation that was not accompanied by impaction.

Thus, the difference in the distances between the humeral heads and the adjacent coracoid processes of the injured and healthy shoulder joints, which was more than 7 mm in favor of the injured shoulder joint, may be considered a sign of the posterior shoulder dislocation. The additional absence of active and passive motions in the shoulder joint on functional ultrasonograms may be considered as an ultrasound sign of a fixed posterior shoulder dislocation.

Conclusions

Posterior shoulder dislocation has quantitative and functional ultrasound signs. Functional ultrasonography allows making differential diagnosis between fixed and non-fixed posterior shoulder dislocations.

OUR EXPERIENCE IN REVISION HIP JOINT REPLACEMENT

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Relevance

The total hip joint replacement (THJR) was proven to be the method of choice in treating various severe forms of articular disorders, as it ensures the elimination of pain and rapid restoration of a sufficiently high level of functional activity of the patient in most cases. The number of such surgeries increases steadily every year. However, this trend leads to a progressive increase in the number of patients who need to undergo revision hip joint replacement due to an inevitable decrease in functional performance over time and an increase in the intensity of the pain syndrome. Currently, many methods of hip joint revision replacement are available and applied; antiprotrusion rings and so-called revision models of the femoral implant components are widely used; nevertheless, the proportion of repeated revisions is quite high. Thus, in our opinion, at present, there is a need for a comprehensive understanding of the problem in question and for conducting a research aimed at improving the results of treatment of patients requiring revision hip joint replacement.

Research objective: Retrospective clinical and statistical analysis of the results of revision hip joint replacements.

Materials and methods

The follow-up group included 583 patients (235 men and 348 women) who underwent 621 revision hip joint replacements within the period from 2000 to 2014 in Mechnikov Orthopedics and Traumatology Clinic of the Regional Hospital, Dnepropetrovsk. The average age of patients was 58.71 years. Both domestic implants (ORTEN) and imported implants (Muller support rings, Wagner revision hip stems, Aloclassic SL of Zimmer, USA) were used for revision hip joint replacement. Cemented, cementless, and hybrid methods of fixing the implant components were used. When performing revision surgeries, 439 (75.3%) domestic components of ORTEN implants and 136 (23.3%) imported implants were installed; 8 (1.4%) patients required implant removal because of infectious complications. Repeated revision interventions were performed in 38 (6.51%) patients for the follow-up period. The reasons for the revision surgeries were as follows: aseptic instability of the acetabular component in 14 (36.8%) cases; aseptic instability of the femoral component in 6 (15.8%) cases; necrectomy due to superficial infection in 13 (34.2%) cases; postoperative dislocations of the implant head in 4 (10.5%) cases; and implant removal due to infectious complications in 1 (2.6%) case. The results of revision hip joint replacements were analyzed by examining data of patient medical records, operation logs, implant registers, and by monitoring patients' follow-up data time profile. Clinical evaluation of the treatment results was carried out according to the Harris Hip Score (Harris W.H., 1969).

Research findings and discussion

When comparing primary and repeated revision surgeries in the groups of different age, the largest number of primary operations was in the patients aged 31 to 50 years, while the largest numbers of revision surgeries was in patients aged 41 to 60 years both in women and men, as well as in patients of both sexes older than 71 years. The prevalence of young patients is associated with a high level of their physical activity and, as a consequence, a decrease in the terms of the normal functioning of the implants in them. The presence of middle-aged and elderly patients is related to the cemented type of implants and aseptic instability of components used in these patients. The immediate and long-term results of treatment evaluated as per the Harris Hip Score after primary revision hip joint replacement were studied in 496 (85.1%) patients, and after repeated revision of the hip joint implant in 38 (100%) patients. When analyzing the clinical results of treatment of the patients who underwent revision hip joint replacements within a period from 1 year to 14 years, it was noted that excellent and good results were obtained in 425 (79.6%) patients and satisfactory results were obtained in 100 (18.7%) patients. Unsatisfactory results took place in 9 (1.7%) patients; they were associated with the need to remove the implants because of infectious complications.

Conclusions

There is a global trend towards an increase in the number of hip joint replacements, which leads to a progressive increase in the number of patients requiring revision hip joint replacement surgeries. However, despite the presence of a sufficient number of methods of revision hip joint replacement, the incidence of repeated revisions reaches 30% according to publication data, which creates a need to conduct researches aimed at improving the results of treatment of this group of patients.

Revision hip joint replacement is a nonstandard and highly individual surgery in each specific case, which requires the development of a tactics of a differentiated approach to the choice of methods of a revision hip joint replacement and individual selection of modern implants to achieve good functional and anatomical results for a long time.

PHOTOMETRIC COMPUTER MONITORING OF BONE AND JOINT TRANSFORMATION OF THE MUSCULOSKELETAL SYSTEM

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Orthopedists and traumatologists often have clinical situations in their practice when there is a need for dynamic control or monitoring of patient's musculoskeletal system to clarify the biomechanical particularities of the musculoskeletal system segment under investigation or to record anthropometric parameters with a scientific purpose for analyzing the results of treatment or the course of age-related bone and joint transformation.

The most common convenient methods of such monitoring are orthopedic examination and radiography.

In the information age of digital computer technologies and devices, computer methods of diagnostics and monitoring of orthopedic indicators develop and increasingly attract attention of both doctors and patients.

One of the obvious advantages of these methods is the absence of radiation load on the human body.

We consider the following computer methods to be the most prospective: mechanometric, scanometric, tensometric and photometric methods. We used the photometric hardware and software method in our studies.

This technology has the capacity to register the segment under study with digital cameras, which are used in the same conditions (level, distance, contrast, etc.), and the data processing with software, with the software base including orthopedic and calculated mathematical indicators.

The doctor corrects the setting of target points on all the images, and the computer calculates the indicators. The results are united into a conclusion sheet, and the diagnosis is made on their bases.

Diagnostics is easy to perform and it does not carry radiation exposure; the indicators are confirmed by mathematical data, which makes it possible to diagnose a pathology and conduct a reliable follow-up time profile.

The whole information also remains in the database; and, when re-testing in half a year or a year, the results of the re-diagnosis are compared with the primary or previous ones even if the patient lost the data of the previous test.

Computer photometry is the best for the follow-up time profile of the pathology as all the indicators are represented in figures, and the diagnostics does not have a pathological effect to patient's body (a non-radiation method). Also this method is affordable and economical.

The standardization of this technology allows it to be used in the practice of an orthopedist for topography, measurement and correction of the human body.

To summarize, we can note that currently, computer diagnostic technologies are developed and may be used to analyze the state of biomechanics and monitor the pathological and age-related transformation of the musculoskeletal system.

It is especially convenient to record and analyze indicators of ankle joint deformity, axial deformities of the knee joint, shortening and deformities of the arch of foot, and the deflection angle of the first toe.

EXPERIMENTAL SUBSTANTIATION OF INTEGRATED CONSERVATIVE TREATMENT OF GONARTHROSIS

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Introduction

Gonarthrosis is diagnosed in 25-40% of patients with osteoarthritis. To increase the efficiency of treatment for patients with gonarthrosis, an integrated conservative therapy includes various

physical factors along with pharmacotherapy (non-steroidal anti-inflammatory drugs, chondroprotectors, etc.). In articular, a low-intensity laser radiation is widely used. The tactical approach that combines different therapeutic methods makes it possible to influence simultaneously to various component of pathogenesis of the disease and to achieve the potentiation of a positive therapeutic effect associated with inhibition of dystrophic and inflammatory processes, and with reduction of adverse reactions to pharmaceuticals used in the treatment of patients with gonarthrosis. At the same time, the substantiation remains relevant with regard to the optimal sequence of the use of laser and pharmacotherapy methods in the early stages of the disease.

Research objective: Studying the efficiency of the integrated conservative treatment in animals with induced gonarthrosis in terms of the sequences of using laser and pharmacotherapy.

Materials and methods

An experimental study was performed on 40 white rats aged 6 months, with body weight being within the range of 250 to 300 g. Glucocorticoid-induced gonarthrosis (GIO) was modeled in animals by intramuscular administration of dexamethasone (7 mg / kg, once a week for 3 weeks). In this case, destructive changes, which corresponded to Stage I osteoarthritis according to Osteoarthritis Research Society International (OARSI) histological classification, appeared in the articular cartilage of the animals. The experiment was conducted in compliance with the modern bioethics requirements regarding humane attitude towards experimental animals (positive conclusion of the local Bioethics Committee, protocol No. 81 dated 20 December 2010).

Diclofenac sodium (8 mg / kg, per os) and glucosamine hydrochloride (50 mg / kg, per os) were administered as pharmacotherapy. The doses of these drugs are determined, taking into account coefficients of species resistance of the rat and the human; the doses are conditional therapeutic, and they correspond to the doses used to treat human patients with osteoarthritis. Laser therapy was carried out in rats on the posterior surface of the knee joint, by using the Mustang apparatus (wavelength of 0.89 μm , pulse power of 7-8 W, frequency of 3000 Hz, duration of the session was 3 minutes 42 seconds, which corresponded to the dose of 0.3 J officially recommended for use in patients with this disease).

Therapeutic measures (10 daily sessions) were started in 3 days once after completion gonarthrosis modelling (after the last injection of dexamethasone). The time interval between laser therapy and the administration of pharmacotherapy was 15 minutes, regardless the sequence of their application. In our previous studies, we found that the first concentrations of diclofenac sodium were recorded in blood plasma of the rats in 15 minutes after the introduction of the drug substance. The rats were distributed in 6 experimental groups according to the treatment regimen: Group 1 - intact animals; Group 2 - control animals (gonarthrosis model); Group 3 - diclofenac sodium and glucosamine hydrochloride on the gonarthrosis model; Group 4 - laser therapy on the gonarthrosis model; Group 5 - diclofenac sodium and glucosamine hydrochloride with subsequent laser therapy on the model of gonarthrosis; Group 6 - laser therapy followed by administration of diclofenac sodium and glucosamine hydrochloride on the gonarthrosis model. The structural organization of the articular cartilage of the femur processes was investigated by histological and electron microscopic methods before and after the treatment (in 3 and 28 days after the completion of the modeling of gonarthrosis respectively). The number of chondrocytes in the superficial zone of the articular

cartilage was calculated in seven fields of view by using the Micros-50 microscope (400X magnification).

Research findings

The following signs of destructive processes in the superficial and intermediate zones of articular cartilage were found in the control group rats just after the modeling of gonarthrosis (before treatment): chondrocytes with picnotic nuclei and cells of cytoplasmic disorders, empty chondrocyte capsules, matrix fragments without cells, uneven articular contour of the articular surface, chaotic location of collagen fibers, and low density of chondrocytes in the superficial zone.

Similar destructive changes were recorded in 28 days after the modeling of gonarthrosis in the articular cartilage, but they were more pronounced and covered larger cartilage surface than at the previous study period (3rd day), indicating the further development of structural disorders in cartilage tissue of glucocorticoid- induced gonarthrosis .

After administration of all the treatment regimens, rats of experimental groups, unlike control group animals, showed substantially less structural disturbances in the superficial and intermediate zones of articular cartilage. At the same time, morphological signs of the biosynthetic activity of chondrocytes were observed in the articular cartilage, which indicates reparative processes: isogenic groups of chondrocytes, large chondrocytes with a hypochromic nucleus and nucleoli, as well as numerous membrane organelles in the cytoplasm. It was found that the most pronounced manifestation of these morphological markers of reducing processes in articular cartilage was in the group of rats, which were injected diclofenac sodium and glucosamine hydrochloride after the application of low-intensity infrared laser radiation. The number of chondrocytes in the superficial area of the articular cartilage of rats in the group treated with pharmacotherapy only indicates a trend to an increase (control group - 12.06 ± 1.21 , experimental group - 15.67 ± 1.07 cells, $P > 0.05$), whereas after the use of laser therapy in different sequences, the chondrocytes were statistically significantly higher than the control index - 1.4 times higher (laser therapy only), 1.6 times higher (pharmacotherapy followed by laser therapy), 2.1 times higher (laser therapy followed by pharmacotherapy).

Conclusions

- 1) Using an integrated treatment: initial use of low-infrared laser light followed by diclofenac sodium and glucosamine hydrochloride causes the most complete recovery of structural and metabolic status and the number of chondrocytes of articular cartilage in rats with induced gonarthrosis;
- 2) The results of morphological studies made it possible to substantiate and develop the method of conservative integrated treatment of patients with Stages I-II of gonarthrosis (patent for utility model number 60579).

DIFFERENTIATED APPROACH IN CONSERVATIVE TREATMENT OF PHANTOM PAIN SYNDROME IN PATIENTS WITH POST-TRAUMATIC AMPUTATIONS

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Introduction

Phantom pain syndrome arising after the amputation of a part or the whole limb remains a complicated medical, social, and humanitarian problem. At present, the relevance of phantom pain syndrome is due to an increase in the number of persons injured in military actions, natural disasters, and man-made disasters.

The incidence of phantom pain syndrome after limb amputation, according to statistics, ranges from 40% to 90%.

Currently, the structure of the causes of phantom pain syndrome after amputations is as follows: about 52% of cases are caused by mine-blast trauma and shell fragment wound; 23% cases are caused by ischemic limb disorders due to complications of diabetes mellitus and vascular diseases; and about 15% of cases are caused by amputations and exarticulations in case of malignant tumors of the long bones of the limbs.

The need for timely and adequate treatment of phantom pain syndrome is caused by the high incidence and the intensity of pain, as well as by the high percentage of pain persistence, which significantly affects the quality of life of patients. It is known that resistance to the therapy administered is largely due to insufficient etiopathogenetic orientation of therapeutic measures, lack of multidisciplinary (combined use of pharmacotherapy, invasive treatment methods, functional rehabilitation, physiotherapy and non-drug treatment methods, and psychological assistance as well) and individual approaches when appointing the treatment.

Research objective: Finding the optimal differentiated complex of conservative medical measures, allowing improvement of the results of treatment in patients with phantom pain syndrome resulting from post-traumatic amputation of the limb.

Materials and methods

We followed up 24 patients aged 24 to 56 years suffering from phantom pain due to amputation of a limb after a trauma, including a battlefield injury, with men being the overwhelming majority of the patients: 22 (92%).

The lower limbs amputation at different levels was performed in all the patients as per the myofascioplasty technique. The express-prosthesis (prosthesis on the operating table) was applied in 5 patients in a planned manner. The control group (20 patients) was selected retrospectively from the patients with phantom pain syndrome after amputation, with the patients receiving an appropriate medication only. To evaluate objectively the severity of pain before and after treatment, a visual analogue scale (VAS), an adapted MacGillovsky pain questionnaire, and Oswestry questionnaire were used.

The patients of the main group received pharmacotherapy aimed at reducing pain and overcoming limb ischemia; acupuncture; and dynamic electrical nerve stimulation (DENS-therapy). Acupuncture was performed as per the classical canons of acupuncture, taking into account the approach developed by us, i.e. the use of trigger points and points symmetrical to the trigger points on a preserved limb, the "principle of large and small injections" on the healthy side, and pharmacopuncture of analgesic drugs in trigger zones. The duration of the acupuncture course depended on the amputation level; and the repetition of treatment courses depended on the nature of the clinical course of the phantom pain syndrome.

Research results and discussion

Analysis of subjective pain in patients of the main and control groups allowed us to determine the trends in the development and course of phantom pain syndrome.

The higher the level of limb amputation, the more intensive the phantom pain and the earlier the

pain was manifested. The longer before the operation the ischemia and pain in the limb soft tissues, the higher the intensity of phantom pain was noted in the postoperative period.

A comparative analysis of the results of treatment of the patients in the main and control groups proved the feasibility of using the DENS-therapy and the acupuncture in a complex of conservative measures in patients with phantom pain syndrome. Thus, in the main group patients, the intensity of pain decreased by 77%. Phantom pain syndrome in patients with express-prosthetics was completely relieved.

The results of pharmacotherapy in patients of the control group, did not allow us to identify reliable positive results of the treatment.

When assessing the quality of life as per the Oswestry questionnaire, patients of the main group noted an increase in the possibility of self-care, normalization of sleep, a reduction in the required dose of analgesic drugs or a complete rejection of them.

Conclusions

As a result of the study, we were able to identify a positive synergistic therapeutic effect when using pharmacotherapy and DENS-therapy, and acupuncture for phantom pain of post-traumatic etiology; also it allowed us to determine the sequence of procedures depending on the type of clinical course and the amputation level. A consistent use of pharmacotherapy, acupuncture, and DENS-therapy in patients with limb amputation and acute or subacute phantom pain syndrome allowed improvement of the treatment results, which in turn made it possible to conduct adequate timely prosthetics in patients with this pathology.

TOPICS FOR DIALOGUE OF GENETICS, ORTHOPEDICS AND ...

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Summary: The work is a search and discussion in nature.

Objective: Attracting attention of scientists of various specialties to innovative approaches to solve a challenging problem of prevention and treatment of genetically determined diseases of the skeletal system.

Currently, there is already a complex of modern research methods that make it possible to get some data about the genetic status of the patient; it is possible as the functioning of organs and systems is genetically determined. However, the determination of genetic factors associated with the suspected disease is still a difficult task.

Although a proton cytometer is already known for detecting DNA defects, some genetic markers of certain diseases were partially found. So the affected gene was replaced with a healthy one in an experiment in foreign studies. At the present level of science, the scientists try to determine the

pathological gene and affect it. In this aspect, gene therapy may be a radical way of treatment for various diseases, including the skeletal system diseases.

Dispite this brand new scientific branch is still in its inception phase, many questions arise, for example:

- Will it be possible to achieve a normal expression of an alien gene after its introduction?
- Is "targeted" gene introduction possible?
- Will new properties arise in cells with a new gene and will they be only positive?
- Will side effects appear?
- Can the introduced gene completely replace the affected one?
- Can the introduction of an alien gene adversely affect the human gene pool?

Solving even these issues poses great challenges for genetic engineering and also for scientists of any othe profile.

As the human body is an evolutionary system, then, in our opinion, entropy may be used to study the questions posed.

This is the most important concept of physics, which connects the state of the system and the degree of order in it. The structure of bone tissue, which is primarily tense, may be an example of it. In this case, bone trabeculae are strictly oriented with respect to axial loads or on a Cartesian coordinate system. Hence, it can be assumed that a genetically determined disorder of the bone structure and all soft tissue formations leads to an increase in entropy. In other terms, as the human body develops, an atypical musculoskeletal system is formed with various abnormalities (coxavalga, coxavara, coxaantetorta, coxaanteverta) due to an increase in entropy. However, it is possible that entropy may decrease due to self-regulation internal processes of the body.

For example, with an increased antetorsion of the proximal femur, rotation of the the anterior cavity is possible, while with valgus deformity of the femoral neck, the angle of sagittal inclination increases. However, why it is selective? What makes such individualism manifest? And where is the early level when correction of these deviations may be introduced? It is already obvious that the capability of preserving self-organization and internal order may be lost in the process of growth of such an organism. Proof is the continuation of the dysplastic process in the joints, e.g., in the development of dysplastic arthrosis (A.A. Korzh, B.I. Simenach, Z.M. Miteleva, 1987). So it is obvious that numerous stress factors play a minor role in this complex multi-element process and condition. However, the existence of more than 4,000 inherited defects requires only sufficiently effective treatments. It is possible that gene therapy will allow treatmet of other human diseases. We can repeat the words said by S.S. Yudin that "surgery can achieve success thanks to the development of theoretical disciplines, the growth of technology, as well as enthusiasm in scientific researches."

TACTICS OF TREATMENT OF COMPOUND FRACTURES OF DISTAL HUMERAL EPIPHYSIS

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Introduction

Compuond intra-articular distal humeral fractures are severe injuries that require a technically complicated surgical intervention with a large propotion of negative long-term results in the form of persistent functional disorders, and may lead to loss of ability to work.

Research objective: Determining the optimal tactics of treatment for complicated fractures of distal humeral epimetaphysis by analyzing long-term results.

Materials and methods

The results of surgical treatment of 78 patients with transprocessus humeral fractures were studied. In accordance with the AO / ASIF classification, 13A type fractures were observed in 19 cases, 13B type fractures were observed in 28 cases, and 13C type fractures were observed in 31 cases. A combined trauma was observed in 46 patients; and open fractures were in 29 patients. The surgical interventions included preventive osteosynthesis with modular rod apparatus and primary surgical debridement of wounds. Antibacterial therapy was carried out by intravenous administration of cephalosporins of 2 or 3 generations and ornidazole. Primary osteosynthesis with wires and screws was performed in 11 patients (A1-2 and B2 type fractures). Carried out on 35 patients (B and C types), the change in the method was done on the 12-th day on average; it consisted in an open reduction and extracortical osteosynthesis. In 21C type fractures, transolecranon access was used. The combination of AO plates, screws, and wires was used in 12 patients, while the combination of plates with angular stability was used in 40 patients. In the postoperative period external immobilization was not used after the osteosynthesis with LCP plates as an active restoration of the elbow joint function was used.

Research findings and discussion

The urgent stabilization of the fracture with the apparatus for external fixation in the injured persons with polytrauma contributed to the successful treatment of all combined injuries and the healing of wounds by providing rest to the injured area. Postoperative wounds were healed primarily in 52 patients; a superficial inflammation was found in 7 patients; marginal necrosis was found in 9 patients. No purulent complications were found. Fracture fusion and restoration of the function of the injured limb were achieved in all the cases. A clinical presentation of neuropathy of the ulnar nerve was observed in 8 patients with 13C type fractures after submersing osteosynthesis with plates. Revision and neurolisis was performed in three patients, while conservative treatment was applied in the remaining patients: the treatment led to improvement. Long-term results (as per the Meio Clinic score) were rated as positive in 88% of cases. The best functional results were obtained in the patients who underwent osteosynthesis with angular stability plates and early rehabilitation.

Conclusions

In intra-articular distal humel fractures, the surgery should include a thorough open reduction of articular surfaces and stable osteosynthesis.

Using a two-stage therapeutic tactics in patients with polytrauma (including preventive external osteosynthesis followed by replacing this method with internal osteosynthesis with plates with angular stability, and early recovery of motions in the elbow) made it possible to prevent complications, improve quality of patients' life and functional results of the treatment.

EXPERIENCE IN SURGICAL TREATMENT OF PATIENTS WITH OF INTRA-ARTICULAR DISTAL METAPHYSEAL HUMERAL FRACTURES WITH AN APPARATUS FOR EXTERNAL FIXATION

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Introduction

The restoration of the physiological range of motions in the elbow joint (EJ) and the prevention of contractures are important issues in the rehabilitation of patients with distal humeral metaphyseal fractures (DHMF). Currently, surgical methods of treatment are widely used to restore the function of the elbow joint lost because of the injury. However, views on the choice of method to fix DHMF fractures are different. So in open reduction, favorable conditions are created for the anatomical reconstruction of the articular surface, surrounding structures, and soft tissues, and for the revision of the neurovascular bundle. At the same time, the cause of late mobilization of the elbow joint is the instability of fixation of fracture fragments due to the injury severity, technical errors or unstable osteosynthesis. In extrafocal osteosynthesis, soft tissues are minimally damaged, and there is a possibility to manipulate fracture fragments in the process of treatment, and the elbow joint mobilization is possible in the apparatus for external fixation (AEF). However, it is difficult to restore the congruence of the articular surface with wires and rods in comminuted intra-articular fractures. Thus, from our point of view, there is a need to study the advantages and disadvantages of various methods of fixation of fracture fragments.

Research objective: Improving the results of treatment of patients with distal humeral metaphyseal fractures (DHMF) by improving the methods of surgical treatment.

Materials and methods

The results of surgical treatment of 54 patients aged 18 to 64 years (12 men, 42 women) followed up in the clinic within a period from 2006 to 2015 with intra-articular distal humeral metaphyseal fractures (DHMF) of C type (20 patients with C2 type fracture and 34 patients with C3 type fracture) (as per the AO classification) were analyzed.

Surgical intervention was performed within a period lasted from several hours to 2 days after the injury. To treat the injured persons, the open reduction and external osteosynthesis of the fracture with reconstructive or congruent plates were performed, which was followed by fixation in a single-plane apparatus for external fixation (AEF) with a ball-and-socket hinge proposed by us, which makes it possible to bring motions in the elbow joint (EJ) as close as possible to physiological ones.

At the first stage of surgical treatment, the reduction of bone fragments and their preliminary fixation with Kirchner's wires was performed by using open reduction through the posterior median approach along with V-shaped osteotomy of the olecranon. Once the congruence of the joint has been restored, the stable fixation of the intra-articular fracture was performed by using plates located on the lateral columns of the DHMF. Reconstructive plates were used in 16 patients and congruent plates were used in 38 patients. In 24 patients, plastic of bone defects was performed with a cancellous autobone. Once the olecranon has been fixated with a tight wire loop, a spongy screw or a congruent plate, the soft-tissues were reconstructed and the the postoperative wound was closed.

At the second first stage of surgical treatment, the core apparatus for external fixation (AEF) was mounted. The standard scheme was used to mount a single-plane core apparatus for external fixation, which consisted of two parts, on the shoulder and forearm, with a ball-and-socket hinge, whose center of rotation coinciding with the center of rotation of the humerus block, as determined by an X-ray pattern. A distinctive feature of mounting the apparatus for external fixation (AEF)

was the absence of an axial wire and the presence of a ball-and-socket hinge located between the proximal and distal beams of the core AEF to fulfill the controlled passive function of the elbow joint up to 140° of flexion (according to Marks V. O., 1978).

Passive motions in the elbow joint were started within 1 day after the surgery by distracting the components of the core AEF to a distance of 20 mm per day. Active motions (flexion / extension) were performed by the patient independently in the AEF in 2-3 weeks, and the load on the limb was permitted in 3-3.5 months after the surgery. The average period of fixation in the AEF with a ball-and-socket hinge was 5.5 weeks (from 4 to 6 weeks).

Research findings and discussion

The average length of follow-up was 76.9 months. (the follow-up length was of 9 years to 12 months). The postoperative period was uneventful in 49 (90.7%) patients. In those patients, the average range of motion in the elbow joint in the late postoperative period was as follows (according to V. O. Marks, 1978): extension / flexion - 0° / 0° / 130° ± 10°; pronation / supination - 70° ± 10° / 0° / 70° ± 10°.

Conclusions

Thus, the treatment of intra-articular distal humeral metaphyseal fractures by using open reduction and bone fixation followed by the imposition of a single-plane core apparatus for external fixation with a ball-and-socket hinge located in the axis of rotation of the elbow joint provides the maximum recovery of the function of the affected limb segment and makes it possible to decrease the number of adverse treatment results.

As a result of using the offered treatment method for distal humeral metaphyseal fractures, positive treatment outcomes were obtained in 49 (90.7%) patients, which indicates efficiency of the treatment method and its acceptability in practical traumatology.

**UNIVERSAL BENCH FOR STUDYING STABILITY OF OSTEOSYNTHESIS AND
PROPERTIES OF THE REGENERATED BONE AS BIOMECHANICAL FACTORS
THAT SUBSTANTE LOADING
IN VARIOUS PERIODS OF MEDICAL REHABILITATION
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The dosed load on the regenerated bone, depending on its degree of maturity, in the range of elastic deformations, is the leading stimulating factor of consolidation, and therefore the determining criterion for medical rehabilitation. When using any modern Metal Osteosynthesis systems (IBS, PLP plates, MIPO, etc.), they are assumed to be an essential factor in reducing the level of complications. The overwhelming majority of biomechanical calculations in scientific and practical studies are performed in our time with a convenient, visually demonstrative and low-cost mathematical method of finite elements, which does not take into account all the anisotropic biomechanical properties of bone tissue that, in addition, is often osteoporotically altered; therefore errors in calculations may be essential. So the role of experimental bench tests of various techniques of Metal Osteosynthesis for fracture models, which are performed on natural bones, especially on wet-drying specimens, cannot be overestimated for obtaining highly reliable information.

Research objective: Developing a universal bench for comparative biomechanical studies of the stability of the fragments of experimental bones in various Metal Osteosynthesis techniques and options, as well as studies of the resistance properties of the regenerated bone by using compressing, stretching, bending, rotating static and dynamic forces acting at various frequencies.

Materials and methods

The bench developed consists of loading, fixing, and measuring parts. The loading part consists of a massive metal base with the mechanism that centers axial loads in two planes rigidly fixed to a massive table. A constant or variable force of the axial, static, steplike compressive, stretching, dynamic or alternating load, which acts at various frequencies, is created by attaching a lever balanced on the axis with a five-fold long shoulder to the table, with a holder for weights of 1 kg (30 kg in total) fastened to the lever. The force of the weights was transferred to the fixing part of the bench; it created efforts of different nature on the test object within the range of 50 to 1,000 or 1,500 N.

The fixing part consists of a massive metal base; there is a disc-shaped table on the metal base surface with a circular hole in the middle of it, which may be moved with coordinate screws along the X-Y axes with possible rotation around the vertical axis. T-shaped lateral supports are fastened rigidly to the table surface; the lateral supports are connected to each other with the upper support plate, with an upper cup fixed on the support plate. The efforts are transmitted from the short lever arm through the loading rod and through a steel ball to the lower load plate with a fastened lower loading cup. The parallel movement of the plates is maintained by telescopic guides that may be removed at axial load with an additional rotational component. Epiphyses or ends of the experimental bone (where metal osteosynthesis was performed) or regenerated bone after removing a metal fixture, are evenly tightened by 4 sharpened screws radially screwed in the threaded holes of the cups. For secure fixation, the inner surfaces of the metal cups have chamfers, while the cavities of the cups are filled with a Wood alloy along with the tighten specimen. All the bench parts are made of steel of sufficient cross-section ($4-7 \text{ cm}^2$) with a high carrying capacity. To change the direction of force for it to be stretching, the cable should be put from the long lever arm through two shaft-like blocks on the bearings fastened on the additional support angles. To create variable loads, the weights were uplifted gradually by two hands at a preset frequency.

To test specimens with metal osteosynthesis or regenerated bone for deflection on two supports or on a cantilever, that is, when applying force in a plane parallel to the fracture plane (shear deformation), as the most sensitive indicator of maturity of the regenerated bone, the bench was adapted: T-shaped lateral supports were dismantled. Mobile transverse plates were fastened rigidly on the disk table: one plate was fastened for a cantilever deflection or two plates were fastened for bending on two supports, with supporting triangular prisms. The upper rib of the prism was the support midpoint for the specimen under test for the cantilever deflection. Its external loose diaphyseal part was tightened with 5 sharpened screws screwed into the fixing clamp of the base, and it was securely pressed against the prism with a support screw and a remote cantilever distal screw. The force of traction was transferred to the specimen perpendicularly to its axis from the rod of the short lever arm through the loading ring with a hook. The force was transmitted onto a profiled specimen, such as a femoral head, through a hollow matrix adapter filled with a Wood alloy with a concave surface congruent to the femoral head. It was provided by the individual print of a spherical head in the phase of alloy hardening, which simulated the acetabular

surface and the transfer of force at functional loads. For the deflection on two supports, the loading ring was put on the specimen, and the specimen was placed on two supporting prisms.

The measuring part of the bench consists of 2-5 MIG-1 clock type travel indicators with an accuracy of 0.01 mm, which are fastened on sliding supports with a magnetic base; the sliding supports are set in target points for their measuring probes contacted with sharpened heads of screws screwed into the specimen (reference points). The scheme of mounting and adjustment of indicators is individual in each series of tests and biomechanically grounded. When carrying out tests for the stability of fastening in metal osteosynthesis for the medial femoral neck fracture, the measuring part consisted of three indicators. They were fastened securely with screws through the transition plates to the proximal or distal bone fragments in three different planes to determine the share deformation of the osteotomy (skew plane), varus flexion (frontal plane), and wedging out of bone fragments at the upper edge of the osteotomy line of the femoral neck (horizontal plane).

Research findings

The bench is universal as it may be used to test the stability of metal osteosynthesis of any animal or human bones or their models. As an example, we can provide previous highly complicated studies of 28 specimens of dog bones with models of medial femoral neck fracture of Pauwels II type on cantilever elastic deflection in consolidation at different times before and after removal of a metal fixture and 6 isolated wet and 3 dry proximal parts of human femur with models of medial femoral neck fracture of Pauwels II type, osteosynthesized by various options of metal osteosynthesis (legal norms of bioethics on carrying out experiments and taking corpses material are observed; experiments up to 2005, sampling up to 2000).

According to the method above described, axial stepwise increasing static loads of specimens and additional variable load (5 cycles) at a frequency of 1 Hz, with force of 50 to 1,000 N were created in three series. In total, 108 series of measurements were analyzed. The measurement results were introduced into specially created electronic tables based on Excel tables that built, in the software mode, individual plots of static and dynamic components of deformation with lines of different thickness and colors. Electronic plots of hysteresis loops of specimens were built. A comparative statistical analysis made it possible to make a conclusion in accordance with: the optimal directions for carrying out conventional and canulated threaded screws in the proximal fragment of the femoral head, their lengths, the forces of the maximum tightening, the use of washes, and the degree of maturity of the regenerated bones in different periods of consolidation.

Conclusions

The deformation of dry and wet specimens with models of metal osteosynthesis is fundamentally different, dry specimens may be only used for approximate estimation.

Carried out with three screws with a tightening force of $\geq 1 \text{ N} \cdot \text{m}$, metal osteosynthesis in medial femoral neck fracture provides a stable fixation at dynamic loads of body weight. Washers and canulated screws increase the stability of fixation in osteoporotic bones by 50-100%.

The developed bench and methods of experimental tests of the stability of different types of metal osteosynthesis pave the ways to optimize the individual rehabilitation conditions for the patient, depending on the condition of his bones, to reduce the time of treatment and disability, and to improve the treatment results and quality of life.

EXPERIENCE IN TREATMENT OF COMPOUND FRACTURES OF THE PROXIMAL TIBIA IN PATIENTS WITH CRANIO-CEREBRAL INJURY

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Reserch objective: Analyzing long-term results to optimize the treatment tactics for compound fractures of the proximal tibia in the injured persons with combined craniocerebral trauma (CCT).

Materials and methods

The treatment results of 216 patients were studied. According to the Glasgow Coma Score (GCS), severe craniocerebral trauma (CCT) was observed in 22 patients, moderate CCT was observed in 66 patients, and light CCT was observed in 128 patients.

Severe craniocerebral trauma

Conservative treatment was used in 11 patients (3-5 scores as per GCS); craniotomy with concurrent or sequential closed imposition of the modular rod apparatus was performed in 5 patients with 41A3 and 41C3 type fractures combined with distal hip fractures. Internal osteosynthesis with plates with angular stability was performed in 6 patients after restoration of vital functions (approximately in 3 weeks).

Moderate craniocerebral trauma

53 patients were operated on: transcutaneous compressing osteosynthesis (12); open reduction with bone autoplasty and osteosynthesis with immersed structures (31); and external osteosynthesis (10). The latter was performed urgently in 8 injured persons with 41A3 type fractures, and in combination with a hip fracture.

Mild craniocerebral trauma

After the relief of traumatic shock, which determined the severity of patient's performance status, the simultaneous treatment of the injured knee joint and craniocerebral trauma was provided. Conservative treatment was provided in 29 patients of this group with fractures of 41A1 and 41B1 types.

Research findings

Good results (77 fractures - 48%) and excellent results (43 fractures - 27%) were observed in most cases.

Conclusions

1. In polytrauma conditions, the key factor determining the choice of time and method of treatment is not the nature of the fracture, but severe performance status of the injured person and the presence of concomitant injuries that may be often predominant.

2. At the early hospital stage, in severe and open 41C type fractures combined with CCT, preventive stabilization of the knee joint with a modular rod device is indicated rather simultaneously with surgeries on the brain.
3. At the specialized clinical stage, after normalization of patient's performance status, the method change is recommended: it should open reduction and stable osteosynthesis with submerged structures.

**TEACHING OF MILITARY SURGERY AT THE CHAIR OF DISASTER
MEDICINE OF ZAPOROZHYE MEDICAL UNIVERSITY**

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The experience in carrying out the antiterrorist operation (ATO) showed that modern Ukrainian civil medicine is not prepared to provide the first medical aid on a high professional level to wounded and injured persons during hostilities. The elimination of military chairs in 2010 and the abolition of the teaching of military surgery at medical universities contributed to it. Zaporozhye Medical University is one of the three medical universities in Ukraine wherein the military chair was left, and the discipline "military surgery with emergency surgery" (MS) continued to be taught in the chair of disaster medicine (DM) and military medicine for students who took the course of special training. The main clinical base of the chair is the Municipal University Hospital of Emergency and Urgent Medical Aid. To hold practical classes on relevant topics, the following hospital departments are used: admission, neurosurgery, thoracic surgery, burn injury, polytrauma and traumatology, resuscitation and intensive care, and the first aid station. The hospital is the center of territorial disaster medicine service (TDMS) and the largest medical institution in Zaporozhye Region to assist patients having medical emergencies. After the re-opening of previously closed garrison hospital, its clinical basis is used once again for practical classes. The teaching staff of the chair is represented by doctors and candidates of medical sciences in various surgical specialties (vascular surgeon, traumatologist-orthopedist, neurosurgeon, combustiologist, thoracic surgeon, emergency physician) who are curators and heads of the relevant departments of the clinic. Students train practical skills both at classes and mandatory night duties at the admission department.

Teaching military surgery in the clinic with massive admissions of patients requiring urgent medical aid greatly enhances the visibility of the educational process and facilitates the consolidation of the theoretical knowledge. Students have the opportunity to observe injured persons and get acquainted with work of the structural units of the hospital while rendering assistance to patients requiring urgent medical aid. The main focus is on timely identification and implementation of the required amount of emergency medical aid, determination of indications for emergency admission, adequacy of emergency care at the pre-hospital stage, including emergency care at time shortage and limited medical and diagnostic capabilities in case of mass disasters.

The military surgery teaching scheme used at the Chair of Disaster Medicine allows improving the quality of training of future doctors in providing emergency care in case of concomitant and combined injuries, massive admission of injured persons in wartime and in emergency situations of peacetime.

Set by the Ministry of Healthcare to higher education establishments, the task to amend current academic programmes and renew the teaching of compulsory disciplines of military training for doctors is late; however it corrects previous mistakes.

In our opinion, it would be more logical to unite military surgery and military traumatology into a single discipline instead of splitting the hours allocated for them between different departments, and teach this united discipline on the clinical bases wherein emergency medical aid is provided to polytraum patients and in military hospital as well.

REHABILITATION OF PATIENTS IN POSTOPERATIVE PERIOD IN CASE OF PROXIMAL HUMERUS FRACTURES

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Introduction

Currently, the system of rehabilitation measures in the postoperative period in patients with proximal humerus fractures, unfortunately, remains unstructured, and it is improperly regarded as a secondary task.

Research objective: Improving the results of treatment of patients with proximal humerus fractures by developing rehabilitation in the postoperative period on the bases of the restoration of the anatomical integrity of the humerus, the integrity of tendon-capsule apparatus of the shoulder joint, and the muscle tone of the pectoral girdle, as well as on the understanding of the structure of traumatic pathology in patients with fractures and anatomical aspects of the proximal humerus segment.

Materials and methods

The study group included 68 patients (31 men and 37 women) aged 16 to 83 years (mean age of 49.5 years) with the proximal humerus fracture. 24 patients had a two-fragment fracture, 7 patients had a dislocated two-fragment fracture; 21 patients had a three-fragment fracture; 3 patients had a three-fragment fracture with a dislocation of the articular surface of the humeral head; 9 patients had a four-fragment fracture; and 4 patients had a four-fragment fracture with dislocation of the articular surface of the humeral head. In all the patients, this fracture type was accompanied by a rotational component of more than 45° and a diastasis of more than 1 cm between the debris. All the patients were operated on and underwent a developed rehabilitation system based on restoration of passive and active motions in the shoulder joint in the early and late postoperative period. The control group included 68 patients with the same types of fractures of the proximal humerus, with the standard rehabilitation technique used in the postoperative period for those patients.

Research findings and discussion

To determine the restoration of the upper limb function, the Constant-Murley score was used. Follow-up period was within the range of 2 months to 1 year after surgical treatment. Recovery results on the patients of the group that used the developed rehabilitation system: subjective

assessment of 30-34 points (absolute norm is 35 points); objective assessment of 55-64 points (absolute norm is 65 points); total assessment of 85-98 points (absolute norm is 100 points).

Recovery results on the patients of the control group: subjective assessment of 22-26 points; objective assessment of 40-51 points; total assessment of 62-77 points.

Positive (excellent and good) results were obtained in patients with two- and three-fragment proximal humerus fractures. It is directly associated with the nature of the fracture and the possibility to workout early active motions in the shoulder joint in this group of patients. Satisfactory results were obtained in patients with dislocated fractures.

Unsatisfactory results were obtained in patients with dislocated four-fragment fracture. Satisfactory and unsatisfactory results, both in study groups and in the control group, are associated with the late development of both passive and active movement workout in the shoulder joint (on average in 3 weeks after the surgery).

Conclusions

The standard rehabilitation technique does not provide an efficient restoration of the functioning of the upper limb in the shoulder joint in the early and late postoperative period.

Patients with the proximal humerus fractures require early restoration of motions in the shoulder joint to prevent the development of contracture of the shoulder and atrophy of the muscles of the pectoral girdle.

Positive results of treatment of patients with the above mentioned types of fractures, which were treated the developed rehabilitation system, witness the success of the use of this technique in the treatment of patients with this type of injury, which reduces the time of their disability.

FACTORS CONTRIBUTING TO DEVELOPING PERI-IMPLANT INFECTIONS OF THE KNEE JOINT

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Introduction

The knee joint replacement is a widely used surgery in severe pathology of the knee joint. An increase in the number of primary operations also increases the number of suppurative and inflammatory complications. According to academic literature on the subject, peri-implant infection after the knee joint replacement surgery may be developed in 6% of the total number of knee joint replacement surgeries. Patients, both young (aged 30 years and less) and adult (aged 70 years and older) are at risk of purulent complications (periimplantitis).

Research objective: Studying the risk factors for developing peri-implant infection after knee joint replacement surgeries.

Materials and methods

The patients undergoing the knee joint replacement surgery have a certain risk of developing infectious complications. Aggravating factors include chronic somatic diseases, previous joint surgeries, malnutrition or morbid obesity, the presence of social habits. The incidence of peri-implant infection in patients with diabetes mellitus is 3.43%.

Observations indicate that the development of the inflammatory process does not depend on a past history of diabetes, but on the control and correction of the blood glucose levels.

According to academic literature on the subject, the risk of peri-implant infection is almost the same in patients with controlled diabetes and in patients without diabetes.

In general, indicators of developing purulent complications are high in patients with chronic renal failure. The incidence of peri-implant infection in patients with hepatitis C and signs of hepatic cirrhosis increases to 77.8%.

Morbid obesity with a body mass index (BMI) $> 50 \text{ kg} / \text{m}^2$ increases the risk of developing infection by three or four times. Malnutrition leads to a prolongation of the healing of postoperative wounds. A low degree of activity of the rheumatoid process and a short duration of the disease (less than 7 years) have virtually no effect on the incidence of peri-implant infection. However, the high activity of the inflammatory process in rheumatoid arthritis is a contraindication for arthroplasty. Another important factor contributing to developing peri-implant infection of the knee joint is the number of surgeries performed on the joint.

In cases where hip joint replacement was preceded by joint debridement or reconstructive surgery, the risk of complications increases from 1.7% to 33.4%.

Each subsequent surgery on the joint, as well as the revision of the implant, increases the percentage of infection due to the developing scar-adhesive process, impaired microcirculation in the tissues, and an increase in the volume of blood loss. The risk of postoperative complications after hip joint replacement increases significantly in patients who abuse alcohol.

Some authors recommend total abstinence from alcohol for four weeks before surgery.

In addition, studies showed an increase in the number of peri-implant infections in patients smoking up to 25 cigarettes per day.

Conclusions

The risk factors for developing peri-implant infection after the knee joint replacement surgery include both young and old patient age, severe comorbidities (diabetes, rheumatoid arthritis, kidney and liver disease), malnutrition or morbid obesity, social habits (smoking, alcohol abuse), as well as the nature of previously performed surgeries on the knee joint.

PECULIARITY OF TOTAL HIP JOINT REPLACEMENT IN HIP JOINT ANKYLOSIS

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The total hip joint replacement in ankylosis of the hip joint refers to the hip joint replacement under difficult conditions, which is stipulated by changes in the hip joint and soft tissues around it.

Research objective: Determining particularities of hip joint replacement in patients with ankylosis of the hip joint.

Materials and methods

The total hip joint replacement was performed in 33 patients aged 22 to 64 years (average age of 42.5 years) – 19 men and 14 women – with ankylosis of the the hip joint. The main reason that led to ankylosis was inflammatory process in the hip joint. Thus, 12 patients were diagnosed with ankylosing spondylitis and 14 patients were diagnosed with rheumatoid arthritis. Hip joint ankylosis developed after tuberculosis process in 2 cases; after the hip joint injury with an acetabular fracture in 3 cases; and after arthrodesis of the hip joint in 2 cases. In the preoperative period, it is important to determine condition of the lower limb muscles, as well as condition of the bones in the hip joint. These indicators determine the choice of the implant type and restoration of the range of motion in the operated joint in the postoperative period. The strength of the muscles should be at least of M3 category. The bone condition was determined by using X-ray densitometry. Cemented implants were used in 16 patients; cementless implants were used in 12; and hybrid implants were used in 5 patients.

Research findings and discussion

The peculiarity of surgery intervention is stipulated by lack of motions in the hip joint and a low elasticity of muscles, which requires the release and the need to determine the anatomical position of the acetabulum. Moreover, patients with rheumatic diseases showed increased bleeding of soft tissues in the surgery site, which is associated with systemic connective tissue inflammation. The condition of the bone tissue must be taken into account as careless movements may lead to a femoral fracture. In the course of the surgical intervention, the femoral neck was isolated, and its osteotomy was performed; the proximal hip release was performed, which allowed an access to the acetabulum location. The femoral head was fragmented and removed by parts. The residual cartilage and fatty tissue in the acetabular bottom were **the benchmark to determine the** acetabular bottom. In cases of ankylosis, which occurred as a result from the hip joint arthrodesis, there was no need to determine the acetabular bottom.

In patients with rheumatoid arthritis, as a rule, the process was bilateral with the involvement of the knee joint and the ankle-joint. Such patients needed the knee and ankle joints to be set in a functionally favorable position; it should be followed by the replacement of the knee joints and arthrodesis of the ankle joints in a functionally favorable position.

Conclusions

The total hip joint replacement, in case of ankylosis of the hip joint, refers to the hip joint replacement under difficult conditions. An important point in preoperative planning is determining condition of the hip muscles and condition of the bone tissue. In the course of a surgery intervention, it is necessary to determine the anatomical position of the acetabulum with the removal of residual cartilage and fatty tissue.

DIPLASTIC GONARTHROSIS. PREDICTING THE DEVELOPMENT

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Introduction

Recently, an increase in the number of patients with osteoarthritis of different etiology from 19.8 to 63% has been observed in Ukraine, like in the rest of the world (Gayko, GV, 2006). It was found that the number of people suffering from osteoarthritis was more than 2 thousand per 100 000 population in this country. More than 10 million persons suffer from osteoarthritis in the USA; the incidence of osteoarthritis is 80% among all joint diseases in Western Europe (Kovalenko V.M., 2005; Korzh M.O., 2007).

Knee dysplasia is one of the reasons for developing gonarthrosis in young and adult people; the proportion of dysplastic gonarthrosis in the structure of knee osteoarthritis is within the range of 10 to 45% (Zazirnyi I. M., 2007). Dysplastic deviations in the structure of the knee joint are risk factors for developing osteoarthritis (Korzh M. O., 2010).

In case of dysplastic gonarthrosis, the main factors of developing degenerative lesion of the articular ends of the bones are, first of all, anatomical and functional inconsistencies that lead to biomechanical disturbances in the knee joint and cause the specified pathological process (Siminach B. I., 2009).

Research objective: Developing a prognostic model of dysplastic gonarthrosis.

Materials and methods

Graphical, analytical, and mathematical modeling, X-ray and statistical methods were used. Retrospective analysis of medical records and other medical documents, X-ray patterns of 198 patients, including 189 patients with dysplastic pathology of the knee joint showed that:

- dysplastic pathology of the knee joint with frontal deformity was in 129 cases, with valgus deformity in 19 cases and varus deformity in 110 cases among them;
- dysplastic pathology of the knee joint with pathology of the patellofemoral junction was in 60 cases.

The control group included 9 persons with traumatic lesions of meniscus without signs of dysplastic deformity.

The patients were divided by age:

Group I: 35 persons aged less than 20 years;

Group II: 48 persons aged 20 to 49 years;

Group III: 106 patients aged 50 years and older.

Research findings

X-ray examinations of knee joints parameters were carried out as per our schemes in patients of different age, with different dysplastic syndromes and deformities at different stages of gonarthrosis to obtain new information on the condition of the knee joint and for possible prediction of pathological changes.

The distribution of developing gonarthrosis in patients with dysplastic knee joint syndromes was analyzed by using the method of conjugate tables, analysis by χ^2 criterion, Pearson correlation analysis, discriminant analysis, and regression analysis to determine developing changes characteristic for arthrosis as function of the state of anatomical parameters of the knee joint.

Firstly, the distribution of gonarthrosis in patients was estimated in terms of age. It was established that the disease distribution difference between the age groups is statistically significant ($\chi^2 = 282,971$; $p \ll 0,001$). A significant difference in the distribution of stages of arthrosis changes as function of the dysplastic syndrome in all age groups was also determined.

In case of valgus deformity, arthrosis was observed predominantly in patients older than 50 years. It should be noted that the proportion of patients with Stage IV arthrosis with valgus deformity is higher (in 26% of the 19 patients with this pathology).

In the case of varus deformity, arthrosis was observed in patients aged 20 to 49 years and mostly in Stage II arthrosis (in 64% of 14 patients), and predominantly stage III arthrosis was observed in the group aged 50 years and older (67% of 92 patients).

In patients with dysplastic syndromes of the patellofemoral junction, Stage I-II arthrosis was predominantly observed in the group aged 20 to 49 years (93.5%).

It is difficult to speak about the distribution of arthrosis in patients aged 50 years and older with pathology of the patellofemoral junction because of a small number of patients in this group. No Stage IV arthrosis was documented in patients of this group.

Correlation between arthrosis changes with anatomical parameters of knee joint was evaluated, with mathematical relation between them revealed. This mathematical relation is defined with a mathematical equation:

$$\text{The stage of arthrosis} = 0.323 \times L_s - 0.204 \times L_b + 0.175 \times m_m - 0.201 \times L_a$$

Where:

L_s : area of patellar articular surface;

L_b : distance from the lower patella to the tibial tuberosity;

m_m : width of the medial hip process;

L_a : distance from the lower edge of the patellar articular surface to the anterior tibial margin.

Such a prognostic model of developing gonarthrosis is based on the discriminant analysis. The result is compared to the classification table to determine the anticipated stage of arthrosis.

Table

Classification table for determining the anticipated stage of arthrosis

The value obtained	Predicted stage of arthrosis
< 1	0
3	I
5	II
7	III
> 7	IV

Based on discriminant analysis, we were able to predict and confirm the correctness of the diagnosis of gonarthrosis as function of anatomical particularities of the knee joint in patients.

The purpose of the discriminant analysis is to determine the coefficients of the discriminant equation, in which it is possible to achieve the maximum accuracy of the diagnosis of the arthrosis stage or its occurrence in the near future.

The overall accuracy of the forecast is 97.7%. It makes it possible to develop a prognostic model for the diagnosis of dysplastic gonarthrosis, to determine the arthrosis stage or to predict the development of arthroscopic changes, to optimize the treatment and early prevention of the disease.

The arthrosis stage was an independent parameter. While anatomical parameters of the knee joint in the frontal and sagittal planes and the age of the patient were dependent parameters.

Conclusions

The mathematical relation between the arthrosis stage and anatomical parameters of the knee joint was determined on the basis of the retrospective study. The prognostic model (formula) for developing gonarthrosis was elaborated on the basis of discriminant analysis, which achieves the maximum accuracy in the diagnosis of the arthrosis stage or its occurrence in the near future. The overall accuracy of the forecast in this case is 97%, which qualitatively complements the diagnostic search in arthrology.

CORRECTION OF EQUINUS CONTRACTURES IN PATIENTS WITH INFANTILE CEREBRAL PALSY AT THE SANATORIUM STAGE OF TREATMENT

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Key words: ICP – infantile cerebral palsy, EC - equinus contracture, FTCA - frontal talocalcaneal angle, LTCA - lateral talocalcaneal angle, PPS - permanent passive stretching, SPS – stage-by-stage plaster splinting.

Research onjective: Increasing the efficiency of the treatment of spastic forms of infantile cerebral palsy by including some orthopedic techniques in the sanatorium treatment.

Matrerials and methods

We assessed 26 patients aged 7 to 11 years of both sexes suffering from infantile cerebral palsy (ICP) in the form of spastic diplegia.

Research methods: clinical and orthopedic, X-ray (frontal talocalcaneal angl (FTCA) and lateral talocalcaneal angle (LTCA) were determined by X-ray patterns of the feet with a load).

The degrees of muscle spasticity were determined by the Ashworth scale. Functional disorders were assessed by a modified GMFCS scale. The integrated assessment of the condition of children with cerebral palsy was carried out according to the scale developed by us. 11 patients of the group moved freely to a distance of 30 m (Level II), and 15 patients moved with a support (Level III). Equinus contracture (EC) was noted at the fixation stage, i.e. spasticity Stage III (angle of 5 to 7°), in 15 patients (Group 1, 57.7%); fixed EC, i.e. spasticity Stage IV (angle of 7 to 10 °), was noted in 11 patients (Group 2, 42.3%). Stage II-III planovalgus deformity of the feet was observed in all the

cases. FTCA >30°, LTCA >40°. The secondary dynamic contracture of the knee joints (up to an angle of 5°) was characteristic. The observation period was 1 year.

For the follow-up period, the patients received 2 courses of rehabilitation treatment in Khadzhibey specialized children's university sanatorium (balneo- and peloid therapy, hydro-kinesiotherapy, physiotherapy, training in walking in the "Gravistat" rehabilitation costume, etc.).

To correct EC in Group 1 patients in the course of sanatorium treatment, the procedures were performed for permanent passive stretching (PPS) of the triceps muscle of the lower leg by using the device developed by us (Patent No. 78994). The first two days of the procedure in the apparatus were adaptive (they lasted for 1-2 hours at daytime) and 8 hours at night. The course duration was within the range of 10 to 14 days, depending on the degree of contracture. Using PPS procedures made it possible to achieve a positive result that was consolidated at home by wearing polymeric semi-rigid orthoses made in the sanatorium for the period of rest.

After the sanatorium treatment, patients of Group 2 underwent stage-by-stage plaster splinting (SPS) (i.e., "boot" circular plaster cast) in 3 stages (duration of one stage was 2 weeks): partial correction was provided at Stage I; complete correction was provided at at Stag II; and Stag III was a consolidating stage. Additional support of the foot at Stage II was provided by means of a polymer splint inserted into the plaster as per our method (Patent No. 101752). Before this stage, blanks were manufactured for semi-rigid polymer orthoses, and orthopedic shoes were ordered.

The equinus levelling was achieved in all the children of Group 1 within a period of 5 months. In 9 patients of Group 2, correction of the feet position after the stage-by-stage plaster splinting persisted for 3-4 months. Improvement of radiological indicators consisted in the reduction of FTCA and LTCA by 5-7° on average. 18 children improved their abilities to move and stepped up to a higher level of GMFCS (in both groups); 8 children were unchanged, which was also regarded as an improvement against positive dynamics of clinical and radiological indicators. The integral assessment showed an increase in the total score by 17.0 ± 2.1 points.

A functional improvement consisted in an increase in support ability of the feet and in improving motor abilities of the patients.

Thus, permanent passive stretching (PPS) of the triceps muscle of the lower leg in dynamic spastic equinus contracture (EC), and stage-by-stage plaster splinting (SPS) in spastic equinus contracture in the fixation stage in combination with the stage-by-stage recuperative sanatorium treatment showed its efficiency for correcting the spastic contracture of the ankle joint, which made it possible to improve the functional result, i.e. allowed free movement.

EXPERIENCE IN USING RADIAL SHOCKWAVE THERAPY IN REHABILITATION OF PROFESSIONAL ATHLETES

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Relevance

The therapy is underlain by the unique properties of shock waves able to cause changes in body tissues.

The shock wave non-invasively penetrates into soft tissues, dramatically improves local blood circulation, and loosens calcium deposits and fibrous foci, which are the cause of inflammation and pain. Fragments of calcium deposits and fibrous foci are gradually resorbed after the shockwave procedure. One of the advantages of the shockwave procedure is the emergence of new microvessels in the problem area, the expansion of existing vessels and, consequently, the improvement of blood supply and lymph circulation.

Research objective: Determining the efficiency of the method of radial shockwave therapy in the treatment of various kinds of lesions and injuries in professional athletes.

Material and methods

63 professional athletes, such as players of a professional handball club, professional footballers, tennis players, track athlete, and boxers, were treated in our clinic for the follow-up period. The main diagnoses were enthesopathies of various localizations: enthesopathy of the rotator cuff, enthesopathy of the patellar ligament, achillobursitis and achillobodynia, plantar fasciitis, epicondylitis, enthesopathy of the hip muscles (ARS syndrome). The treatment was carried out on the MASTER PULSE 200 apparatus by STORZ MEDICAL, SWITZERLAND. All the athletes received 5 sessions of radial shockwave therapy once a week by applying various parameters. Therapy was also carried out with the use of V-AKTOR technology that makes it possible to avoid any limitation of physical exertions while the treatment lasts, and to regain quickly tone tired muscles.

Research findings and discussion

As a result of the treatment applied, all athletes returned to their professional activities. The results were evaluated by interviewing the athletes, by evaluating them by VAS score, ultrasound and MRI examinations. After 3 shockwave procedures, the pain decreased, on average, by 4 units as per VAS score. When evaluating the ultrasound examination results, a 30% reduction in calcifications was observed after 6 therapeutic procedures. The full lysis of calcium deposits is obtained after 10 procedures.

Conclusions

Radial shockwave therapy is a modern and efficient conservative method of recovery after injuries, and a treatment method for diseases of the musculoskeletal system. This is especially true in professional sports, where heavy physical exertions are practiced on a regular basis, which may cause chronic overstrain and injury. Shockwave therapy makes it possible to achieve results comparable to surgical treatment in a relatively short period of time, without possible complications; it may be used as both an optimizing method in the integrated treatment and as an independent treatment method for sports injuries. The application of the shockwave therapy and the V-AKTOR technique makes it possible to quickly and efficiently return athletes to their professional activities after injuries.

CLINICAL PRESENTATION, DIAGNOSTICS, AND PECULIARITIES OF TREATMENT OF INTRA-ARTICULAR INJURIES OF LONG HEAD OF THE BICEPS TENDON

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According to the academic literature on this subject, isolated injuries of the long head of the biceps tendon constitute 7% of all injuries of the shoulder joint. These injuries may be conditionally divided into three zones: 1) Injuries in the area of fixation to the scapula (SLAP); 2) Injuries at the level of the shoulder joint (degenerative or traumatic tears); 3) Injuries at the level of intertubercular groove (Pulley Lesion). We found inflammatory changes in the long head of the biceps tendon in 70% of patients with various injuries and diseases of the shoulder joint at MRI, and in 90% of patients at arthroscopy of the shoulder joint. The tenosynovitis of the long head of the biceps tendon is one of the main causes of pain in the shoulder joints.

Research objective: Comparing the results of conservative and surgical treatment of various types of injuries of the long head of the bicep tendon.

The clinical group consisted of 120 patients who were divided into 3 groups: A group included 40 patients with various SLAP lesions (surgical treatment was in 30 patients and conservative treatment was in 10 patients); B group included 26 patients with degenerative or traumatic rupture (surgical treatment was in 16 patients and conservative treatment was in 10 patients); and C group included 54 patients (surgical treatment was in 34 patients and conservative treatment was in 20 patients) with ligament lesions that hold the tendon of the long biceps head (Pulley Lesions) of 1-4 type as per Habermeier classification. **Conservative treatment included:** local (ointment) and general anti-inflammatory therapy (nonsteroidal anti-inflammatory drugs, NSAID), 5 local injections of homeopathic anti-inflammatory drugs once every 3-4 days and physical methods.

Surgical treatment included: arthroscopy, debridement of the shoulder joint, re-fixation of the glenoid labrum (Bankart surgery/repair), tenotomy or tenodesis of the long-headed biceps tendon at the level of the proximal third of the intertubercular groove of the humerus (arthroscopic), or tenodesis at the level of distal third of the intertubercular groove of the humerus (subpectoral tenodesis). The shoulder joint was assessed on the Oxford Shoulder Score and Constant Shoulder Score in 3 months after the surgery or the end of the course of conservative treatment.

In case of conservative treatment, good results (as per Oxford Shoulder Score and Constant Shoulder Score scales) were obtained in patients of A group with SLAP type 1 injury and in C group with the Pulley Lesions type 1 as per Habermeier classification; poor results were obtained in patients in A group with SLAP type 2-4 injuries and in C group with Pulley Lesions type 2-4. In case of surgical treatment, good results (as per the Oxford Shoulder Score and Constant Shoulder Score) were obtained in 3 months in A group for all types of SLAP lesions and in C group for Pulley Lesions type 1; worse results were obtained in patients with type 2-4 injuries. However, an increase in the function of the shoulder joint in 3 months after surgical treatment was significantly higher than in case of conservative treatment. The overall results of surgical treatment were also better than those of conservative treatment. In B group, the results of conservative and surgical treatment in 3 months were almost identical.

USING PLASMA RICH IN PLATELETS FOR STIMULATION OF OSTEOINTEGRATION OF STEM OF THE HIP JOINT IMPLANT IN MIDDLE-AGED PATIENTS WITH OSTEOPOROSIS

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Introduction

Nowadays, osteoporosis – a reduced amount of bone tissue per unit of volume – has become widespread, and its incidence is rising in younger patients. This is due both to the physiological characteristics of the elderly and to the numerous pathological conditions. Reduced bone density significantly impedes the treatment of bone fractures and worsens the course of orthopedic diseases. In cases of insufficient bone quality, hip joint replacement is risky or even impossible as it is doubtful that an early limb function will be achieved. To improve the implant fixation, the cemented implants are used; however, they are not acceptable in young patients for many reasons, including future revisions. To stimulate osteointegration of cementless implants, it is proposed to use different types of bone plastics. There are some reports on the efficiency of stimulation of reparative osteogenesis by the local application of plasma rich in platelets.

Research objective: Using plasma rich in platelets to improve the osteointegration of the hip joint implant stem in patients with osteoporosis.

Materials and methods

The study analyzed the results of treatment of 62 patients aged 55 to 60 years who were treated with cementless hip joint replacement against postmenopausal osteoporosis. Verification of osteoporosis in the preoperative period was performed by using a two-photon densitometer. Bone autoplasty of the proximal hip was used in all patients along with plasma rich in platelets (PRP). The data were compared with those in the control group (50 patients) where PRP was not used. PRP was obtained in the course of surgeries from patients' blood in amount of 6 mL by the double centrifugation method, and applied to the cancellous bone autograft prior to inserting it into the femoral canal. The dynamics of osteointegration of the hip joint implant stem was studied on the basis of X-ray and computed tomography data, as well as on clinical signs (painless axial load of the operated limb).

Research findings

Radiological studies showed a quite efficient osteointegration of the hip joint implant stem in the study group of patients within a period of 67.0 ± 7 days after the surgery: a practically painless load of the operated limb was possible. None of the patients showed signs of early implant instability. The time of integration of the implant was longer on average by 20 ± 3 days in the control group of patients. Signs of early instability of the hip joint implant stem were identified in 2 patients, which caused a longer use of an additional support and a long-term use of osteotropic therapy.

Conclusions

The use of plasma rich in platelets may improve the osteointegration of the cementless hip joint implant stem in middle-aged patients with the background of osteoporosis, and significantly reduce the rehabilitation time.

BIOMECHANICS OF PATIENTS WITH DEGENERATIVE COXARTHROSIS BEFORE AND AFTER THE TOTAL HIP JOINT REPLACEMENT

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The total hip joint replacement is a reliable and efficient method of surgical treatment of severe degenerative diseases of the hip joint. The hip joint replacement has been used for a long time as a priority method to help patients with degenerative diseases of the femoral head. Although the method used to be a unique one, currently it is a routine surgical intervention. The high rehabilitation effect of the hip joint replacement, long lasting, and successful functioning of the joint implant in the body have expanded the age limits of using the hip joint replacement. However, despite the constant improvement of implant structures and techniques for their implantation, functional results are not always satisfactory. The reason is that the development of degenerative process leads to significant disorders of statics and locomotory, whose manifestation depends on the duration and severity of the disease. Due to the duration of the disease, the strength of the femoral joint muscles is dramatically reduced, especially the strength of adductor muscles, and other links of the musculoskeletal system are involved in the process followed by formation of complex adaptive and compensatory reorganizations of both functions and anatomical interrelations.

At the surgery time, the patient has a steady range of bone and muscular pathology. At the surgery time, the patient has a steady range of bone and muscular pathology. The situation is complicated even more by the fact that the implants are largely developed not individually, but as a universal serial product. Rehabilitation of the patient who underwent the total hip replacement surgery is transformed into a complex task. Even after eliminating the pain syndrome and increasing the range of motion in the affected joint, some patients can not walk without additional support; while walking biomechanics, as well as static and dynamic functions remain intact.

Research objective: Studying the effect of severe degenerative diseases of the hip joint on the walking biomechanics.

Research task: The study goal is to study the basic integral indicators of walking quality, which assess the time parameters of the load and the transport of affected and intact limbs.

Materials and methods

The research was performed on the Gait Rite device in neurological department of Vinnitsa National Medical University. 50 patients aged 27 to 81 years (the average age was 54 years) with coxarthrosis were investigated, with 17 patients having bilateral coxarthrosis. The patients were examined in a period of 5 to 10 years after the surgery.

Research findings and discussion

In unilateral coxarthrosis, the supporting period on the affected limb is shortened due to the pain syndrome, with the supporting phase growing compensatorily on the other limb. The amplitude of the anterior and posterior pushes is reduced, i.e., a limitation of the load on the affected joint appears at the moment of the maximum dramatic change in the force of interaction between the limb and the support surface. The walking pace is decreased substantially, which reduces the amplitude of pushes.

In bilateral coxarthrosis, there is also an asymmetry of the temporal and supporting functions of the limbs: as normally, one joint suffers more than other. In general, in patients with coxarthrosis, instability of biomechanical parameters while walking is observed due to both the accumulation of fatigue in the course of the day, and the fact that patients with degenerative joint lesions are strongly influenced by climatic and seasonal changes in the environment.

The length of the period of support on the affected limb was different in patients, and according to our observations, it correlated more often with patient's age: the older the patient, the less time of support to the affected limb ($r = 0.75$, $p < 0.05$); the degree of shortening of the affected limb: the bigger the magnitude of the limb shortening, the longer the time of support to this limb; however, this relation was not obvious, and the clear relation was seen in the difference of limb lengths of 3 cm and more, in the presence of pain in the joint affected, and in the presence of intermittent lameness and irritating pain due to a pathology of the lumbar spine .

A decrease in the duration (50 to 50% of normal) of movement from heel to toe was observed on both limbs in all the patients.

A decrease in the reaction of the support of the affected limb and disturbances in walking rhythm were observed in all the patients with coxarthrosis, which leads to a significant difference of biomechanical parameters in each step, and unsteady gait.

The total hip joint replacement leads to an increase in the step length, a more even distribution of the load on the lower limbs, a decrease in the duration of the double step, which indicates an increase in the pace of walking; the pushing functions of the limb operated increase by several times.

With all the positive effects of total hip replacement on walking, normal locomotion, however, is not fully recovered. Although, the range of motions in the joint is recuperated in full and the strength of the gluteal muscles is satisfactory, lameness does not disappear, and the reason is lack of organization of the muscles surrounding the implant joint.

Conclusions

Functional assessment of walking before and after the total hip joint replacement makes it possible to determine the pathological characteristics of walking, especially in the postoperative period, to observe the restoration of the quality of walking and to determine in time the deterioration of the results of postoperative recovery to take appropriate rehabilitation or therapeutic measures.

ARTHROSCOPY IN THE INTEGRATED MEDICAL AND DIAGNOSTIC ACTIVITIES IN OSTEOARTHRISIS OF THE KNEE JOINT

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Osteoarthritis is one of the most common pathologies of the human musculoskeletal system. Currently, a wide range of therapeutic measures is available, whose efficiency largely depends on the severity of degenerative changes in the joint. No correlation exists between radiological signs (on which the most common osteoarthritis classifications are based) and condition of the articular cartilage: this fact is generally recognized. Therefore, determining the osteoarthritis stage and the degree of intraarticular changes (first of all, changes in articular cartilage, menisci and ligaments) is of paramount importance for the choice of a treatment method for a particular patient. Despite a widespread introduction of various non-invasive instrumental examination methods into the routine practice of the orthopedists and traumatologists, lack of correlation between them remains a challenge.

Research objective: Comparing the diagnostic capabilities of various methods of radiation examination of patients with the knee joint osteoarthritis.

Materials and methods

Results of clinical, laboratory, and X-ray studies, ultrasound examinations, MRI, CT, and surgical intervention protocols of 714 patients with the knee joint osteoarthritis, which underwent arthroscopy in clinic of the Chair of Traumatology, Anesthesiology, and Military Surgery of Kharkov Medical Academy of Postgrade Education for the last 5 years.

Research findings and discussion

The patients underwent standard examinations. The degree of degenerative changes was assessed by Kellgren-Lawrence, Outerbridge, and ICRS classifications.

While carrying out arthroscopy, changes in articular cartilage of various degrees of severity were detected in all the patients. We used mosaic chondroplasty technique in 14 patients with local deep cartilage damages (Stage 3-4 as per Outerbridge classification and Stage 2-3 as per ICRS classification). A lesion focus was treated and chondroplasty was performed (abrasive osteoperforation) in the initial stages of osteoarthritis corresponding to Stage 2-3 of chondromalacia as per Outerbridge classification. Abrasive chondroplasty was performed in 238 patients, while fenestration was performed in 117 patients.

Condition of the synovial membrane was assessed, and hypertrophied areas of the mediopatellar and infrapatellar folds of the synovial membrane were removed in 523 patients. Loose bone and cartilage bodies were removed in 76 patients; resection of degenerative meniscus tears was performed in 281 patients.

After arthroscopy, 97 patients were offered the total arthroplasty.

Analyzing the data, we concluded that ultrasound and MRI do not allow accurate determination of the chondromalacia degree and the size of the cartilage defect. We revealed a complete absence of articular cartilage on most of the surface of one or several condyles in 56 patients, while radiological diagnostic methods showed this defect in one case only. These data are of paramount importance for determining the prospects of conducting chondrotropic therapy and indications for surgery (corrective osteotomy, knee joint replacement).

Based on the analysis of the results of clinical, radiological, and laboratory examinations, data of radiation diagnostic methods, the immediate and long-term results of surgical treatment of patients with lesions of the articular cartilage of the knee joints, we came to the following conclusions.

Conclusions

The available methods of radiation diagnostics are unable to determine reliably the degree and extension of the lesion of the articular cartilage.

Arthroscopy of the knee joint allows obtaining reliable data on the condition of the knee joint and choosing a method for further treatment of the patient. In some cases, arthroscopy of the knee joint makes it possible to achieve a good clinical effect (local cartilage defects, meniscal tears, hypertrophy of the mediopatellar fold and the fat body).

A differentiated approach to the choice of treatment, depending on the size and extent of injury of the articular cartilage, may improve the treatment results.

KNEE JOINT REPLACEMENT WITH MOTOR SICH EPK-2 TOTAL CEMENTED IMPLANT

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Introduction

Osteoarthritis is a multifaceted term that covers diseases of different etiologies, but with the same biological, morphological, and clinical signs. According to the WHO, today, degenerative joint diseases are among the most common lesions of the musculoskeletal system. Moreover, its share reaches almost 80% in the overall structure of joint diseases.

Currently, the knee joint replacement is one of the main methods of choice for surgical treatment of osteoarthritis in the advanced stages of the disease when the joint is substantially destroyed. Motor Sich JSC has been developing and manufacturing medical products for more than 20 years. In 2002, the development of knee joint implant started, and since 2005 commercial production of the knee joint implant has started. Currently, it is the first and the only one knee joint implant manufactured in Ukraine. The plant manufactures commercially the Motor Sich EPK-2 total knee joint implant (Specifications U 33.1-14307794-219: 2008, state registration certificate No. 7528/2008). The femoral component is made of a cobalt chrome molybdenum alloy and has six standard sizes. The tibial implant is made of BT6 titanium alloy by using thermohydrogen surface treatment (eight standard sizes). The tibial plateau inserts are made of Chirulen 1020, ToISO 5834, ENMEX Ltd, high molecular weight polyethylene with increased intermolecular bonds by gamma irradiation.

Materials and methods

Within a period from 2009 to 2015, 96 knee joint replacement surgeries were performed in the department of traumatology and orthopedics of Clinic Motor Sich Ltd by using the Motor Sich

EPK-2 implant system. Within a period from 2009 to 2015, knee joint replacement surgeries were performed in 96 patients aged 35 to 80 years, the average age is 62 years, in the department of traumatology and orthopedics of Clinic Motor Sich Ltd by using the Motor Sich EPK-2 implant system. The majority of patients were women (69 patients, 71.9%), men were 27 (28.1%). All the patients underwent primary knee joint replacement with preservation of the posterior cruciate ligament. Patients with posttraumatic osteoarthritis stage III prevailed (91 patients, 94.7%). Five patients were operated on for rheumatoid arthritis (6.3%).

Research findings and discussion

All the patients acquired a support limb; there were no cases of implant instability. The follow-up lasted up to 1 year in 9 patients; within a period of 1 year to 3 years in 17 patients; within a period of 3 to 4 years in 31 patients; within a period of 4 to 5 years in 20 patients; and for more than 5 years in 19 patients.

We analyzed the results of function recovery in 30 patients by using the Knee Society Score (KSS) scale (Table 1).

Table 1. Evaluation of the results of a total knee joint replacement by means of the Knee Society Score (KSS) scale [2]

Assessment period	Clinical evaluation	Functional evaluation
Prior to the surgery	42	48
In 2 months after the surgery	68	59
In a period of 1 to 3 years after the surgery	88	91
In a period of 4 to 6 years after the surgery	83	88

Made by patients on the bases of the analysis of pain, a subjective assessment of the treatment results showed that 50.0% of patients considered the treatment results to be excellent; 43.3% of patients considered the treatment results to be good; and 6.7% of patients noted an improvement at the time of inspection.

Knee joint functions

The functional results seemed to be very good at the assessment time. All the patients were able to flex the knee to an angle of 90° or more. Lack of extension of more than 5° was only in one case; and it should be noted that the patient achieved a significant improvement in joint function as a result of the surgery.

Fortunately, we never had to perform a joint redressing under general anesthesia after the surgery due to marked contracture (within a period from 4 to 6 weeks).

The analysis of the gait at the time of the re-examination in a long-term period showed that 89% of patients could walk without a cane and lameness. When walking long distances, 5 patients (11%) used a cane or a crutch supported on the forearm at the “healthy” side. In comparison with the preoperative situation, all the patients had a significant improvement in their gait at the time of the re-examination. More than two thirds of patients could walk on regular bases.

Particularities of surgery

Bone grafting of the defects of the tibial condyles was required in 7 patients (7.3%); the grafts were additionally fixed with a cortical screw in 5 cases. One patient had a severe varus deformity of 30° underwent a corrective osteotomy at the first stage, and after bone consolidation, the total knee joint replacement was carried out. Palacos bone cement was used in 70 cases; and Simplex bone cement

was used in 36 cases. Transplantation of the patella implant was not used. Arthroplasty was performed with remodeling of patellar articular surface and denervation with the diathermocoagulator. An early load on the operated limb was applied for 2 days after surgery in 96 cases.

Complications and their prevention

The patients received intraoperative antibiotic prophylaxis with cephalosporins. Superficial disorders of wound healing occurred in 3 cases (3%), and they were successfully relieved. Deep infection was in 1 patient (1%), which required a two-stage revision. The instability of the tibial component developed in 2 cases (2%); the instability of the femoral component was in 1 patient (1%), and revision knee joint replacement was performed. Thus, the share of complications that required removal of implants was in 4 cases (4%); and the implant survival for 6 years was about 96%. It corresponds to the data, for example, of the Norwegian register.

Conclusion

The use of the Motor Sich EPK-2 knee joint implant showed positive results in 96% of patients within 6 years after the surgery.

The knee joint replacement with the Motor Sich EPK-2 system is an effective treatment for gonarthrosis; it significantly improves the quality of life of patients.

PARTICULARITIES OF POSTTRAUMATIC OSTEOMYELITIS OF LONG BONES OF LOWER LIMBS AND TREATMENT WITH ENDOLYMPHATIC LASER THERAPY AND ANTIBIOTICS

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Introduction

Treatment of traumatic osteomyelitis is a major medical and social problem as the overwhelming majority of patients are young and able-bodied. Such patients undergo a long-term and expensive treatment with a partial positive outcome and disability.

We pay special attention to patients with post-traumatic osteomyelitis, when threatening patients with iodine deficiency, which proceed most often from mountainous regions.

According to the World Health Organization data, osteomyelitis incidence is about 7.6% among diseases of the musculoskeletal system. In modern traumatology, post-traumatic osteomyelitis of the lower extremities develops in patients with a wrong tactics of fracture management, which has long-term consequences. Post-traumatic osteomyelitis incidence is within the range of 12 to 23%, and the incidence of postoperative osteomyelitis is within the range of 3.3 to 7.3% because of purulent-necrotic complications in soft tissues in the post-operative period. Currently, the incidence of gunshot wounds increased against the background of hostilities in this country; as a result we note an increase in the incidence of osteomyelitis. At an early stage of treatment, it is necessary to follow strictly the algorithm and keep in mind possibility of infectious complications of fractures in

each case; also it is necessary to use new treatment methods that will increase the concentration of antibiotics in the infected area and stimulate regenerative processes.

Research objective: Determining biomechanical loads in metal osteosynthesis of the proximal femur by simulating the stress and strained state of the human femur; analyzing and clinically confirming the efficiency of endolymphatic laser therapy and endolymphatic administration of antibacterial drugs in treatment of post-traumatic osteomyelitis of the tibia and femur.

Materials and methods

Well-known treatment methods, including intra-arterial administration of drugs along with blood irradiation laser therapy, cannot meet fully requirements to treatment in computer simulation of the stressed and strained state. Therefore, the search for new treatment methods continues.

Used by us, the technique of intra-arterial drug administration through a. epigastrica does not meet fully the current requirements to treatment of post-traumatic osteomyelitis. Therefore, we developed the technique of endolymphatic antibiotic therapy and laser therapy for post-traumatic osteomyelitis of long bones of the lower limb.

17 patients with chronic post-traumatic osteomyelitis of long bones were treated in A. Novak Clinic of Orthopedics and Purulent Surgery. The patients lived in iodine deficiency endemic areas.

All the patients underwent catheterization of the foot lymphatic vessel, with the catheterization modification as per our method. The method was based on the catheterization of lymphatic vessels developed by R.T. Panchenkov *et alii* in 1984, with the catheterization underlain by the direct lymphography method published by Kinmonth in 1952. Lymphatic vessels were stained with 0.4% indigo carmine injected into the skin of the first interdigital space of the foot. A transverse incision of 1.5 to 2 cm was made in the middle third of the dorsum of foot under local anesthesia, with collector lymphatic vessels found stained.

A vessel was separated at a distance of 1 cm and catheterized with a polyethylene catheter of 0.1 cm diameter. The catheter was fastened to the vessel with ligatures, and it was fastened to the skin with an additional stitch and a plaster.

To carry out endolymphatic laser therapy, we used the Lika-Terapevt device. The irradiation was carried out with an infrared laser of 1 mW with a wavelength of 810 nm and exposition of 1 hour per day, with the number of laser sessions being within the range of 3 to 5.

Antibacterial therapy was carried out with an auto-injector. Preference was given to osteotropic antibiotics (lincomycin, clindamycin) which were diluted in 4-6 mL of 0.25% solution of lidocaine and injected endolymphatically through the catheter.

Research findings and discussion

We noted that performance status was improved and considered good in the postoperative period in 76.47% of patients. The result was satisfactory in 17.64% of patients. The results, which were considered unsatisfactory, were noted in 5.88% of patients; those patients did not return to work.

Dynamics of the wound process, X-ray presentation, and the level of endotoxemia were evaluated as per the following parameters of the blood: content of medium molecular weight peptides (it increases in 18-20 days); intoxication coefficient; leukocyte index of intoxication; lymphocytic index; and the presence of iodine. We noted that the most negative results, in our opinion, were in

patients who did not undergo adequate surgical intervention, and if a wrong treatment tactics was chosen in the preparatory period. Ignoring the condition of soft tissues of the injured limb was also a big mistake.

Conclusions

Proposed by us, the method of endolymphatic antibiotic therapy and laser therapy in the treatment of posttraumatic osteomyelitis of the tibia and femur requires further development and research. However, the method is quite a promising one, and it may take the rightful place among the methods of treatment for post-traumatic osteomyelitis in the future. It is especially true for patients with iodine deficiency, which live in endemic areas.

STUDY OF A STRESSED AND DEFORMED STATE OF BIOMECHANICAL SYSTEM ELEMENTS IN PROXIMAL FEMUR METAL OSTEOSYNTHESIS

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Intruduction

Over the past decades, the number of petrochanteric and subtrochanteric fractures of the femur has increased substantially, and it continues increasing. Using surgical treatment of petrochanteric and subtrochanteric femoral injuries significantly reduced the mortality of the patients. Metal osteosynthesis of petrochanteric and subtrochanteric femoral fractures is an efficient surgical treatment method; however, the available techniques can not fully satisfy the requirements of the patient and the physician. Current trends lead to the improvement of the shape and design of the fixtures and to minimization of surgical access. We consider that studies in this area will continue to be relevant for a long time; and the relevance is determined by the development of new structures, materials, forms and technologies for the production of metal fixtures.

Computer simulation in medical practice complements the clinical presentation of injuries and diseases under research. It is an integral part of treatment in current practice worldwide.

Mathematical modeling of the stressed and strained state (SSS) of elements of biological and biomechanical systems (BS and BMS) allows us to understand the fundamental nature of interaction of the elements of BS and BMS in various traumas and further prediction of the results of surgical treatment. Computer simulation may help justify the choice of surgical treatment of injuries or diseases, and determine a set of parameters and characteristics of a metal fixture for surgical treatment of fractures. The Ansys Workbench software uses the finite element method for calculations.

The model is underlain by a 3D model built on the basis of computer tomography images. The built model described the femur with a lesion layer, iliac bone and the fossa cartilage. Also, the model was supplemented with an "upper support" element for correct loading. The structure of the built bone elements was divided into cortical and spongy tissue. Geometric models were built in the Solidworks software package; then they were exported to the Workbench design software where the finite element models were built later on and numerous studies of the stressed and strained state were carried out.

For the purposes of this study, a geometric model describing the femur with the iliac bone and the fossa cartilage was built. Also, an element of the femur was identified, which corresponded to the damaged part. Components of the DHS and PFNA fixtures were added to the model to simulate joint replacement with various designs of the DHS and PFNA fixtures.

Research findings and discussion

Based on the calculation results, components of the stressed and strained state of the elements of the model under study were obtained. The equivalent stress as per Von Mises was determined, as well as the total displacement for the "upper support" element. Results were obtained for various parts of the femur (cortical and cancellous bone constituents).

The obtained values of the maximum equivalent stresses determined for the elements of the models under study do not exceed the strength limits of 160 MPa for cortical bone, 18-22 MPa for cancellous bone, and 1,000 MPa for titanium alloy.

The analysis of the stress values obtained for a cortical bone showed similar values for INTACT and DAMAGED models; for fixture models, the stress values were 40% higher for the DHS model and 16% higher for the PFNA model.

The analysis of the stress values obtained for cancellous bone showed a different situation: the difference between INTACT and DAMAGED models does not exceed 10%; the maximum stress value for the DHS fixture model is 40% higher than in the INTACT model; and the stress value is 93% higher in PFNA fixture model than in the intact model.

When analyzing the numerous values of the maximum stresses for the fixtures, the model may be arranged in the following order: DHS model and then PFNA model, in order of increasing values with a 50% difference in stress values.

Conclusions

Using the DHS and PFNA type fixtures in osteosynthesis is an efficient method; components of a stressed and strained state meets stiffness and strength characteristics.

An increase in stresses in bone tissues is observed, especially when using the PFNA type fixture, but this trend will depend on the layer of destruction, or rather on how it will be located.

Due to computer simulation, we managed to determine the distribution of stresses in the normal femur and in case of trochanteric fracture of the femur, as well as when using the DHS and PFNA fixtures. Further researches to determine destructive loads will allow us to substantiate the tactic of choosing a fixture for the treatment of the fractures specified.

REHABILITATION OF PATIENTS WITH COMPLICATED THORACIC SPINE INJURY

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Spinal cord and spine injuries are among the most relevant issues in modern orthopedics and traumatology. Complicated spinal cord and spine injuries occur in 2,000-3,000 injured persons in Ukraine every year. Treatment is long-term and the severity is confirmed by the high number of persons lost their capacity for work and high degree of disability (up to 76.5%), which leads to substantial economic losses of the patient and the state, and determines the medical and social significance of the spine injuries. Up to 60-70% of all the patients who require rehabilitation are patients with injuries and diseases of the musculoskeletal system, with 27.3% of spinal cord injuries among them.

Research objective: Improving the efficacy of the rehabilitation measures in patients with thoracic spine and spinal cord injuries complicated by neurological symptoms.

Materials and methods

40 patients, 16 women and 24 men, aged 18 to 65 years with injuries of the thoracic spine complicated by spinal cord injuries were treated in A. Novak Clinic of Orthopedics and Traumatology, Uzhhorod, for the period from 2011 to 2016.

The injured patients were divided according to the time that passed from the injury to the admission to clinic: those admitted up to 8 hours - 10 patients; those admitted up to 24 hours - 16 patients; those admitted within a period of 24 to 48 hours - 9 patients; and those admitted in more than 48 hours - 5 patients.

The level of spine injury was as follows: Th5 in 2 patients; Th6 in 4 patients; Th7 in 6 patients; Th8 in 5 patients; Th9 in 6 patients; Th10 in 4 patients; Th11 in 6 patients; and Th12 in 7 patients.

According to F. Denis Scale, A type neurological disorders were observed in 10 patients; B type neurological disorders were observed in 12 patients; C type neurological disorders were observed in 11 patients; and D type neurological disorders were observed in 7 patients. Dysfunction of the pelvic organs was observed in 24 patients. Concomitant radicular syndromes without dysfunction of the pelvic organs were observed in 11 patients. Once the patients had been admitted in clinic, rehabilitation measures began immediately. The patients performed complex of therapeutic exercises under the instructor supervision; the patients underwent massage; and physiotherapeutic measures were taken. To prevent decubital ulcers, orthopedic means, such as soft pads, soft circles, rollers, etc., were placed under the heels, the sacrum and the blades. In postoperative period, the patients were mobilized in the bed at the same day of the surgery: they were turned to lateral and prone positions, with the patients holding their heads with their hands. In case of dysfunction of the pelvic organs, the Monroe system, which is often neglected by doctors, was used to control pressure in the urinary bladder; the bladder was filled and emptied, which contributed to a quick restoration of its function; and in case of irreversible changes, it contributes to the development of spinal automatism. Transcutaneous stimulation of the bladder was also used: electrophoresis with prozerin was used in hypotension bladder dysfunction (flaccid bladder), and electrophoresis with atropine sulfate was used in case of hypertension bladder dysfunction (bladder dysfunction (spastic)). In neurogenic bowel dysfunction, transcutaneous intestinal stimulation was performed. Laxatives were administered in parallel, and if it did not result, purgative enemas were administered every 3 days. The compulsory rehabilitation component is work with a psychologist, especially in case of severe patients with bad predictive expectations.

Research findings and discussion

After the surgery, patients were mobilized within a short period of time (on the first day after the surgery). They were helped to turn in the bed to lateral and prone positions. The pain at the surgical site improved within the first week after the surgery in 22 patients; within 2 weeks in 13 patients; another 5 patients complained of pain at the surgical site up to 6 weeks. The muscular strength of the lower extremities and micturition were restored within the first three weeks after the surgery in

7 patients with D type neurological disorders. Neurological symptoms returned to D type within a month in 11 patients with C type of neurological disorders, and in 7 of them, neurological symptoms returned to E type within the next month. Micturition was fully recovered in these patients. Only a small positive neurological dynamics was observed in 2 patients: a normotonic neurogenic bladder was developed in them. Neurological symptoms were recovered in 12 patients with B type neurological disorders within the hospital stay (up to 14 days), and before the discharge, neurological symptoms were consistent with C type. Neurological symptoms fully recovered within 6 months in 23 patients, and neurological symptoms recovered to D type in 7 patients, and to C type in 6 patients. No neurological symptoms were noted in 4 cases of recovery. Micturition was recovered in 37 patients; normotonic neurogenic bladder was developed in 1 patient; and atonic neurogenic bladder was developed in 2 patients, with episcistomy superimposed in them. No positive neurological dynamics was observed in 3 patients with A type neurological disorders. Neurological symptoms improved to B type in 7 patients within 6 months; to C type in 1 patient; and to D type and E type in 2 patients. Function of the bladder was fully restored in 2 patients; normotonic neurogenic bladder was developed in 2 patients; atonic neurogenic bladder was developed in 4 patients; 1 patient died in 2 months after the surgery.

Only a minor improvement of neurological symptoms was observed and hypotonic neurogenic bladder was developed in 1 case.

The patients were verticalized as muscular strength in the lower extremities increased. Decubital ulcers of large size appeared in 4 patients within 3 months. The reason for this complication was the fact that the patients failed to follow doctor's instructions when staying home.

Conclusions

1. The optimal solution is a surgical treatment undertaken within the first 6 to 8 hours after the injury.
2. Rehabilitation measures should be initiated immediately once the patient has been admitted to hospital.
3. Psychological rehabilitation is the necessary part of the rehabilitation course of patients with complicated injuries of the spine; therefore a doctor specializing in psychology should be the first to hold a conversation with the patient.
4. The best method of stimulating the contractile function of the bladder in complicated spinal trauma is the Monroe system that was unfairly forgotten.
5. After discharge from hospital, such patients should continue the rehabilitation in specialized centers and sanatoriums, which, unfortunately, are not enough, in Ukraine. It means that the number of this kind of facilities should be increased, especially in such regions as Transcarpathia.