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SURGICAL TREATMENT OF CHRONIC ELBOW JOINT INJURIES WITH THE VOLKOV-OGANESIAN APPARATUS

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Abstract:

Patients who have undergone severe elbow joint trauma often develop various complications. Heterotopic ossification is considered to be the most severe complication; it leads to severe impairment of the upper extremity function due to the formation of severe contractures and ankylosis in the elbow joint. The paper presents the results of surgical treatment of the elbow joint in a patient with "immature" ossification against the background of aged dislocation of the forearm bones, non-unionized fracture of the radial head, and stage II osteoarthritis. Analysis of the outpatient follow-up of the patient after injury revealed gross diagnostic and treatment errors. As a result of medical errors, inadequate treatment of injuries in the early stages after injury was prescribed, which contributed to the formation of heterotopic ossification and resulted in functional failure of the joint. During surgery, the ossification located in the ulnar fossa was removed via a small posterior access to the elbow joint, the remaining tissues of the joint were not affected, thorough hemostasis was performed, and a Volkov-Oganesian articulation-distraction device was applied to provide physiological range of motion in the elbow joint. Postoperative long-term rehabilitation ensured restoration of the elbow joint function with the patient's return to professional activities.

Keywords: elbow joint, arthroplasty, contracture, ankylosis, articulated distraction apparatus, arthrolysis

RELEVANCE. At the present stage of development of orthopedics and traumatology it is safe to state that the problem of diagnostics and treatment of fresh injuries is largely solved thanks to the achievements of both Russian and foreign researchers. As for the treatment of consequences of elbow joint injuries in the form of contractures, protracted dislocations and ankylosis, it remains a complex and unsolved problem since its results often do not satisfy either the surgeon or the patient. Meanwhile, the incidence of these complications is very high and ranges from 20.5% to 82% This is due to the fact that the elbow joint is a complex dynamic apparatus with a significant volume and variety of functions. Any disturbance of the joint affects its function to a certain extent, since it is highly sensitive to even minor injuries. In addition to the special sensitivity of the elbow joint to trauma in terms of its increased reactivity, a proper treatment tactic aimed at restoring joint function depending on the severity of the damage undoubtedly plays a major role in the favorable treatment outcome..

GENERAL CHARACTERISTICS OF CLINICAL OBSERVATIONS

The basis of our clinical observations is a study of 37 patients with chronic injuries of the elbow joint from 2012-2022. Republican Scientific and Practical Center for Traumatology and Orthopedics in the city of Samarkand. The age of the patients ranged from 12 to 44 years of them 33 males and 4 females. The higher frequency in men is typical for their psychophysical development and related peculiarities of behavior in everyday life.

Children and teenagers (21 people) made up the basic mass of the patients admitted for treatment. It should be emphasized that frequent elbow joint injuries in children and adolescents are apparently primarily related to the peculiarities of the structure of the distal end of the humerus in this age group. Thus, according to some authors (F.R.Bogdanov, 1949; Z.A.Siablina, 1959; G.A.Bairov, 1962; Duisenov N.B., Tsykunov M.B., Merkulov V.N., Dorokhin A.I., Sokolov O.G., Matiashvili G.M. 2008).

I.S. Bondarenko 1974 et al, P.U. Urinbaev 2021), the high incidence of fractures of the distal end of the humerus in children and adolescents is associated with the fact that their humerus thickness in the epicondyle region is much less compared with the diaphyseal region, which is not observed in adults. This also explains the incidence of transcondylar fractures of the humerus because the apex of the angle of intersection of the longitudinal axis of the condyle with the longitudinal axis of the humerus itself corresponds to the center of the ulnar fossa, which has a thin cortical lamina.

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At the same time, in contrast to adults, the presence of the metaphyseal cartilage zone in children results in epiphysiolysis or osteoepiphysiolysis of the distal end of the humerus in some cases of trauma.

It should also be remembered that children lead the most mobile lifestyle, which leads to trauma relatively frequently.

The vast majority of the examined patients (14) were injured at home. Due to the fact that patients were hospitalized mainly in rural areas, the circumstances of elbow injuries were typical: falling from a tree, fence, roof, horse, bicycle, etc. They had elbow injuries of varying degrees of severity. The second most frequent was sports trauma (8), which is observed in unorganized sports activities (soccer, wrestling, various national sports). Transportation injuries were noted in 6 patients. School trauma 6, finally the last group consisted of 3 patients whose trauma occurred at work, mostly as a result of non-observance of safety rules. These patients also had both open and closed injuries of the elbow joint. Impairment of joint function was caused not only by the severity of damage to the limb, but also by untimely, often insufficiently skilled care given to the patients after the injury. Post-injury treatment performed at medical institutions at the patients' place of residence, 19 patients with various elbow joint injuries received conservative treatment after injury, and 14 patients received surgical treatment. Four people did not seek medical care after the injury. It should be noted that most patients made gross errors in the choice of treatment method and its implementation, which, in our opinion, was one of the main reasons for the development of persistent elbow joint motion restriction or ankylosis. The time of patients' admission to the clinic after injury ranged from 1 month to 6 years or more. The vast majority of patients (89-90.8%) were hospitalized for up to 2 years with profound anatomical and functional disorders in the elbow joint.

Patients underwent clinical, radiological, electromyographic examinations

1. clinical examinations:

a) interview (complaints, anamnesis)

b) comparative examination of upper extremities

c) palpation to detect pain, character of deformation and relative mobility of bone fragments

d) examination of sensitivity in the zone of innervation of nerve trunks

e) Angulometric tests - range of motion in the elbow joint (flexion and extension, rotational movements (pronation and supination), axis determination of the upper extremity, measurement of shoulder and forearm circumference in the middle third.

g) hand dynamometry.

2. X-ray examination of the elbow joint in 2 projections at the admission of patients, after surgery in the course of treatment, and in the distant terms after the performed treatment.

Electromyographic studies to determine the condition of the neuromuscular apparatus of the upper extremity when deciding on the indications and contraindications for the use of this or that type of restorative surgical intervention on the elbow joint. When deciding on indications and contraindications for surgical restoration of elbow joint function using articulating and distraction apparatus, we considered not only the degree of pathological changes in the joint (fibrous and bone ankylosis, persistent limitations of movements that cannot be treated conservatively, We took into account not only the degree of pathological changes of the joint (fibrous, bony ankylosis, persistent limitation of movements which could not be treated conservatively, but also the condition of neuromuscular apparatus of the limb, age, volitional qualities, intellect, and occupation of the patient). It should be emphasized that clinically observed significant atrophy of the shoulder and forearm muscles associated with prolonged joint inactivity in ankylosis and contractures is not always an absolute contraindication for reconstructive surgery using articulating and distraction apparatus. Despite atrophy, the muscles retain their bioelectrical activity, which allows them to perform a certain function of the joint. Physiofunctional and medical treatment (massage, electrical stimulation of muscles, therapeutic exercises, thermal procedures, ATP, aloe, etc.) carried out in such patients in the preoperative period contributed to quite satisfactory results after mobilizing operations in a number of cases. When determining indications for open or closed mobilization of the elbow joint using articulating and distraction apparatuses, we paid attention to the severity of pathological changes of the articular ends, the condition of the soft tissues of the joint, and the amplitude of movements. The indication for open mobilization of the elbow joint is limitation of extension within 30 degrees with a period of at least 6 weeks after fracture fusion of the bones composing the elbow joint. In these cases, arthrolysis of the elbow joint with removal of bone overgrowth around the joint and resection of the radial head was often resorted to. In cases of bone and fibrous ankylosis, contractures with a range of motion of 20 degrees or more than 2 months with severe deformation of articular surfaces, restoration of joint function with an open system is advisable. Closed application of the device is indicated in contractures with a range of motion of at least 20 degrees, good

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condition of muscles and articular surfaces, uncomplicated, long-standing dislocations of the forearm bones not more than 2 months after injury, and in the absence of gross anatomical changes in muscles and articular surfaces. Absolute contraindications to the use of articulating and distraction devices are inflammatory processes in or near the joint, gross anatomical changes in the neuromuscular system in the form of severe atrophy, extensive scar stitches based on deep burns or a past inflammatory process, accompanied by absence of muscle bioelectrical activity even at maximum tension All types of surgical interventions performed by us on the elbow joint with the use of Volkov-Oganesian articulation-distraction apparatuses were categorized into the following groups:

1. Mobilization of the joint by arthrolysis followed by
application of articulating-distraction apparatuses:
a) with soft tissue intervention;
b) with intervention on the bone tissue (removal of
b. Bone interventions (removal of ossificates, loose bone fragments, partial
resection of articular surfaces and bone projections).
2. Mobilization of the elbow joint by arthroplasty followed by articulation-distraction devices.

We mobilized the elbow joint by arthroplasty with the use of Volkov-Oganesian articulated distraction apparatus in 18 patients; the amplitude of flexion-extensor movements in the elbow joint in them ranged from 5 to 40" in the functionally unfavorable range. In 4 patients, arthrolysis was limited to intervention on the soft tissues only, because the main cause of stiffness in the elbow joint in them was fibrous changes in the soft tissues of the joint without disturbing the anatomic structure of the articular surfaces. In the remaining 14 patients with arthrolysis, we also performed intervention on the bone tissue, removal of ossifications, removal of the internal epicondyle impinged in the joint cavity, osteotomy, and partial resection of the articular ends.

As a rule, surgical intervention was performed under general anesthesia. A posterior incision (lo Langebeck) starting from the middle third of the shoulder, passing to the elbow joint area on the inside of the ulnar process to the upper third of the forearm, exposed the ulnar joint area. After dissecting the skin and subcutaneous tissue, the ulnar nerve was isolated and taken on a "holder. The middle head of the triceps muscle and its tendon were carefully mobilized to the level of its attachment to the ulnar process. Then it was pulled outward and backward using a hook. The joint capsule was dissected and partially excised along the edges of the ulnar process. Sharp flexion of the forearm severed the remaining undissected intraarticular adhesions. The ulnar fossa was thoroughly cleaned of fibrous tissue, and if ossificates were present, it was deepened using a circular milling cutter. For more thorough examination of the articular ends and their cartilaginous covering, in some cases we had to lead the articular ends into the wound, which was formed by dissecting the tendon part of the hand and finger flexor muscles at the level of their attachment to the internal epicondyle. This excluded the necessity of cutting off the tendon of the triceps muscle as its intersection both for the purpose of exposing the articular surfaces and for lengthening during retraction had a deleterious effect on the restoration of the joint function (V.A. Averkiev, 1979). The advantage of this access with dissection of finger and hand flexor tendons is that it greatly facilitates dissection of the anterior part of the joint capsule and lengthening of the tendons of retarded muscles under visual control. Meanwhile, a number of authors (S.L. Mironov, 978; S. Battacharma, 1974 and others) use double lateral or anterior wide incisions to approach the anterior part of the joint, which, in our opinion, increases the traumatic nature of the intervention and is sometimes risky in terms of damage of vessels and nerves of this area.

In cases where the articular ends do not have gross anatomical changes, after their release from fibrous adhesions and dissection of the anterior part of the joint capsule, if necessary, the articular ends are compared with subsequent verification of the volume of passive movements. If the volume of passive movements is sufficient, the dissected tendons of the finger and hand flexors are sutured to the internal epicondyle with transposition of the ulnar nerve to the anterior surface of the elbow joint. Then, using a drill, an axial spoke of the articulating and distracting apparatus is perpendicular to the axis of rotation in the elbow joint in the center of the humerus block. The ends of the spokes are led through the skin to the outside. Before closing the wound, a polyethylene drainage tube 10-15 cm long with a diameter of 1.5 mm is inserted into the joint cavity. The purpose of the tube will be explained a little later. The wound is stitched up layer by layer and the articulated distraction apparatus is applied according to the above method with the creation of a diastasis between the articular surfaces of not more than 0.5-1 mm. The apparatus is then locked in the middle physiological position of the forearm for 8-10 days with the help of a flexor-distractor device. After the specified period of time, the patient is carried out passive and then active movements in the elbow joint.

Here are some examples.

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Patient N., 22 years old, sustained a fracture of the internal epicondyle with impingement in the joint cavity as a result of a fall during a sports game.

He was admitted to the clinic 3.5 months after the injury. On admission, the range of motion in the elbow joint was within 30' (flexion to an angle of 90', extension to 120') (Fig. 1-a), and rotational movements were severely limited.

Under anesthesia, arthrolysis of the right ulnar joint with removal of the impinged internal epicondyle and placement of the Volkov-Oganesian model 1970-IV articulated distraction apparatus was performed (Fig. 1-b). A 1-mm diastasis was created between the articular surfaces using the apparatus, and 2 ml of hydrocortisone emulsion was injected pararticularly. After 8 days, passive movements in the ulnar ostium were started with the help of the apparatus. The amplitude of the movements gradually increased, and within 2.5 months, flexion to 70' and extension to 170' was achieved with the help of the machine. (Fig. 2-a, b) During the postoperative period the patient received intra-articular oxygen and vitamin therapy and luronitotherapy. The device was removed after 3 months. The patient was examined 3 years after discharge from the hospital (Fig. 3). Flexion in the right elbow joint 60', extension 170', full rotational movements, no pain during physical work.

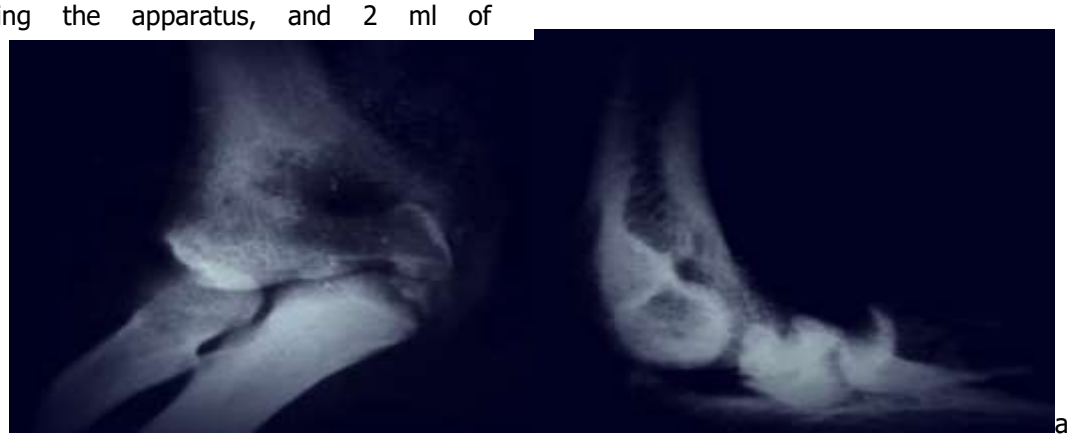
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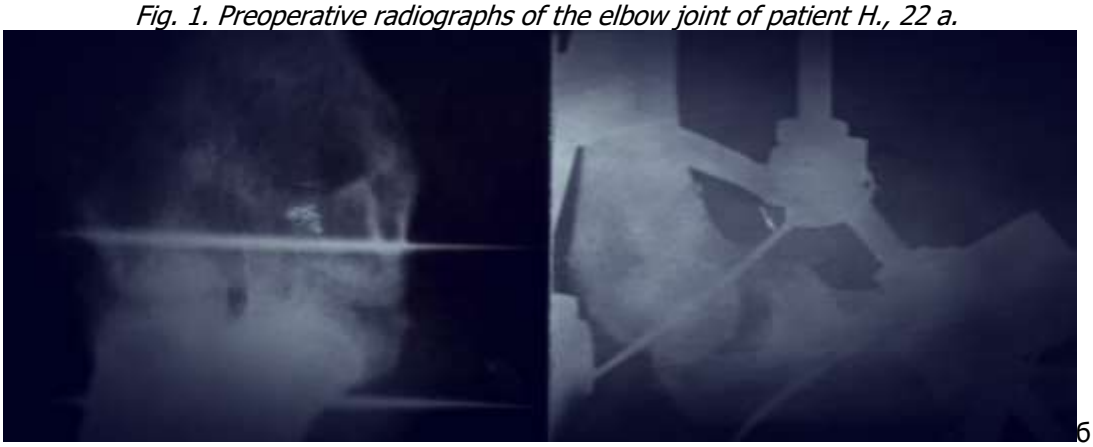
Fig. 1. Preoperative radiographs of the elbow joint of patient H., 22 a.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b. After arthrolysis with Volkov-Oganesian apparatus

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Fig. 2. Photo and X-ray of the patient N., 22 years old:

a) photo of the patient after surgery. b) radiographs of the right elbow joint 3 years after surgery: the contours of the articular surfaces are clear, their congruence has been restored, the articular gap is normal in size.

Fig. 3 Joint function of the same patient 3 years after surgery

The indications for elbow joint arthroplasty were not only clinically detected signs of ankylosis or sharply pronounced contracture, but also the macroscopic picture of articular surfaces detected during surgery, which in our patients was characterized by pronounced deformities based on irregularly healed fractures of the humeral condyle head or humerus block, pericondylar fractures, as well as severely pronounced degenerative-dystrophic changes of articular cartilage up to its complete resorption. The ulnar joint was exposed using the Langenbeck posterior access starting from the middle third of the shoulder with transition to the area of the elbow joint to the outside of the ulnar process and ending at the level of the upper third of the ulna. After exposing the ulnar nerve, the medial head of the triceps muscle was carefully mobilized and withdrawn to

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the back and inside. The joint capsule was dissected, first longitudinally along the posterior surface of the shoulder from the apex of the ulnar process upward and then downward along the edges of the ulnar notch. After that, the articular end of the humerus was skeletonized subcutaneously to the level of the epicondyle. For easier access to the articular surfaces, the tendons of the finger and hand flexors were dissected in the zone of their attachment to the inner epicondyle of the humerus. After skeletonization of the distal articular end of the shoulder with bone ankylosis, an osteotomy was performed using a grooved chisel in the area of the former articular gap. The articular ends were then brought into the wound for subsequent treatment.

Using a special device, we gave the shape of a semi-cylinder with the center of rotation correspondingly to the axial spokes of the apparatus. A similar concave shape was given to the ulnar notch of the ulna. However, this option of arthroplasty in the postoperative period, in the process of movement development, was accompanied in some cases by lateral displacement of the articular ends. In this regard, we recently shaped the articular ends close to normal after disconnection using special mills. The condyle of the humerus was shaped as a block in the inner part and the outer part of the condyle was shaped as a head. The ulnar notch was crescent-shaped according to the shape of the newly formed block.

After treatment, the articular ends were matched and the volume of passive movements was determined. It should be noted that if the volume of forearm flexion was insufficient, we resorted to triceps lengthening only in extremely necessary cases, since its lengthening had a negative effect on the function of the joint. After obtaining a sufficient amount of movement on the operating table, an axial spoke of the apparatus was inserted through the rotation axis of the elbow joint in the newly formed condyle of the shoulder. The wound was sutured layer-by-layer with a polyethylene drainage tube inserted into the joint cavity. After that, the articulated distraction apparatus was applied with a diastasis between the articular surfaces of 1-1.5 mm. The forearm was fixed at an angle of 90' with a bending and extending device for 8-10 days.

Patient Ya, 43 years old, was admitted to the clinic of traumatology and orthopedics with the diagnosis of fibrous ankylosis of the left elbow joint (Fig. 4A).

A fall resulted in injury to the left elbow joint, and he was treated by a tabby bone surgeon. The patient subsequently developed ankylosis of the left elbow joint.

Arthroplasty of the left elbow joint with application of the Volkov-Oganesian articulating and distraction apparatus was performed (Fig. 4 B).

During surgery, it was found that the articular surfaces were covered by dense fibrous tissue, and the underlying bone tissue had uneven contours and somewhat resembled the subchondral bone plate. The latter was removed before the appearance of cancellous bone substance. The articular end of the humerus was formed as a coaxial semi-cylinder, and the ulnar notch was treated accordingly. On the operating table, the range of motion was achieved - flexion up to 70', extension up to 170'. The forearm was fixed with an apparatus with a diastasis between the articular surfaces of I mm. Paraarticularly, 2 ml of hydrocortisone emulsion was injected. Passive and active movements in the elbow joint were developed for 2.5 months, after which the device was removed. In the postoperative period the patient underwent intraarticular oxygene-vitamin and luronite therapy.

The patient was examined 3 years after discharge from the hospital: the range of motion in the elbow joint was within 80' (flexion to an angle of 111°, extension - 160'), rotational movements were limited (75'), lateral stability was not impaired (Fig. 5)

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Fig. 4(a) Preoperative radiographs of the elbow joint

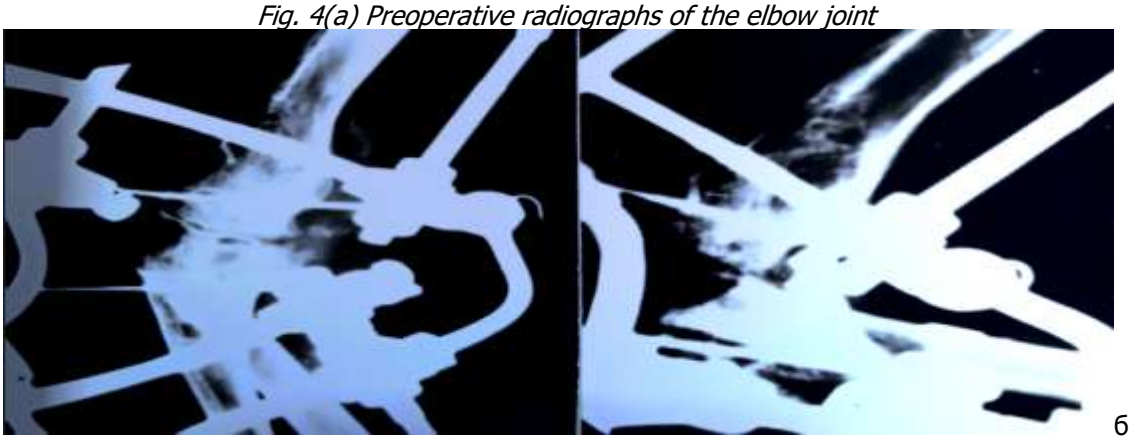

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*Fig. 4 (b) Radiographs and photos of a patient after arthroplasty of the elbow joint with application of the Volkov-Oganesian apparatus*а

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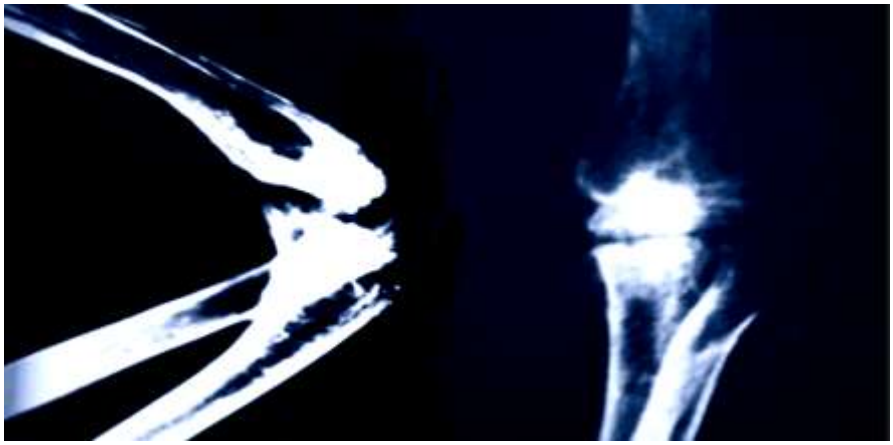


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Figure 5 . Photographs and radiographs of the same patient 3 years after

The contours of the articular ends are clear, the articular The joint ends are clearly defined, the joint gap is traceable, moderately deformed, and the function of the joint is restored.

The patient felt significant weakness in the operated limb when exercising, which was probably due to the presence of pronounced atrophy of the shoulder and forearm muscles.

CONCLUSIONS: we can say that contractures and ankylosis of the elbow joint in 37 patients were the result of severe injuries of the bones forming the elbow joint. The direct causes preventing movements in the joint were: fibrous degeneration of the joint capsule, paraarticular ossifications, pronounced incongruence of articular surfaces resulting from incorrectly fused peri- and intra-articular localizations, interposition of bone fragments in the joint cavity.

Complex treatment of posttraumatic ankylosis and contractures of the elbow joint should be based on the principles of creating conditions for complete regeneration of the elements of the operated joint: conducting therapeutic measures aimed at normalizing the intraarticular environment and metabolic processes in the regenerating tissues of the joint by introducing oxygen, B-group vitamins, chondoitinsert or hyaluronic acid drugs, and paraarticular hydrocortisone administration.

The developed complex treatment of severe pathology of the elbow joint can be recommended for introduction into practice of specialized traumatology and orthopedic departments.

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