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DIFFERENTIATED SURGICAL TACTICS OF SURGERY OF A CAPITELLUM PSEUDOARTHROSIS OF HUMERUS WITH CUBITUS VALGUS DEFORMATION IN CHILDREN

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ABSTRACT

Actually: Damages of bone structures of an elbow joint in children, according to various authors are occurred between 16 and 40% among all of skeleton fractures and makes up 50-80% from all intraarticulate damages of the upper extremity. It was required to develop of a differentiated surgical tactics for surgery of capitellum pseudoarthrosis of humerus with cubitus valgus in child aged patients, that, the cases associated with the nonunion of capitellum or the extension necrosis process, causing to be hypermobility of elbow joint and to pull of ulnar nerve.

Object of research was the capitellum pseudoarthrosis with or without cubitus valgus, which is diagnosed in 59 patients, whom three types of surgical correction are spent depending on weight of deformation, prescription of the got trauma and age of the patients. The capitellum pseudoarthrosis liquidation or necrosis field resection are made in 21 (35,6%) patients, for 8 (13,6 %) patient are admitted the extraarticular supracondylar osteotomy of humerus with ulnar nerve transposition and stabilization by Ilizarov's apparatus and other 30 (50,8 %) patients was corrected by the developing own clinic technique - «Capitellum pseudoarthorosis resection of the humerus, supracondylar osteotomy of humerus and osteosynthesis by Ilizarov's apparatus».

Conclusion We believe it is reasonable to use our repair techniques when dealing with nonunion of the lateral humeral condyle with cubitus valgus. These differential techniques help to shape the distal part of humerus, thus, restoring the function of the elbow joint.

INTRODUCTION

Damages of bone structures of an elbow joint in children, according to various researchers [1, 2, 4, 6], averaged from 16 to 40% among several kinds of bone fractures and 50-80% from all intraarticulate damages of upper extremity. Occurrence patients with the chronic capitellum fractures of humerus is made 3,5-20% of all an elbow joint fractures [10]. It explains on the one part by revaluation in plastic possibilities of children's age, and on the other part by errors, which are perhaps in diagnostics, treatment and rehabilitation.

The capitellum of humerus is one of basic elements of the distal end of humerus, which is made role as a lateral supporting point and participates in correct distribution of attaching loading on elbow joint and participates in rotation of forearm bones. Nonunion of the capitellum of humerus in time leads to aseptic necrosis of lateral part of distal end of humerus with loosening of its articulate structures. Frequently the part of the block of humerus is resolved. The absence of lateral supporting point leads to aggravation of cubitus valgus with following of consequences. Today this pathology becomes a social and economic problem so children with pathology become persistent invalids.

Purpose was to develop the differentiated approaches for capitellum pseudoarthrosis surgery of humerus with cubitus valgus in children.

MATERIALS AND RESEARCHES

For observation underwent 59 children, which are treated since 1998 to 2013 yy in Children's Traumatology Department of RITO Uzbekistan Republic with capitellum pseudoarthrosis of humerus with cubitus valgus. For all patients clinic-laboratory analyses, radiological measurement, a tomography investigation and electromyography of damaged segment are carried out in dynamics in comparison by healthy extremity.

Due to clinic-radiological changes the electronic software product was developed, that allows observing the severity of elbow joint valgusal deformity in patients with capitellum pseudoarthrosis of humerus, which data are presented in table 1. This developed software product is registered and patented in Patent Office RUz DGU 2007 0040 PV RUz 28.05.2007

Results and discussions

Distribution of patients who have admitted on treatment with capitellum pseudoarthrosis of humerus (after trauma - more than 4 months) due to on age and gender was made, that presented in table 2. The age of patients fluctuated from 2 till 18.

Table 1 Distribution of patients by capitellum pseudoarthrosis of humerus due to an age, sex, severity level of deformation and operation types (n=59)

Age	Gender	Capitellum pseudoarthrosis of humerus with elbow joint valgusal deformity									Total
		I operation type – (n=21)			II operation type- (n=9)			III operation type- (n=29)			
		Degree of deformaty			Degree of deformaty			Degree of deformaty			
		I	II	III	I	II	III	I	II	III	
Till 3	b	-	-	-	-	-	-	-	-	-	-
	g	-	-	-	-	-	-	-	-	-	-
3-7	b	3	2	-	-	-	-	-	3	1	9
	g	4	-	-	-	-	-	-	-	-	4
7-11	b	3	1	-	-	2	1	-	2	1	10
	g	-	1	-	-	-	-	-	2	4	7
11-15	b	1	2	3	-	1	2	1	5	3	18
	g	-	1	-	-	-	2	-	1	3	7
15-18	b	-	-	-	-	-	1	-	1	2	4
	g	-	-	-	-	-	-	-	-	-	-
Total		11	7	3	-	3	6	1	14	14	59

As follows from presented data in table 1, all patients have been distributed on 5 age groups: 3-7 years - 13 patients (9 boys and 4 girls); 7-11 y. - 17 (10 - boys and 7 girls); 11-15 y. - 25 (18 boys, 7 girls) and adolescent group from 15 till 18 y. - 4 patients.

As has shown the retrospective analysis data, causes of nonunion occurrence were untimely diagnostics or wrong interpretation of data, omissions during choice of treatment tactics and to decrease of responsibility, infringement of an orthopedic regimen, especially by boys.

In all patients the correction methods were chosen on three types of operation techniques due to severity level of deformation of elbow joint, prescription of the got trauma and age of the patients.

The first operation type is spent in 21 (35,6 %) patients with capitellum pseudoarthrosis of humerus without cubitus valgus deformation (15 boys, 6 girls) who complicated with elbow joint contracture various severity. From them in 12 cases 1st severity level of deformation, in 5 children - 2nd severity level and other 3 patients with 3rd severity level of deformation were marked. In all these patients it is spent elbow joint arthrolysis with elimination of capitellum pseudoarthrosis and stably functional osteosynthesis with Ilizarov's device consisting of 2 semicircles. The operation feature was that the adjacent bone fragments surfaces covered with a fibrous tissue "were freshened" to a healthy bone tissue. In a maternal bed was created a surface corresponding to fragment of capitellum and made its adaptation. Its mobilization was made for the best adaptation of capitellum from the adhesive secondary healing [scar] tissues then bone fragment adapted and was made reduction for a maternal bed. A following stage was conducting three bulb-tipped pins in diameter of 1,5 mm through capitellum: the first - in a diagonal direction on the outside to inside and from below-upwards, the second - it is perpendicular to a humeral bone axis on the outside to inside. The third pin spent through the lower third of humeral bone axis, thus the bulb-tipped pin located opposite concerning the previous pins for creation of an opposite direction compression. Then Ilizarov's apparatus installation carried out from 2 semicircles with creation of stability bone fragments by pins tension and postoperative wound took in hermetically.

The second operation type is spent in 9 (15,3 %) patients (7 boys, 2 girls). On deformation severity level was marked the 2-nd severity level in two cases and in 6 cases the 3-rd severity level. In these patients it is spent the extraarticular varusal osteotomy of humerus with an elbow nerve transposition and Ilizarov's apparatus imposing. It is necessary to notice, that the current operation type was made in children of an average and the senior school age. This results from the fact that often patient addressed for the help very much late in connection with development peripheral neurotrophic infringements and hypotrophy development corresponding hand and forearm muscles up to their atrophy, because of cubitus valgus progressing. With the times occurs almost full distal end resorption of humerus with adapted capitellum pseudoarthrosis formation. In such cases in patients the full volume of elbow joint movement was marked and we in this group of patients spent only correction of cubitus valgus with an elbow nerve transposition and an osteosynthesis with Ilizarov's apparatus from two semicircle.

Carrying out for children of the senior age groups intra-and extraarticular reconstructive operations significantly raises the risk of development of stable elbow joint contracture, which are very difficultly giving in working out demanding long time (3-3,5 years), a regularity of performance of physio-functional procedures and exercises and patience as parents, and patients.

Last year we were limited to carrying out of extraarticular corrections with an elbow nerve transposition without intraarticulate intervention as some parents negatively concern for postoperative contracture, demanding long time for working out of available deficiency of joint movement volume.

The third operation type is made in 29 (49,1 %) children (19 boys, 10 girls) mainly with 2nd and 3rd severity level of cubitus valgus deformations. In 3 cases children had 1st severity deformation level, in 14 - 2nd severity level and in 13 cases 3rd severity deformation level. These patients had rough anatomic elements defect of distal parts of humerus because of aseptic necrosis of the lateral epicondyle and parts of internal block with the subsequent of neurotrophic disorders.

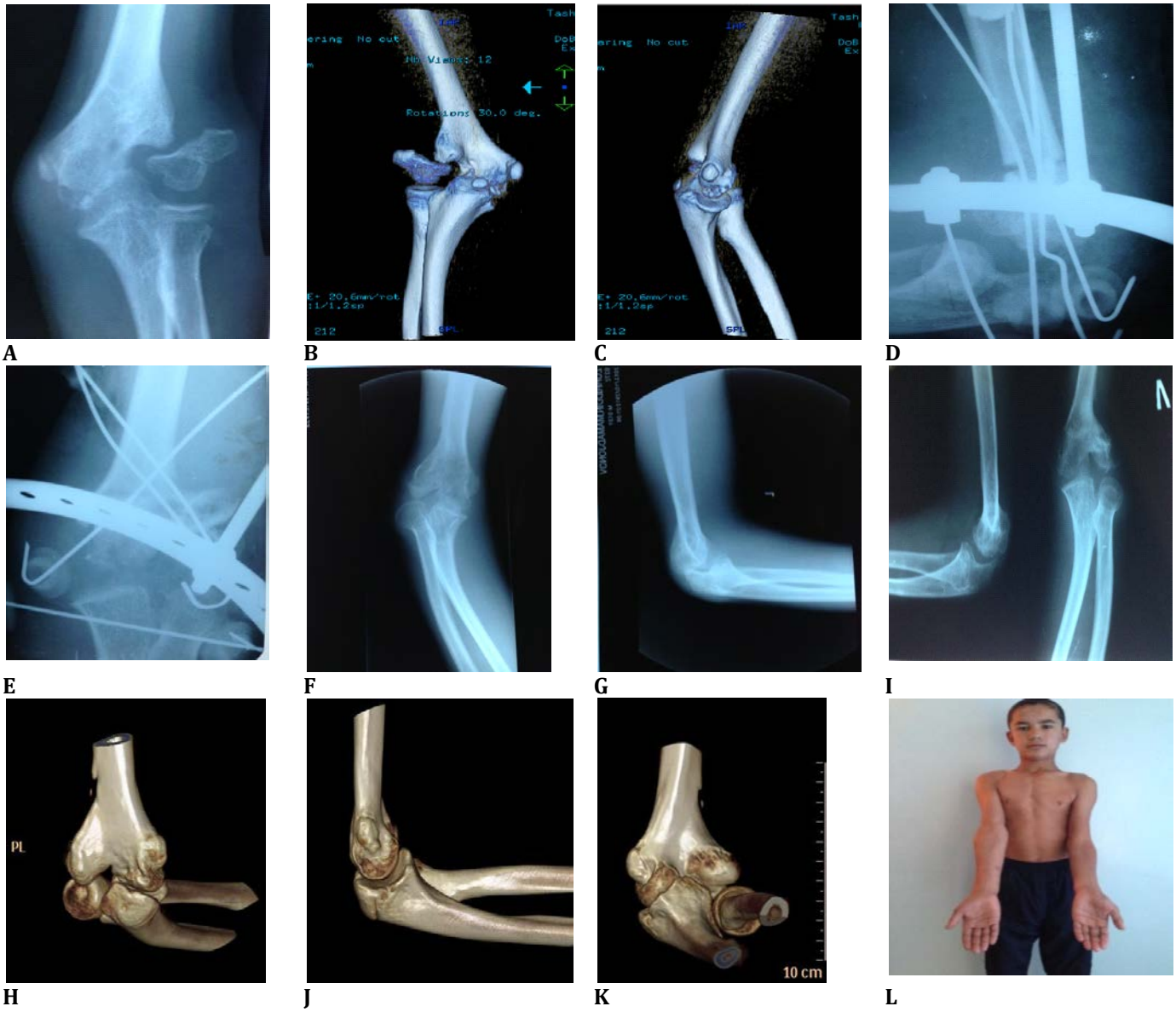
We in such difficult cases had been developed a new technique repair of capitellum pseudoarthrosis of humerus with cubitus valgus, consisting in a pseudoarthrosis resection of with the supracondylar extraaticular corrected osteotomy of humerus, elbow nerve transposition and cross fixing of bone fragments and stable-functional osteosynthesis by Ilizarov's apparatus, consisting of 2 semicircles on which was received the certificate of receipt from 23.02.05. IAP 2005.0060 Patent Office RUz for invention «Technique of capitellum pseudoarthrosis repair of humerus with cubitus valgus in children»). The essence of method consists in the maximum preservation of the soft tissue cover of lateral epycondile elements and capitellum of humerus as blood supply source, in elbow nerve transposition, correcting osteotomy distal part of humerus, "cleansing" of bone fragments and "T" shape transposition all of elements, to cross fixing with wires, the installation of Ilizarov's apparatus consisting of 2

semicircles. Fixation duration of the apparatus at this technique depended on degree of bone elements consolidation which corresponded to 5-8 weeks.

It is necessary to notice, that after carrying out of this difficult intra-and extraarticular elbow joint reconstructive operation, first of all the upper extremity axis was corrected, but after device removal it is necessary the period of 2-2,5 years for full restoration of elbow joint functions depending on age of the child and aseptic necrosis processes of the distal end of humerus, as the patient is more younger more full and earlier is restored and formed of joint congruity of distal end of humerus and faster there is a full elbow joint movements volume restoration. The first received results after such reconstructive operation have shown gradual formation of distal end elements of humerus within 2-3 years. This type of operation is recommended to carrying out for patients are aged till 12 years. The example from our experience is shown.

Clinical example

Patient M. 3, 10 years (И.б. 5422). From his anamnesis: the patient was injured 2 years ago before arrival to RITO clinic in 2010, first time was treated domiciliary by a plaster bandage. During examination a cubitus valgus deformation and upper extremity weakness were defined. During inspection locality cubitus valgus with deformation angle is 32 °, flexion - 45 °, extension - 180 ° were defined, the volume of elbow joint movement is made 135 °. Marx's line and Gunter triangle have been considerably changed. Fingers movement and sensitivity are kept. The peripheral neurotrophic changes aren't revealed. On the basis of clinical and instrumentation investigations the diagnosis has been established: Posttraumatic left sided cubitus valgus, the capitellum pseudoarthrosis of left humerus (Fig. a,b,c). In November 2010 the operation №237-238 «The liquidation of the capitellum pseudoarthrosis f humerus, supracondylar extraarticular correcting osteotomy of humerus with an elbow joint transposition, cross fixing Ilizarov's wires and a stable-functional osthesynthesis using Ilizarov's apparatus from 2 semicircles» (Fig. d,e) are made. The postoperative period proceeded smoothly. Patient has received the corresponding medication, physiotherapeutic therapy. The postoperative wound has begun to live a primary tension. The patient is discharged from the hospital in 9 days in a satisfactory condition. In analysis of the nearest and remote postoperative results the full capitellum consolidation of humerus with distal end anatomical formation humerus are revealed (Fig. f, g, i, h, j, k). In 3 years restoration of full volume of elbow joint movements (Fig., I, m, n, o) was defined.



A B C D E F G I H J K L

M

N

O

We study the remote postoperative results in terms till 10 years (table 2). For objective estimation of operative results and standardization of studying of the clinic-radiological founding, which defining the pathology necessary for comparison of treatment outcomes between literature data was applied the developed Yu.P.Soldatov and V.D.Makushin (1997) table with indicators of anatomic-functional signs of disease and an estimation of each sign in points: 14-21- good result, 8-13 - satisfactory, 0-7- unsatisfactory. According to the table data in 59 patients the outcome results in 48 (81,3%) cases were marked as good, in 9 (15,3%) - satisfied, in 2 (3,4 %) - the unsatisfied result, so, preoperatively in this 18-year-old young man with a primary trauma of 12-year-old prescription the hypertrophy of a radius head was marked, postoperatively elbow joint flexion-extension contracture has developed because of an orthopedic mode infringement and default of the appointed physio-functional purposes.

Table 2 Outcome results of treatment of patients.

Age	Sex	Capitellum pseudoarthrosis of humerus with cubitus valgus									Total
		I type (n=21)			II type (n=9)			III type (n=29)			
		good	satisfied	unsatisfied	good	satisfied	unsatisfied	good	satisfied	unsatisfied	
0-3	B	-	-	-	-	-	-	-	-	-	-
	g	-	-	-	-	-	-	-	-	-	-
3-7	b	4	1	-	-	-	-	2	1	1	9
	g	4	-	-	-	-	-	-	-	-	4
7-11	b	4	-	-	2	1	-	2	1	-	10
	g	1	-	-	-	-	-	5	1	-	7
11-15	b	6	-	-	2	1	-	7	1	1	18
	g	1	-	-	1	1	-	3	1	-	7
15-18	b	-	-	-	1	-	-	3	-	-	4
	g	-	-	-	-	-	-	-	-	-	-
Total		20	1	0	6	3	0	22	5	2	59

As shown by data 2-nd table, that, good results considerably have been received in patients, whom were performed 1 and 3 type operative techniques. Because 1 type operation was made in patients with little anatomico-functinal disfiguring of elbow joint and and without joint incompetence and with other side applied method for these patients was sufficient for joint malfunction recovery. Third type operation technique was traumatically, but due to the extend joint disfiguring and considerably distal joint elements dislocation that, it was necessary to apply such technique for repair as “T” shape reconstruction of distal part of humerus and fixation by Ilizarov’s apparatus, that was reasonable method for correcting.

As has shown the retrospective analysis data, causes of nonunion occurrence were untimely diagnostics or wrong interpretation of data, omissions during choice of treatment tactics and to decrease of responsibility, infringement of an orthopedic regimen, especially in boys.
In all patients the correction methods were chosen on three types of operation techniques due to severity level of deformation of elbow joint, prescription of the got trauma and age of the patients.

Thus, the capitellum pseudoarthrosis of humerus with the expressed aseptic necrosis of distal end anatomic structures of humerus only by operative treatment can prevent the heavy and great complications development in children (progressing cubitus valgus, late period an elbow nerve neuritis and others). Operative intervention should be to as much as possible sparing and differentiated approaches. For capitellum fragment allocation from adhesion it is necessary to aspire to keep communication of a fragment with tendomuscular supplied. Bone fragment fixing should be carried out by external fixing devices with preservation of an elbow joint function, the external immobilization is necessary for occurrence of full consolidation (6 weeks).

CONCLUSIONS

1. The capitellum pseudoarthrosis of humerus is an elbow joint composite pathology, which is met rather often and lead to early physical disability of children.
2. The differentiated tactical approach for a choice of operation type, considering deformation severity level, prescription of injury and age of the child allow improving the treatment results.
3. Developed and approved in our clinic the new surgical treatment technique allows to reach in one stage restoration of anatomy and promotes distal end humerus formation and by that restores function of an elbow joint in children.

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