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SHOULDER INSTABILITY – RESULTS OF DIFFERENT METHODS OF TREATMENT

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Abstract. *The aim of this study is to present results after different procedures of surgical treatment of the unstable shoulder joint: arthroscopic stabilization; arthroscopic stabilization followed by the operative technique by Matev; the Latarjet procedure in cases with the presence of bone defects. From 2004 to 2017 291 patients aged between 15 and 35 years were operated at the University Hospital "Prof. B. Boychev", Medical University − Sofia. 247 patients had anterior and 44 − combined shoulder instability. 173 of the patients were active athletes practicing different disciplines. The average age at the time of the first dislocation was 17 years. In 172 patients, the first dislocation occurred without significant trauma, 124 of them had anterior shoulder instability and 48 – combined shoulder instability. In 120 patients with anterior dislocations, there was history of a serious injury during the first accident. The number of dislocations varied between ten and fifteen in all patients. For the same period, 45 patients with significant bone defects requiring open surgery (Latarjet procedure) were operated. Among the patients with bone defects, the dislocations were between 8 and 30 before the first examination. There were 11 patients, who had undergone previous surgery in different hospitals and different number of relaxations after surgery were found. The data were evaluated radiographically and clinically. Functionally, the patients recovered according to a well-established protocol of physiotherapy and the external rotation regained the full range of motion. The patients were able to return to their sports activity. The successful results in all patients show that these combined operative techniques can be the method of choice in the treatment of a greater number of dislocations of the shoulder, especially in people who seek to quickly return to active sport activities.*

Key words: *shoulder instability, arthroscopic stabilization, combined operative technique, Latarjet procedure*

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INTRODUCTION

The successful treatment of shoulder instability requires a strict balance between safe joints stabilization and minimization of the reduction of the volume of movement. The selection of an operative method depends on the degree of instability, the diagnosed pathology and the patient's lifestyle requirements – whether the patient will practice sport and what kind of. The age of the patient and the time of instability are also important factors.

A number of operative standard techniques are known to help in the recovery of the two major stabilizers of the shoulder joint:

– the passive element − the labrum of the glenoid and the capsule-ligament apparatus;
– the active motor − m. subscapularis.

The surgical treatment is limited to three types of surgical stabilization:

– capsule reconstructions;
– shortening of subscapularis or other soft tissue techniques to change its position;
– bone block placed on the front surface of cavitas glenoidalis.

The easiest procedure is the transposition of m. subscapularis from tuberositas minor to tuberositas major but it limits the outermost rotation.

Various types of Bankart type capsuloplastics are used to treat the soft tissues and, although complicated, they best preserve the volume of movement. They are successful when no significant physiological predispositions, reduced glenodal anteversion, narrowed inferior glenoid, glenoidal dysplasia; lesions of the glenoidal edge and Hill-Sachs lesions − lesions on the rotator cuff are detected on the x-ray and MRI.

The arthroscopic treatment of the shoulder instability is becoming increasingly popular with the progress of endoscopic surgery. The indications for this procedure widened because of the improvement of the implants and technical skills. This treatment better meets basic requirements: it secures stabilization of the joint and minimizes the possibility of postoperative restraints [1–5]. It is essential that this operation is performed in the initial period of the long series of untreated recurrent dislocations in adolescents and young people, regardless of their requirements for the lifestyle – whether actively practicing sports or not. This period is often missed, and larger lesions need later more invasive surgical procedures. It is known that most arthroscopic techniques are an alternative type of Bankarts' capsuloplasties and are successful in cases of physiological predisposition, bone lesions of the glenoidal edge, rotator cuff lesions and Hill–Sachs lesions – in up to 15-20% [6–15, 18-21]. Applying an arthroscopic technique with anchors, it is technically important to ensure the anterior and lateral part of the neck of the scapula and the capsule-ligament apparatus, not just the glenoidal labrum. Only thus the healing process responsible for the future stability of the joint can be ensured [4]. In the cases of **multidirectional instability**, the technique of the extracapsular suture for the plication of the posterior capsule can be used [2–5].

Many patients are referred after several recurrences of shoulder dislocations. Moreover, they have higher requirements as to continue with active sport activities. At this moment, it is not yet appropriate to perform bone operations trying to restore stability to the joint. It is then best to perform single-step combined surgery involving both the passive and active stabilizers of the shoulder joint, which includes the arthroscopic technique combined with the operative method developed by Ivan Matev [6, 17], who refined the original technique of Boychev [16, 17].

However, in the presence **of bone defects**, these procedures may fail. Bone defects can be compression of the anterior glenoid and lesions of the Hill-Sachs of the humerus head. In these cases, as well as in soft-tissue surgery failure after intervening the capsuloligamental apparatus or the contraction force of subscapularis, the creation of a bone-muscular passive-active barrier is the most appropriate approach. In these cases the Latarjet procedure is the last method of treatment choice [7]. Only the most severe cases, combined with fractures need alloplastics [8].

Surgery techniques

Arthroscopic surgical technique. The patient is placed in the lateral decubitus position with the affected shoulder exposed. By using standard arthroscopic approaches, the glenohumeral ligaments and the anterior capsule were evaluated, especially their integrity and their mobility or adhesion to the medial scapular neck. Thereafter, the surgery was prolonged with preparation of a capsule-ligament complex. This included debridement of fibrous tissue, followed by the mobilization of the middle and lower glenohumeral ligaments, detachment of their adhesion medially and release of the anterior-inferior capsule for free reinsertion in the proximal direction (Fig. 1a). After that, preparation of the anterior surface of the glenoid was performed. The reinsertion of the capsule-ligament complex was was provided by means of anchors, most commonly Bio-PushLock system (Arthrex). After fixation, the degree of stability of the insertion of the shoulder joint was tested in external rotation of the humerus.

Operative surgical technique after Ivan Matev. This technique consists of three steps [11]. The first step included construction of a muscle flap. This flap is thinner and consists of the short head of biceps brachii muscle and the coraco-brachialis muscle. Usually, the flap is 4–5 cm wide in his middle portion. It is detached 1–1.5 cm distal to the coracoid process through an L-shaped incision of the con- joint tendon, whose medial part remains intact. The musculocutaneous nerve is traced, identified and preserved. The second step is presented by subscapularis muscle plasty. After the muscle flap has passed through the

tunnel and its tendon is reattached, the exposed part of the loose subscapularis muscle is longitudinally shortened with multiplication. The third step includes the use of the long head of biceps brachii muscle. At the level of the subscapularis tendon, the tendon of the long head of biceps brachii is also identified at 45° flexion of the shoulder. After that, the tendon of the biceps brachii is fixed to the subscapularis insertion to the humeral bone, to the neighboring periosteum and soft tissues. The tendon must be fixed in this position for optimal tension to be achieved.

Operative surgical technique after Latarjet

Latarjet is a transplant transfer of proc. coracoideus, along with the inserted to him biceps brachii and m. coracobrachialis, on the anterior-lower edge of cavitas glenoidalis. Recovering the labrum glenoidale and the ligamentary apparatus also comes into play.

The aims of the operating technique are as follows: bone, passive bulkhead – increasing the depth of the cavitas glenoidalis; front – supporting the anterior rim; muscular, active barrier – in the case of abduction and external rotation (the most critical position), (Fig. 2a) that is obtained from mm. coracobrachialis and biceps brachii; lower-anterior muscle barrier from the distal third of m. subscapularis, pushed and held distal by the transposed coracoid.

Stages:

- Through a standard deltoidoperopeal approach, proc. coracoideus is exhibited.
- osteotomy of proc. coracoideus
- distal liberation of the lamb
- entry into m. subscapularis parallel to its fibers and capsulotomy – in the same plane
- restoration of labrum glenoidale and ligamentary apparatus by fixation with anchors
- brring of holes: – in the neck of the scapula and in the transplant
- fixation of the transplant to the front and lower part of the neck of the scapula with a screw
- suture of the muscle and the capsule
- an assessment of the position of the transplant is made radiographically to an ideal AP-position, relative to the glenoidal edge and the equator of the glenoid; the Y-position and axial position – for the position of the fixing screw.

MATERIAL AND METHODS

From 2004 to 2017, 291 patients aged between 15 and 35 years were operated at the University Hospital “Prof. B. Boychev”, Medical University – Sofia. 247 of them had anterior and 44 – combined shoulder instability. 173 of the patients were active athletes practicing different disciplines. The average age at the first dislocation was 17 years. In 172 patients, the first dislocation occurred without significant trauma, 124 of them presented with anterior shoulder instability and 48 – with combined shoulder instability. In 120 patients with anterior dislocations, a serious injury occurred during the first accident. The number of dislocations varied between ten and fifteen in all patients.

For the same period, 45 patients with significant bone defects requiring open surgery (Latarjet procedure) were operated. In the patients with bone defects, the dislocations were between 8 and 30 before the time of the first examination. 11 patients had undergone previous surgery in different hospitals and at presentation they had different numbers of relaxations after surgery.

Each patient was examined for instability of the shoulder using various clinical tests. Translational load (load and shift), anterior apprehension and reluxation tests were positive in all patients. The Gerber anterior drawer test for shoulder instability was positive in 195 and negative in 96 patients. The sulcus sign test was positive in 98 patients. The translational and posterior apprehension tests were positive in 44 patients. In 246 patients, the second degree of instability of the shoulder was assessed by the scale of Hawkins–Monhtadi. In 45 patients, the third degree of instability of the shoulder was assessed by the scale of Hawkins–Monhtadi. All patients with anterior instability had almost a full range of motion with the exception of external rotation, which was limited to an average of 20°. The patients with combined instability had painful internal rotation with slightly limited range of motion between 5° and 10°. The patients, who had previously undergone surgery had limited range of motion – external rotation, which was limited to an average of 50°, as the abduction , limited to an average of 95°. A disturbance of the skin sensitivity in the area of n. axillary was present in seven of the patients with significant bone defects.

The patients were also evaluated by X-ray, including: AP-view, Y-view, and axillary views. The X-ray images revealed dysplasia of cavitas glenoidalis in 12 patients and bony lesions of glenoidal edge in 40 patients. In 145 patients, Hill–Sachs type lesions were found. Magnetic resonance imaging was made in 201 patients [12]. This imaging modality revealed the presence of a Bankart lesion in ten patients. A partial lesion of the rotator cuff with inconclusive data was found in 34 patients. Ligament lesions were detected

in 197 patients and in 54 of them – a combination with SLAP (superior labral tear from anterior to posterior) lesions . Lesions of posterior labrum were found in 39 patients were established. The arthroscopic findings revealed true Bankart lesions in 198 patients. Connate labrum and ligament apparatus to the medial glenoidal edge were found in 74 patients after previous lesions . The glenoidal damage of the posterior edge in 7 patients and enlarged inferior recessus of the capsule, the so-called “front-bottom pocket”, were identified in 129 patients.

Postoperative rehabilitation protocol

A well-established postoperative program was followed after surgery [13,14]. In the first four to five weeks, brace immobilization with active and passive movements of the elbow and wrist were performed. At the sixth week, the patient started passive movement of the shoulder as far as tolerated as well as active movements without internal rotation. At the eighth week, the external rotation should be up to 30◦. At the start of the twelfth week, the patient was allowed to do stretching exercises and after the sixth month sport activities could be resumed.

RESULTS

The postoperative follow-up period was between 2 and 14 years. Clinical examination after surgery showed significant improvements [15]. The apprehension, reluxation and anterior drawer tests were negative in all patients after surgery. The “load and shift” test was negative in 210 patients in the third month. In the remaining 81 patients, this test was fully negative in the fifth month and their shoulder stability was 0–1st degree by Hawkins–Monhtadi scale. The sulcus sign test was negative in 90 of 98 patients registered with positive test before. No musculo-cutaneus nerve lesions were observed. The improvement of the motion range in the postoperative period was significant as shown in Table 1.

The postoperative results in patients having undergone the procedure by Latarjet were proved radiographically: in 40 of them the transplant was positioned relative to the glenodular edge; under the equator of the glenoid; perpendicular to the joint surface; in 5 – the transplant was on the equator of the glenoid, the 2 screws were not perpendicular to the joint surface.

All patients followed the rehabilitation program strictly and the painfulness of the movements progressively decreased in the early postoperative period except for two patients who reported a severe soreness at twentieth postoperative day that lasted for 3 4 weeks. They also had the most limited external rotation − 40°.

Table 1. Motion range during the study

Examination	Movements	Min	Max	R	X
Beginning	Extension	0	40	40	10
	Flexion	100	120	20	105
	Abduction	80	90	10	85
	Int. rot.	45	70	25	55
	Ext. rot.	5	10	5	8
1 week	Extension	25	55	30	45
	Flexion	130	145	15	140
	Abduction	95	110	15	103
	Int. rot.	70	75	5	73
	Ext. rot.	10	20	10	17
2 weeks	Extension	55	60	5	57
	Flexion	130	150	20	147
	Abduction	110	115	5	113
	Int. rot.	80	90	10	87
	Ext. rot.	35	45	10	38
4 weeks	Extension	50	55	5	52
	Flexion	150	160	10	158
	Abduction	120	130	10	124
	Int. rot.	85	90	5	88
	Ext. rot.	45	55	10	52
2 months	Extension	50	60	10	56
	Flexion	155	160	5	157
	Abduction	135	145	10	141
	Int. rot.	85	90	5	89
	Ext. rot.	60	75	5	70

A few complications after surgery were registered. In three patients, active athletes with previous open surgery, reluxation in the sixth month after returning to sports, injury was detected. In these patients, the load and shift test was completely negative in the fifth month after surgery. In one patient, mild pain up to the eighth month after surgery was established [22]. In one patient migration of hardware material was found. In one patient who did not comply with the rehabilitation protocol, the external rotation deficit was up to 30°.

Possible complications after the operative technique by Latarjet: osteoarthritis – eccentric and centered; osteoarthritis developing in a too lateral-graded transplant; screw breaking; lack of transplant growth; partial osteolysis of the transplant; transplant migration; hematoma, osteophytosis; infections.

DISCUSSION

The arthroscopic operative technique addresses the elements which stabilize the shoulder joint: the glenoidal labrum and the capsule-ligament complex. Only the restoration of ruptured ligaments and reinsertion of the torn or stretched capsule may lead to reliable stabilization. Implants that meet these requirements are anchors with a pair of sutures. Treating only the labrum would jeopardize the success of the intervention. The technique is not suitable in the presence of bone lesions or dysplasia of the cavitas glenoidalis. The most convenient time for surgery is immediately after the diagnosis is made – after the first or second dislocation [1–5]. This technique keeps the range of motion at the best possible. It uses the advantages of endoscopic surgery. It is suitable for patients without gonadal dysplasia, bone lesions, severe ruptures of the anterior capsule-ligament apparatus. Most useful for evaluation is MRI, before and after surgery. But when the dislocations are multiple and the patients are active athletes, the combined single-step surgical intervention involving arthroscopic surgery combined with the operative technique after Ivan Matev is a method of choice [17]. It uses the main positive characteristics of the Boychev's operation, adding security of stabilization: the subscapularis muscle is tightened by shortening in the area of the tendon fibers; a flap made of the coracobrachialis muscle and the short head of biceps brachii; the musculocutaneous nerve is protected by the flap medially; building one more passive barrier against the anterior dislocation using the long head of biceps brachii muscle. The operative technique after Latarjet could be a method of choice for cavitas glenidalis dysplasia, reduced glenoid revertosis, bone defects of cavitas glenidalis and Hill-Sachs lesions as well as after failure with other surgical techniques. This is because it achieves passive-active bone muscular barrier and in the most critical position of the shoulder, avoiding the overthrow of m. subscapularis. The lower third of m. subscapularis remains in the front-down position, even in abduction and external rotation. The obstruction of m. subscapularis is proximal in abduction and external rotation, the external rotation is reduced by about 17º. In persons returning to the same level of sport activities, arthrosis does not develop when the transplant is placed correctly and there are no significant lesions on the rotator cuff and joint decentrating.

CONCLUSION

Successful postoperative results in this group of patients at the University Hospital "Prof. B. Boychev" show that these operative techniques, with their specific indications, advantages, technical requirements and timely performance, can be the method of choice in the treatment of patients, who want to quickly return to active sport, having sustained a greater number of shoulder dislocations. Our algorithm for treatment could be considered as optimal.

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