



SHOULDER INSTABILITY – A FREQUENT PATHOLOGY – VARIOUS METHODS OF TREATMENT

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SUMMARY

Purpose: The goal of this study is to present the results after different methods of surgical treatment of the unstable shoulder joint: arthroscopic stabilization; arthroscopic stabilization followed by the operative technique of Matev and the Latarjet procedure in cases of presence of bone defects.

Materials and methods: For the period from 2004 to 2017, 291 patients between 15 and 35 years were operated at University Hospital “Prof. B. Boychev”- Medical University - Sofia. 247 of them were with anterior and 44 with combined shoulder instability. 173 of the patients were active athletes practicing different disciplines. The average age of appearance of the first dislocation was 17 years. In 172 patients, the first dislocation came without significant trauma, 124 of them had an anterior shoulder instability and 48- combined shoulder instability. In 120 patients with anterior dislocations, there was 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 underwent open surgery (Latarjet – procedure). In the cases with bone defects, there were between 8 and 30 dislocations before the first examination. There were 11 patients, who underwent previous surgery in other hospitals and they came in our clinic with a different number of postoperative relaxations.

Results: The results were evaluated radiographically and clinically. Functionally, the patients recovered according to a well-established protocol. Full range of external rotation was observed. All of them returned to sports activity.

Conclusions: This combined operative technique tends to be the most effective method in the treatment of shoulder dislocations, especially in people who want a quick return to active sports.

Keywords: shoulder instability, arthroscopic stabilization, combined operative technique, Latarjet procedure,

INTRODUCTION

The successful treatment of shoulder instability requires a combination of joint stabilization and range of motion preservation. The operative method depends on the degree of instability, the diagnosed pathology and the patient's

lifestyle and physical activity. The patient's age and the duration of the instability are also important.

Standard operative techniques are known for 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.

There are 3 major 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 the cavitasglenoidalis.

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

Various types of Bankart-type capsuloplasty recover the soft tissues. Although they are complicated to perform they best preserve the range of motion of the joint. Preoperative predispositions for a successful capsuloplasty are lack of reduced glenoidanteversion, narrowed inferior glenoid, glenoid dysplasia; - lesions of the glenoid edge and Hill-Sachs lesions - lesions on the rotator cuff detected on x-ray and MRI.

Arthroscopic treatment of shoulder instability is becoming more popular with the progress of endoscopic surgery. The indications for it widened because of the improvement of the implants and technical skills. This treatment increasingly meets basic requirements: secure stabilization of the joint and minimises the possibility for restraint postoperatively [1-5]. This method must be performed in early stages of untreated recurrent dislocations in adolescents and young people, regardless of their sports lifestyle. These early stages are usually misdiagnosed and later larger lesions need more invasive surgical procedures. It is known that most of the arthroscopic techniques are an alternative to Bankart's capsuloplasties successful in cases of physiological predisposition, bone lesions of the glenoid edge, rotator cuff lesions and Hill-Sachs lesions – up to 15%–20% [6-15, 18-20] In an arthroscopic technique with anchors, it is important to stabilize the anterior and lateral part of the neck of the scapula and the capsule-ligament apparatus, not just the glenoid labrum. This insures the healing process responsible for the future stability of the joint [4]. In case of **multidirectional instability**, the technique of the ext-

racapsular suture for the plication of the posterior capsule can be used [2-5].

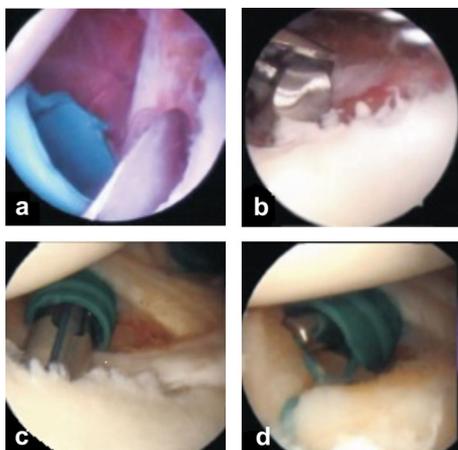
Many patients come to our clinic after recurrent dislocation of the shoulder. Moreover, they required to continue with active sport activities. At this moment we believe it is not appropriate to make bone operations to restore joint stability. The most suitable method is the single-step combined surgery (arthroscopic technique combined with the operating method of Ivan Matev who improved the original technique of Boychev [16, 17] affecting both the passive and active stabilizers of the shoulder joint, [6, 17].

However, in the presence of **bone defects**, these procedures may be unsuccessful. Bone defects could be compression of the anterior glenoid and Hill-Sachs lesions of the humeral head. In these cases and in failed soft-tissue surgery, intervention on the capsuloligamental apparatus or on the contraction force of subscapularis for creating of a bone-muscular passive-active barrier is the most appropriate. Then the Latarjet procedure is a method of treatment [7]. Only the most severe cases, combined with fractures appeared to require 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 integrity, mobility and adhesion to the medial scapular neck of the glenohumeral ligaments and the anterior capsule, were evaluated. Thereafter preparation of capsule-ligament complex was performed. 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 proximal direction (Fig. 1a). After that, the preparation of the anterior surface of the glenoid was performed (Fig. 1b). The reinsertion of the capsule-ligament complex was provided by anchors (Fig. 1c-d), most commonly with Bio-pushlock system (Arthrex). After fixation, the stability of insertion of the shoulder joint was tested in external rotation of the humerus.

Fig. 1. a-d. Arthroscopic findings during different steps of the procedure.



Operative surgical technique of Ivan Matev. This technique consists of three steps [11]. The first step included construction of a muscle flap. The flap is thin- consisting of the short head of biceps brachii muscle and the coraco- brachialis muscle. Usually, the flap is 4–5 cm wide in the middle. 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 stays intact. The musculocutaneous nerve is identified and preserved. The second step is the subscapularis muscle plasty. After the muscle flap is passed through the tunnel and its tendon is reattached, the loose subscapularis muscle is longitudinally shortened with multiplication. The third step includes the long head of biceps brachii muscle. At the level of 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 at the subscapularis insertion to the humeral bone, to the neighbouring periosteum and soft tissues. The tendon must be fixed in this position for optimal tension to be achieved. The presented method is demonstrated to be successful in the treatment of recurrent shoulder instability in physically demanding patients. Its indications must be carefully evaluated pre-operatively.

Operative surgical technique of Latarjet

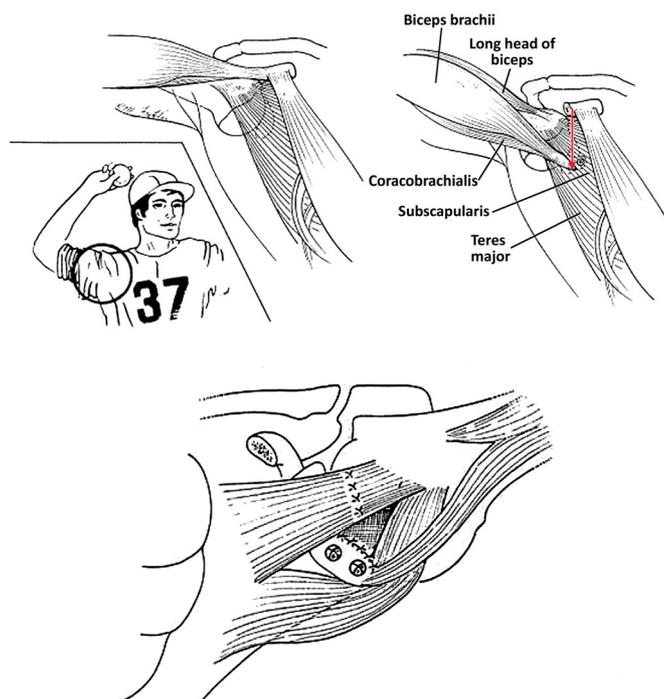
Latarjet is a transplant transfer of proc. coracoideus, the insertion of m. biceps brachii and m. coracobrachialis, on the anterior-lower edge of cavitasglenoidalis. Recovery of labrumglenoidale and the ligamentary apparatus are also performed.

The aim of the operative technique is to create a bony block, increasing the depth of cavitasglenoidalis, supporting the anterior rim acting as an active barrier during abduction and external rotation (Fig. 2a). This is provided by mm. coracobrachialis, biceps brachii and the distal third of m. subscapularis, pushed and held distally by the transposed coracoid.

Stages:

- exposure of proc.coracoideus through a standard deltoideopeopeal approach
- osteotomy of proc. coracoideus
- distal liberation of the lump
- parallel to its fibers penetration into m. subscapularis and capsulotomy in the same plane
- restoration of labrumglenoidale and the ligamentary apparatus by anchor fixation
- drilling 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 (Fig. 2b)
- suture of the muscle and the capsule
- the position of the transplant is checked radiographically with an ideal AP –position, relative to the glenoidal edge and the equator of the glenoid; a Y-position and axial position - for the position of the fixing screw.

Fig. 2 a, b: Surgical principles of the Latarjet – procedure



MATERIALS AND METHODS

For the period 2004 - 2017, 291 patients between 15 and 35 years were operated at University Hospital “Prof. B. Boychev”- Medical University - Sofia. 247 of them were with anterior and 44 with combined shoulder instability. 173 of the patients were active athletes. The average age of the first dislocation was 17 years. In 172 patients, the first dislocation was without significant trauma, 124 of them were with anterior shoulder instability and 48 with combined shoulder instability. In 120 patients with anterior dislocations, there was a serious injury during the first accident. The number of dislocations varied between ten and fifteen in all patients. There were operated 211 patients by arthroscopically stabilization and 35 patients by combined method - arthroscopically plus open method of Matev, depends of the number of dislocations, type of the lesions and the demanding of the patients of their everyday life.

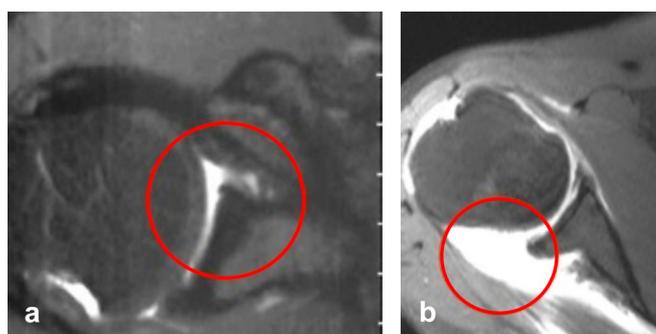
For the same period, 45 patients with significant bone defects needed open surgery (Latarjet – procedure) were operated. In the patients with bone defects, the dislocations were between 8 and 30 before the first examination. There were 11 patients, who were undergone previous surgery in different hospitals and now they were with different number of relaxations after surgery.

Each patient was examined with various clinical tests for instability of the shoulder. Translational load (load and shift), anterior apprehension and relaxation tests were positive in all patients. The Gerber anterior drawer test for shoulder instability was positive 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 full range of motion with the exception of external rotation, which was limited to 20%. The patients with combined instability had painful and slightly limited (5% - 10%) internal rotation. The patients, who underwent previous surgery had limited range of motion - especially external rotation. It was limited to 50% and the abduction to 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 radiographic, including: AP-view, Y-view, and axillary views. The radiographs revealed dysplasia of cavitasglenoidalis in 12 patients and bony lesions of glenoidal edge in 40 patients. In 145 patients, Hill–Sachs type lesions were established. Magnetic resonance imaging was made in 201 patients [12]. This imaging modality revealed the presence of Bankart lesion in all ten patients (Fig. 3a). The partial lesion of the rotator cuff with inconclusive data 34 patients was found. Ligament lesions in 197 patients in combination with SLAP (superior labral tear from anterior to posterior) lesions in 54 of them were detected. The lesions of posterior labrum in 39 patients were established (Fig. 3b). The arthroscopic findings revealed true Bankart lesions in 198 patients. The connate labrum and the ligament apparatus to the medial glenoidal edge after previous lesions in 74 patients were found. The glenoidal damage of the posterior edge in 7 patients and enlarged inferior recessus of the capsule, the so-called “front-bottom pocket”, were established in 129 patients.

Fig. 3 a,b. MRI of the shoulder joint. a - presence of Bankart lesion; b - lesion of posterior labrum.



Postoperative rehabilitation protocol

After surgery a well-established postoperative programme was followed [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 tolerated and 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 could do stretching exercises and after the sixth month sport activities could be resumed.

RESULTS

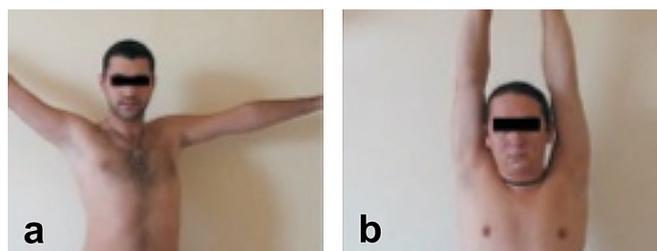
The postoperative follow-up was between 2 and 14 years. Clinical examination after surgery showed significant improvement in the patients physical status, (Fig. 4a, b) [15]. The apprehension, relaxation and anterior drawer tests were negative in all patients after surgery. The "load and shift" test was negative in 210 patients in the third month. In the other 81 patients of the study, 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 had been registered with positive test before. No musculocutaneous nerve lesion was observed in the current study. The improvement of the range of motion in the postoperative period was significant as shown on Table 1.

Table 1. The improvement of the range of motion in the postoperative period.

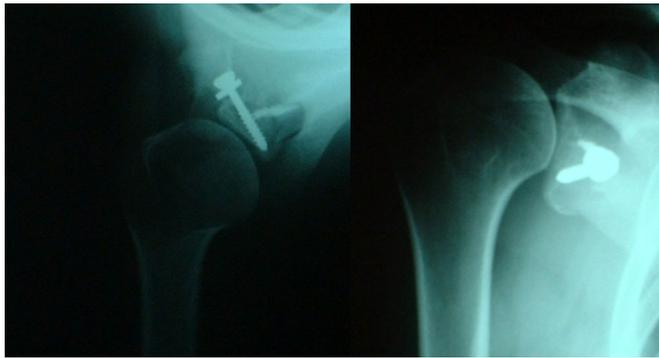
Examination	Movements	Minæ%	Maxæ%	Ræ%	Xæ%
Beginning	Extension	0	40	40	10
	Flexion	100	120	20	105
	Abduction	80	90	10	85
	Int. rot.	45	70	25	55
	Ext. rot.	5	10	5	8
1 week	Extension	25	55	30	45
	Flexion	130	145	15	140
	Abduction	95	110	15	103
	Int. rot.	70	75	5	73
	Ext. rot.	10	20	10	17
2 weeks	Extension	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

Fig. 4 a, b: a - postoperative clinical examination 15 days after immobilization; b - postoperative clinical examination 3 months after immobilization.



Postoperative results in patients undergone the procedure of Latarjet were proved radiographically as follows: in 40 of the patients the transplant was positioned relative to the glandular edge; under the equator of the glenoid; perpendicular to the joint surface; in 5 transplants was on the equator of the glenoid, the 2 screws were not perpendicular to the joint surface, (Fig. 5 a -b)

Fig. 5 a, b Postoperative results after Latarjet – procedure.



All patients strictly fulfilled the rehabilitation program. The pain during movements progressively decreased in the early postop period except for two patients who reported a severe soreness at the twentieth postoperative day that lasted for 3-4 weeks. They also had limited external rotation - 40°.

Some complications after surgery were registered. In three patients, active athletes with previous open surgery, relaxation in the sixth month after returning to sports was detected. In these patients, the load and shift test was completely negative in the fifth month after surgery. In one patient, mild soreness up to the eighth month after surgery was established the migration of hardware material in one patient was also found. In one patient who did not comply with the rehabilitation protocol, the external rotation deficit up to 30% was established.

Possible complications after the operative technique of Latarjet: osteoarthritis: eccentric and centered; osteoarthritis develops in a too lateral-graded transplant; breaking the screw; not growing the transplant; partial osteolysis of the transplant; transplant migration; hematoma, osteophytosis; infections

DISCUSSION

The arthroscopic operative technique addresses the elements which stabilize the shoulder joint: the glenoid 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 risk the suc-

cess of the intervention. The technique is not suitable in the presence of bone lesions or dysplasia of cavitasglenoidalis. The most suitable time for surgery is immediately after diagnosis – first or second episode of dislocation [1-5]. This technique keeps the range of motion unaffected. It has the advantages of endoscopic surgery. It is suitable for patients without gonadal dysplasia, bone lesions, severe tears of the anterior capsule-ligament apparatus. The most useful method for evaluation is MRI, before and after surgery. In cases of recurrent dislocations especially in active athletes, the combined single-step surgical intervention involving arthroscopic surgery combined with the operative technique of Ivan Matev is a method of choice [17]. It takes advantage of Boychev's operation and also provides reliable stabilization: the subscapularis muscle is tightened by shortening in the area of tendon fibres; 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 of Latarjet could be a method of choice for cavitasglenoidalis dysplasia, reduced glenoid retroversion, bone defects of cavitasglenoidalis and Hill-Sachs lesions as well as failure after other surgical techniques because it achieves passive-active bone muscular barrier and in the most critical position of the shoulder, avoiding the overthrow of m. subscapularis, lower third of m. subscapularis remains in the front-down position, even in abduction and external rotation, obstruction of m.subscapularis proximal in abduction and external rotation, the external rotation is reduced by about 17° [16, 18]. Persons returning to the same level of sport, 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 University Hospital "Prof. B. Boychev" warrant these operative techniques with their indications, advantages, observing the technical requirements and performed on time to be the method of choice in the treatment of patients with greater number of dislocations of the shoulder, who want to quickly return to active sport. Our algorithm of treatment could be suggested to be taken in mind.

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