Research Paper

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Modified Boytchev Procedure- Simple and cost Effective Solution to Recurrent Anterior Dislocation of Shoulder

Medical Science

KEYWORDS : Modified Boytchev procedure, recurrent anterior dislocation of shoulder, coracoid process

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ABSTRACT

Purpose: To study functional advantages of Modified Boytchev procedure in recurrent anterior dislocation of shoulder

Materials: Modified Boytchev procedure was performed on 6 patients in between 2013-2015. None of the patients had previous shoulder surgery 5 patients were males and 1 was female. The right shoulder was affected in 5 and the remaining 1 was left. All the patients are manual labours. Outcome was evaluated using the Burk head and Rockwood criteria.

Results: The mean follow-up period was 18 months. Outcome was excellent in4 patients (66.6%), good in one (16%),and fair in one(16%). None had poor outcome. No patient had fragmentation of coracoid process.

Conclusion: The modified Boytchev procedure is a viable and simple treatment for recurrent anterior shoulder dislocation. This is important particularly in developing countries because it is cost effective compared to arthroscopic repair.

Introduction

The risk of recurrent anterior dislocation of the shoulder tends to increase with the activity level in young adults and athletes. Factors contribute to the anterior shoulder instability are avulsion of the glenoid labrum, stretching of the joint capsule and the subscapularis muscle, and relatively small sized shallow glenoid cavity. The surgical procedures for recurrent anterior dislocation of the shoulder are based on two principles: either passive control of the humeral head with capsular repair, like in the Bankart procedure or active control, in which the muscle power prevents redislocation, as in modified Bristow procedure and in the Boytchev procedure. Open procedures for repair of anterior shoulder instability have a low recurrence rate but are associated with loss of external rotation. Arthroscopic procedures are associated with less loss of motion but have a higher recurrence rate and a substantial learning curve for the surgeons. The Boytchev procedure can overcome these disadvantages by re-routing the coracoid process with its attached conjoined tendon of the short head of the biceps and coracobrachialis with the pectorals minor muscle deep to the subscapularis muscle and re-attachment to its anatomic location. It was then modified by rerouting the conjoined tendons of the short head of biceps and coracobrachialis only. The surgical results were excellent with minimal surgical morbidity and it was proved to be cost-effective.

Materials:

Modified Boytchev procedure was performed on 6 patients in between 2013-2015. None of the patients had previous shoulder surgery. Age of the patients ranged from 20 to 52 years with an average of 30 years. 5 patients were males and 1 female. The right shoulder was affected in 5 and the remaining 1 was left. All the patients are manual labours. No patient had any previous surgeries.

Operative technique:

After general anaesthesia patients were placed in a supine position with a sand bag under the medial border of the scapula. The standard deltopectoral approach was used. The anterior margin of the deltoid was exposed, while the pectoralis major was retracted medially to expose the horizontal part of the coracoid process that was the tendinous origin of the short head of the biceps and coracobrachialis **(Fig.1,1A)**.The coracoid process was predrilled anteroposteriorly with 2.0 mm drill bit to facilitate a later anatomic attachment. The coracoid process was osteotomised by a power saw and the osteotomy was completed by curved osteotome. The osteotomy must be made from medial to lateral to protect the neurovascular bundle and the conjoined tendons attached to the osteotomised coracoid process are then retracted downward **(Fig.2,2A).**Careful dissection and gentle traction of the conjoined tendons prevent injury to the musculocutaneous nerve. With the shoulder in internal rotation, a plane was developed between the joint capsule of shoulder and the subscapularis starting just proximal to the lower border of the subscapularis which was identified with the anterior circumflex humeral vessels present transversely at its lower border. The detached tip of the coracoids process along with the attached muscles was passed through the plane and fixed to the predrilled proximal counterpart of the coracoid process using a 4-mm cancellous screw (about 25-30 mm in length) with washer while the arm was maintained in internal rotation **(Fig.3,3A).**

After haemostasis, the wound was closed in layers. The arm was immobilized by the side of chest with the shoulder in internal rotation. The position of the screw was assessed using radiographs **(Fig.4).** Removal of suture done after 10 days.

Physiotherapy started after 4 weeks, initially with pendulum exercises followed by active assisted shoulder mobilization aiming to achieve full range of shoulder movements at around 8-12 weeks. .The patients were followed every 12 weeks during the first year. Outcome of Patients evaluated using the Burk head and Rockwood criteria **(Table)**; a score of 90 to 100 was considered excellent, 70 to 89 good, 40 to 69 fair, and ≤39 poor. The overall satisfaction level of the patient was recorded. Physical examination of the operated shoulder included inspection of the scar, muscle wasting and range of shoulder movements **(Fig.5a-d)** compared to the opposite normal side. All patients were pain free during rest of the shoulder, with overhead activity.

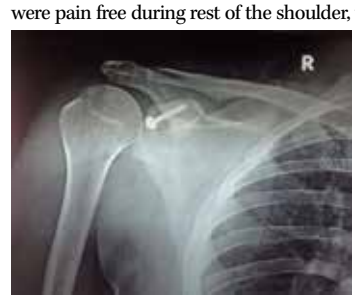

Figure 4. The reattached coracoid process fixed with a lag screw.

Results:

All patients were assessed in terms of working activity, shoulder pain, stability of shoulder, and movements of shoulder in relation to pre-operative activity. The mean follow-up period was 18 months. Outcome was excellent in 4 patients (66.6%), good in one (16%), and fair in one (16%). None had poor outcome. Almost all the patients were able to attend their activities in daily life after three months of surgery. Shoulder movements were near normal to opposite shoulder. Each patient was asked to grade the results from 0 to 100% compared to the pre-injured performance level. All patients were satisfied from the results of surgery and returned to the same working activity as before. One patient had pain around coracoid region but on radiograph there was no evidence of loosening and migration of coracoid screw or glenohumeral arthritis. No patient had fragmentation of coracoid process.

Table: Burk head and Rockwood criteria for evaluation of shoulder function

Outcome	Score*
Function No limitation in sports or work, able to throw baseball and football, can swim, crawl, stroke No limitation in work, slight limitation in throwing baseball, serving forcefully in tennis or swimming, crawl, stroke, can throw football normally Moderate limitation in overhead work, throwing baseball and football, swimming, crawl, stroke or serving tennis Marked limitation in throwing in all sports, unable to work with arm overhead	 50 35 20 0
Pain None Moderate Severe	 10 5 0
Stability Negative apprehension test, no subluxation Negative apprehension test, but discomfort with arm in position of abduction and external rotation Positive apprehensive test and sense of subluxation	 30 15 0
Range of motion Full 25% loss of motion in any plane >25% loss of motion in any plane	 10 5 0

* A score of 90 to 100 is considered excellent, 70 to 89 good, 40 to 69 fair, and ≤39 poor

Fig 1,1A.Coracoids process with three muscles attached to it.

Fig.2, 2A.Osteotomised coracoid

Fig .3, 3A.Rerouting the coracoid process between subscapularis and joint capsule.

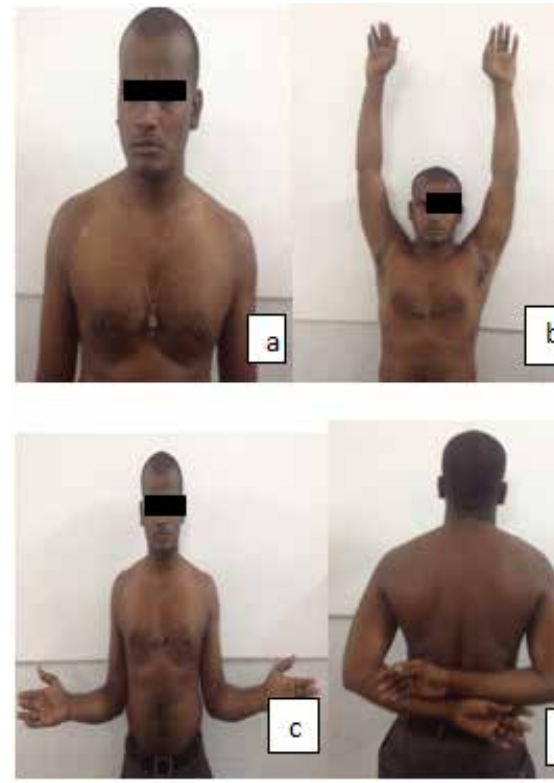

Figure. 5.a.Surgical scar b. Full abduction c. external rotation and d. internal rotation of the operated right shoulder.

Discussion:

Treatment for recurrent anterior dislocation of shoulder should provide an active corrective force that pushes the humeral head into the glenoid fossa. The Boytchev procedure achieves this objective in 4 ways. First, the increased muscle bulk of the subscapularis, coracobrachialis, and the short head of biceps augments the bracing effect over the antero-inferior aspect of the glenohumeral joint, and thus prevents anterior dislocation by acting as dynamic muscular sling. Second, the muscle bellies of two strong muscles are rerouted to lie more directly in contact with the joint capsule and humeral head so that their active contraction exerts a strong control on the anterior exertion of the humeral head, thereby balancing the deforming forces of dislocation. Third, the modified Boytchev procedure increases the pressure between the humeral head and subscapularis tendon, and thus increases proprioceptive stimuli in the subscapularis tendon, which accelerates the protective reflex needed to

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prevent shoulder dislocation. Lastly the addition of the pectoralis minor to the transfer will augment the lower portion of the subscapularis by its oblique course and this will re-enforce the weakened antero-inferior aspect of the capsule during abduction and external rotation of the shoulder joint. Lengthening of the subscapularis is the main cause of shoulder instability, whereas the capsular and bony defects are the subsidiary causes. This is contrary to the current trend of addressing mainly the intra-articular pathology of the unstable shoulder. Therefore, the recurrence rate is higher after arthroscopic repair than open procedure. However, limited range of motion was the main drawback of open procedures. The recurrence rates after the Bankart procedure, Putti-Platt procedure, Magnuson-Stack procedure, and Bristow procedure for recurrent anterior dislocation of shoulder were 6%, 20%, 7%, and 13%, respectively, with restriction of external rotation and glenohumeral arthritis in long-term follow-up. Ideally, the procedure for recurrent instability should include the following factors: (1) has a low recurrence rate, (2) has a low complication rate, (3) has a low reoperation rate, (4) does no harm (Gleno humeral arthritis), (5) maintains motion, (6) is applicable in most cases, (7) allows observation of the joint, (8) corrects the pathological condition, and (9) is not too difficult.

The Modified Boytchev procedure achieves comparable results, with lower recurrence rate, minimal restriction of external rotation, and no glenohumeral arthritis. However, this procedure may be contraindicated in epileptic patients and those with weak subscapularis or large glenoid defect.

Arthroscopic repair of unidirectional shoulder instability yields inferior results compared to traditional open repair, according to Weber and Manifold. The benefit of decreased peri operative morbidity with arthroscopic repair does not outweigh the risk of recurrence in these patients. After all these controversies, it seems that the technique of modified Boytchev has many advantages as it is safe, simple, provides immediate strong dynamic stability to the shoulder joint, this will hold the humeral head posterior when the arm is abducted and externally rotated as in overhead activity. Moreover, the conjoint tendons by their new route behind the subscapularis muscle provide a strong dynamic muscular sling immediately antero inferior to the shoulder joint in addition to functional shortening of the subscapularis muscle.

Conclusion

The modified Boytchev procedure is a viable and technically easy treatment for recurrent anterior shoulder dislocation. This procedure is relatively simple and can be performed by all orthopaedic surgeons without the need of specialized arthroscopic instruments. This is important particularly in developing countries because it is cost effective compared to arthroscopic repair.

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