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M Antony Vimal Raj
Professor of Orthopaedics, Department of Orthopaedics, Stanley Medical College & Govt. Stanley Hospital, Chennai, Tamil Nadu, India

S Karuppasamy
Assistant Professor of Orthopaedics, Department of Orthopaedics, Stanley Medical College & Govt. Stanley Hospital, Chennai, Tamil Nadu, India

SR Venkateswaran
M.S Orthopaedics Final Year Post Graduate, Department of Orthopaedics, Stanley Medical College & Govt. Stanley Hospital, Chennai, Tamil Nadu, India

J Manoj
M.S Orthopaedics Second Year Post Graduate, Department of Orthopaedics, Stanley Medical College & Govt. Stanley Hospital, Chennai, Tamil Nadu, India

KR Aanand
D. Ortho Final Year Post Graduate, Department of Orthopaedics, Stanley Medical College & Govt. Stanley Hospital, Chennai, Tamil Nadu, India

Correspondence
S Karuppasamy
Assistant Professor of Orthopaedics, Department of Orthopaedics, Stanley Medical College & Govt. Stanley Hospital, Chennai, Tamil Nadu, India

Ha-Eri Chari procedure for recurrent anterior dislocation of shoulder

M Antony Vimal Raj, S Karuppasamy, SR Venkateswaran, J Manoj and KR Aanand

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Abstract
Background: To evaluate the functional outcome following Ha-Eri Chari procedure as treatment for recurrent anterior dislocation of shoulder.
Materials and methods: This study is a prospective study. 20 patients aged 20 to 44, who underwent Ha-Eri chari procedure from 2014 to 2016 for recurrent anterior dislocation of the right (n=14) and left (n=6) shoulders were included in this study. The mean number of dislocations was 20. The patients were evaluated every 12 weeks during the first year and every 6 months thereafter. The mean follow-up period was 12 months. Outcome was evaluated using the Burkhead and Rockwood criteria.
Results: Outcome was excellent in 16 patients, good in 4. None had poor outcome. The mean external rotation deficit at 0^0 and 90^0 of abduction improved. No patient had evidence of loosening, infection, re dislocation, migration of coracoid screw or glenohumeral arthritis.
Conclusion: Ha-Eri Chari procedure is a viable and simple treatment for recurrent anterior shoulder dislocation. This procedure is relatively simple and can be performed by all orthopaedic surgeons without the need of specialised arthroscopic instruments.

Keywords: Recuurent anterior dislocation of shoulder; Ha-Eri Chari procedure

Introduction
Surgical treatments for recurrent anterior dislocation of the shoulder include passive interventions using capsuloligamentous or bone block to create barriers and active interventions using muscle action. Major disadvantages of these treatments are long immobilisation and loss of external rotation of shoulder. The Ha-Eri Chari 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 deep to the subscapularis muscle and re-attachment to its anatomic location [1-5]. In this study, we evaluated the functional outcome of the Ha-Eri chari procedure in 20 patients.

Materials and methods
This study is a prospective study. 20 patients aged 20 to 44, who underwent Ha-Eri chari procedure from 2014-2016 for recurrent anterior dislocation of the right (n=14) and left (n=6) shoulders were included in this study. The mean number of dislocations was 20. Patients with epilepsy, multidirectional instability, neuromuscular disorders, and abnormal mental status were excluded.
Preoperatively, apprehension test for anterior dislocation was positive in all patients. Shift and load test and sulcus test indicating instability were negative in all patients. Radiographs with internal rotation of the shoulder were taken. In patients with bony defect, the defect was less than 20%. All these patients had evidence of Bankart's lesion on MRI.

Surgical procedure and follow up
Patients were placed in a supine position under general anaesthesia, and a sand bag was placed under the medial border of the scapula. The standard deltopectoral approach was used. The deltoid was retracted laterally and the pectoralis major was retracted medially to expose the coracoid with tendinous origin of the short head of the biceps and coracobrachialis (Fig. 1a).

A drill hole was made in the coracoid process along its axis with 2.5mm drill bit. The coracoid process along with the origin of short head of biceps and coracobrachialis was osteotomised and moved distally (Fig. 1b). With the shoulder in internal rotation, a plane was developed between the joint capsule of shoulder and the subscapularis starting from the lower border of the subscapularis. Care was taken not to damage the anterior circumflex humeral vessels. The detached tip of the coracoid 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 AO cancellous screw (about 30 mm in length) [Fig. 1c]. After haemostasis, the wound was closed in layers. The arm was immobilised by the side of chest with the shoulder in internal rotation. The position of the screw was assessed using radiographs (Fig. 2). After 2 days, pendulum shoulder exercises were started after removal of drain. At week 3, active assisted shoulder mobilisation was started aiming to achieve full shoulder movements at week 8 (Fig. 3). The patients were evaluated every 12 weeks during the first year and every 6 months thereafter. Outcome was evaluated using the Burkhead and Rockwood criteria (Table); a score of 90 to 100 was considered excellent, 70 to 89 as good, 40 to 69 as fair, and ≤39 as poor.

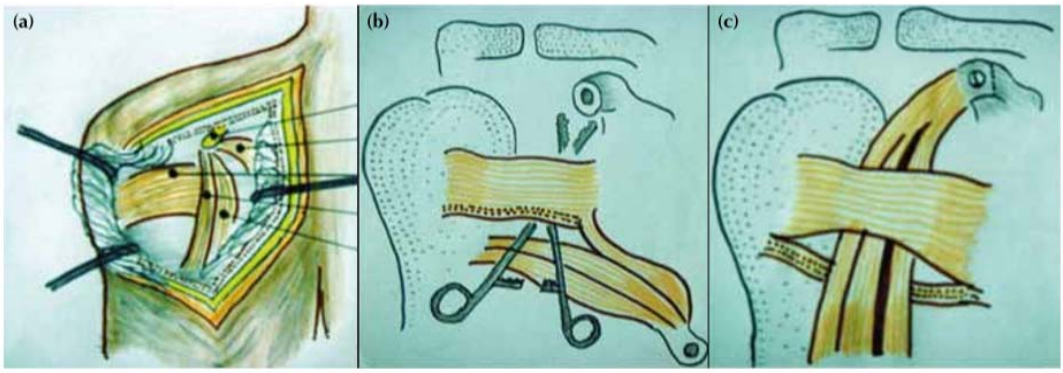

Figure 1 (a) The coracoid process and the 3 muscles attached to it are seen through the deltopectoral approach. (b) The coracoid process is osteotomised and the tunnel between the joint capsule and the subscapularis is prepared after distal reflection of the coracoid process along with the attached long head of biceps and coracobrachialis. (c) The coracoid process with the attached muscle is rerouted between the subscapularis and the joint capsule. The osteotomised tip of the coracoid process is fixed with a screw at its original place.

Figure 2 The reattached coracoid process fixed with a lag screw.

Fig 3: Clinical images showing the range of movements

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

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

Results

The mean follow-up period was 12 months. Outcome was excellent in 16 patients, good in 4 patients. None had poor outcome. The mean external rotation deficit at 0^0 and 90^0 of abduction improved. No patient had evidence of loosening, infection, re dislocation, migration of coracoid screw or glenohumeral arthritis.

Discussion

Treatment for recurrent anterior dislocation of shoulder should provide an active corrective force that pushes the humeral head into the glenoid fossa. The Ha-Eri chari procedure achieves this objective in 2 ways. First, the increased muscle bulk of the subscapularis, coracobrachialis, and the short head of biceps augments the bracing effect over the anteroinferior aspect of the glenohumeral joint, and thus prevents anterior dislocation. Second, the muscle bellies of 2 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. Lengthening of the subscapularis is the main cause of shoulder instability, whereas the capsular and bony defects are the subsidiary causes [6]. This is contrary to the current trend of addressing mainly the intra-articular pathology of the unstable shoulder [5]. Therefore, the recurrence rate is higher after arthroscopic repair than open procedure [7]. However, limited range of motion was the main drawback of open procedures [8].

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 [8–10]. The Ha-Eri chari 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 [11-13].

Conclusion

Ha-Eri chari procedure is a viable and simple treatment for recurrent anterior shoulder dislocation. This procedure is relatively simple and can be performed by all orthopaedic surgeons without the need of specialised arthroscopic instruments. This is important particularly in developing countries.

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