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Sternoclavicular instability - reconstruction of sternoclavicular ligament using semitendinosus autograft

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ABSTRACT

Background: Injury to the sternoclavicular joint is rare with an incidence of 3% of all the injuries around the shoulder girdle. Most of them heal with conservative treatment. Rarely some progress to chronic instability associated with pain.
Methods: We present a small series of 4 such cases of chronic symptomatic sternoclavicular joint instability. We performed reconstruction of the sternoclavicular ligament using semitendinosus autograft, with excellent result, with minimum of 15 months follow up.
Results: All the patients returned to pre injury level of activity at the end of 6 months. There was significant improvement in the DASH score following surgery. Our results are comparable with that of Castropil et al, who had performed a similar technique.
Conclusions: Reconstruction of sternoclavicular ligament using the semitendinosus autograft is a safe, reproducible and functionally good surgical option in patients with chronic sternoclavicular instability.

Keywords: Sternoclavicular joint, Instability, Reconstruction, Semitendinosus

INTRODUCTION

Sternoclavicular joint is a saddle type of synovial joint. It is formed by the medial end of clavicle which is convex supero-inferiorly with the notch on the manubrium. It is the only joint between the axial and appendicular skeleton. The joint is involved in all the movements of the upper limb. The joint is stabilised by fibrous intraarticular disc that arises from the synchondral junction of first rib and manubrium. The disc divides the sternoclavicular joint into two compartments.[1] The joint is reinforced by the capsule, costoclavicular ligament and interclavicular ligament. The costoclavicular ligament, also known as Rhomboid ligament, has anterior and posterior fasiculi. It extends from anteromedial surface of first rib to the medial end of clavicle. The interclavicular ligament connects the superomedial aspect of both clavicle, the capsule and the proximal sternum. The joint is innervated by branches from medial suprascapular nerve and nerve to subclavius. The vascular supply is by articular branches from internal thoracic and suprascapular artery. The brachiocephalic trunk, common carotid artery and the internal jugular vein lie directly posterior to the sternoclavicular joint.

Injury to sternoclavicular joint is rare with an incidence of 3% of all injuries around the shoulder girdle.[2] The mechanism of injury is either a direct trauma to the medial end of clavicle that causes a posterior dislocation or an indirect posterior impact to the shoulder and lateral

end of clavicle that causes anterior dislocation of sternoclavicular joint. Most of the injuries are diagnosed late because of associated injuries. Acute anterior or posterior dislocations are treated with closed reduction and if required open reduction and immobilisation. Most of these injuries heal and incidence of chronic instability is rare.

Clinical presentation

Patients with chronic instability of sternoclavicular joint may be asymptomatic, a group that does not need any intervention. Symptomatic patients present with pain on all shoulder movements, bearing weight on the upper limb, carrying weight and activities involving overhead abduction (Figure 1). Instability can be palpated but care should be taken to appreciate posterior instability due to the risk of injuring the posterior structures.

Figure 1: Prominent right sternoclavicular joint.

Imaging and investigations

Chest x-ray provides no information on the sternoclavicular joint. Wirth and Rockwood described the "serendipity" view, an oblique view which shows both the sternoclavicular joints for comparision.[3] Hobbs view is taken with the patient leaning forward with neck parallel to the x-ray plate and the image passes through the neck.[4] Heinig described a view similar to swimmer's view for the sternoclavicular joint in 1968.[5] A CT scan and MRI are very useful to document and also find anterior or posterior dislocation (Figure 2). Blood investigations are required to rule out any infective pathology. Tuberculosis of the sternoclavicular joint is common especially in countries with higher prevalence of Tuberculosis.[6]

Treatment

Chronic instability of the sternoclavicular joint that are symptomatic requires surgical intervention. Initial attempts to transfix the joint by various methods have failed. Broken implants with migration of the broken pins due to fatigue failure have been documented into almost all the viscera including heart, aorta, pulomary artery, subclavian artery and innominate artery.[7-10] Various surgeries have been advocated with variable results some of which are resection of medial end of clavicle, reconstruction of sternoclavicular ligament and reconstruction of the costoclavicular ligaments.

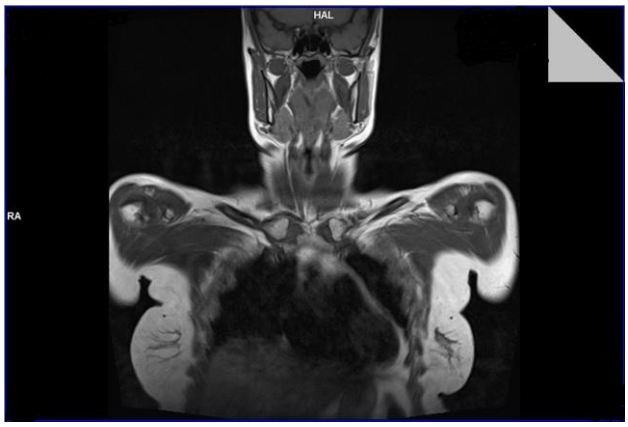

Figure 2: MRI showing effusion of right sternoclavicular joint.

METHODS

Our study was a prospective study. It includes 4 cases of chronic sternoclavicular instability operated between September 2011 to November 2016.

Figure 3: Intraoperative – demonstration of instability.

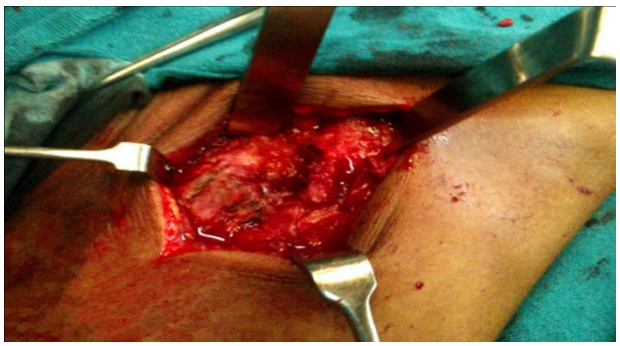

Figure 4: Intraoperative – sternoclavicular joint with the disc and fibrous tissue excised.

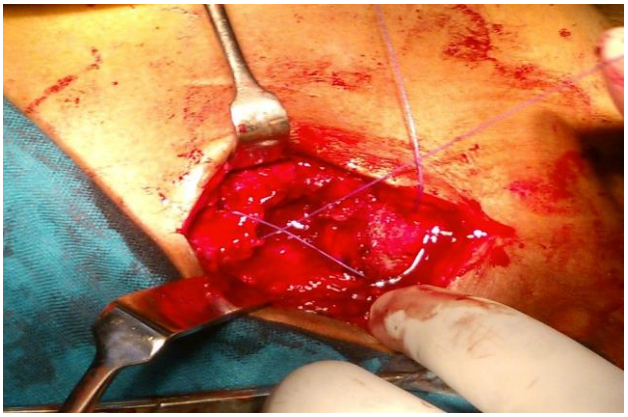

Figure 5: Intraoperative – leading suture passed in figure of 8 pattern.

Figure 6: Intraoperative – final semitendinosus autograft construct.

Surgical technique

Under general anaesthesia patient was positioned in supine position. The instability was clinically appreciated (Figure 3). Semitendinosus tendon graft was harvested from the ipsilateral side and was prepared. Through an 8 cm long incision centred on the sternoclavicular joint, the skin and fascia was cut. The medial end of clavicle and the manubrium were exposed. The sternoclavicular joint was exposed, the intraarticular disc and fibrous tissue was excised (Figure 4). Two drill holes were made in the medial end of clavicle and two holes in the manubrium sternum. Leading sutures were passed through the drill holes in a figure of 8 fashions (Figure 5). The prepared Semitendinosus tendon graft was passed using the leading sutures. The joint was manually reduced and the graft was tightened and sutured on to itself, completing the figure of 8 pattern reconstruction of the sternoclavicular ligament (Figure 6).

Postoperative

The patient was immobilised in an arm sling with the arm by the side for 2 weeks, during which intermittent elbow flexion and extension was allowed. After two weeks, shoulder mobilisation up to 90 degrees of forward flexion and 90 degrees of abduction was allowed. The sling was discontinued after 3 weeks. Full range of shoulder movement was allowed after 6 weeks and weight bearing by the upper limb as tolerated was started after 12 weeks.

Figure 7: Postoperative – deformity corrected.

Patients were periodically reviewed and returned to at the end of 6 months. At one year follow up, they had full range of pain free shoulder movement (Figure 7).

RESULTS

The mean age of patients in our study was 47.5 years with a range from 28 years to 65 years with a male preponderance. The duration of symptoms from injury was in the range of 2 years to 6 years.

Table 1: Functional outcome.

Patient	Age	Sex	Side	Mode of Injury	Duration	DASH Score	
						Preoperative	**Postoperative**
A	28	M	Left	RTA	3 years	20	3.3
B	55	F	Right	Fall	2 years	30	2.5
C	42	M	Right	Fall	2 years	28.3	2.5
D	65	M	Right	Fall	6 years	33.3	3.3

Patients had significant improvement in pain score and also strength. The DASH score at one year follow up was in the range of 2.5 to 3.3 (Table 1) showing significant improvement. Patients were comfortable doing overhead activities and did not have any sense of instability at one year follow up.

Incidentally one patient returned, 15 months post-operative with a trochanteric fracture following trauma. He underwent internal fixation and was able to non-weight bear with walking aid with full load on the operated upper limb.

DISCUSSION

Chronic instability of the sternoclavicular joint is a rare presentation. The experience of individual surgeon is limited. There is a wide variety of surgical methods explained in the literature. Initial non anatomic methods of transfixing the joint with various implants failed due to fatigue failure of the implant and have been given up.

In 2007, Armstrong and Dias published their results of reconstruction of sternoclavicular ligament with the sternocleidomastoid tendon.[11] The study by Spencer and Kuhn compared three methods of reconstruction in cadaver.[12] The first method was using the subclavius tendon described by Burrows.[13] The second method was the intramedullary ligament reconstruction of Rockwood.[14] The third was figure of 8 reconstruction using the semitendinosus tendon. They compared the reconstructed ligament's strength to that of the native ligament in anteroposterior and superoinferior direction. They reported better strength with the figure of 8 reconstructions using the semitendinosus tendon.

We reconstructed the sternoclavicular ligament using the semitendinosus tendon in a figure of 8 pattern using two drill holes in the medial end of clavicle and two drill holes in the manubrium. The results in our series was excellent at 15 months follow up comparable to that of Castropil et al.[15]

CONCLUSION

Chronic symptomatic sternoclavicular joint instability requires surgical intervention. The methods to transfix the joint should not be attempted. Reconstruction of the sternoclavicular ligament using the semitendinosus tendon in the figure of 8 patterns provides good and reproducible results.

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