Temporomandibular Joint Disc Repositioning Using an Orthopedic Suture Anchor: A Modified Disc Anchoring Technique

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Abstract

Purpose The study assessed the efficacy of orthopedic suture anchor as a modified suture anchor for disc repositioning in case of a closed lock of TMJ.

Patient and Methods Disc repositioning was undertaken via a mini preauricular approach. The disc was repositioned on the surface of the condyle and stabilized using an orthopedic suture anchor. Postoperatively functional outcomes were assessed in terms of reduction in pain, joint movement and absence of joint noise and clicking sounds. Postoperative MRI was used to assess the disc position and morphological changes in the disc and arthritic changes in the condyle at the end of six months.

Results Patients were post surgically followed up at regular intervals of 1, 3 and 6 months. Patient experienced significant improvement in mouth opening with good functional outcomes and stable repositioning of disc as noticed By MRI at the end of six months.

Conclusions We describe a modified technique of disc repositioning using an orthopedic suture anchor for more favorable disc position and joint function. However the long term functional sequel of the procedure and changes in the articular disc needs to be assessed.

Keywords Internal derangement · Disc repositioning · Orthopedic suture anchor

Introduction

Temporomandibular joint (TMJ) disc displacement (DD) is the most common condition associated with progressive joint dysfunction [1]. These conditions are characterized by deterioration of the articular cartilage, disc, synovium and subchondral bone. Closed lock is the result of an internal derangement of the TMJ that is specifically caused by disc displacement without reduction. Without treatment the articular disc will deform, degenerate and progress to more severe anterior displacement [2]. Though conservative treatments offer symptomatic relief in many patients, the progression of the disease continues unabated. Variety of open surgical procedures have been advocated for management of internal derangement (ID) of the TMJ. Currently, the standard open surgical procedure is disc repositioning [3]. Clinical studies of disc repositioning surgery have demonstrated a favorable outcome in terms of decreased pain and improved mandibular function in 80–94 % of patients [4].

Orthopedic suture anchors have been used in a variety of orthopedic procedures, for example, shoulder stabilization, meniscus fixation to the knee, hand surgery and procedures involving the elbow. Moreover, they have become a useful alternative in other medical specialties such as esthetic, reconstructive, orbital and in facial trauma surgery for intermaxillary fixation, for corrections of obstructive sleep apneas and disc repositioning surgery of the TMJ [5]. The case report elicits a modified disc repositioning procedure using an orthopaedic suture anchor in a case of closed lock of the TMJ.

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Fig. 1 A biotech screwdriver with a 2.8 mm titanium screw along the end of the shaft

Orthopedic Suture Anchor Characteristics

Biotech Orthopedic suture anchor (BIOTEK, Chetan Meditech, Ahmedabad, India) has been used in Bankart's repair, involving the reattachment and tightening of the torn labrum and ligaments of the shoulder joint. The suture anchor employs a self-drilling titanium screw with 2.8 mm wide threads to provide a superior bone purchase, stability and tremendous pull out strength (Fig. 1). The suture anchor is preloaded with a swaged ultra-high molecular weight, long chain linear polyethylene suture (# 2 BioFiber). BioFiber sutures elicit a minimal of inflammatory reaction in tissues, followed by gradual encapsulation of the suture by the fibrous tissue. BioFiber suture is non-absorbable and no significant changes in tensile strength retention are known to occur in vivo. It exhibits high flex strength with ten times more abrasion resistance when compared to polyester suture and is available in vibrant tracer colors with triaxial pattern design for enhanced visibility during surgery.

Surgical Technique

Under general anesthesia with nasotracheal intubation, a preauricular incision was marked extending from the root of the helix to the point where the tragus meets the ear lobule. After achieving adequate vasoconstriction, an incision was placed through the skin and subcutaneous tissue, dissection was extended 2 cm anteriorly in the subcutaneous tissue plane. The superficial temporal fascia was grasped 5 mm anterior to the tragus with an Adson forceps and a blunt dissection was done in an oblique and superior direction following the branches of the facial nerves towards the zygomatic arch, exposing the temporal fascia. An incision was placed in the temporalis fascia at this level, and extended inferiorly to develop a surgical plane above the capsule of the TMJ. The superior joint space was expanded by application of a mastoid retractor and insufflation of the space with Ringer's lactate. A T-shaped incision was performed with an electrosurgical

Fig. 2 A biotech screw was fixed on to the posterior surface of the condyle, approximately 6–8 mm below the posterior slope of the condyle

Fig. 3 BioFiber threads used for disc plication placed on the medial and lateral aspects of the posterior band of the disc

pencil with care being taken not to damage the articular disc attached to the capsular ligament. Dissection was performed with a Molt's elevator liberating the anterior insertion of the articular disc from the preglenoid plane. An incision was extended mediolaterally along the anterior surface of the disc and anterior release ensured by relieving the superior lateral pterygoid insertion into the

anteromedial aspect of the disc. Disc liberation enabled posterior movement and repositioning of the TMJ disc.

For biotech anchor placement, an incision was made on the joint capsule to access the inferior joint space and locating the condylar head. An osteotomy was made on the posterior surface of the condyle using a 2.3 mm drill. A biotech screw was fixed on to the posterior surface of the condyle, approximately 6–8 mm below the posterior slope of the condyle (Fig. 2). After fixation of the screw, the biotech screw driver handle was released to free the two BioFiber threads attached to the screw. The disc was passively repositioned over the condylar head, so that the posterior band of the disc remains on the posterior aspect of the superior surface. The BioFiber threads were inserted through a round body, $\frac{3}{4}$ needle and disc plication was achieved by sutures placed on the medial and lateral aspects of the posterior band of the disc (Fig. 3). The final position and stabilization of the disc was checked by gently translating the condyle forward onto the eminence and back into the fossa. The capsule was closed carefully with no. 4-0 vicryl sutures with utmost importance for appropriate wound and synovial membrane tissue healing. The incision was then closed in layers with 4-0 vicryl and skin reapproximated with subcuticular 4-0 nylon sutures.

Case Illustration

A 28 year old male reported to our dental department with complaints of progressive decrease in mouth opening and difficulty in chewing food since approximately 6 months. He also gave a history of episodes of intermittent pain in the left TMJ with audible click on opening. Clinical examination revealed a mouth opening of 23 mm with restricted lateral excursive movements to the opposite side as assessed from the closed mouth position and feeble

condylar movements on palpation. MRI evaluation of the disc showed a complete prolapse of the disc in T1, T2 and PD sagittal spin echo sequences (Fig. 4). Open mouth position showed completely displaced articular disc with prolapsed retrodiscal tissue, impeding the translatory movement of the condyle. No signs of joint effusion, fibrillations of the disc or subchondral changes in the articulating surface of the condylar bone were noted. Patient was taken up for surgical repositioning of the disc using the orthopaedic suture anchor after thoroughly explaining the procedure and obtaining informed signed consent for the procedure. Post operatively patient was advised active mouth opening exercises for a period of 6 weeks, there was a gradual improvement of mouth opening from 23 to 44 mm. The mouth opening and lateral excursive movements to the opposite side from the closed mouth position as assessed at the end of 6 months was 39 and 5 mm respectively. Patient did not complain of any pain or headache in the L temporal region postoperatively.

Discussion

Internal derangements that affect the TMJ have a prevalence rate of approximately 20 % [5]. Anterior displacement without reduction (ADDwoR) is a clinical condition in which the disc of the joint is dislocated in an anterior and medial position in relation to the mandibular condyle and does not return to its normal position when performing normal joint movement [6]. Closed lock is the result of an internal derangement of the TMJ that is specifically caused

Fig. 4 Sagittal PD MRI of the L TMJ showing a complete anterior prolapse of the disc

Fig. 5 Six months post-operative sagittal T1 MR of the L TMJ showing stable positioning of the disc

by ADDwoR. Clinically, the patient has limited mouth opening because of the abnormal disc position, which does not allow appropriate translation or functional movement of the mandibular condyle. Painful symptoms can develop when the patient tries to open his or her mouth due to compression in the bilaminar zone, as well as the presence or even absence of TMJ clicks and sounds, among other clinical symptoms and signs evident during the physical examination. Disc-repositioning surgery can mitigate the degeneration caused by internal derangements by eliminating mechanical interferences and facilitating coordinated joint movement [7]. Appropriate position and morphological preservation of the disc are critical to preventing excess remodeling and degenerative changes within the TM joint [4]. Essentially, the disc acts as a biological cushion between the condyle and fossa and disperses the excessive forces that can promote joint destruction. The rationale for repositioning of the disc in our case was to remove the mechanical impediment to the condylar movement and allow coordinated movements of the condyle with the disc and prevent further osteoarthritic changes on the condylar surface.

Currently, the two most common methods used to stabilize the TMJ articular disc are (1) suturing the disc directly to the retrodiscal tissues and (2) suturing the disc directly to the condyle through an intraosseous implant anchor. It is not likely that the retrodiscal tissues offer the degree of disc stabilization that could be provided by the rigidity of a titanium anchor in the condyle. Mitek mini anchors (DePuy Mitek, Raynham, MA) have been used extensively in the TMJ for procedures such as discoplasty of the TMJ disc [1, 8]. However the studies on mean pull out strength have shown that orthopaedic suture anchors have significantly greater pull out strength (12.5–237 lbs) as compared to the Mitek anchors (16.02-lb) [9]. The suture anchor we have used employs a titanium screw with a diameter of 2.8 mm with wide threads which provide excellent bone purchase and pull out strength. MRI evaluation at the end of 6 months revealed stable fixation of the anchor to the condyle. Mitek screw also employs a separate suture to anchor the disc like a size 0 braided polyester suture. The Biotek suture anchor offers the advantage of ultra-high molecular weight polyethylene suture swaged to the screw head which elicits a minimum inflammatory

reaction in tissues and has ten times more abrasion resistance when compared to polyester suture.

Post-operative MRI evaluation at the end of 6 months revealed stable positioning of the disc without any inflammatory changes in the joint (Fig. 5). Moreover Biotek suture in comparison to Mitek anchors can more easily be retrieved if broken or malpositioned because of the simple design. We have used an orthopedic suture anchor for modified disc repositioning in a case of closed lock of the TMJ. The postoperative stability of the anchor, along with stable repositioning of the disc and mitigation of degenerative changes in the joint suggest that Biotek suture anchor could be a viable option for disc repositioning in cases of internal derangement.

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