Almanac of Clinical Medicine. 2017 September-October; 45 (6): 466–470. doi: 10.18786/2072-0505-2017-45-6-466-470

Article

# Temporomandibular joint disc repositioning by modified anchorage surgery

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The appropriate position and morphologic preservation of the disc are critical to prevent excess remodeling and degenerative changes within the temporomandibular joint. The paper reviews the history of surgical approaches to disc displacement and presents a modified technique of temporomandibular joint disc reposition developed by the authors. Seven key points are highlighted that are essential for the success of the proposed arthroscopic intervention. The anterior release should be complete, with avoidance of any damage to the masseteric nerve and vessels. Expansion of the upper joint space to ensure appropriate placement of the incision should be performed with the straight ramus retractor used to distract the mandible and injecting saline, which helps prevent cutting of the disc or cartilage when entering the fossa. The disc should be repositioned without any tension. Two mattress sutures (one medial and one lateral) should be placed at the border of the disc and the posterior band. The disc is fixed with one bone anchor which is sufficient for its further stability. The position of the disc should be overcorrected to avoid relapse. Autogenous fat grafting in the anterior release region is vital to lessen scarring and thus to improve long term outcomes. All steps of the proposed technique are discussed with comparison with previous approaches. Factors influencing a relapse and measures to prevent it are reviewed in detail.

**Key words:** temporomandibular joint, temporomandibular joint disorders, orthopedic procedures/methods, disc displacement, disc reposition, anchorage screw

**For citation:** Yang Ch, He D, Zhang X, Bai G, Liu X. Temporomandibular joint disc repositioning by modified anchorage surgery. Almanac of Clinical Medicine. 2017;45(6):466–70. doi: 10.18786/2072-0505-2017-45-6-466-470.

Received 11 July 2017; Accepted 26 July 2017

**Acknowledgments**

This work was supported by the National Natural Science Foundation of China (81070848); the Research Fund of Science and Technology Commission of Shanghai Municipality (13XD1402300, 14DZ2294300).

The authors are grateful for the contribution of Qianyang Xie, DDS, MS, Dong Huang, DDS, MS, Chuan Lu, DDS, MS, and Xieyi Cai, DDS, MD, Department of Oral and Maxillofacial Surgery, Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai Key Laboratory of Stomatology, Shanghai, China.

**Conflicts of Interest**

The authors declare that they have no conflict of interest.

Temporomandibular joint (TMJ) disc displacement is the most common condition associated with progressive joint dysfunction [1]. Disc displacement can provoke inflammatory changes that cause osteoarthritis and progressive degenerative joint disease. These conditions are characterized by degeneration of the articular cartilage, disc, synovium and subchondral bone. In our previous study we suggested that without treatment the articular disc would deform, degenerate, and progress to more severe anterior displacement [2].

In addition, persistence of the internal derangement would produce condyle remodeling and an overall decrease in the condyle height. Often, the extent of degenerative change is proportional to the time the disc remains displaced. Arthrocentesis and arthroscopic lavage are commonly used to alleviate pain and improve range of motion in patients with symptomatic internal derangements. These therapies are limited in that they merely decrease symptoms and do not treat the underlying cause of the destructive inflammation. Many of these patients develop severe degeneration after a very

short period of time. As long as the associated condyle remodeling can produce significant changes in occlusion and marked skeletal facial deformities, we advocate for disc repositioning surgery as soon as possible.

Previously we published our experience of two techniques of repositioning and suture stabilization of the displaced disc [3–5]. The first is an arthroscopic technique in which the disc is repositioned by releasing the anterior attachment with a radiofrequency ablation probe and the disc is sutured to the external auditory meatus [3]. This has proved to be an effective technique for early internal derangements, but is often inadequate for patients with a longstanding history of disc displacement whose posterior band is generally quite thick, inflexible, and distorted, making arthroscopic repositioning challenging and often unstable. In these patients, open reduction and repositioning of the disc with mini-screw anchor fixation is recommended. Since T. Annandale [6] first described surgical repositioning of the disc in 1887, the reported clinical results have been variable and unpredictable. We have been performing open surgical interventions for TMJ disc repositioning since 2003 [5], and a recent 5-year retrospective magnetic resonance imaging (MRI) analysis (2003 through 2008) of 61 patients (76 joints) showed a success rate of 89%. Moreover, 89% of patients treated with open disc repositioning showed less pain and greater range of motion and had an appropriate relation between the disc and the condyle at 5 years after the initial operation. MRI examination of the relapsed joints showed that relapse was closely associated with 2 factors. The first is the excessive fibrosis and scarring within the anterior recess of the TMJ. The second is the resorption of the anterior slope of the condyle owing to foreshortening of the disc after repositioning surgery.

To improve the success rate and decrease the potential for relapse, we have modified the technique for open disc repositioning since 2011. This was approved by the local Ethics Board of the hospital. The recent MRI follow-up of 95 patients (142 joints) showed an excellent disc position in 93.7% (133 joints), a good disc position in 4.9% (7 joints), and relapse in only 1.4% (2 joints) of the patients who had been operated by one the same surgeon (at a mean follow-up of 10 months). The purpose of this article is to introduce several new technical modifications and to discuss their effectiveness.

## Surgical Technique

### Approach

A modified pre-auricular approach is used for this procedure. The first layer of dissection is located just in the subcutaneous tissue to expose the path of superficial temporal vessels. The flap is retracted anteriorly for approximately 3 cm. The superficial temporal vessel is used as a landmark for cranial and caudal dissections. Above the zygomatic arch, the superficial temporal fascia is cut deep to the fat pad with subperiosteal dissection. Below the zygomatic arch, the upper part of the parotid gland is dissected along the vessel. The facial nerve and transversal artery cross the vessel transversally in the parotid gland. The artery is ligated if it was in the way. The facial nerve should be protected with a small retractor. After opening the capsule and ramus periosteum, the displaced disc and stump of the ramus and sigmoid notch are exposed [7].

### Exposure

A straight forked retractor is placed on the sigmoid notch to gently displace the ramus outward and downward. This allows for distention of the superior joint space, which significantly improves visualization of the anterior recess, disc, and bilaminar tissue. After injecting saline with epinephrine into the superior joint space, the articular capsule is entered with a 15# blade. The disc is identified and inspected for shape, length, and perforations (Fig. 1). The inferior joint space is entered only if smoothing of the condylar head is required. The anterior and posterior attachments of the disc are identified primarily by differences in color, texture, and vascularity. The disc is typically glossier, more rigid, and less vascularized than the anterior attachment and the retrodiscal tissue.

### Anterior release

After injection of a vasoconstrictor into the anterior recess, a 15# blade is used to make an incision approximately 2 to 3 mm anterior to the disc. This incision is carried out medio-laterally through the entire anterior attachment. The depth of the incision does not exceed than 2 mm to avoid damaging the masseteric nerve and artery, which lie within the anteromedial synovium. Scissors are used to complete the anterior release by relieving the superior lateral pterygoid insertion into the disc. The disc release should be controlled, but generous enough to permit the passive repositioning of the disc.

### Disc reduction and fixation

After the anterior release is completed, a periosteal elevator is wedged behind the condyle over the bilaminar tissue to evaluate for passive reduction of the disc. One self-drilling 2.0 mm mini-screw with a slot is implanted in the posterior mid-condyle 8 to 10 mm inferior to the posterior condylar slope. Two 3-0 non-resorbable polyester sutures are secured to the anchor. Two horizontal mattress sutures are placed at the junction of the disc and the retrodiscal tissue. One suture is placed through the medial aspect of

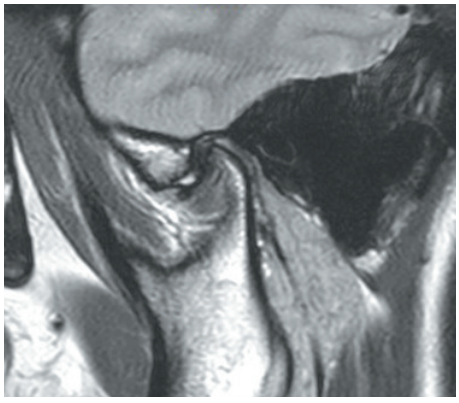

**Fig. 1.** Magnetic resonance image shows preoperative anterior disc displacement

**Fig. 2.** Postoperative magnetic resonance image shows the disc position with the posterior band at approximately 1 to 2 o'clock over the condylar head

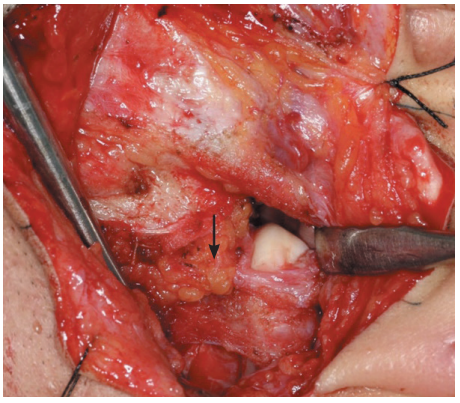

**Fig. 3.** Fat graft is used to fill the gap after anterior disc release. Fat within the anterior recess (*arrow*)

the posterior band and the other is placed through its lateral aspect. Six to seven knots are required to avoid any looseness of the suture. The disc should be overcorrected and the posterior band remains at approximately 1 to 2 o'clock over the condylar head (Fig. 2). If the disc is appropriately repositioned, there should be no space between the disc and the fossa. The absence of space indicates an adequate tension-free release. Any space between the disc and the fossa indicates excessive tension, thus necessitating the revision of the anterior release. The final position and stabilization of the disc is checked by gently moving the condyle forward onto the eminence and back into the fossa. The movement should be smooth, and the disc should remain flush with the head of the condyle throughout.

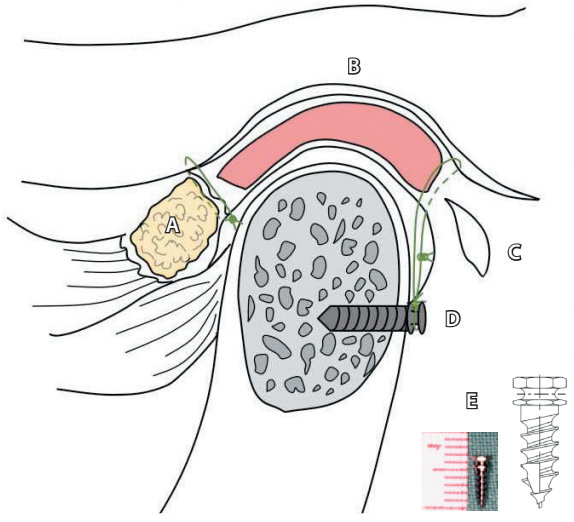


**Fig. 4.** The illustration shows the outcome of anchorage surgery. **A** the fat graft, **B** the disc which has been repositioned at approximately 1 to 2 o'clock over the condylar head, **C** the suture which was tied to control the disc, **D** the anchorage screw, **E** the actual anchorage screw and the illustration

### Free fascial fat graft

The space created by the anterior release is filled with subcutaneous fat harvested from the preauricular region. The purpose of this is to prevent a relapse caused by fibrosis and scar contracture. It also protects the anterior slope of the condyle particularly in patients whose disc is shortened by degeneration. The fat is secured to the anterior release with 3 interrupted sutures placed equidistantly and running mediolaterally (Fig. 3, 4). The placement of the fat not only protects the anterior slope of the condyle, but also can be tethered to the lateral aspect of the capsule to lessen fibrosis that often limits lateral excursive movements.

## Discussion

The cause-and-effect relationship between internal derangements and progression of osteoarthritis has long been controversial. Since the advent of minimally invasive treatments such as arthroscopic lavage and arthrocentesis, many researchers have found disc repositioning surgery superfluous [8]. Conversely, some authors have found that a large number of their patients with untreated internal derangements exhibited considerable worsening over time. The authors firmly believe that disc repositioning surgery can mitigate the degeneration caused by internal derangements by eliminating mechanical interferences and facilitating coordinated joint movement [9, 10].

A retrospective analysis of cases and clinical observations has shown that the appropriate position and morphologic preservation of the disc are critical to prevent excess remodeling and degenerative changes within the TMJ [11]. Essentially, the disc acts as a biological cushion between the condyle and the fossa and disperses excessive forces that can promote joint destruction. In

many of their growing patients, the authors have observed condylar bone regeneration after the disc is surgically repositioned. When the disc is anteriorly displaced, the vessel-rich posterior band begins to deteriorate as the tissue undergoes cyclic ischemia and reperfusion injury caused by excessive loading. Ultimately, this would lead to constant inflammation and degeneration of the cartilaginous structures that comprise the joint.

The authors' technique of disc repositioning has been modified several times and the key elements pertinent to this discussion follow. 1) Expansion of the upper joint space to ensure appropriate placement of the incision is accomplished using the straight ramus retractor used to distract the mandible and injecting saline, which helps prevent cutting of the disc or cartilage when entering the fossa. 2) Protection of the masseteric artery and nerve is accomplished by the injection of saline with a vasoconstrictor into the anterior attachment. By decreasing bleeding in the anterior recess, the nerve and artery are better visualized and thus can be protected. 3) Overcorrection of the disc to the 1- to 2-o'clock position is necessary. The MRI analysis of the authors' unsuccessful cases showed that relapse occurred only when the postoperative disc position was normal or undercorrected. Therefore, the authors advocate for overcorrection of the disc position. Observations from the authors' previous technique showed a 5-year success rate of 89% by MRI, whereas after modification, the rate for excellent and good disc positions was 98.6% (mean follow-up, 10 months) by MRI. 4) Complete release of the anterior attachment is characterized by the absence of a gap between the disc and the fossa. 5) An autogenous fat graft is placed at the anterior release to obtund fibrosis and protect the anterior condylar slope. 6) The last modification involves the design of the bone anchor. Most surgical anchors, including the Arthrex and Mitek anchors, cannot be removed if broken or malpositioned. We use a modified bone anchor that is a self-drilling screw with a slot on the end for the sutures. Previously, they used 2 screws for disc fixation. Because the modified screw is very stable, we currently use only 1 screw.

The most significant aspect of this new technique compared to the previous one is the use of autogenous fat to span the anterior release. During revision operations in patients with a relapse, it was readily obvious that excessive scarring at the anterior release was contributing to the persistent internal derangement. Likewise, many of these patients had an excellent disc position at the 1-week postoperative MRI examination only to develop a relapse soon thereafter. This prompted us to study the effects of autogenous fat placement in an animal experiment and then to use it as a new modification to the existing surgical technique. The practitioner is free to use fat harvested from any location. We prefer local subcutaneous fat because it is readily accessible through the basic preauricular incision and can be harvested locally without additional morbidity.

In conclusion, there are 7 key points of the present modified open disc repositioning surgery. 1) Anterior release should be conducted completely. 2) Damage to the masseteric nerve and vessels should be avoided during the anterior release. 3) Disc repositioning should be tension free. 4) Two mattress sutures (one medial and one lateral) should be placed at the border of the disc and the posterior band. 5) One bone anchor is enough for disc fixation. 6) The position of the disc should be overcorrected to avoid relapse. 7) Autogenous fat should be placed in the anterior release region to lessen scarring.

## References


1. Mehra P, Wolford LM. The Mitek mini anchor for TMJ disc repositioning: surgical technique and results. Int J Oral Maxillofac Surg. 2001;30(6): 497–503. doi: 10.1054/ijom.2001.0163.
2. Cai XY, Jin JM, Yang C. Changes in disc position, disc length, and condylar height in the temporomandibular joint with anterior disc displacement: a longitudinal retrospective magnetic resonance imaging study. J Oral Maxillofac Surg. 2011;69(11):e340–6. doi: 10.1016/j.joms.2011.02.038.
3. Yang C, Cai XY, Chen MJ, Zhang SY. New arthroscopic disc repositioning and suturing technique for treating an anteriorly displaced disc of the temporomandibular joint: part I – technique introduction. Int J Oral Maxillofac Surg. 2012;41(9):1058–63. doi: 10.1016/j.ijom.2012.05.025.
4. Zhang SY, Liu XM, Yang C, Cai XY, Chen MJ, Haddad MS, Yun B, Chen ZZ. New arthroscopic disc repositioning and suturing technique for treating internal derangement of the temporomandibular joint: part II – magnetic resonance imaging evaluation. J Oral Maxillofac Surg. 2010;68(8):1813–7. doi: 10.1016/j.joms.2009.08.012.
5. Zhang S, Liu X, Yang X, Yang C, Chen M, Haddad MS, Chen Z. Temporomandibular joint disc repositioning using bone anchors: an immediate post surgical evaluation by magnetic resonance imaging. BMC Musculoskelet Disord. 2010;11:262. doi: 10.1186/1471-2474-11-262.
6. Annandale T. An address on internal derangements of the knee-joint and their treatment by operation. Br Med J. 1887;1(1363):319–21.
7. He D, Yang C, Chen M, Bin J, Zhang X, Qiu Y. Modified preauricular approach and rigid internal fixation for intracapsular condyle fracture of the mandible. J Oral Maxillofac Surg. 2010;68(7): 1578–84. doi: 10.1016/j.joms.2009.07.076.
8. Sidebottom AJ. Current thinking in temporomandibular joint management. Br J Oral Maxillofac Surg. 2009;47(2):91–4. doi: 10.1016/j.bjoms.2008.08.012.
9. Abramowicz S, Dolwick MF. 20-year follow-up study of disc repositioning surgery for temporomandibular joint internal derangement. J Oral Maxillofac Surg. 2010;68(2):239–42. doi: 10.1016/j.joms.2009.09.051.
10. Dolwick MF, Nitzan DW. The role of disc-repositioning surgery for internal derangements of the temporomandibular joint. Oral Maxillofacial Surg Clin North Am. 1994;6:271–5.
11. Kondoh T, Hamada Y, Kamei K, Seto K. Simple disc reshaping surgery for internal derangement of the temporomandibular joint: 5-year follow-up results. J Oral Maxillofac Surg. 2003;61(1):41–8. doi: 10.1053/joms.2003.50007.