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Article

Temporomandibular joint disc repositioning with arthroscopy: part III – detailed introduction of the technique

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Disc displacement is one of the most common conditions affecting the temporomandibular joint (TMJ). In our previous publications we described the basic technical elements of the anterior disc repositioning surgery with arthroscopy and the success rates immediately after surgery. However, the surgical procedure is very complicated and difficult to study, and the technique has not been introduced in details in the previous papers. The present article presents the detailed introduction of the arthroscopic surgery to demonstrate the safe and successful performance of this procedure. It describes preparation for the surgery, the instruments and materials used, the puncture procedure with the choice of the puncture points, the technique of anterior release of the disc, stepwise disc suturing, and discusses some key points to avoid potential pitfalls and mistakes during the surgery. All steps of the technique are comprehensively illustrated by original photographs and diagrams and the intervention results are supported by magnetic resonance imaging scans. Since 2015, the arthroscopic procedure of this type has been performed by the study authors in 760 joints with a short-term success rate of up to 99.08%.

Key words: temporomandibular joint, disc displacement, disc reposition, orthopedic procedures/methods, arthroscopy

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Conflicts of Interest

The authors declare that they have no conflict of interest.

Temporomandibular joint (TMJ) disorders are relatively common conditions with an estimated prevalence rate of 28%~88% [1]. Their most common cause is the anterior and/or medial displacement of the disc, also known as TMJ internal derangement, which can provoke osteoarthritis and progressive degenerative joint disease [2]. In our practice, we advocate for disc repositioning surgery following a certain period of conservative treatment, if there is no improvement of symptoms. This approach has been introduced in our previous studies [3–11].

Two techniques of repositioning the displaced disc have been reported [6–9]. One is the arthroscopic technique, which has been proved to be effective for management of early internal derangements. Some clinicians have tried to reposition the disc arthroscopically with various suturing techniques, but the success rate and long-term stability have not been satisfactory [6, 7]. J.P. McCain et al. [3] described a method of arthroscopic disc repositioning and suturing, with the success rate of up to 81.8%; however, their series consisted of only 8 subjects (11 joints). In our department, Ch. Yang et al. [6] reported a new arthroscopic disc repositioning and suturing technique, which has been used in 2167 subjects (2622 joints), and a high short-term success rate of 95.42% was demonstrated by magnetic resonance imaging (MRI) scans [7]. However, the previous studies just reported the basic technique for the anterior disc displacement. In fact,

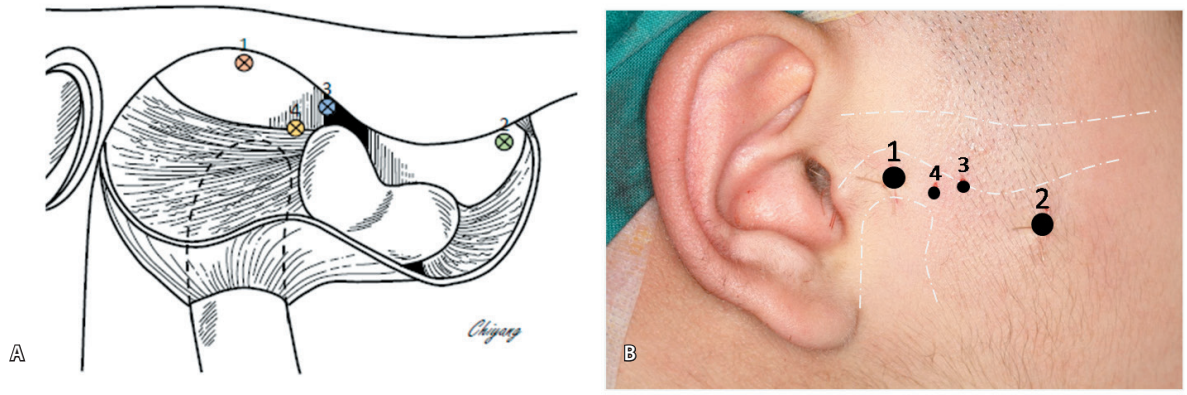

Fig. 1. The puncture points for arthroscopic surgery

the procedure is complex and difficult to understand. In order to make the surgery be studied easily, here we have presented our experience and the detailed technique for arthroscopic repositioning we have been using since 2015. This method had been approved by the local Ethics Board of the hospital. The short-term follow-up by MRI performed for 760 joints showed an excellent disc position in 99.08%. Therefore, the purpose of this paper is to introduce the detailed techniques for anterior disc displacement.

Materials and methods

Preparation for disc repositioning

- The TMJ MRI within 6 months is used to confirm the location of the disc and the condyle.
- Routine hematology and coagulation tests are performed in each patient.
- The plaster dental model is obtained to manufacture the occlusal splint (soft or hard splint, or Herbst device).
- The hair should be cut 3 cm upward from the ear to prevent infection.

Instruments

- A 2.3 mm arthroscope, including a video surveillance system and an image printer (Stryker, San Jose, CA) with a 2.8 mm outer protective cannula [1, 6, 7].
- TMJ disc suturing instruments, containing a 12 gauge suturing needle and a pair of self-designed needles with an exchangeable lasso-type and hook-type suture gripper (Shanghai ShenDing Industrial Co. Ltd., Shanghai, China) [6, 7].
- The disc repositioning suture: a customized non-resorbable surgical suture made of medical woven polyester with an inner core (Shanghai Pudong Golden Ring Co. Ltd., Shanghai, China) [6, 7].

Puncture

First, the zygomatic arch, lateral fossa, and condyle are marked with gentian violet. Then, the highest point of the fossa (Fig. 1, point 1) is also marked for the first puncture.

- From this point, local anesthesia is performed with a 5-gauge needle. The needle is inserted into the upper compartment of the joint simultaneously. The upper compartment is expanded by instillation of liquid local anesthetic (about 3 mL).
- The triple channel arthroscopic technique is used to complete the first puncture from a 3 mm incision in the first puncture point. Then, the triple channel is punctured into the upper compartment in the forward and upward direction.
- In the arthroscopic screen, the view of the upper compartment is shown. The triple channel is inserted forward to reach the anterior recess.
- A 3 mm incision (Fig. 1, point 2) is performed under additional local anesthesia near the anterior attachment region. The other working channel is inserted into the anterior recess.

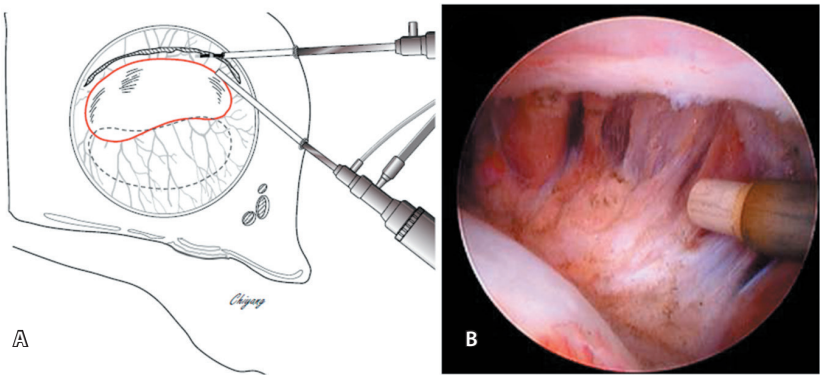

Fig. 2. The technique of the anterior release

Anterior release

Through the working cannula, some additional volume of local anesthetic is injected into the antero-medial synovium.

- The coblation probe is inserted to cut the anterior attachment of the disc and the neighboring part of the lateral pterygoid muscle from its medial to lateral side. The incision line performed by the coblation probe is located approximately 2–3 mm anterior to the anterior band of the disc and the depth should not exceed 2 mm (Fig. 2).
- A sharp trocar is inserted to release the fibers further. Then the disc is pushed backwards, and the tissue behind the disc is pushed down and backwards.

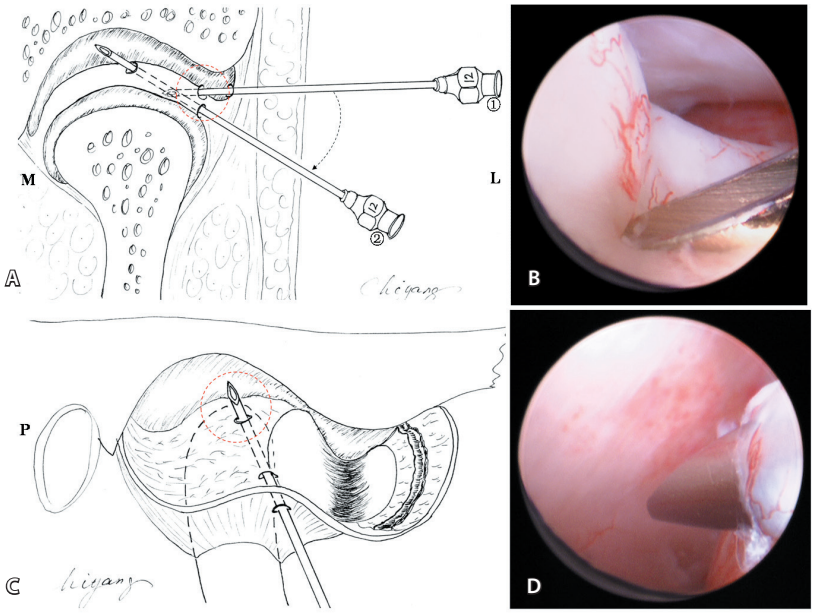

Fig. 3. The first step of the disc suturing

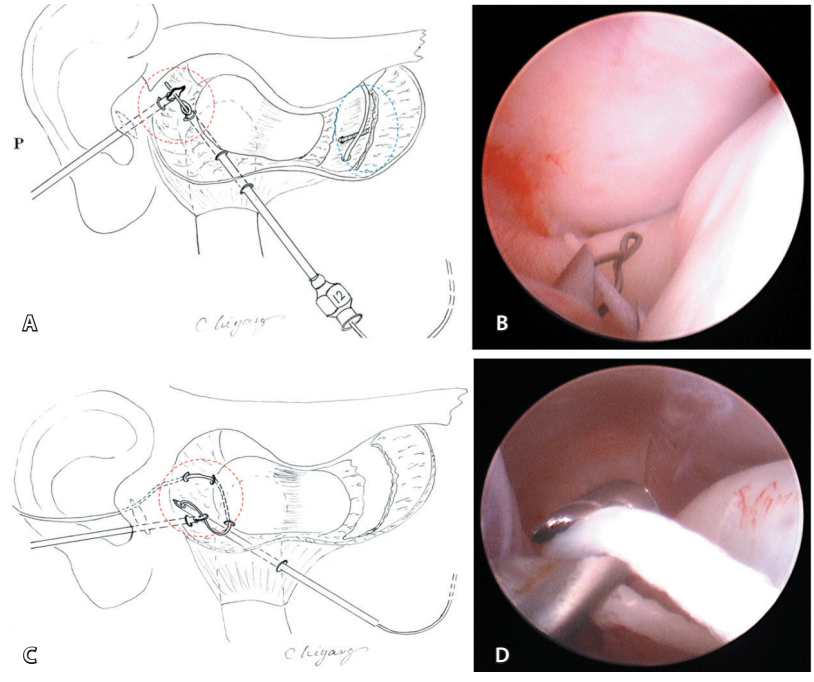

Fig. 4. The second step of suturing of the disc

Disc suturing

Between the first two punctures, a point is marked on the skin, which is commonly located at 1.0 cm anteriorly from the first puncture point (Fig. 1, point 3).

- A 12-gauge suturing needle perforates the joint capsule and is inserted into the upper joint space. The arthroscope is moved to find the tip of the needle.
- Under direct visualization, the tip of the needle is inserted into the junction of the disc and the retrodiscal tissue near the lateral synovial groove. The needle is pushed in and comes out of the retrodiscal tissue more medially (Fig. 3).
- The third puncture is performed through a transmeatal approach. The point of puncture is at the anterior wall of the external auditory canal and is usually 10 mm away from the tip of the tragus.
- A custom-made needle with an exchangeable lasso-type suture gripper is inserted into the posterior recess and faces the tip of the first needle (Fig. 4A).
- A custom-made non-absorbable surgical suture is put into the first needle. Once one of the ends of the suture comes into view under the arthroscope, it is caught by the lasso and pulled through the third portal, leaving the external auditory canal (Fig. 4A, 4B).
- The first needle is retracted from the retrodiscal tissue, but remains in the joint cavity. The second, also custom-made, hook-type gripper is introduced into the lateral part of the posterior recess via the third portal, and the other end of the suture is pulled through, leaving the external auditory canal again (Fig. 4A, 4B).
- The second suture is commonly performed in most patients to keep the disc stable. The point of skin puncture for the suturing needle is usually at 5 mm posteriorly to the first one.
- The needle perforates the joint capsule and enters the posterior pouch in the same direction as the arthroscope.
- Under arthroscopic guidance, the needle tip enters the retrodiscal tissue between the visible parts of the first suture and leaves it medial of the medial part of the first suture.

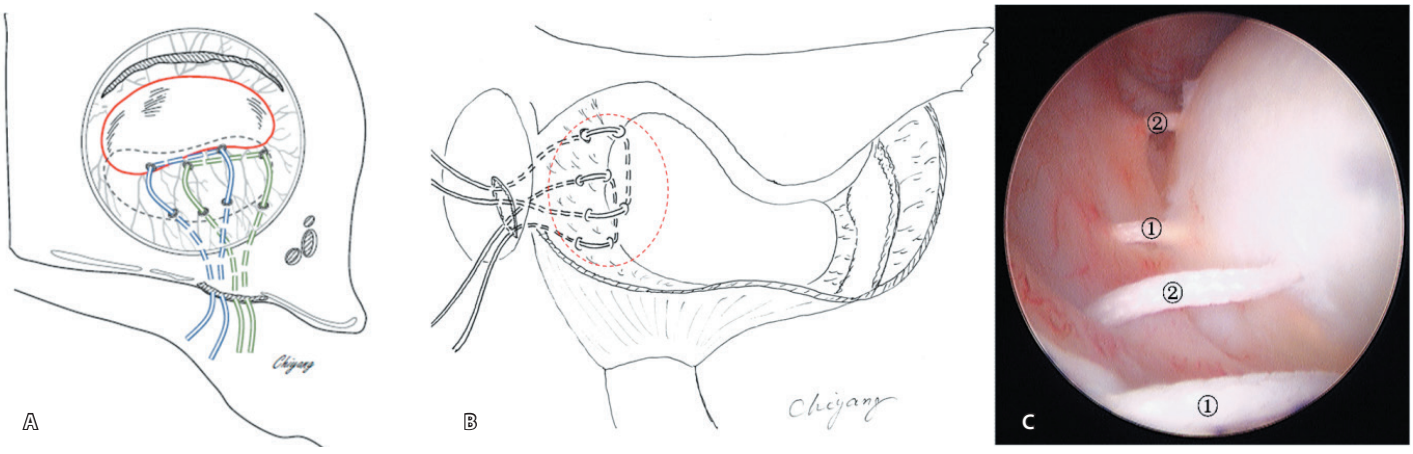

Fig. 5. Suturing of the disc

- The following steps are performed as described for the first suture. After suturing is completed, the arthroscope is moved from posterior to anterior to check whether the disc repositioning has been satisfactory. If not, the anterior release is extended using the coblation device, until the disc can be repositioned freely (Fig. 5).
- The sutures are then tied, with the knots placed underneath the cartilage of the external auditory canal (Fig. 6). The skin incisions are closed.

Discussion

The TMJ arthroscopic disc suturing technique was introduced by H.A. Israel [12] and A.W. Tarro [13] in 1989. Up to now, the technique of the arthroscopic surgery for the disc repositioning is quite mature [6], especially after in 2012 Ch. Yang et al. [4, 6] modified it. It has proved to be a reliable procedure in the short term, which might be due to complete release of the anterior attachment, proper suturing design and adequate postoperative care; therefore, postoperative serial magnetic resonance images confirmed that 95.42% (729/764) of the joints were satisfactory [7]. Simultaneously, we introduced the basic technique for anterior disc displacement to make the procedure easier to understand and study. This study introduced the surgical procedure step by step. There are some key points which should be focused on during the surgery.

In the puncture part, this study listed all the puncture points in the model and surgical figures firstly to guide the puncture into the joint compartment. Based on the puncture points, the directions of the punctures also should be followed accurately. Second, the liquid local anesthetic was injected into the upper compartment. This injection expands the joint compartment, and promotes a successful chance for the first and second punctures [4, 6].

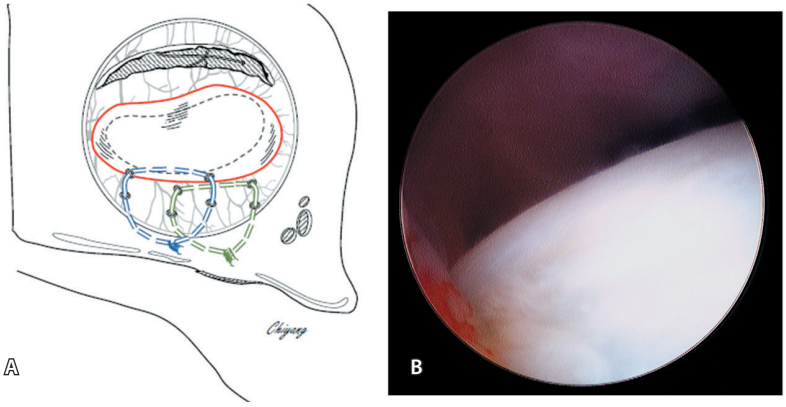

Fig. 6. The disc position after suturing

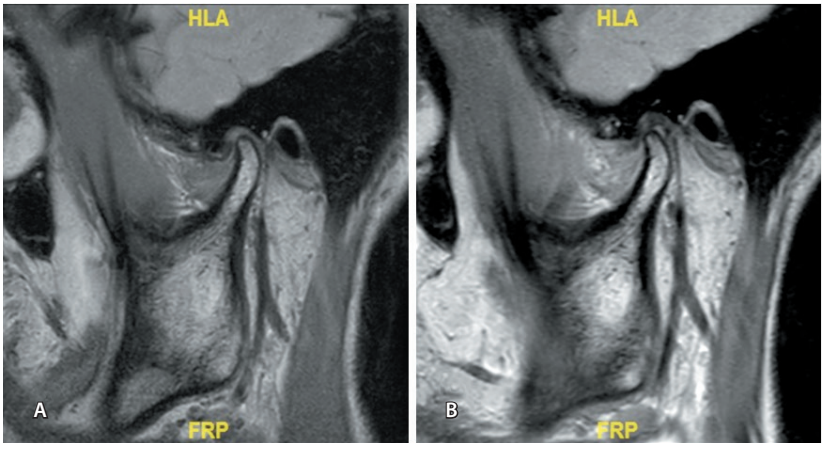

Fig. 7. The preoperative and postoperative magnetic resonance images for disc repositioning surgery with arthroscopy

In the anterior release section, additional amount of the local anesthetic through the working cannula was injected into the anterior attachment. This

procedure could help to avoid pain, decrease bleeding, and reduce the risk of masticatory muscle nerve injury. It also made the arthroscopic visualization more clear and allowed the surgery to be finished as soon as possible. In addition, the location of incision line for anterior release was quantified. It can help insufficiently experienced doctors to cut the attachment without breaking of the large blood vessels and damaging of masticatory muscle nerve [6].

In the disc suturing procedure, the disc was sutured with the retrodiscal tissue through horizontal mattress sutures. Two sutures from the lateral to medial side were suitable for most patients, and there should always be some overcorrection to avoid relapse of disc displacement. This study involved 760 joints for arthroscopic surgery since 2015. The excellent disc position was reached in up to 99.08%, confirmed by immediate MRI examination (Fig. 7) [4, 6].

In summary, we have given a detailed description of the arthroscopic disc repositioning and suturing technique for patients with anterior disc displacement of the TMJ. It will be helpful for the TMJ surgeons to study and practice the surgical procedure and to gain solid experienced in this type of the arthroscopic surgery.

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