Int. J. Oral Maxillofac. Surg. 2012; 41: 1058–1063
http://dx.doi.org/10.1016/j.ijom.2012.05.025, available online at http://www.sciencedirect.com

International Journal of Oral & Maxillofacial Surgery

Technical Note
TMJ Disorders

New arthroscopic disc repositioning and suturing technique for treating an anteriorly displaced disc of the temporomandibular joint: part I – technique introduction

C. Yang, X.-Y. Cai, M.-J. Chen, S.-Y. Zhang
Department of Oral & Maxillofacial Surgery, Shanghai Ninth People's Hospital Affiliated to Shanghai Jiaotong University, School of Medicine, Shanghai Key Laboratory of Stomatology, Shanghai, People's Republic of China

C. Yang, X.-Y. Cai, M.-J. Chen, S.-Y. Zhang: 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: 1058–1063.

Abstract. Anterior disc displacement is one of the most frequent types of temporomandibular joint disorders. Various arthroscopic disc repositioning and suturing techniques were reported to treat patients with disc displacement in the 1990s, but the success rate and long-term stability was not satisfactory. This report describes a new repositioning and suturing technique and discusses its advantages and disadvantages.

Key words: temporomandibular joint; anterior disc displacement; arthroscopy; disc repositioning.

Accepted for publication 24 May 2012
Available online 4 July 2012

Anterior disc displacement is one of the most frequent temporomandibular joint (TMJ) disorders, which often results in clicking, joint pain, a limited range of motion and masticatory difficulties. Disc repositioning is a common procedure for patients with disc displacement to eliminate mechanical interference, to relieve pain and to improve the range of motion. It was first described by Annandale in 1887.[1] Following the development of radiology and medical materials, various modified disc repositioning techniques have been reported over the last three decades. Good results have been reported, with success rates ranging from 77% to 100%.[2,3] Arthroscopy has proved to be a clinically useful procedure to treat disc displacement. 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.[4–6]

In the authors' department, therapeutic arthroscopy has been carried out for more than 30 years. In the 1990s, displaced discs were repositioned according to the methods described by McCain et al.[4] and Ohnishi,[6] but the success rate was not high. A new arthroscopic disc repositioning and suturing technique was designed in 2001, which had been used in 2167 patients (2622 joints) by July 2011. Regarding this technique, the authors consider the following points: the indications for arthroscopic disc repositioning; the disc repositioning technique; postoperative clinical evaluation of short- and long-term results; and magnetic resonance

0901-5027/0901058 + 06 $36.00/0

imaging (MRI) evaluation of the short- and long-term results for disc position and condylar remodelling. The authors think that it is important to prove this new disc repositioning technique has high effectiveness before the detailed technique is introduced. We published an MRI evaluation of the short-term results of this disc repositioning technique, which demonstrated a high success rate of 95.42%.[7]

Anterior disc displacement of the TMJ can be categorized as: pure anterior displacement; anterolateral displacement; or anteromedial displacement. The disc repositioning techniques for these situations are not the same. Since pure anterior displacement is the most common, this report will describe the technique for pure anterior displacement and discuss its advantages and disadvantages.

Surgical technique

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, is used. The TMJ disc suturing instruments contain 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). The disc repositioning suture is a custom-made, non-resorbable surgical suture made of medical woven polyester with an inner core (Shanghai Pudong Golden Ring Co. Ltd., Shanghai, China).

The diagnosis of anterior disc displacement is made according to clinical assessment and preoperative MRI (Fig. 1a). The procedure is commonly performed under local anaesthesia. The triple-channel arthroscopic technique of McCain et al. is used.[4] After the first puncture of the fossa, a systematic diagnostic arthroscopy is carried out (Fig. 1b). A second puncture is carried out aiming at the anterior recess under direct arthroscopic visualization.

Anterior release

Through the working cannula additional local anaesthesia is injected to avoid pain and to decrease bleeding; it can also reduce the risk of masticatory muscle nerve injury. The coblation probe is inserted to cut the anterior attachment of the disc and the neighbouring part of the lateral pterygoid muscle. The incision line is located approximately 2–3 mm anterior to the anterior band of the disc and is carried out across the whole width from medial to lateral. The depth of the anterior release is no more than 2 mm to avoid breaking large blood vessels and damaging the masticatory muscle nerve in the anteromedial synovium. A sharp trocar is inserted to release the fibres further.[8]

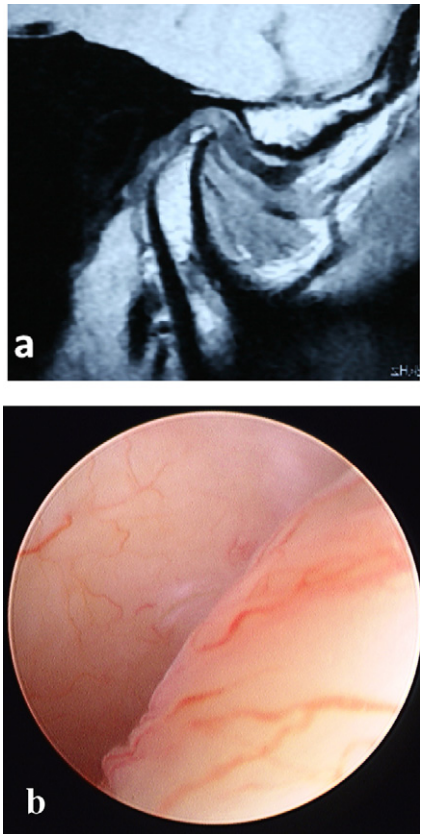


Fig. 1. Anterior disc displacement is shown by: (a) preoperative sagittal MRI examination (closed mouth, T1-weighted image) and (b) arthroscopic view of the retrodiscal tissue in the posterior pouch for patients with disc displacement.

Disc reduction

After the anterior release is completed, the obturator is positioned at the anterior margin of the disc and the disc is pushed backwards. The obturator slides along the surface of the disc and arrives in the posterolateral recess. The retrodiscal tissue is pushed down inferiorly and posteriorly.

Disc suturing

Between the first two punctures, a point is marked on the skin, which is commonly 1.0 cm anterior of the first puncture site. 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. 2). A 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. A custom-made nonabsorbable 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. 3a and b). The first needle is retracted from the retrodiscal tissue but remains in the joint cavity. The second, also custom-made, hook-type gripper is fed 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. 3c and d). The suturing needle is removed.

A second suture is commonly performed for most patients to keep the disc stable. The point of puncture on the skin

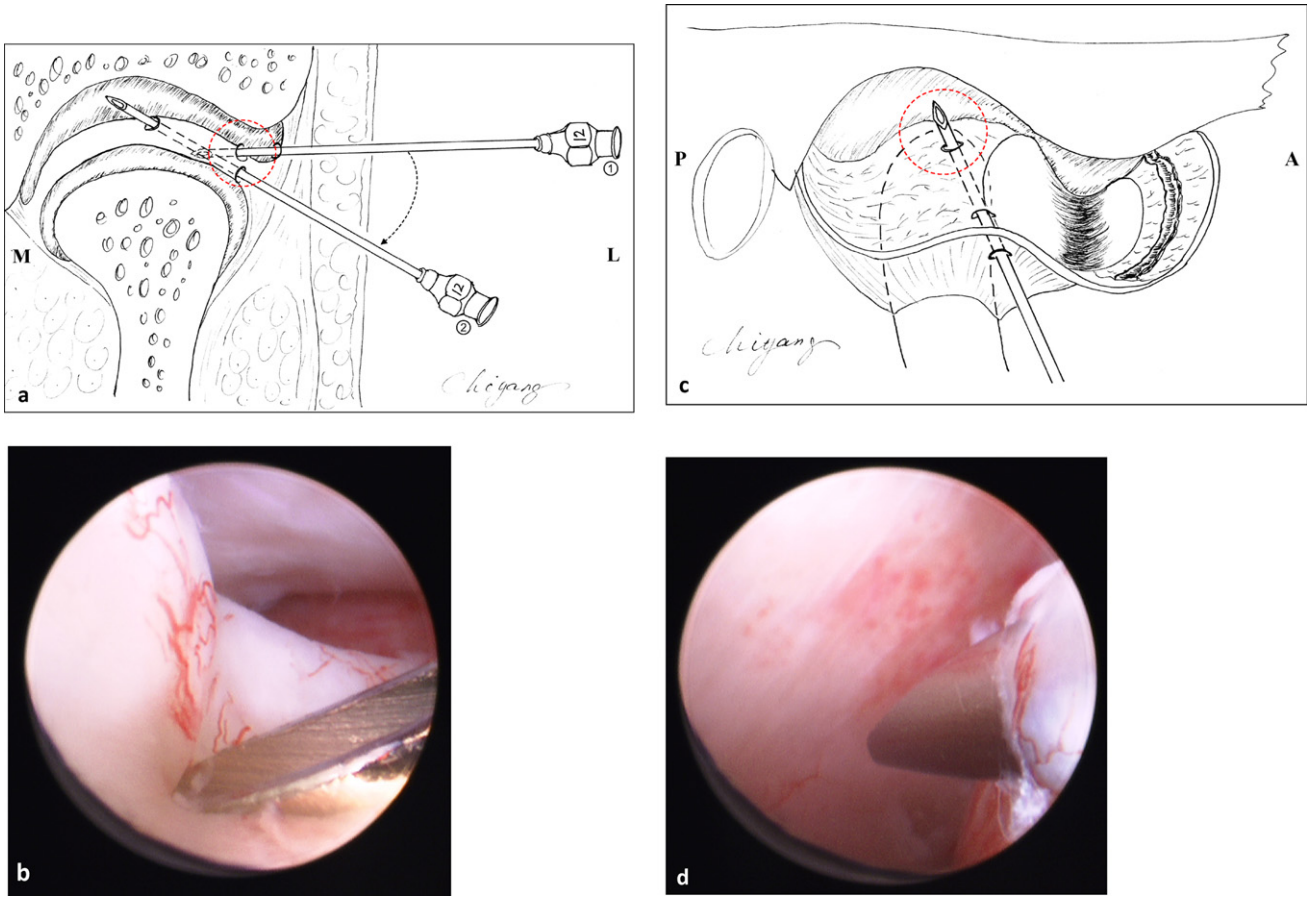


Fig. 2. A suture needle is inserted into the junction of the disc and the retrodiscal tissue. (a) The direction of the needle is changed from ① to ② (L, lateral; M, medial). (b) Arthroscopic view of the puncture point for the suture needle. (c) The tip of the needle reaches the upper joint space again. (d) Arthroscopic view of the tip of the suture needle.

for the suturing needle is usually 5 mm posterior 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. 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 disc repositioning is satisfactory. If not, the anterior release is extended using the coblation device until the disc can be repositioned freely. The sutures are then tied, with the knots underneath the cartilage of the external auditory canal (Fig. 4a and b). The skin incisions are closed.

Postoperative management

Antibiotics and nonsteroidal anti-inflammatory drugs are routinely prescribed for 3 days. The softness of the postoperative diet should be decreased slowly. Exercises to improve mouth opening are explained to the patient and start 1 week after operation. In patients with significant postoperative occlusal changes, a splint or intermaxillary elastic fixation is recommended. A postoperative MRI is done to evaluate the disc position within 1–7 days after the operation (Fig. 4c). After certain intervals further clinical investigations and follow-up MRIs are performed.

Discussion

Disc repositioning is a common procedure to treat anterior disc displacement of the TMJ. Surgical treatment is usually performed in patients who have not responded well to nonsurgical therapy for at least 6 months. Guidelines for the diagnosis and management of TMD approved by American Society of Temporomandibular Joint Surgeons (ASTMJS) and The American Society of Maxillofacial Surgeons (ASMS) propose that surgery should be considered as a last resort for patients in whom other treatment has failed.[3] In this report, pain and/or dysfunction is an indication for disc repositioning. It is recommended for young patients with mandibular retrusion resulting from disc displacement and condylar resorption. Generally, the goals of treatment and the advantages and disadvantages of nonsurgical and surgical therapies are explained to the patients and their families, and they choose the final treatment modality.

Based on the reported surgical procedures and especially referring to the method of McCain et al.,[4–6] the authors modified the arthroscopic repositioning and suturing technique. 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.[7]

Complete release of the anterior attachment is thought to be the first key step to ensure the success of the operation and avoid recurrence. Initially, the displaced disc was repositioned and sutured without release of the anterior attachment in about 500 patients between 2001 and 2002; relapse was common on follow-up MRIs. Subsequently, partial release of the anterior

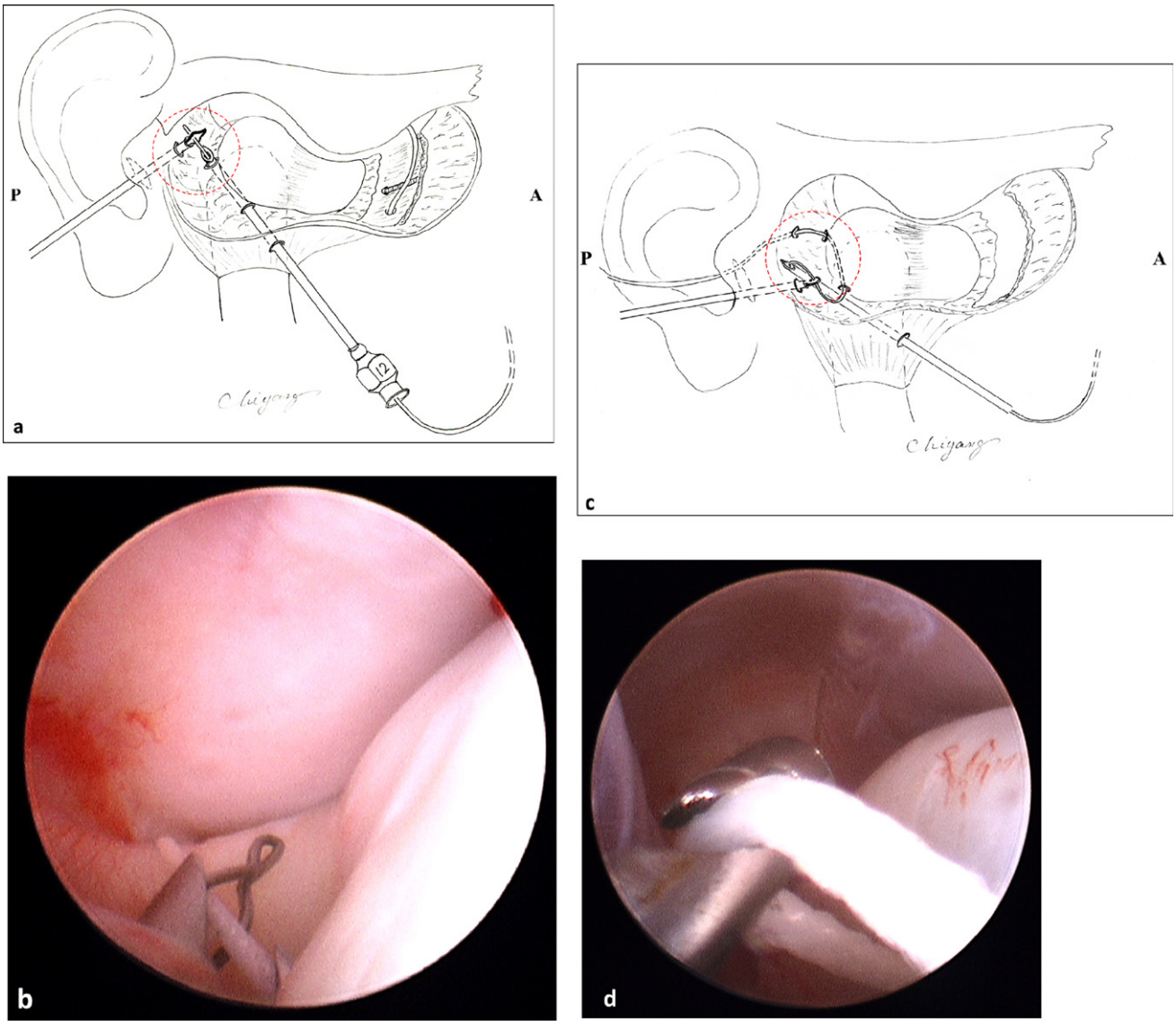


Fig. 3. (a) Side view shows that one of the ends of the suture is caught by the exchangeable lasso-type suture gripper (A, anterior; P, posterior). (b) Close-up arthroscopic view shows the suture caught by the lasso-type suture gripper. (c) Side view shows that the other end of the suture is caught by the hook-type suture gripper. (d) Close-up arthroscopic view of the hook-type gripper.

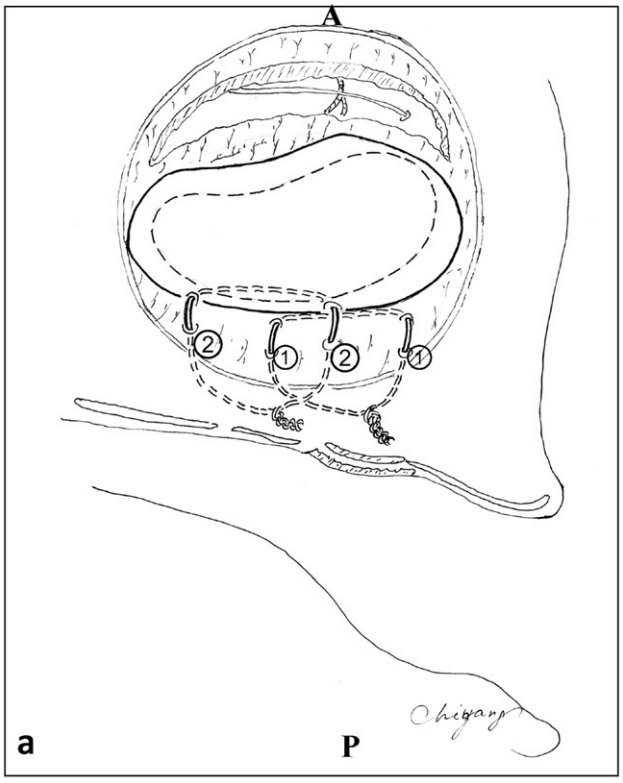
attachment was performed. Better results were achieved but the were still unsatisfactory. Since 2004, complete release of the anterior attachment has been conducted, emphasizing the lateral part of the anterior attachment. The disc can now be repositioned easily and the long-term stability has improved greatly.

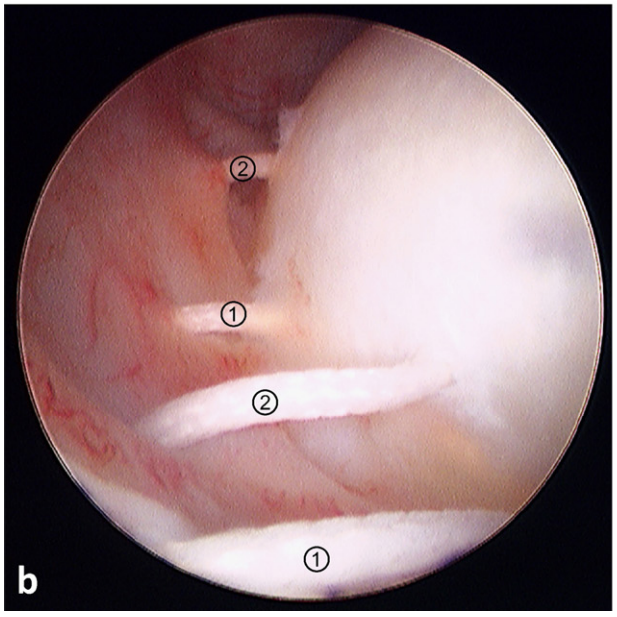
The authors commonly perform the release of the anterior attachment with coblation, but sometimes blades and scissors are used. Using a coblation device can reduce bleeding and is more convenient, releasing the lateral part of the anterior attachment. The depth of cutting should be well controlled in order not to damage vessels or the masticatory muscle nerve. To increase visibility, adhesions should be solved first.

Previously published procedures describe the fixation of the disc within the extracapsular fatty tissue.[2,5] The authors think that these techniques have some shortcomings. The tractive direction is inconsistent with the anteroposterior axis of the disc, not being able to resist the strength of the lateral pterygoid muscle. It is difficult to suture the medial part of the disc with these techniques, which might be responsible for the short-term stability of the repositioned disc. Most of the procedures could not be performed under permanent visualization and so it is difficult for beginners to meet the requirements.

Referring to the technique of McCain et al.,[4] the present authors modified the suturing instruments and technique. An exchangeable lasso-type and hook-type suture gripper have been designed. The ends of the suture for repositioning the disc have been hardened, enabling the suture to slide through the cannula. The disc is sutured with the retrodiscal tissue through horizontal mattress sutures, which is similar to the reported disc plication procedure. According to the severity of disc displacement, 1 suture, 2 sutures or 3 sutures have been used for 52 joints, 2240 joints and 330 joints, respectively. Empirically, 2 sutures are suitable for most patients. There should always be some overcorrection to avoid relapse of disc displacement.

Some surgical skill is necessary for this technique. The operator must have knowledge of open TMJ surgery and profound





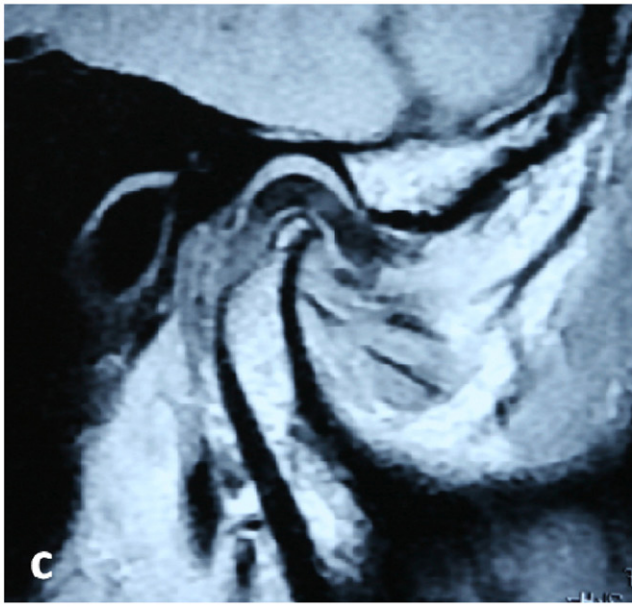


Fig. 4. (a) Overhead view shows the tied sutures underneath the cartilage of the external auditory canal (A, anterior; P, posterior). The distance between ① and ① and the distance between ② and ② is 5–10 mm. (b) Arthroscopic view shows the corresponding pairs of sutures. (c) Postoperative sagittal MRI (closed mouth, T1-weighted image) shows the repositioned, but slightly overcorrected disc.

arthroscopic puncture and triangulation skills. Particular attention has to be paid to the first puncture so as not to damage the superficial temporal vessels or the auriculotemporal nerve. Otherwise, copious bleeding will interfere with the next steps, or numbness and paresthesia will impair the patient's quality of life. The suturing instruments are slender and easy to break, so the procedure should be performed gently.[9]

Proper postoperative management is indispensable for successful treatment. Patients are instructed to exercise mouth opening for at least 1 month. Postoperative malocclusion is a common occurrence. It occurs almost in every patient, but spontaneously disappears in 84.4% of patients.[10] A splint or intermaxillary fixation via elastics is provided for the remaining patients.

For some young patients with jaw deformity and malocclusion, a functional appliance and/or orthodontics and/or orthognathia may be recommended after arthroscopy. Health education should be given to patients to avoid relapse of disc displacement by changing maladaptive habits that stress the TMJ.

In conclusion, the authors describe a new arthroscopic disc repositioning and suturing technique for pure anterior disc displacement of the TMJ. Further details will be given for anterolateral displacement, anteromedial displacement and displacement with disc perforations in subsequent articles. The long-term results, relapse rate, and condylar remodelling will be discussed through clinical and MRI evaluation in the future.

Funding

This project was supported by the National Natural Science Foundation of China (Grant No. 81070848), Science and Technology Commission of Shanghai (08DZ2271100, 08411967400).

Competing interests

None declared.

Ethical approval

Not required.

Acknowledgements. The authors are grateful for the assistance of Dr. Hartwig Paulo, Department of Maxillofacial and Reconstructive Surgery, Paracelsus-Krankenhaus Ruit, 73760 Ostfildern, Germany.

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Address:
Chi Yang
Department of Oral & Maxillofacial Surgery
Shanghai Ninth People's Hospital
Affiliated to Shanghai Jiaotong University
School of Medicine
639 Zhi Zao Ju Road
Shanghai 200011
People's Republic of China
E-mail: yangchi63@hotmail.com