Two Cases of Rheumatoid Arthritis of the Temporomandibular Joints Treated by Intermaxillary Traction and the Arthroscopic Disc Suture / Fixation Technique

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Patients with severe rheumatoid arthritis of the temporomandibular joints (TMJ) often present with degenerative changes in the condylar process of the mandible and a reduction of the mandibular ramus, which leads to osteoarthrosis of the TMJ and resultant anterior open bite and retrognathism. This report documents the treatment of this type of problem with a new technique combining intermaxillary traction and arthroscopic disc suture / fixation. The intermaxillary traction of the upper and lower dentition was performed on two patients in order to bring the lower jaw back to its original position and improve occlusion. The disc was then sutured and fixed to the posterior wall of the upper joint cavity under arthroscopy to protect the condylar surface in the enlarged articular space. Both patients showed good postoperative stability after the remodeling of the condylar process of the mandible. As well as improved occlusion.

**Keywords:** rheumatoid arthritis; temporomandibular joint; remodeling; open bite; arthroscopic disc suture / fixation; intermaxillary traction

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**Introduction**

In some patients with severe rheumatoid arthritis of the temporomandibular joint (TMJ), this condition may develop into osteoarthrosis accompanied by a shortening of the mandibular ramus due to the destruction of the condylar process(1-5). This can lead to occlusal anomalies such as an anterior open bite malocclusion, thus causing subsequent masticatory dysfunction(6). Currently, active intervention is not typically undertaken to correct these conditions. This report presents the cases of two patients with either destroyed or lost mandibular heads due to rheumatoid arthritis of the TMJ who underwent intermaxillary traction (Fig. 1) and arthroscopic disc suture / fixation (7,8) (Fig. 2), which resulted in a desired remodeling of the mandibular heads and improved dental occlusion.

**Cases**

Case 1: In June 1994, a 60-year-old woman presented at our clinic complaining of difficulty in chewing. The patient had been diagnosed as having rheumatoid arthritis (stage IV with general difficulty of motion in multiple joints of about 20 years duration) by an orthopedist at a hospital. The patient underwent an examination of the systemic joints at an orthopedic clinic and was diagnosed with advanced deformation of the right hip joint. She had been taking 2.5mg of prednisolone (adrenocorticosteroid) every day for 5 years. The patient com-
Fig. 1: Schematic drawings of pre-and post-treatment views.
A: pre-treatment: Retrognathism and open bite resulting from destruction of the mandibular condylar heads and shortening of the mandibular rami are recognized.
B: mid-treatment: A pivoting splint is applied to the rear-most molar and occlusion is restored in the normal position by using intermaxillary traction between the upper jaw and the lower jaw in order to enlarge the articular space.
C: post-treatment: The narrowed articular space is enlarged by using intermaxillary traction. The circumferential tissues and articular disc are sutured and reduced by using the technique of arthroscopic disc suture / fixation so that the condylar process can be sufficiently protected. Through these procedures, the thickness of the articular disc is successfully increased. This treatment is thought to induce remodeling of the mandibular head and regeneration of the mandibular head which was once absorbed.

Fig. 2: Schematic drawing (horizontal section of the right TMJ, view from upper side) of the arthroscopic disc suture / fixation technique.
1 The enlarged articular space is narrowed by using intermaxillary traction. The circumferential tissues and articular disc are sutured and reduced by using the technique of arthroscopic disc suture / fixation so that the condylar process can be sufficiently protected. Through these procedures, the thickness of the articular disc is successfully increased. This treatment is thought to induce remodeling of the mandibular head and regeneration of the mandibular head which was once absorbed.
2 The suture needle is arthroscopically inserted from the skin of the anterior articular tubercle into the articular cavity. Then the needle is inserted into the articular disc and through the posterior wall of the articular cavity. The tip of the suture needle is arthroscopically drawn out of the anterior wall of the external auditory canal. A nylon thread is put through the small hole at the tip of the suture needle under the arthroscopy.
3 The suture needle is arthroscopically inserted into the articular cavity again. Under the arthroscopy, the needle is inserted into the articular disc of the different site to be sutured and through the posterior wall of the articular cavity. The needle is drawn out of the anterior wall of the external auditory canal.
4 These procedures are repeated, and the thickness of the articular disc is increased with suture ligation of nylon threads in line with field block ligation.
plained that she had recognized a gradual development of anterior open bite malocclusion for 18 months before coming to us, which eventually had developed into occlusal problems including difficulty in chewing. She was 140cm tall and weighed 40kg. The patient was diagnosed with malocclusion due to open bite, and she experienced difficulty masticating and insufficient food intake leading to weight loss.

The important laboratory test findings were an ESR 38.0mm, CRP 11.7 mg/dl, RA 1(+) , and ASO 12 (>), and the activity of rheumatoid arthritis was moderate. There was a tendency toward anemia (RBC, $3.37 \times 10^9/\mu l$; Hb 9.6 g/dl; Ht 28.6%) and light dysproteinemia (TP 6.5 g/dl, Alb 3.5 g/dl). The patient displayed a petite build and was in a slightly poor nutritional state due to difficulty in chewing, with a pale complexion. Her face showed symmetry (Fig. 3A). An intraoral examination revealed occlusal tooth contacts, only on the molars segments bilaterally at the habitual intercuspation position, and there was a vertical gap of about 8mm between the maxillary and mandibular incisor teeth (Fig. 4A). In addition, she could only open her jaw to a maximum of about 32mm, thus indicating moderate difficulty in jaw opening. The radiographic findings demonstrated a destruction of the condylar process of the mandible, a shortening of the mandibular ramus and a retropositioning of the mandible.

A cephalometric X-ray view of the head demonstrated a shortening of the mandibular ramus, a clockwise rotation of the mandible and a relative retraction of the mental protuberance.

Double-contrasted computed tomography of the TMJ revealed a deformation of the articular discs, fibrous adhesion and a narrowing of the TMJ space (Fig. 5A).

Treatment was started by means of the intermaxillary traction between the incisor teeth using a pivoting splint and elastic gumrings to move the mandible into a normal position (Fig. 4B). Arthroscopic disc suturing / fixation was performed 18 days after the commencement of traction, to suture the disc to the posterior wall of the
upper joint cavity, which resulted in an effective increase in the thickness of the discs. Intraoperative arthroscopy revealed a narrowing of the articular space. To prevent any postoperative mandibular shift or a reopening of the overbite, the intermaxillary traction with elastic gum rings was continued along with concomitant physical therapy for masticatory muscles using a Myo-monitor® (Myodentronics Co., USA).

At 4 years 7 months postoperatively, the patient can now open her jaw to a maximum of 43 mm, and she also shows an improved occlusal status and jaw function (Figs. 3B and 4C). In addition, the anterior open bite has improved. Furthermore, postoperative radiography has confirmed the osteogenic regeneration of the condylar head (Fig. 5B).

Cephalometric tracing and the overlay of pre- and post-treatment radiographs revealed a mandibular rotation and a disappearance of the anterior open bite after treatment (Fig. 6B).

Case 2: A 66-year-old man presented at our university clinic, complaining of difficulty in chewing food. The patient had a Class IV rheumatoid arthritis dysfunction with a disease duration of about 3 years. His elder brother and younger sister both had histories of rheumatoid arthritis. The patient was diagnosed as having rheumatoid
arthritis by an orthopedist at another hospital.

The patient was taking 10mg of prednisolone (adrenocorticosteroid) every other day and 25 mg of diclofenac sodium (nonsteroidal anti-inflammatory agent/analgesic) daily. Three years previously, the patient had been referred to the internal Medicine department of total hospital due to a duodenal ulcer caused by the long-term administration of diclofenac. Concomitant to this, the patient had recently begun to claim of TMJ discomfort and difficulty in jaw opening and closing. The occlusal dysfunction had become exacerbated, and the patient gradually began to experience retrognathism and difficulty in speaking. Eventually, the patient demonstrated an anterior open bite and masticatory jaw dysfunction. For this reason, the patient was referred to our clinic to undergo a thorough clinical examination and treatment. The patient was 160cm tall and weighed 40kg. The patient was diagnosed with malocclusion due to open bite, and he experienced difficulty masticating and insufficient food intake leading to weight loss. The important laboratory test findings were an ESR 101.0mm, CRP 1.8mg/dl, RF: IgG 1.8, and ASO 12 >, and the activity of rheumatoid arthritis was moderate. There was a tendency toward anemia (RBC, 4.50 × 10⁶ / μl; Hb 11.7 g/dl; Ht 36.8 %) and light dysproteinemia (TP 6.9 g/dl, Alb 3.6 g/dl). The patient showed a poor nutritional state. In addition, since he experienced significant difficulty in eating foods, his face showed a pale complexion because of anemia, and his skin was very dry (Fig. 7A). Although his face showed symmetry, there was a jaw deviation posteriorly with the teeth in occlusion. Regarding the TMJ, the patient complained of discomfort, but there was no pain or noise.

An intraoral examination revealed occlusal tooth contact only on the second molar teeth bilaterally at the habitual intercuspatation position, and there was a vertical incisal gap of about 15mm with the teeth in the centric occlusion position (Fig. 8A). In addition, he could only open his jaw to a maximum of about 34mm, indicating...
moderate difficulty in jaw opening.

A radiographic examination confirmed the destruction of the mandibular condylar heads bilaterally, a shortening of the mandibular ramus, and a posterior shift of the mandible (Fig. 9A). Intermaxillary traction was initiated to return the mandible to its original position (Fig. 8B).

Arthroscopic biopsies revealed the following histopathological findings: 1) granulation tissue and a marked proliferation of fibroblasts in the synovial membrane, extending to the surrounding bones and fibrous cartilage; and 2) a moderate infiltration of inflammatory cells, with numerous small round cells but few neutrophils. Arthroscopic disc suture/fixation was then performed 15 days later to suture the disc to the posterior wall of the upper joint cavity and thus effectively increase the thickness of the disc. Intraoperative arthroscopy revealed a narrowing of the articular space. To prevent postsurgical mandibular displacement posteriorly and relapse of the openbite, intermaxillary traction using elastic rings was continued, and concomitant physical therapy for masticatory muscles was performed using a Myomonitor®.

The postoperative course of the patient has been favorable. Fourteen months postsurgery, there has been no relapse of the openbite and the patient can now achieve a maximum jaw opening of 38mm (Figs. 7B and 8D). Because of the significant improvement in occlusal condition as well as regaining more mobility of the joints, thus resulting in an improved ability to chew food, the patient has showed an increase in body weight of 10.5 kg. Postoperative radiography demonstrated a remarkable regeneration of the condylar process of the mandible processes (Fig. 9B).

Cephalometric tracing and the overlay of pre- and post-treatment radiographs revealed a mandibular repo-

![Fig. 9: Case 2: Findings of the TMJ of the 3D-CT.](image)

A: Right TMJ
B: Left TMJ

Left: Before treatment; Bilateral condyles show erosive changes.
Right: After treatment (1 year 2 months post surgery); remarked remodeling of the bilateral condyle was observed.

![Fig. 10: Case 2: Cephalometric tracings. Before and after treatment on the SN at Sella.](image)
sition and a disappearance of the anterior open bite after
treatment (Fig. 10).

Discussion

In severe rheumatoid arthritis of the TMJ, radiography
usually reveals the destruction and resorption ofonne and cartilage(1-5). Arthroscopy can determine soft
tissue changes such as narrowing of the articular space and
fibrous adhesion due to joint contraction(9). Both pa-
tients in the present report demonstrated these findings.
They also showed anterior openbite malocclusions. It
would be reasonable to assume that such malocclusions
were caused by a shortening of the articular process and
its resultant backward and superior repositioning of the
mandible posteriorly because the major jaw closing
muscles, such as the masseter and medial pterygoid
muscles as well as the middle and posterior parts of the
anterior temporalis muscle whose lines of contraction are
located on or posterior to the molar teeth(6) sagittally,
act to move the mandible in a backwards and upwards
direction on jaw closing. The aim of the mandibular re-
positioning with the present treatment method is to main-
tain the mandible in its new position permanently due to
the adaptation of the surrounding muscles and joint-sup-
porting tissues. The associated arthroscopic surgery(8)
helps maintain the relationship between the condylar
head and the mandibular fossa, thereby reducing the
enlarged articular space using intermaxillary traction by
suturing the articular disc and posterior wall of the up-
per joint cavity together.

In this type of treatment for a damaged condylar
process caused by severe rheumatoid arthritis of the TMJ,
intermaxillary traction was performed to reposition the
mandible, and arthroscopic disc fixation was then per-
formed to suture the disc and the posterior wall of upper
joint cavity to increase the effective thickness of the disc,
thus protecting the mandibular head, preventing postop-
erative mandibular shift, and facilitating occlusal recov-
ery. The elastic gum ring used for the intermaxillary
traction measured 8mm in outer diameter, 6mm in inner
diameter and 2.5 mm in width. Double traction by the
ring between the intermaxillary distance of 10mm al-
lows for a traction power of 0.5 kg to be obtained. For
patients similar to those presented in this report,
intermaxillary traction should be performed continuously
except duarung meals for a period of from 2 to 3 weeks.

Furthermore, postoperative radiography clearly
demonstrated the regeneration of the condylar head. Re-
modeling of the mandibular head has been previously
reported to occur(3), but the fact that the present treat-
ment resulted in a regeneration of the resorbed and lost
mandibular heads is clinically significant. Long-term (2-
8 years, with a mean of 4.8 years) radiological follow-up
observations have been reported in 34 patients with rheu-
matoid arthritis, regarding changes in whole body joints
other than the temporomandibular joint, especially in the
hand, carpal bones, and joints of the upper extremities.

In the above study, healing was considered to oc-
cur with the reappearance (sclerosis) of the cortical plate,
partial or complete filling of the erosion caused by the
disease, and subchondral bone sclerosis with osteophyte
formation (secondary osteoarthritis). It was reported that
according to the above criteria, healing of wounds and re-
repair of erosion were occasionally seen in patients with
long-term progression of rheumatoid arthritis(10).

We speculate that the reparative ability of the
mandibular head can be activated and increased by re-
ducing the applied load and offering mechanical protec-
tion by increasing the effective thickness of the articular
disc. The successful treatment outcomes obtained in the
present patients add to our understanding of the relation-
ship between the mandibular head load and articu-
lar disc. Ascertaining whether this phenomenon can also
be observed in the joints of the extremities, which unlike
the TMJ are load-bearing joints, will be very interesting
to elucidate in the near future. The results of the present
study suggest that this new treatment may facilitate sec-
ondary bone regeneration of the mandibular head. As a
result of intermaxillary traction, which enables reduc-
tion of loading on the temporomandibular joint, this tech-
nique probably promotes transition from the mechanism
of bone absorption on the mandibular joint surface to the
mechanism of restoration by bone addition leading to en-
dochondral ossification. Since the active remodeling phe-
nomenon on the mandibular head is widely known, this
technique can be applied to the cases of mandibular head
deforation excluding rheumatoid arthritis reported in
this study.

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