3 weeks to 20 years or more after the external injury. In our patient, as similarly reported by Spinazzè et al., laboratory examinations revealed serum calcium, phosphorus, and parathyroid hormone levels were within reference range. It is reported that roentgen rays and CT, including three-dimensional CT, are useful in diagnosis.

Although the generating mechanism of MOT is not clear, Carey has postulated 4 hypotheses: (1) displacement of bony fragments into the soft tissue and hematoma with subsequent proliferation, (2) detachment of periosteal fragments into the surrounding tissue with proliferation of osteoprogenitor cells, (3) migration of subperiosteal osteoprogenitor cells into surrounding soft tissue through periosteal perforations induced by trauma, and (4) differentiation of extraneous cells exposed to bone morphogenic protein. Among these, hypothesis 4 has received the most support.

The typical pathology image of MOT has a 3-layer structure. The outer zone is composed of mature lamellar bone in a less cellular fibrous stroma; the intermediate zone has immature osteoid formation, cartilage, and active osteoblasts, and the central zone is composed hematoma, muscle cell necrosis, and granulation tissue and is cellular with variable mitotic activity.

Many cases of MOT in the oral area are managed operatively. However, it is difficult to determine suitable timing for the operation. Because many recurrent cases have been reported, some suggest that surgery should be performed 6 to 12 months after initial symptom onset. However, if the trismus is neglected, it may result in poor nutritional status and temporomandibular joint contracture. Surgeons tend to choose surgical management at an early stage, even though full ossification of MOT may take 6 weeks. Consequently, the disease should be observed for at least 6 weeks before surgery is performed, and the operation should be planned after checking that the ossification has stopped.

Aoki et al. reported that osteotomy of the muscle attachment is desirable in addition to complete muscular excision. These procedures may have prevented recurrence in our case. We also recommend excision of all the ossified muscle and osteotomy and dissection of the ossified muscle attachment from the bone. The hematoma may be the cause of MOT, and therefore caution is also required for operatively induced hematoma. Transplant of adipose tissue and pedicled buccal fat as the interposition between the bone and muscles has been reported to prevent recurrence.

Physical therapy should be started early in the postoperative period. In our case, because the lateral pterygoid muscle was involved, the mandibular protrusion arose from postoperative scar formation. Although a chin cap was used to improve occlusion, this was in conflict with the opening exercise. Indeed, it proved difficult to balance both management aspects in this case.

Magnesium agents, steroids, nonsteroidal anti-inflammatory drugs, low-dose radiation therapy, warfarin, and bisphosphonates such as etidronate have been used for conservative treatment and postoperative recurrence prevention. Long-term administration of etidronate has been linked with osteomalacia but is often administered for MOP. Etidronate has been recommended to be given for 2 to 3 months after surgery for the prevention of postsurgical recurrence, although its efficacy, as well as that of other drugs, remains controversial at present.

**CONCLUSIONS**

We experienced a case of MOT involving the bilateral masseter muscles, the left temporal muscle, the left lateral pterygoid muscle, and the left frontal muscle. A good outcome was obtained by surgically excising the invaded muscles, osteotomy, and dissection of the ossified muscle attachment. Surgeons treating facial injury should be cognizant of this disease.

**REFERENCES**

16. Carey EJ. Multiple bilateral periosteal bone and callus formations of the femur and left innominate bone. Arch Surg 1924;8:592

**Recurrent Mandibular Dislocation Treated by Eminectomy**

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**Abstract:** Mandibular dislocations present with frequency; when they are recurrent and sustained over time, surgical treatment is...
In fact, Weinberg presented 8 patients treated by Dautrey procedure.

The aim of this investigation is to demonstrate that in 3 of the 8 patients there were recurrence and new postoperative dislocations; in addition, in long-term evaluations, noises (clicking) and pain were observed that were not present before the surgery. Srivastava et al. operated on 12 patients using Dautrey procedure, and in a 5-year follow-up, recurrence was observed in only 1 patient. A recent investigation by Gadre et al. treated 20 patients with Dautrey procedure (in this case stabilized with plate osteosynthesis) with an 18-month follow-up, with a success rate of 100%; however, they reported a zygomatic arch fracture as a complication in a 60-year-old patient, who was treated immediately with osteosynthesis. In all the patients, there was an approximately 6-mm decrease in the mouth opening with no signs of pain or postoperative alterations.

Another surgical alternative for recurrent mandibular dislocation is the placement of plates in the articular eminence, which impede the condylar passage in its transitional movement. The aim of this technique is essentially the same as the LeClerc procedure or the Dautrey procedure (also called the modified LeClerc procedure): to prevent the movement of the condyle beyond the glenoid cavity.

Cardoso et al. published the results of 11 patients treated with osteosynthesis plates installed in the articular eminence, comparing them with eminectomy procedures, and indicating that there were no differences in the results of the 2 procedures. Nevertheless, Vasconcelos and Porto (from the same group as Cardoso et al.) conducted the same study with a larger sample, indicating that in the patients treated with eminectomy, there was no recurrence of the pathology, whereas in patients treated with plates, 2 patients (11%) had a recurrence due to the plate fracturing; they therefore concluded that although plates are used, there is always the possibility that they will fracture. In these cases, an eminectomy would pose less of a potential for recurrence.

The eminectomy technique proposed by Myrhaug in 1951 is designed to remove the articular eminence and allow free movement of the condyle. In his article, Myrhaug describes the surgical procedure to remove the articular eminence in cases of recurrent mandibular dislocations. Helman et al. presented 8 patients treated by unilateral or bilateral eminectomy, demonstrating success in 7 patients; the failure occurred in 1 patient because the initial pathology stemmed from neuromuscular alterations with spasms that induced mandibular dislocation in such a way that surgical treatment was not correctly indicated.

In one of the largest series of patients treated with eminectomy, published in 1984, Oatis and Baker treated 44 patients diagnosed with painful chronic subdislocation and painful chronic dislocation with a bilateral eminectomy. They reported that 82% were pain-free and with no alterations in mandibular function in the postoperative stage, 11% had tolerable discomfort, and in 7% the procedure failed because of diagnostic errors or postoperative behavior.

The eminectomy has been used in other joint pathologies, such as those associated with a reduction in the mouth opening (closed lock), resulting in a decrease in pain and an improvement in the mouth opening. In fact, Weinberg established some surgical parameters for achieving success in managing the pain associated with TMI, with the eminectomy being considered a method for improving recurrent.

**TABLE 1. Surgeries to Treat Recurrent Mandibular Dislocations (According to Mizuno et al. and Weinberg et al.)**

<table>
<thead>
<tr>
<th>Surgeries Indicated to Treat Recurrent Mandibular Dislocations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condylectomy and condylotomy</td>
</tr>
<tr>
<td>Kostecka’s osteotomy</td>
</tr>
<tr>
<td>Subcondylar osteotomy with coronoidectomy</td>
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<tr>
<td>Coronoidecomy</td>
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<tr>
<td>Mandibular ramus L-inverted osteotomy</td>
</tr>
<tr>
<td>Modified subsigmoid vertical osteotomy</td>
</tr>
<tr>
<td>Temporal myotomy</td>
</tr>
<tr>
<td>Fink’s method</td>
</tr>
<tr>
<td>Traction with wires of the mandibular angle (surgical approach)</td>
</tr>
<tr>
<td>Meniscectomy</td>
</tr>
</tbody>
</table>

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Received February 21, 2012. Accepted for publication April 13, 2012.

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The authors report no conflicts of interest.

DOI: 10.1097/SCS.0b013e31825eb523

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**FIGURE 1.** Computed tomography, sagittal image, demonstrating the presence of a pronounced articular eminence.
mandibular dislocation and also for achieving intra-articular decompression, thereby reducing regional pain.

The aim of this investigation was to present 3 new cases of recurrent mandibular dislocations treated by eminectomy using Myrhaug’s procedure and to discuss the indication and the particularities of these cases.

**CLINICAL REPORT**

**Patient 1**

A male patient, 23 years old, white, arrived at our practice complaining of pain in both TMJ. He also referred to recurrent episodes of mandibular dislocations of 5 years’ duration. During the physical examination, stable occlusion and limitation of the mouth opening were observed. Computed tomography revealed the presence of a prominent articular eminence and deep articular fossa on both the right and left sides. The attempt was made at a conservative treatment using face support bandages and intraoral devices with no satisfactory results. This being the case, surgical treatment by bilateral eminectomy was indicated (Fig. 1).

The surgery was planned using the TMJ biomodel obtained from the computed tomography, in which the necessary measurements were taken to determine the amount of bone structure that had to be removed (Fig. 2). The surgery was performed under general anesthesia, using Myrhaug’s procedure, by means of a bilateral preauricular access and osteotomy of the articular eminence with an oscillating saw (Fig. 3). The osteotomy was concluded in the medial region with a chisel. Next, the region was flattened with erosion drilling, taking special care not to invade the infratemporal fossa. The surgical procedure was evaluated postoperatively with computed tomography, and during the postoperative 12-month follow-up, there were no new episodes of mandibular dislocation. The mouth opening at that point was 36 mm, with no painful alterations of the TMJ in either the static or functional dynamic state.

**Patient 2**

A male patient, 48 years old, black, presented in our practice with an episode of mandibular dislocation (Fig. 4). The examination revealed tooth destruction as a result of decay, in addition to a significant sagittal mandibular deficiency. The patient had these events repeatedly, daily, of 5 years’ duration, being treated with manual reduction and stabilization with bandages. Dental management was performed by a specialist and was rehabilitated with a dental prosthesis, stabilizing the occlusion; nevertheless, the mandibular dislocations continued with the same frequency.

**Patient 3**

A male patient, 20 years old, white, arrived at our practice with recurrent episodes of TMJ dislocation. The examination showed the absence of some bilateral molars. The patient was treated by specialists for oral rehabilitation, yet despite the occlusal stabilization and the improvements in the clinical picture, the dislocations were still frequent, occurring several times per month. In the tomography, it was possible to observe a pronounced articular eminence and a deep articular fossa.

A surgical procedure with eminectomy using Myrhaug’s procedure bilaterally was indicated. After 2 years’ follow-up, there was no dislocation recurrence, and no pain or functional impotence was observed.

**DISCUSSION**

Temporomandibular joint dysfunctions appear in different forms and with different symptoms. In some cases, conservative management is an ineffective and inefficient option, with surgery being necessary. In all the cases presented, the dislocations evolved over more than 5 years, with episodes of multiple dislocations in the same month and even in the same day.

Eminectomy has proven to be a versatile technique in the management of different types of patients, with different complexities and with no age limit. Mizuno et al presented 2 cases of permanent dislocation, these being a 62-year-old woman with mandibular dislocation with some weeks of duration due to repeated vomiting and a 74-year-old patient with a mandibular dislocation of 57 days of duration; Klüppel et al presented the case of a woman with chronic dislocation with 3 months of duration that was treated...
with an eminectomy with no painful sequelae or recurrences of dislocation.

These 3 cases showed a decrease in the mouth opening, consistent with the results of Vasconcelos et al, who presented the follow-up of 10 patients treated with bilateral eminectomy for an average of 37 months; in all the patients, the maximum mouth opening decreased (from 48 to 41 mm), and there were no new episodes of mandibular dislocation. Before this, Williamson et al had performed the eminectomy to treat TMJ dysfunction that was unresponsive to conservative treatments; in the 20 patients treated, an improvement was observed in the degree of pain, increasing the maximum mouth opening on average 9 mm after the surgery. The difference in the results obtained in the maximum mouth opening of the patient between the groups of Vasconcelos et al and Williamson et al may be in the differences in diagnosis of the 2 groups.

Although condylar hypermobility might be expected because there is no articular eminence capable of containing it, the study by Undt et al did not show any changes in the joint movements preoperatively or postoperatively; the extreme translocation that might be expected from not presenting the eminence was not observed in these patients, indicating as a probable cause the presence of a fibrous scar in the anterior sector of the capsule that would prevent excessive movement. This situation is also demonstrated in the 3 cases presented here.

A particularity of cases 2 and 3 is in the absence of posterior teeth. The study by Tallents et al indicated that modification of the occlusion, optimizing it with prosthesis use, would not necessarily improve the pain or the functional deficiency of the TMJ. Cases 2 and 3 were ultimately solved by bilateral eminectomy, supporting the fact that, in the presence of recurrent dislocations, deficient occlusions and instability may only be 1 factor contributing to the joint pathology.

In terms of complications, the series of 14 patients by Undt et al showed that the complications were observed in 3 cases, these being fracture of the condylar head, persistence of the mandibular dislocation, and osteoarthrosis of the TMJ. Surgical access is not observed as a complication in the postoperative aesthetics or possible damage to the facial nerve; in fact, nowadays preauricular or endaural access is considered routine procedure. Horizontal access, on the zygomatic arch, investigated initially so as not to damage the facial nerve, did not present any differences when compared with preauricular access. The neurovascular complications have also been referred to on the basis of regional anatomical conditions, including reports of sinus bradycardia associated with the proximity of the carotid artery. In our cases, motor complications of the facial nerve, functional alterations, and recurrent dislocation were not observed.

Considering the potential complications that the procedure poses, an extra aid lies in the use of biomodels, which make it possible to define and plan the surgical procedures not only in the image but also in volume. In addition, it allows the surgery to be performed on the biomodel, identifying distances and points of insertion for the saws or drills, as well as the obstacles that may be found during the osteotomy. In the first case dealt with, the use of the biomodel optimized the treatment by visualizing the surgery before performing it.

Variations and modifications of the initial procedure have also been proposed by some authors. Gay Escoda presented a series of 12 patients with eminectomy and repositioning of the temporal muscle instead of the articular eminence; he reported success in terms of the absence of dislocation recurrence and an almost 4-mm reduction in the maximum mouth opening after a year of follow-up. Güven presented 12 cases of patients with recurrent dislocations who underwent eminoplasty, where a wedge osteotomy was performed from the posterior toward the anterior in the articular eminence, and a bone graft was installed to increase the eminence vertically; the author indicated good results with a reduction in the mouth opening to approximately 38 mm and with no dislocation recurrence.

Sato et al conducted a comparative study of patients treated with eminectomy by means of Myrhaug’s procedure and with eminoplasty by means of the arthroscopic technique. They identified a dislocation recurrence close to 25% in both groups, concluding that the arthroscopic technique can be just as efficient at reducing mandibular dislocation and is a less invasive procedure, with less bleeding and a shorter surgical time. Another more radical modification was reported by Stassen and O’Halloran, who presented a retrospective series of 9 patients who underwent an eminectomy with local anesthesia and conscious sedation, establishing a functional procedure of TMJ surgery. Here, the eminectomy was performed to treat the reduced mouth opening resistant to nonsurgical treatments, indicating a decrease in pain and an improvement in the mouth opening.

In conclusion, the bilateral eminectomy applied to cases of recurrent mandibular dislocations is a completely viable option, with few complications; it is currently presented as a well-known procedure that is constantly being modified to optimize the indications and their results.

REFERENCES


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Temporomandibular joint ankylosis is a devastating condition for the patient associated with both functional disability and aesthetic deformities. Various techniques have been described in the literature to overcome this problem; however, there is still a high risk of reankylosis in patients undergoing multiple temporomandibular joint operations, severe heterotopic ossification, and fibrosis of the soft tissues.

This study includes 5 patients with severe and recurrent ankylosis. Two-stage reconstruction with excision of the bony mass and placement of a distraction device in the first stage, followed by gradual distraction of soft tissues, and placement of a total joint prosthesis in the second stage were performed in all patients. The 2-step approach helps to overcome the fibrosis and adhesions in the soft tissues and allows placing an implant with a higher ramus component. This approach seems to be a useful and effective technique for the management of such patients with high risk of reankylosis.

**Key Words:** TMJ, ankylosis, prosthesis, joint, distraction

**Abstract:** Temporomandibular joint ankylosis is a devastating condition for the patient associated with both functional disability and aesthetic deformities. Various techniques have been described in the literature to overcome this problem; however, there is still a high risk of reankylosis in patients undergoing multiple temporomandibular joint operations, severe heterotopic ossification, and fibrosis of the soft tissues.

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