Use of TCP plates in condylar fracture osteosynthesis

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Introduction and Objectives

Until recently, closed treatment was performed in the majority of patients with a condylar fracture of the mandible. However, lately there have been reports of the successful treatment of fractures with a variety of fixation techniques using different kinds of osteosynthesis.

A three-dimensional trapezoidal osteosynthesis plate (Modus TCP plates, Medartis, Basel, Switzerland) was specifically designed for the stabilization of sub-condylar and condylar neck fractures. These plates are based on the principles of functionally stable osteosynthesis.

This study describes our results in performing condylar fracture osteosynthesis using a TCP plate.
Patients and Methods

From January 2009 to February 2010, five patients (4 males and 1 female, aged 14-79) underwent surgery for the treatment of 8 condylar Fractures (bilateral in 3 patients and unilateral in 2) in the Department of Oral and Maxillofacial Surgery at Shimane University Hospital. These condylar fractures included 1 condylar head fracture, 4 condylar neck fractures and 3 sub-condylar fractures. The 4 condylar neck fractures and 3 sub-condylar fractures were treated by osteosynthesis using a 4- or 9-hole TCP plate.

The pre-auricular approach was used for the 4 condylar neck fractures and 1 condyaler head fracture. Either the retromandibular approach or the transoral approach was used for the 3 sub-condylar fractures.
# Characteristics of patients and surgical procedures

<table>
<thead>
<tr>
<th>Pts</th>
<th>Sex</th>
<th>Age</th>
<th>Side</th>
<th>Location of fracture</th>
<th>Additional fracture</th>
<th>Surgical approach</th>
<th>TCP plates</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>61</td>
<td>Bilateral</td>
<td>R-Neck L-Neck</td>
<td>Mandibular body</td>
<td>Pre-auricular Pre-auricular</td>
<td>4-hole</td>
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<td>2</td>
<td>F</td>
<td>79</td>
<td>Bilateral</td>
<td>R-Subcondylar L-Subcondylar</td>
<td>Mandibular body</td>
<td>Retromandibular Retromandibular</td>
<td>9-hole 4-hole</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>78</td>
<td>Bilateral</td>
<td>R-Neck L-Head</td>
<td>Mandibular middle</td>
<td>Pre-auricular Pre-auricular</td>
<td>4-hole</td>
</tr>
<tr>
<td>4</td>
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<tr>
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<td>Unilateral</td>
<td>R-Subcondylar</td>
<td>Mandibular middle</td>
<td>Transoral</td>
<td>4-hole</td>
</tr>
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</table>
Surgical procedure

Surgical technique

- Pre-auricular approach was performed as described by Raveh (1989) and Iizuka (1998).
- Retromandibular approach was performed as described by Ellis (1993) and Kleinheinz (2009).
- Tranoral approach was performed as described by Jeter (1988) and Undt (1998) without endoscopic-assisted osteosynthesis.

The TCP plating system and plating technique

The specific type of TCP plate to be used is selected according to the local anatomical features. The plate is positioned across the fracture line with the posterior arm positioned along the axis of the condylar neck. The first screw is usually inserted in the condylar fragment in the upper posterior hole of the plate. The second screw is inserted into the lower posterior hole in order to achieve temporary stabilization of the fracture and to allow for insertion of the upper and lower anterior screws.
One patient with bilateral condylar fractures was treated by the pre-auricular approach, because it was difficult to reposition the site of the condylar head fracture, and the pony bone was removed. The patient underwent functional rehabilitation after surgery.

Four patients, including the above patient, who underwent osteosynthesis using a TCP plate, achieved favorable articular functional and aesthetic results. However, one patient (Pts 4) suffered from an infection caused by a hematoma associated with a postoperative complication of slight temporal-branch facial nerve palsy. The patient underwent a second operation, in which the TCP plate had to be removed. Postoperative functional rehabilitation was required because the patient had difficulty in lateral movement 3 months after the operation.
Case presentation: Pts1

Pts1: Bilateral mandibular condylar fracture
Using pre-auricular approach

Preoperative, a panoramic view showing bilateral condylar neck fracture.

After open reduction and rigid internal fixation with 4-hole TCP plates, a panoramic view.
Case presentation: Pts2

Pts2: Bilateral mandibular condylar fracture
Using retromandibular approach

Preoperative 3-dimensional computed tomography scan showing mandibular fracture.

Use of a 9-hole TCP plate for right sub-condylar fracture and a 4-hole TCP plate for left sub-condylar fracture. Both sides of the fracture line are sufficient for a good stability.

Postoperative, a panoramic view.
The correct anatomical reconstruction of the condylar process is an important prerequisite for re-establishing articular function. A number of reports now suggest that the treatment of condylar fractures consisting of open reduction and rigid fixation leads to much better anatomic results.

In this study, five patients underwent surgery for condylar fractures. Pre-auricular, retromandibular and transoral approaches were applied for condylar fracture osteosynthesis. The condylar neck fractures and sub-condylar fractures were treated by osteosynthesis using TCP plates.

Compared to the methods of surgical approach, the pre-auricular approach leads easily and directly to the condylar neck region and offers a better overall view of the fracture. The retromandibular approach seems a shorter working distance from the skin incision to the sub-condylar, and greater access to the posterior border of the mandible and sigmoid notch. Both methods have little risk of facial nerve damage, less conspicuous facial scarring and easy reduction. The transoral approach provides for transoral access to the sub-condylar region of the mandible, allowing for repair of fractures in this region with minimal if any facial scarring, while also minimizing the risk of facial nerve injury. The major disadvantage of the technique is limited access, which makes visual control and proper reduction of the fracture difficult. Therefore, the indication for this technique should be carefully selected.

The stabilization of subcondylar fractures today involves the placement of a single straight 4- or 6-hole miniplate vertically in the axis of the condylar neck. However, very few biomechanical studies in support of this technique have been published. Meyer (2007) published the biomechanical testing of TCP plates to stabilize mandibular condylar fractures. These plates are based on the principles of functionally stable osteosynthesis. As our treatment results, with the same number of screws, the TCP plates improved the stability of the assembly, and the system allowed for osteosynthesis of small fragments. Therefore, this plate is suitable for the treatment of condylar neck and sub-condylar fractures.
Pre-auricular, retromandibular and transoral approaches were applied to condylar fracture osteosynthesis using a TCP plate. In all of the above three approaches, the use of a TCP plate was proven to be an easy and effective method for fixing the fracture fragments and maintaining stable osteosynthesis for patients with condylar neck and sub-condylar fractures.

References