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Use of a temporary screw for alignment and fixation of sagittal mandibular condylar fractures with lateral screws

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Abstract. This study introduced and evaluated the clinical application of a temporary and lateral screw technique for open reduction and internal rigid fixation of sagittal mandibular condylar fractures. A preauricular approach was used to expose the fracture. A temporary screw was used to assist in the anatomical reduction, and a lateral lag screw in combination with a lateral position screw was used for internal rigid fixation. Six adult patients with sagittal condylar fractures and more than 5 mm condylar height shortening were treated. The treatment outcomes were followed up clinically and radiographically for 8–27 months (mean 18 months) postoperatively. There were no complications associated with the operation. All patients recovered favorably with good occlusion, normal movement of the mandible, correct repositioning and rigid fixation of the fragment of the fracture and a good condyle shape on radiographs. The temporary and lateral screw technique is a simple, effective, fast, and minimally invasive surgical treatment for adult sagittal condylar fractures.

Keywords: mandible condyle; sagittal fracture; anatomical reduction; rigid internal fixation; screw.

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A sagittal mandibular condylar fracture presents as a fracture line that begins from the lateral pole of the condylar surface to the medial side of the condylar neck. It is also called a type B intracapsular (diacapsular) condylar fracture[11]. With the increase in the movement of people and improvement of radiographic diagnostics, especially computer tomography (CT) scanning, the observed incidence of sagittal condylar fractures has gradually increased in recent years, and accounts for 18–31% of all adult condylar fractures[3,4,6,14]. The chief symptoms are restriction of mandibular movements and deranged occlusion caused by a dislocated fragment of fracture and shortened mandibular ramus. Nonsurgical treatments cannot correctly reposition the dislocated fragment of fracture and restore the normal length of the mandibular ramus, so various surgical techniques have been developed[8–10,12,13] to treat sagittal condylar fractures. These techniques have disadvantages, including the technical complications of anatomical reduction and the instability of the internal fixation. To overcome these shortcomings, the authors developed a surgical technique that uses a temporary screw for alignment and fixation of sagittal condylar fractures with two lateral screws (one lag screw and one position screw) for internal rigid fixation. In this study the authors describe this 'temporary and lateral screw technique' and evaluate its treatment outcomes.

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Patients and methods

From April 2006 to November 2007, 18 patients with sagittal condylar fractures were treated. Diagnoses were made using clinical and radiographic examination, including orthopantomograms and helical CT scans.

The condylar height from the condylar surface to the level of the mandibular sigmoid notch was measured on both sides on orthopantomograms and the amount of shortening on the fractured side was determined for patients with unilateral sagittal condylar fractures (Fig. 1). Inclusion criteria were adult patients of at least 18 years, with unilateral sagittal condylar fractures, and more than 5 mm shortening of the condylar height on the fractured side. Six adult patients met the inclusion criteria and were enrolled in the study (the shortening of condylar height averaged 5.48 mm and the range was 5.02–6.04 mm) and underwent surgery using the authors' technique. The remaining 12 patients were excluded: 7 were less than 18 years of age; one had bilateral condylar fractures; two refused open treatment; and two had condylar height shortening <5 mm. The demographic and clinical data of the enrolled patients are given in Table 1. The study was approved by the Ethics Committee of the School of Stomatology, the Fourth Military Medical University, China, and written informed consent was obtained from all patients.

Surgical procedure

All patients underwent surgery under general anaesthesia. The time between accident and surgery was 7 days on average (range 5–10 days). Dental arch bars were applied to the upper and lower teeth before operation. A preauricular incision was used to approach the fracture[1]. After exposing the temporomandibular joint (TMJ) capsule, a T-shape incision was made. Further dissection exposed the lateral side of the condylar stump and neck. The ramus was disrupted inferiorly to widen the joint space. After identifying the location and shape of the fragment, the posterior articular surface of the medial fragment was exposed. Using a 1.5 mm drill, a hole was made and a 10 mm titanium screw was inserted 6 mm in, leaving 4 mm exposed to be used as a 'temporary screw' (Fig. 2B). Before fracture reduction, a gliding hole vertical to the fracture surface was drilled in the lateral cortex of the condyle near the condylar neck. Reduction of the fracture fragment was performed by holding the 'temporary screw' with the assistance of a periosteal elevator. After the fragment was repositioned, maxillomandibular elastic bands were temporarily applied to the arch bars to maintain occlusion. It is critical to maintain the fragment in a fixed position during traction hole drilling and the insertion of the titanium screw (the 'lateral lag screw'). The screw was tightened gently to compress the interfragmentary gap of the fracture site. A positioning hole was made and a titanium screw (the 'lateral position screw') was inserted. The positioning hole was above the lag screw (Fig. 2C), through the fracture gap, and parallel to the horizontal axis of the condylar process. The lateral lag and position screws were used for bicortical osteosynthesis of the condylar stump and fragment. The temporary screw was removed before or after this process based on the stability of the fracture after the lateral lag screw was inserted. The maxillomandibular elastic bands and arch bars were removed. After verifying that the articular disc was correctly positioned, the capsule was carefully sutured and the wound was closed in layers. Other concomitant mandibular fractures were treated according to the principles of rigid internal fixation. The surgical procedure is demonstrated with a mandible sample in Fig. 3. Titanium mandible cortex screws, 2.0 mm in diameter and 10–16 mm long were used in this study (Switzerland SYNTHES®).

Postoperative radiological and clinical examination

Radiographic examinations including orthopantomograms and helical CT scans were performed immediately following the operation and after 3 months. The condylar heights were measured at these times and compared with the preoperative values (Table 2). The mandibular movements were measured at 3 and 6 months postoperatively and compared with preoperative values (Table 3).

Results

All patients were followed up for 8–27 months (average 18 months). They recovered uneventfully, with no damage to the facial nerve, and restoration of their pretraumatic occlusion. The operation times for sagittal condylar fractures were 80–100 min (average 87 min). Measurements on orthopantomograms showed the condylar height of the fractured side was restored immediately following the operation. At the 3 month postoperative follow up, the condylar heights in all patients showed no significant change or significant difference from those of the non-fractured side (Fig. 4, Table 2). CT scans also showed good reposition and normal shape of the condyle at this time (Fig. 3D). Clinical examinations showed all patients regained normal mandibular movements (Table 3) and had no noticeable scars at 6 months postoperatively. All patients were satisfied with the treatment outcomes.

Discussion

Non-surgical methods are widely accepted for treating children with sagittal condylar fractures but no consensus has been established for adult patients. Owing to the distraction of the lateral pterygoid muscle, the fragment of sagittal condylar fractures is usually dislocated anteromedially and inferiorly, resulting in a shortening of the mandibular ramus. This causes restriction of the mandibular movement and deranged occlusion. The dislocated fragment of the fracture is associated with serious complications including TMJ ankylosis[5–7]; and anatomical re-positioning cannot be achieved by non-surgical

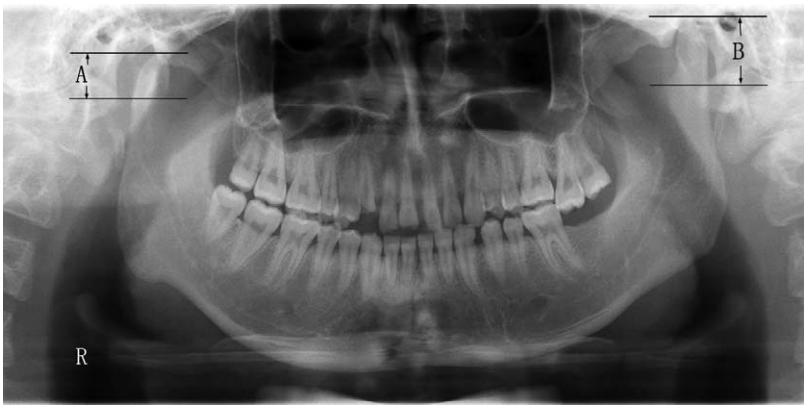

Fig. 1. Measurement of the condylar height on the orthopantomogram. (A) Condylar height on the fractured side and (B) condylar height on the non-fractured side.