

# Treatment of fractures of the mandibular condylar head with ultrasound-activated resorbable pins: early clinical experience

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## Abstract

Controversy continues about the benefits and disadvantages of open reduction and internal fixation of fractures of the condylar head. Once a decision to treat surgically has been made, an appropriate method of fixation must be chosen. Standard titanium fixation has a number of complications, including the risk of protrusion of the screw beyond the condylar head and the possible need for removal later. Resorbable fixation is an alternative, and ultrasound-activated resorbable pins are a new innovation. We have treated a series of 15 patients with 17 fractures of the condylar head, in which the use of ultrasound-activated resorbable fixation has provided adequate strength and stability during early healing. Complications included technical difficulties in achieving complete anatomical reduction as a result of fragmentation of the condylar head, and three facial nerve palsies, two of which recovered within three months. No pins failed, and there was no sign of instability during healing.

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## Introduction

A number of studies have reported better functional outcomes with open reduction and internal fixation (ORIF) of fractures of the condylar head compared with non-surgical treatment, but this remains controversial in craniomaxillofacial traumatology.<sup>1,2</sup> When the decision is made to treat a fracture of the condylar head surgically, there is a further question: how do you fix the fracture while the bone is healing?

Miniplates and screws are difficult to use to fix these fractures because of the relative fragility of the proximal fragment, which may disintegrate further during drilling or

placing screws, and there is also the technical difficulty of placing fixation that does not interfere with the articular surfaces of the condylar head itself. Kermer et al suggested bicortical miniscrews for the fixation of such fractures, and cannulated lag screws and headless bone screws have also been used.<sup>3,4</sup>

More recently the use of resorbable screws has been suggested,<sup>5</sup> the main advantage of which is that they should be less likely to erode or perforate the articular fossa should they become prominent as a result of over-extension, resorption, or remodelling of the condylar head. Potential disadvantages include the technical difficulties in placing larger screws, and questions over the strength and stability of resorbable fixation.

KLS Martin (Tuttlingen, Germany) developed a resorbable fixation system using ultrasound-activated poly D-L lactide pins rather than screws. The advantage over

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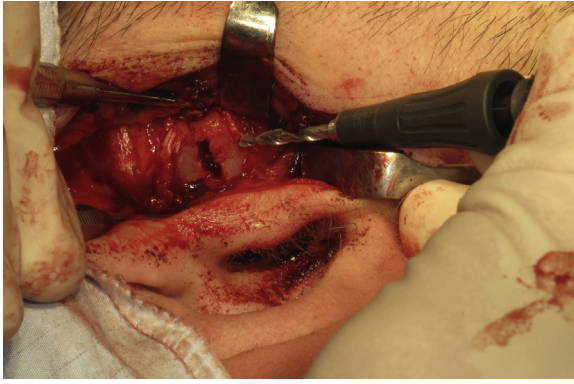


Fig. 1. Reduced fracture showing the graduated drill.

standard resorbable fixation systems is that the ultrasound-activated pins liquify and run into the bone, which avoids the compressive forces that are involved in the insertion of standard metal or resorbable fixation screws. This should minimise the risk of disintegration of fragments during fixation. It was initially used in animals, where it gave sufficient stability to the fragments to encourage its use *in vivo*.<sup>6–8</sup>

Abdel-Galil and Loukota<sup>9</sup> first reported its successful clinical use in 2008, but since then the only other report published in English to our knowledge is of three cases by Müller-Richter et al.<sup>10</sup>

Here we present a larger series of patients treated with ultrasound-activated resorbable pins to fix fractures of the condylar head. We examined specifically whether the technique provides adequate stability for healing fractures.

## Patients and methods

Patients with either unilateral or bilateral fractures of the condylar head who were referred from the Emergency Department had computed tomographic (CT) scans to assess fully the type of fracture (described according to the classification by Loukota et al) and to ensure there were fragments suitable for fixation.<sup>11</sup>

Those with fractures that involved a loss of vertical height of the mandibular ramus (types B and C) were offered the option of non-surgical or surgical treatment after we had discussed the relative risks and benefits of each technique with the patient.

### Surgical technique

Those who opted for surgical treatment had open reduction of the fracture using a preauricular approach and incision of the capsule at the posterolateral aspect of the condylar neck. The fracture is reduced with hooks anteriorly or posteriorly, or both, to pull the displaced fragment into alignment (Fig. 1).

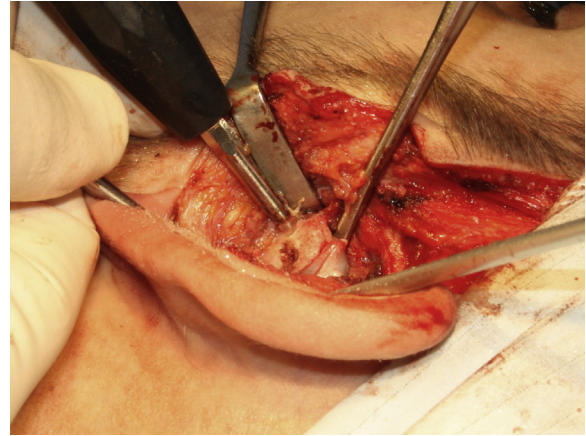


Fig. 2. Insertion of an ultrasound-activated pin with the Sonic probe. The head of the pin is sitting slightly proud of the bone before activation and full insertion.

A special graduated drill, which is provided with the equipment (Fig. 1), is used to drill a hole to the desired depth (measured radiographically or intraoperatively as the medial-lateral width of the condylar head). The pins are inserted into the hole as far as possible and the sonic probe is then activated to allow insertion to their full length (Fig. 2). We used pins that ranged from 13–17 mm long, and between 1 and 3 screws were used to stabilise the fracture (median 2). The design of the pins meant that if we were dissatisfied with their position or stability, we could redrill and insert another pin across the previous site.

The intra-articular disc is pulled medially by the proximal fragment of the condylar head, and is plicated to the retrodisical tissue and lateral capsule with sutures, or reattached to the condylar neck with a Mitek<sup>®</sup> anchor (DePuy Synthes, Leeds, UK) when there is more damage to the disc or capsule.

Where there are additional fractures of the facial skeleton they are treated by standard ORIF using titanium mini-plates or, if there are fractures of the opposite condylar head, these are assessed and treated with the same protocol if appropriate.

### Postoperative care

Postoperatively patients were advised to maintain a soft diet, but were not immobilised.

They were reviewed after 1–2 weeks and at regular intervals until at least 3 months postoperatively.

An orthopantomogram and a posteroanterior view of the mandible were taken routinely immediately postoperatively (Figs. 3 and 4). Where there was doubt about reduction or stability of the fracture we requested CT.

### Assessment

The reduction of the fracture was recorded as good if the alignment of fragments was anatomical, or if there was less than 2 mm shortening of the condyle-ramus complex, and it

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