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Orthodontic Appliances for Reduction and Fixation of a Mandibular Fracture: A Case Report

Abstract: A fractured mandible was treated using orthodontic brackets and wires and intra-oral elastics. The occlusion was corrected and the fracture was efficiently and effectively fixed and the need for a general anaesthetic avoided.

Clinical Relevance: To provide an effective and inexpensive treatment for a fractured mandible avoiding the need for a general anaesthetic. *Dent Update 2007; 34: 239-242*

Mandibular fractures account for 10 to 25% of all facial injuries, with interpersonal assaults ranked as the primary cause of such fractures.¹ A variety of commonly used fixation techniques exist, ranging from intermaxillary fixation alone to more invasive open surgical techniques employing biocompatible bone plates, screws or wires.

A relatively non-invasive technique employing the use of orthodontic brackets and intra-oral elastics to facilitate intermaxillary fixation has been described; however, it is rarely used. Previously, it has been used mainly for paediatric cases where open reduction and the use of plates and screws has the additional risk of a negative effect on

skeletal growth and unerupted teeth.^{2,3} A number of authors have, however, described various versions of this technique on adults with varying degrees of success.⁴⁻⁸

This case report describes the case of a mandibular fracture where treatment was performed with the use of orthodontic brackets and intra-oral elastics, instead of employing the more traditional technique of open reduction and internal fixation with plates and screws.

Case Report

A 22-year-old gentleman presented at Chesterfield Royal Hospital emergency department following an assault the previous day whilst on holiday in Portugal. He complained of limited mouth opening, associated pain and swelling in the left angle of the mandible and that his 'teeth did not meet together properly'. Radiographs had been taken and a preliminary diagnosis of a fractured left angle of the mandible had been made in a local hospital in Portugal where he was initially assessed. On arrival at the emergency department he was referred directly to the maxillofacial surgery team.

Extra-oral examination revealed only slight facial swelling in the left angle area and tenderness on opening over the



Figure 1. Mandibular deviation on wide opening suggests condylar fracture.

right temporomandibular joint. On wide opening, the mandible displaced a little further to the right, suggesting a condylar neck fracture on that side (Figure 1).

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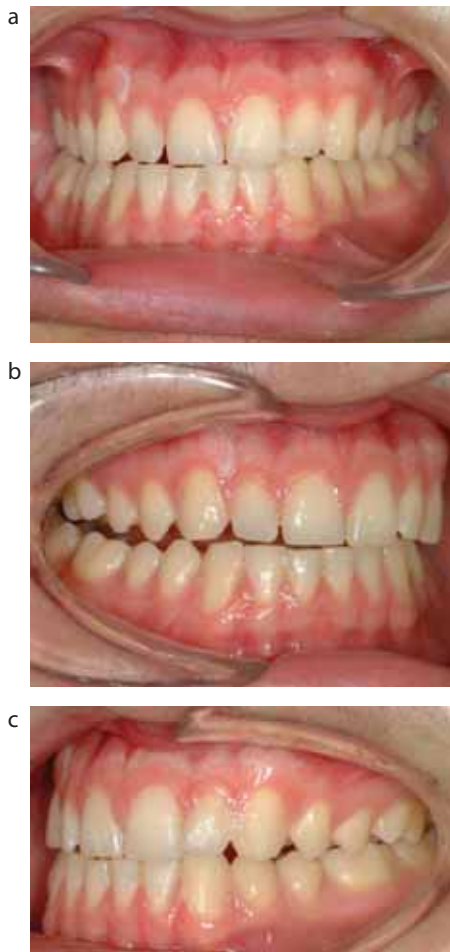


Figure 2. (a-c) Intra-oral photos showing deranged occlusion.

Intra-orally, the occlusion was deranged, with a marked lateral open bite on the right-hand side, with occlusal contact limited to the right second molars. The lower centre line was placed 4.5 mm to the right; the overbite was minimal and the canine relationship measured half a unit Class III on the left (Figure 2).

An orthopantomogram confirmed an undisplaced fracture at the left angle of the mandible running through the lower left third molar tooth (Figure 3). A PA skull radiograph confirmed a hairline fracture of the right condyle (Figure 4).

Treatment provided

A decision was made to place orthodontic appliances to allow correction of the malocclusion and provide fixation

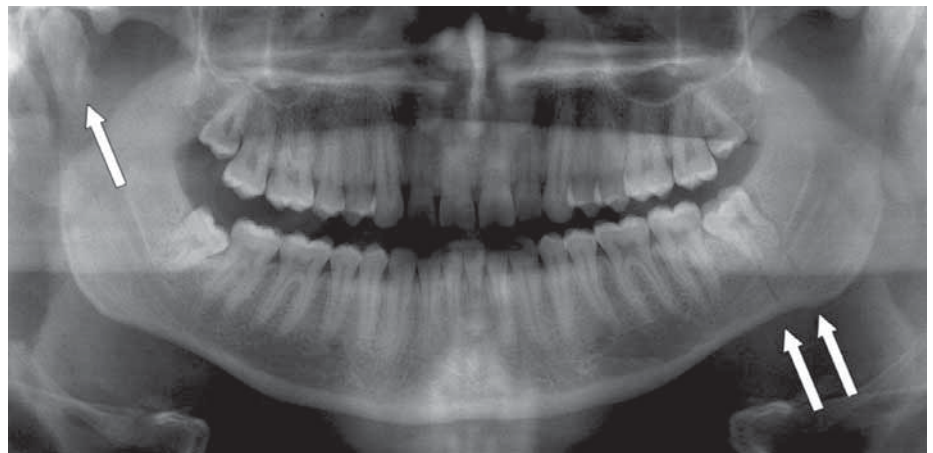


Figure 3. Orthopantomogram showing fracture of left angle and right condyle.



Figure 4. PA skull showing second fracture right condyle.

for the fractured mandible. No anaesthesia or analgesia was required by the patient pre-operatively. However, the usual oral analgesia was recommended after placement.

A straight wire appliance was fitted to the patient's upper and lower dentition and a flexible 0.016" Nickel Titanium archwire was placed and held in place using Kobayashi ligatures. Blue 'up-and-down' intra-oral elastics (1–3/16"

4.6 oz) were then placed between the upper and lower dentition to correct the malocclusion that had occurred as a result of the trauma and to provide fixation to allow the fractures to heal. Placement of the appropriate fixation took 30 minutes (Figure 5).

The patient was reviewed after 3 days to check that he was managing the fixation, that the occlusion was satisfactory and the fixation firm. He was then reviewed after one week and again at two weeks, at which time the fixation was released and the occlusion was satisfactory. The patient was instructed to wear the elastics at night only for a further two-week period. Four weeks after initial presentation the appliance was removed with minimal discomfort to the patient.

Following removal of the orthodontic appliance, the patient demonstrated a good occlusion (Figure 6) with a 2 mm overjet and a 1.5 mm overbite, with both canine teeth in a good Class I relationship and good occlusal contact of the buccal segments. Extra-orally, the patient looked fine with good mouth opening and an absence of mandibular displacement on wide opening (Figure 7).

Discussion

This type of injury would normally have been treated with a general anaesthetic in order to carry out open reduction and fixation of the fracture with bone plates and screws. Assessment of the case involved discussion with both the



Figure 5. (a–c) Canines back in Class I relationship, overjet and overbite correct.

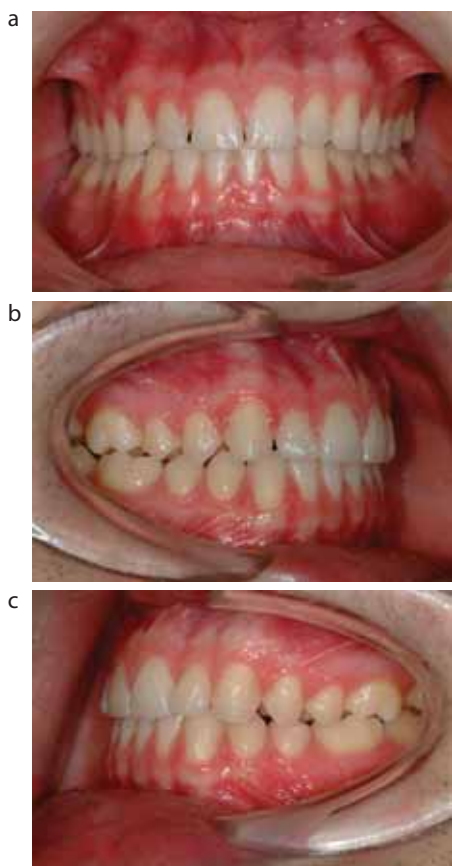


Figure 6. (a–c) Satisfactory occlusion when fixation removed.

maxillofacial surgeons and orthodontists. The patient had a deranged occlusion but an attempt was made in outpatients to correct the malocclusion using the occlusion as the guide to the correct position.

The patient was instructed to apply manual pressure to the outside of his face to push the jaw and teeth back into the correct position. Twenty minutes

after constant force application the patient reported that the teeth felt much more comfortable and the occlusion seemed to be greatly improved. It was therefore decided that this case would be suitable for attempting fixation with a modified orthodontic appliance.

When placing the orthodontic brackets it is important to try and line up all the bracket slots as well as possible so as to avoid differential movement of the teeth within each arch. It is also important not to use a stiff archwire as this would be difficult to place and may also cause unwanted tooth movement. The use of Kobayashis (individual wires with a loop to form a hook) to ligate the archwire allows flexibility in the placement of intra-oral elastics as the exact direction and number of elastics necessary to achieve correction of the occlusion and fixation may need adjusting during the process.

This case went well because the patient had an excellent set of teeth; healthy and well aligned with good oral hygiene. There was also no displacement of the angle fracture and the deranged occlusion was due to the condyle fracture. The patient was amenable to correcting his own occlusion using manual pressure and the occlusion could be used as a guide as to when the correct occlusal position had been achieved. Luckily no significant vertical or horizontal displacements of the teeth were present, which meant brackets and passive archwires could be placed with ease.

If specialist orthodontic expertise is not immediately available on prescription of the maxillofacial surgeon, it may be a task carried out by a suitably trained GDP with the necessary orthodontic experience.

After discussion with the surgeon, a period of two weeks full-time

and two weeks night-time only with the elastics was felt to be appropriate in this particular case.

At the end of the treatment the fracture was well reduced and a satisfactory occlusion had been re-established. General anaesthesia had been avoided and the patient was happy with the result achieved.

The use of orthodontic brackets and elastics to facilitate intermaxillary fixation is not a new idea. It has a number of benefits over the most commonly used techniques, involving open reduction and fixation, as it eliminates the need for theatre time, a general anaesthetic and extended hospital stays, as well as reducing post-operative swelling, sensory disturbance,

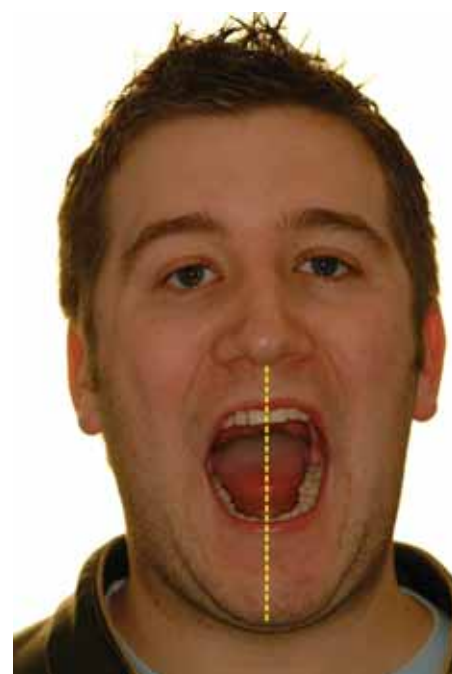


Figure 7. Full recovery after only 4 weeks – good range of movement with no deviation.

discomfort and infection rates.

The disadvantages of arch bar placement can also be avoided, such as high glove perforation rates,⁴ damage to the enamel and periodontal tissues, patient weight loss, and the generalized discomfort sustained throughout treatment.

In summary, this technique is an economical and safe technique that:

- Minimizes blood-borne pathogen risk to the operator;
- Reduces operative time;
- Eliminates periodontal injury;
- Facilitates dental hygiene; and
- Is relatively painless to apply and remove.

It is this author's suggestion that this method is a useful treatment addition in certain cases, such as minimally displaced angle, body or symphyseal fractures associated with condylar fractures. It may also be considered when a general anaesthetic is not advisable for either

medical or social reasons. In the future it may well be the treatment of choice for intermaxillary fixation in cases of mandibular fracture where the favourable circumstances, as seen in this particular case, exist.

References

1. Calloway DM, Anton MA, Jacobs JS. Changing concepts and controversies in the management of mandibular fractures. *Clin Plast Surg* 1992; **19**(1): 59–69. Review.
2. Gawelin PJE, Thor ALI. Conservative treatment of paediatric mandibular fracture by the use of orthodontic appliance and rubber elastics: report of a case. *Dent Traumatol* 2005; **21**: 57–59.
3. Chen CM, Chen YR. Mandibular fractures in children – immediate reduction and fixation with orthodontic resin. *Chang Gung Med J* 1990; **13**: 39–47.
4. Utley DS, Utley JD, Koch RJ, Goode RL. Direct bonded orthodontic brackets for maxillomandibular fixation. *Laryngoscope* 1998; **108**(9): 1338–1345.
5. McKeown HF, Sandler PJ. Orthodontic fixation of mandibular fracture: a case report. *Int J Adult Orthod Orthognath Surg* 1998; **13**(4): 324–326.
6. Sivam R. Orthodontic bracketing: an alternative for intermaxillary fixation in mandibular fracture. *Br J Oral Maxillofac Surg* 1999; **37**(2): 155–156.
7. Magennis P, Craven P. Modification of orthodontic brackets for use in intermaxillary fixation. *Br J Oral Maxillofac Surg* 1990; **28**: 136–137.
8. Saglimbene R, Williams AC. Bonding of metal attachments to teeth for treatment of mandibular fractures. *J Oral Surg* 1974; **32**(9): 702–704.

BookReview

Surgical Manual of Implant Dentistry. By D Buser, JY Cho and ABK Yeo. New Malden: Quintessence Books, 2007 (136pp. h/b, £50). ISBN 978-0-86715-379-8.

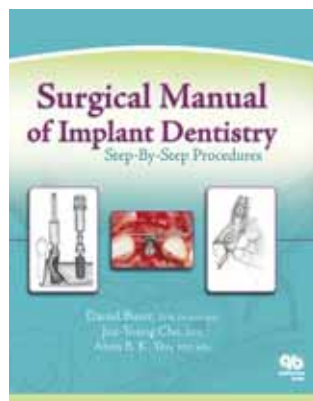
This was an interesting book to review, for a variety of reasons, not least because of the esteemed reputation of the lead author, Professor Daniel Buser. Initial impressions of what appeared to be a much needed manual were quickly dampened by the realization that, of the 120 pages, the first 93 were all black and white drawings. A closer look, however, reveals a multitude of outstanding detailed pencil drawings which are probably able to convey the individual stages better than any clinical photography. Each image is accompanied by a brief description, with a few paragraphs of text commencing each chapter. The last 27 pages are clinical photographs of 14 cases illustrating the subject matter of the manual. Unfortunately, the DVD of surgical cases did not accompany my review text but would appear to be an optional part of the guide.

No real indication is given as to who this book is aimed at, but certainly the first few chapters are fairly specific to the Straumann dental implant system; 'Basic Surgical Principles', 'Indications for Each Implant Type', 'Surgical Procedures in Standard Non-Aesthetic Sites', 'Surgical

Procedures in Standard Aesthetic Sites'. Nevertheless, a number of techniques are described and illustrated (particularly the tips for soft tissue closure) that

would be useful to any surgeon in the earlier stages of their training. Unfortunately, there is no reference to the use of surgical templates, and the concept of 'restoration-driven' implant placement is completely ignored, with detailed measurement diagrams instead, illustrating correct implant placement. There is also no advice as to implant placement close to anatomical structures (inferior dental nerve, maxillary sinus), which seems unusual with so many other dimensions detailed elsewhere in the book. A recommendation for the use of antibiotics is without any qualifying guidance and one or two of the drawings also have small errors.

Chapters 5 and 6 cover 'Guided Bone Regeneration' and 'Sinus Grafting', and give a very good step-by-step guide



as to the authors' preferred method for these procedures. The sinus grafting section illustrates both the 'lateral window' simultaneous approach and the 'osteotome' simultaneous approach and are excellent, but I do have a few concerns that the clarity of the drawings tends to over-simplify what can often be quite challenging surgery.

The final chapter is of the 14 clinical cases, illustrating much of the content of the previous chapters. Much of the follow-up documentation is only for 2 or 3 years, despite the claim of up to 10 year long-term outcomes. Once again, the quality of the images is excellent and gives a good indication of what is achievable with the techniques detailed. At the end of the book, there is no index, but there is a list of 'Suggested Reading'; three out of the six books being by the lead author, Daniel Buser.

Despite these small criticisms, if this book is read in conjunction with one of the more 'standard' implant texts, there is much to be gained for the less experienced surgeon. On balance, this is an informative and well-presented book and I would recommend it to the appropriate audience, but I do not think that there is enough information to justify the book's quite high price, to an experienced clinician.

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