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# Common Facial Fractures: 3. Complications

**Abstract:** The final article of three, this paper highlights the complications that may arise either as a direct result of the fracture or the treatment of the fracture.

**Clinical Relevance:** Dentists may encounter and sometimes have to manage some of the complications of facial fractures or their treatment.

**Dent Update 2006; 33: 470-476**

The previous papers in this series have outlined the presentation and management of facial fractures which may be encountered in general dental practice. In this paper, we present some of the more common complications of fractures or their treatment that may present in general dental practice.

Despite the often severe nature of facial fractures, the complicated anatomical environment in which they occur, and the fact that the majority are compound fractures (ie bone is exposed and/or the teeth are involved), significant complications are relatively uncommon. If one considers limb injuries, compound fractures are much more likely to be complicated, particularly due to infection.

## Early complications

Airway compromise  
Haemorrhage  
Meningitis/Cerebral abscess  
Nerve damage  
Ophthalmic  
Infection  
Deformity/Malocclusion  
Impaired mandibular function  
Dental injuries  
Fistulae

## Late complications

Delayed and non-union  
Implant-associated

**Table 1.** Complications of facial fractures.

- Loss of bone. This can be the result of the injury, subsequent debridement or be due to the ageing process, as in the atrophic mandible. In these cases, there is small contact surface between the fragments (eg atrophic mandible);
- Inadequate reduction and soft tissue interposition between fragments;
- Mobility due to inadequate fixation or excessive occlusal forces;
- Distraction, seen in unfavourable fractures;
- Poor vasculature. This is more common in the elderly, or as a result of therapeutic radiation for head and neck malignancy, which causes end-arteritis obliterans, essentially reducing the blood supply, particularly in the bone;
- Pathological lesion.

## Systemic

Systemic factors which may impair wound healing are those which, again, affect healing in any site of the body and include diseases, such as diabetes, and drugs, such as steroids. Increasing age also slows down wound healing but is generally not a significant problem for facial fractures, as the majority occur in young healthy adults. Non-compliance with post-operative regimes is usually the source of most complications in this age group.

## Local and general factors affecting healing

As with any healing process, there are factors which will impair the healing of fractures which can be local or systemic:

### Local

- Infection;
- Presence of foreign materials;

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**Figure 1.** Comminuted fracture of the anterior mandible owing to gunshot injury. If voluntary tongue control is lost, as a result of a decreased level of consciousness, the loosening of the tongue muscle attachments could allow it to fall back and obstruct the airway.

## Complications

Complications of the facial fractures and their treatment can be divided into:

- Systemic to the fracture sites;
- Specific to the fracture sites;
- Early complications; and
- Late complications.

### Systemic to the fracture sites

The incidence of systemic complications (eg deep venous thrombosis, chest infection) depends on the presence of coexisting injuries, age and pre-existing medical diseases.

### Specific to the fracture sites

The specific to the fracture site complications are summarized in Table 1. This list deals with the more common or significant complications and is by no means exhaustive.

### Early complications

These include the following:

- Airway;



**Figure 2.** Post-operative infection of a fracture at the left angle of the mandible. Note that the screws are no longer engaged in the bone and the plate has fractured.



**Figure 3.** Inadequate reduction and fixation of bilateral fractures of the mandible resulting in malocclusion. Note the residual step at the left angle and the diastema between  $\bar{2}$  and  $\bar{3}$ .

- Nerve damage;
- Infection;
- Deformity;
- Impaired mandibular function;
- Dental injuries;
- Fistulae.

### Airway

Following trauma, the airway may become immediately compromised owing to displacement of the fractured bones which, in the case of mandibular fractures, is usually due to the pull of the muscles on the bone fragments (Figure 1) and, in the maxilla, due to direct occlusion

of the airway. Avulsed teeth or fragments of teeth fractured as part of the injury must always be accounted for, since they can occasionally cause airway obstruction. Although infrequently used now, if rigid intermaxillary fixation has been applied with wire, wire-cutters should be available at any time to release the fixation.

### Nerve damage

Sensory nerve damage is a common complication of facial fractures. Compression of the infra-orbital nerve is an almost invariable feature of fractures of the zygomatic complex and orbital

floor, resulting in numbness of the skin overlying the cheek of the affected side, as well as the lateral aspect of the nose and the upper lip. Patients frequently also experience numbness of the upper anterior teeth. Once treated, there is often some immediate return of sensation, but full function of the nerve can take many months or be permanently compromised. Mandibular fractures of the angle, body and parasymphiseal regions, particularly if displaced, will result in damage to the inferior dental nerve. Additionally, manipulation during treatment and misapplied fixation for such fractures can result in further trauma to the nerve; resolution can take many months and a

significant proportion of patients will have some degree of permanent sensory loss. Occasionally, this will result in neuralgia.

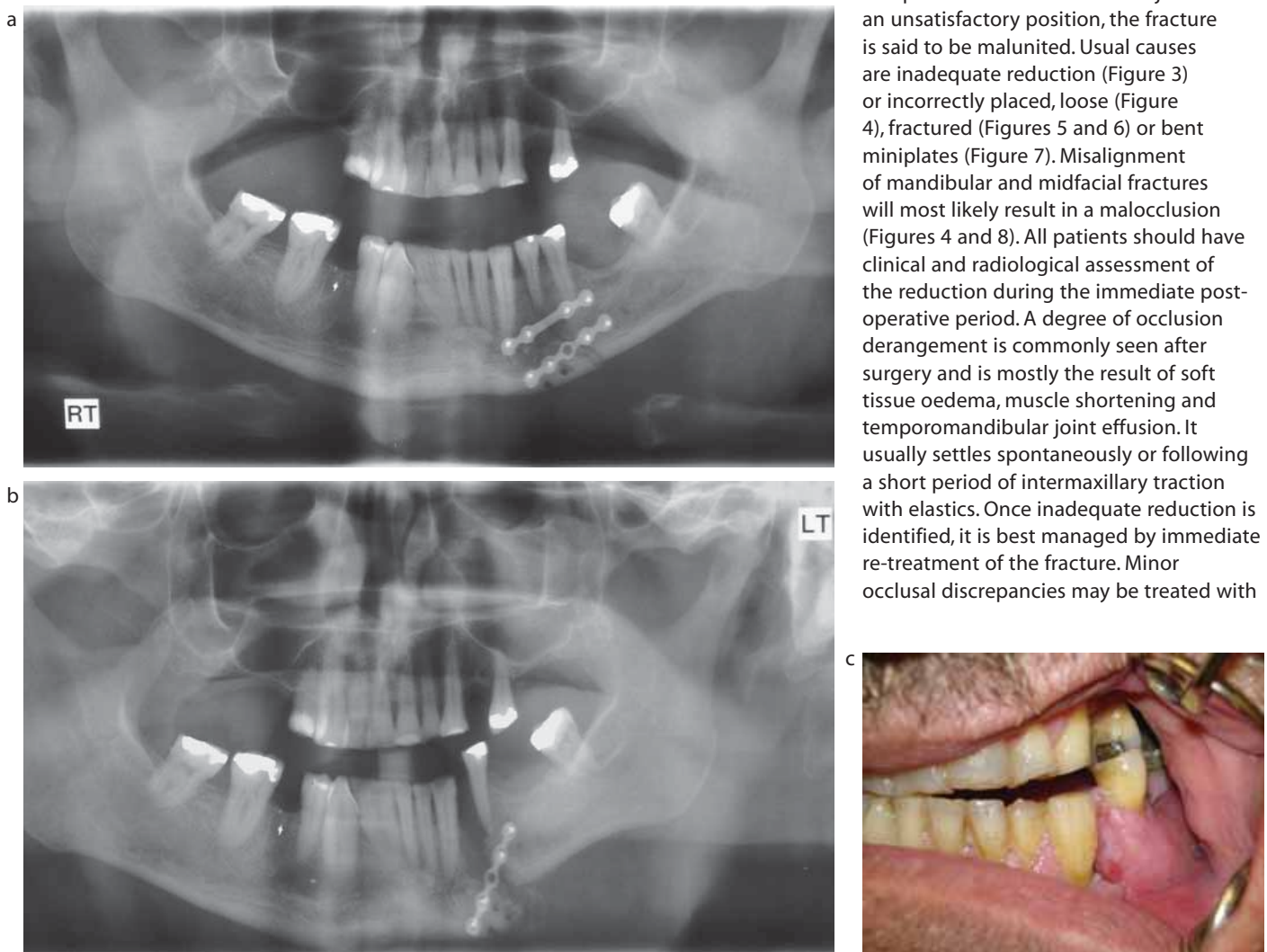
**Infection**

Untreated compound fractures, particularly those of the mandible, are likely to become infected if no intervention is undertaken. If an acute suppurative infection is present at initial presentation it will be treated with intravenous antibiotics, drainage/debridement and adequate immobilization. The use of conventional open reduction and internal fixation in such situations is controversial. Closed reduction and rigid intermaxillary fixation with wires is a commonly used mode of

treatment when infection is present. In general, the incidence of post-operative infections vary from less than 1% to 32%. Significant delays in treatment, risk factors for poor healing, and dental infections (Figure 2) increase the potential for post-operative infections. Fortunately, the majority of these infections respond to adequate drainage and broad spectrum antibiotics.

**Deformity**

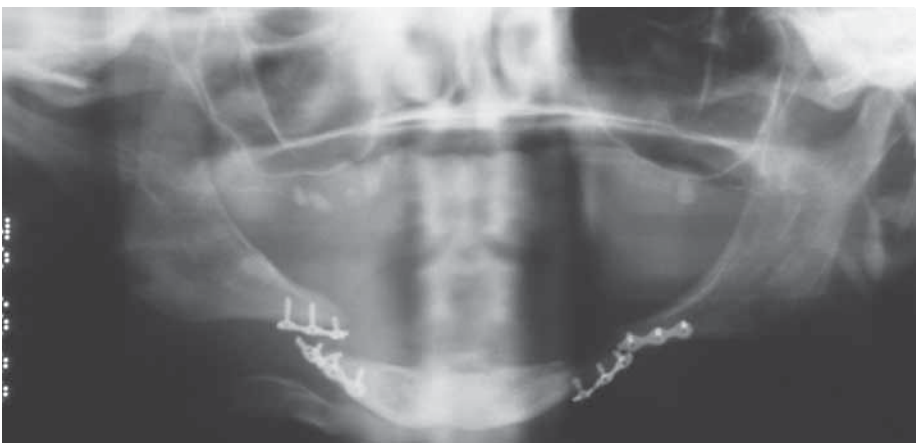
Residual deformity of the facial skeleton and/or the overlying soft tissues often has functional, aesthetic and psychological consequences. It can be due to the severity of the original injury or suboptimal management and complications. When the bones join in an unsatisfactory position, the fracture is said to be malunited. Usual causes are inadequate reduction (Figure 3) or incorrectly placed, loose (Figure 4), fractured (Figures 5 and 6) or bent miniplates (Figure 7). Misalignment of mandibular and midfacial fractures will most likely result in a malocclusion (Figures 4 and 8). All patients should have clinical and radiological assessment of the reduction during the immediate post-operative period. A degree of occlusion derangement is commonly seen after surgery and is mostly the result of soft tissue oedema, muscle shortening and temporomandibular joint effusion. It usually settles spontaneously or following a short period of intermaxillary traction with elastics. Once inadequate reduction is identified, it is best managed by immediate re-treatment of the fracture. Minor occlusal discrepancies may be treated with



**Figure 4.** Devitalization of the  $\bar{4}$  during the injury: (a) led to post-operative infection of this left mandibular fracture and subsequent loosening of the osteosynthesis plates. The tooth, as well as the upper plate, fell out and the patient presented with a step deformity at the fracture area (b, c).



**Figure 5.** The osteosynthesis plate at the right mandibular body has fractured. After treatment it was found that this patient had a pronounced bruxism habit.



**Figure 6.** Post-operative displacement of a bilateral fracture of an atrophic mandible due to fractures of the osteosynthesis plates.



**Figure 7.** Osteosynthesis plate placed at the left infra-orbital rim. It was bent during a second injury within the early post-operative period.

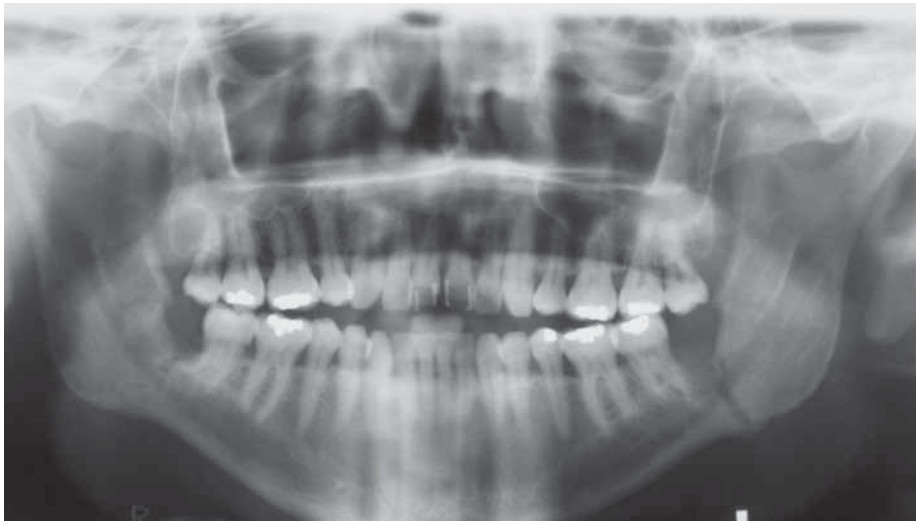
selective grinding. When there are long delays in the treatment of facial fractures and union occurs at the displaced position, correction of the malunion requires secondary surgery more commonly in the form of osteotomy or placement of onlay implants.

**Impaired mandibular function**

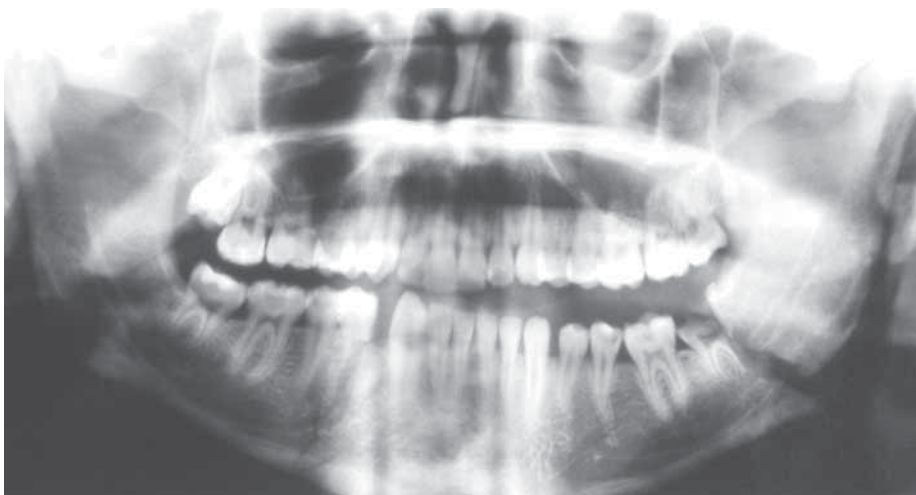
Trismus is a very common post-injury and post-treatment problem. It is frequently associated with mandibular fractures due to involvement of the masseter or pteryoid muscles by haemorrhage or oedema. Unfortunately, treatment with open reduction and fixation is likely to exacerbate this problem temporarily. Trismus is also a common problem associated with fractures of the zygomatic complex owing to the coronoid process of the mandible impinging on the depressed zygoma. Failure to recover a satisfactory range of mandibular movements is a complication which should be prevented and treated as soon as it is diagnosed. The cause of the problem may be derangement of the temporomandibular joint. The latter may also give rise to malocclusion, chronic pain due to internal derangement, or early osteoarthritis, ankylosis and growth disturbance in children.

**Dental injuries**

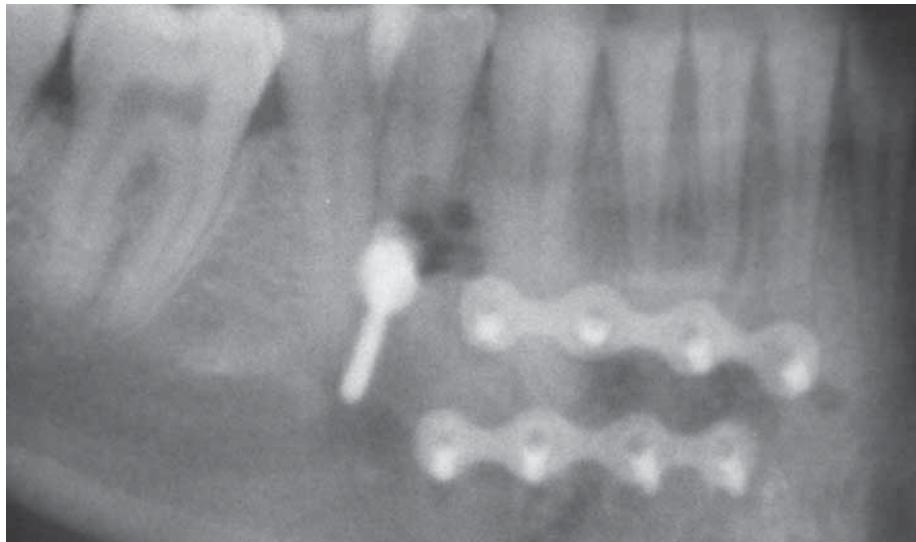
Concurrent tooth fractures are not uncommon with facial fractures, and the reader is directed towards appropriate texts for the management of such injuries. As mentioned earlier, when teeth are involved at the fracture site and there are indications for extraction, they are removed during surgery (Figure 9). Teeth left *in situ* can lose vitality or develop periodontal complications, and close follow up and treatment by the patient's GDP is strongly recommended. Treatment of facial fractures may also result in iatrogenic dental injuries. Placement of intermaxillary fixation inevitably causes a certain degree of gingival and periodontal disruption. If the fixation has to remain post-operatively (eg arch-bars), then prolonged gingival irritation may remain as toothbrushing will be difficult (Figure 10). Such patients would benefit from scaling and polishing of their teeth on removal



**Figure 8.** Open bite due to malunion of bilateral fractures at the mandibular angles.



**Figure 9.** Bilateral fractures of the mandible at the right body and left angle. There are also fractures of the 4| and |8 which need to be extracted during surgery.



**Figure 11.** Multiple 4| root perforations occurred during attempts for placement of a capstan screw.



**Figure 10.** Gingival inflammation immediately after removal of upper and lower arch bars.

of the fixation device. Poor surgical technique and inadequate placement of intermaxillary fixation can result in tooth fracture, extrusion and loosening or damage to dental restorations. The use of capstan screws for intermaxillary fixation can result in injuries to the roots of teeth if they are not positioned correctly (Figure 11). Similar problems are more rarely seen with misapplied miniplates and screws (Figure 12).

#### **Fistulae**

Oro-antral or oro-nasal fistulae may develop following mid facial injuries. Secondary procedures are usually necessary to correct the problem. Chronic sinusitis, often seen as a result of impaired maxillary sinus drainage, can complicate the treatment of oro-antral fistulae.

#### **Late complications**

Although several of the above complications arise in the early post-operative period, they may become apparent late and/or have long-term sequelae, and many authors describe them as late. These include the following conditions:

- Delayed and non-union complications;
- Implant complications;

Occasionally, it is observed that, despite being reduced and fixed, some fractures do not unite and some degree of mobility is evident across the fracture site. If the healing period is unduly prolonged, the term 'delayed union' is used. If the problem is not recognized and adequately treated a 'non-union' is likely to occur. That



**Figure 12.** Root perforation during fixation with an osteosynthesis plate. This led to pulp necrosis, post-operative infection and loss of the tooth.

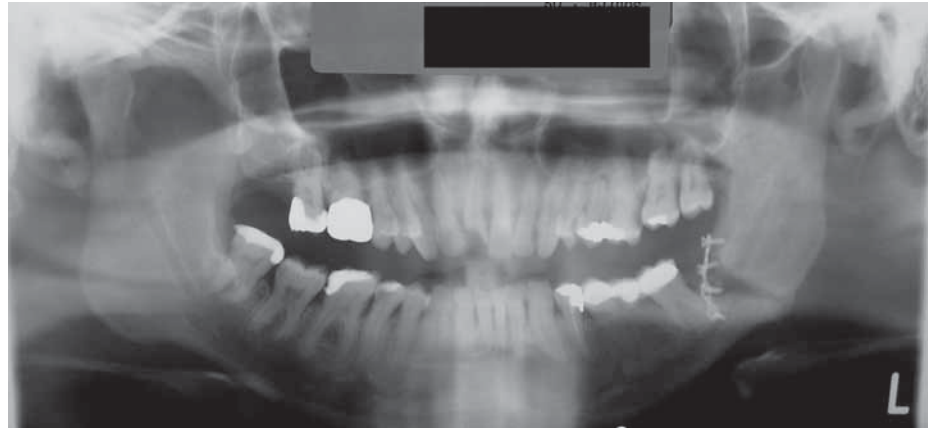


**Figure 14.** Infected right zygomatico-frontal area plate.

means a complete failure of the fracture to heal and it is a particular problem in the mandible (Figure 13). All the above risk factors of unfavourable healing are important, but the vast majority of 'non-union' cases are the result of infection. The time for diagnosis of 'delayed' or 'non-union' is difficult to define because not all patients and fracture patterns have the same healing rate. When there are delays in healing, the contributing factors should be identified and dealt with. Patients with 'delayed union' are usually successfully treated with prolongation of the immobilization period. 'Non-union' cases often require surgical intervention and bone grafting or more complex reconstruction.

**Implant complications**

In some countries it is routine



**Figure 13.** Failure of fracture healing as a result of chronic infection. Note the loosening of the osteosynthesis plate.



**Figure 15.** Multiple abscesses caused by infection of mandibular internal fixation. Note also the scar from the extra-oral incision used for the reduction and fixation.

practice to remove osteosynthesis plates some months after the treatment of facial fractures. However, this is not the case in the UK. A small number of plates do get chronically infected and require removal (Figure 14 and 15). The incidence of infection is higher in the mandible or maxilla, where submucosally placed plates become exposed. Additionally, plates may be removed simply because they irritate the patient, again if they are close to the oral mucosa or palpable beneath the skin, particularly those around the orbit.

**Summary**

The treatment of facial fractures is now well established and, whenever possible, will be done using open reduction and internal fixation, thereby allowing some function post-operatively. Complications following treatment of facial fractures are not common, but may present to the general dental practitioner. If such

complications are identified or suspected, then the patients should be referred to the centre where the treatment was undertaken, if possible.

**Suggested reading**

1. Pigadas N, Oliver R. Common facial fractures: 1. Aetiology and Presentation. *Dent Update* 2006; **33**: 347–356.
2. Pigadas N, Oliver R. Common facial fractures: 2. Management. *Dent Update* 2006; **33**: 413–420.
3. Banks P, Brown A. *Fractures of the Facial Skeleton*. Oxford: Wright, 2001.
4. Booth PW, Schendel SA, Hausamen JE. *Maxillofacial Surgery*. London: Churchill Livingstone, 1999.
5. *Maxillofacial Trauma Guidelines*. British Association of Oral and Maxillofacial Surgeons: [www.baoms.org.uk](http://www.baoms.org.uk)

**CPD ANSWERS**

SEPTEMBER 2006

- |               |            |
|---------------|------------|
| 1. A, B, C    | 6. B, C    |
| 2. A, B, C, D | 7. A, B    |
| 3. B, C, D    | 8. B, C, D |
| 4. A, D       | 9. A, C, D |
| 5. B, C       | 10. C, D   |