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Postoperative radiographs after open reduction and internal fixation of mandibular fractures: clinical need or unnecessary radiation?

Ffion Dewi *, Alastair Henry, Satyajeet Bhatia

Department of Oral & Maxillofacial Surgery, University Hospital of Wales, Cardiff

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Abstract

Postoperative radiographs are conventionally taken after open reduction and internal fixation (ORIF) of mandibular fractures, but routine radiographic exposure in patients who have no clinical signs may not be justified. To find out whether radiographs influence immediate postoperative management, and whether they can be used to predict long-term complications, we retrospectively reviewed the radiographs and case notes of 92 patients who had ORIF of isolated mandibular fractures between June 2010 and June 2012. We evaluated them for the adequacy of reduction and fixation using locally agreed criteria, and correlated them with immediate and long-term outcomes as recorded in the case notes. Eleven patients had complications, usually infection. All 4 patients who required repeat ORIF had worrying signs and symptoms despite the immediate postoperative radiograph looking favourable. The radiographs of 7 patients looked unfavourable, but no patient required another operation, and none developed complications. Routine postoperative radiographs after ORIF of mandibular fractures seem to have little value in the management of patients, as the decision to reoperate is based on clinical signs rather than radiographic appearance, and radiographic appearance is not associated with long-term outcomes. Our findings suggest that radiographs are valuable only in patients with clear clinical indications and, in view of the risk and cost of radiation, we question their continued use.

Introduction

Routine postoperative radiographs are conventionally taken after open reduction and internal fixation (ORIF) of mandibular fractures. Reasons given in support of this include assessment of the adequacy of reduction and fixation before discharge, self-assessment, peer review, teaching purposes, and medicolegal reasons.[1–3] However, we know of little reported evidence to support the practice and several authors are against it,[1–5] but anecdotally, these radiographs are still commonly taken in the UK.

As there is a risk of radiation-related adverse outcomes with each radiograph we should follow the Ionising Radiation (Medical Exposure) Regulations 2000 (IR(ME)R 2000).[6] It is estimated that around 700 cases of cancer/year in the UK (0.6% of the cumulative risk of cancer up to the age of 75) can be attributed to diagnostic radiology.[7] Radiographs are also expensive, and in our Trust, orthopantograms (OPG) and posteroanterior (PA) mandible plain films each cost £31. In our department in a large teaching hospital there is often a delay in obtaining the images so patients often need to stay an additional night before they are discharged. This incurs a further cost of £350-£500/bed/night, and the lack of available beds can then result in elective cases being cancelled.

Guidelines from The Royal College of Radiologists state that "no investigation should be requested unless it can be clinically justified, and its result, normal or abnormal, is likely to influence management of the patient".[8] We suggest that

* Corresponding author.
E-mail address: ffion.dewi@wales.nhs.uk (F. Dewi).

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the adequacy of reduction and fixation can be judged clinically (most importantly assessment of the occlusion) after operation and by direct visualisation operatively. We have noted that even when postoperative radiographs suggest that reduction and fixation are poor, patients with satisfactory occlusion and no mobility are not usually returned to theatre, but are monitored as outpatients. Childress and Newlands[4] retrospectively assessed the radiographs of patients with complications, but we know of no studies that have followed up the outcomes of those whose reductions looked unfavourable radiographically. We therefore decided to find out whether routine postoperative radiographs had influenced the immediate and long-term management of patients with fractured mandibles.

Patients and methods

We identified all patients who had ORIF of a mandibular fracture at the University Hospital of Wales between June 2010 and June 2012. Those with concurrent facial, condylar, or pathological fractures, were excluded, as there may have been additional indications for postoperative radiographs. Three independent assessors (one consultant and 2 middle grades) evaluated the immediate postoperative radiographs for the adequacy of reduction and fixation using simple, locally-agreed criteria. In each case, both the reduction and fixation were assessed as favourable or unfavourable (Table 1).

We retrospectively reviewed the case notes and data relating to the medical history, smoking and alcohol status, mechanism of injury, clinical assessment immediately after operation and at follow up, complications, and any further intervention needed. The data were analysed to identify any correlation between the assessments of the radiographs and outcomes.

Results

A total of 92 patients with 146 fractures were included in the study (86 fractures of the angle, 48 of the parasymphysis, and 12 of the body). The mean age was 25.6 years (range 13 – 51). The male:female ratio was 14:1, and in most cases, the mechanism of injury was assault.

Table 1
Assessment of postoperative radiographs.

	Favourable	Unfavourable
Reduction	Good alignment of the fracture with less than 5 mm discrepancy in a vertical or horizontal plane	Poor alignment of the fracture with more than 5 mm discrepancy in a vertical or horizontal plane
Fixation	Two-point fixation anterior to the mental nerve or a load-bearing plate	Less than two-point fixation anterior to the mental nerve or no load-bearing plate
	At least two screws in plate either side of the fracture line	Fewer than two screws in plate either side of the fracture line

The radiographs of 7 patients were deemed to have an unfavourable appearance: 2 for reduction and fixation, 2 for reduction only, and 3 for fixation only. Six of the 7 had a satisfactory occlusion, and one had a mild malocclusion that was acceptable to the patient and did not require further intervention. Two patients who failed to attend appointments after their first postoperative outpatient review have not presented again with complications. To our knowledge, none of the 7 had long-term complications, and none required a return to theatre.

Of the remaining 85 patients whose radiographs looked favourable, 11 had complications, most commonly infection (n = 7). Other complications included dehiscence and malunion. Six patients were returned to theatre (2 for removal of hardware, and 4 for repeat treatment of the fracture). The decision to repeat the operation was made at follow up and was based on clinical signs such as malocclusion or mobility of the fracture. Although repeat radiographs supported the decision, no patients were returned to theatre on the basis of the images alone. Table 2 shows the details of these 4 patients.

Twelve patients did not attend any postoperative reviews and were lost to follow up, but the radiographs in all of them had been satisfactory. The number of review appointments/patient ranged from 0 to 14 (mode of 2). Patients whose radiographs looked unsatisfactory were not followed up more often or for longer than those whose radiographs looked satisfactory.

Discussion

Previous studies have tended to identify patients with poor clinical outcomes at follow up and have retrospectively evaluated the relevant postoperative radiographs. To our knowledge, no studies have identified patients with poor radiographic findings and followed up their clinical outcomes. We therefore think that this study adds to the current body of work.

Two previous studies have assessed the value of postoperative radiographs for mandibular fractures. In their assessment of 289 patients, Childress and Newlands[4] identified 25 with complications, and retrospectively evaluated their radiographs to find out if they were suspicious for a complication. Six were suspicious but all the patients also had clinical signs. Durham et al[3] assessed 100 patients with mandibular fractures and found that the postoperative occlusion had higher sensitivity and positive predictive value for complications than radiographs, but that the specificity was slightly lower.

Other maxillofacial fractures have also been studied. In their assessment of 257 facial fractures (167 mandibles), Bali and Lopes[1] reported that 3 patients were returned to theatre because of clinical findings. None was based on the radiograph alone. Jain and Alexander[2] prospectively studied