Postoperative radiographs following hip fracture surgery. Do they influence patient management?

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**SUMMARY**

There is still much debate on the appropriateness of taking postoperative radiographs following hip fracture surgery. In our unit, it is routine practice to request postoperative radiographs after hip hemiarthroplasty but not after internal fixation. An audit conducted in our unit highlighted the low acute implant-related complications. This prompted us to conduct a national audit on current UK practice regarding the use of check radiographs following hip fracture surgery. Retrospective case note review of all patients undergoing hip fracture surgery at our hospital, from 2002 to 2004, was performed. Patients undergoing revision surgery in the same admission were identified to determine whether check radiograph influenced the decision. Subsequently a postal performa was sent to 450 randomly chosen UK Orthopaedic Consultants. The performa was designed to determine practice relating to postoperative radiographs. It also attempted to determine whether postoperative radiographs (when requested) influenced the subsequent clinical management of the patient. A total of 1265 hip fractures treated surgically were reviewed locally. Average length of stay was 29.5 days. There were five acute implant-related complications. One revision was performed for a long hip screw which was obvious on the intra-operative image intensifier films. Only one decision to revise (because of incongruous reduction of a hip hemiarthroplasty) was based on a problem identified on a routine check radiograph. All patients undergoing revision were clinically symptomatic. We received 300 responses. Ninety-six per cent routinely took postoperative radiographs following hip hemiarthroplasty of which 83% allowed the patient to mobilise before checking the radiograph. Following dynamic hip screw (DHS)/dynamic condylar screw (DCS) fixation, 61% took check radiographs of which 75% allowed the patient to mobilise prior to reviewing the radiograph. Following cannulated screw (CS) fixation, 58% routinely performed check radiographs of which 67% allowed the patient to mobilise before reviewing the radiograph. The study highlights the lack of national consensus on the use of postoperative radiographs. We recommend that following DHS/DCS fixation and CS fixation, the use of postoperative radiographs should only be undertaken when clinically indicated. Postoperative radiographs following hip hemiarthroplasty should only be undertaken if there are operative concerns or postoperative complications.

**Introduction**

Hip fractures constitute a major proportion of the workload of a trauma unit, presently constituting 20% of orthopaedic bed occupancy and with an estimated UK incidence of 69,500 (age > 65 years) by 2021 (1). X-ray based image intensification is an invaluable tool during operative fixation and the technological advances allow high resolution pictures to be printed as hard copies. However, even when such hard copies are available, postoperative departmental radiographs are routinely requested. Image intensification is not used intra-operatively during a hip hemiarthroplasty and it is common practice to request postoperative check radiographs. In addition to the radiation exposure to the patient, this places a heavy demand on resources including nursing staff, porters, radiographers and radiological resources as well as medical staff. We present the results of two studies.
• A departmental audit to determine the number of revision hip fracture procedures undertaken during the same admission as primary surgery, and whether the routine check radiograph identified the problem.
• A national audit of current UK practice on the use of postoperative radiographs following fractured neck of femur surgery.

Methods
A retrospective case note review was performed, for all patients undergoing hip fracture surgery over the 3 years from 2002 to 2004 at the South Birmingham Trauma Unit, Selly Oak Hospital, Birmingham. We identified those patients who underwent revision surgery following primary fracture neck of femur surgery during the same admission to determine whether a routine check radiograph had influenced their management.

Subsequently a postal questionnaire was sent to 450 UK Trauma and Orthopaedic Consultants sourced from the British Orthopaedic Association handbook and our departmental database of orthopaedic consultants. The computer randomly picked up 450 consultants from the database. The questionnaire was restricted to one side of an A5 card and was accompanied by a letter explaining the background of the study. To improve compliance, all cards had a PO Box number which allowed return postage without the cost of stamps and envelopes. The questions asked were:

• Whether postoperative radiographs were routinely requested following hip fracture surgery?
• Whether patients were allowed to weight bear before the postoperative radiograph?

Results
A total of 1265 operations for fractured neck of femur were performed at Selly Oak Hospital over the 3 years from 2002 to 2004. There were 706 dynamic hip screw (DHS)/dynamic condylar screw (DCS), 99 cannulated screw (CS) and 460 hip hemiarthroplasty procedures. Average inpatient stay was 29.5 days.

There were five acute implant-related complications requiring revision surgery during the same admission. There were two dislocations of a hip hemiarthroplasty. Both of these patients had routine check radiographs which were reported as satisfactory. A repeat radiograph was prompted by episodes of fall in both patients. In one patient, the hip screw was found to be too long on the check radiograph. However, this was obvious on the image intensifier hard copies and had been missed by the surgeon. In another patient, the DHS cut out after mobilisation. A postoperative radiograph had not been requested in this case. The radiograph was requested because of increasing pain and deterioration in mobility. In only one of these patients was the need to revise the initial surgery identified on a routine check radiograph. This was because a routine postoperative radiograph revealed incongruous reduction of hip hemiarthroplasty which was not considered acceptable. Surgery revealed soft tissue interposition in the joint.

Of the 450 questionnaires, 300 replies were received (66.7% response rate). Eighteen responses were excluded as the consultants no longer practiced trauma. Two hundred and eighty-two responses were available for inclusion. No reminder letters were sent out. The results of the postal questionnaire are shown in Table 1.

Discussion
Satisfactory fracture reduction and implant positioning during DHS, DCS and CS fixation necessitates the use of image intensification in theatres. Many theatres also have the facility to print hard copies of the final images for review on ward rounds. Stability of the prosthesis following a hemiarthroplasty is assessed intra-operatively. This audit reveals the common practice of requesting postoperative departmental radiographs.

More than 50% of all consultants still request postoperative radiographs following DHS and CS. In the presence of intra-operative films, we do not believe there is any justification of a routine postoperative radiograph. There are many arguments for

| Operative procedure          | Consultants requesting routine postoperative radiographs (%) | Consultants requiring radiograph prior to weight bearing (%) |
|------------------------------|-------------------------------------------------------------|------------------------------------------------------------|
| Hip hemiarthroplasty         | 96                                                          | 17                                                         |
| DCS/DHS                      | 61                                                          | 25                                                         |
| Cannulated screw fixation    | 58                                                          | 33                                                         |

DCS, dynamic condylar screw; DHS, dynamic hip screw.
requesting postoperative radiograph, especially in relation to hip hemiarthroplasty. Our study revealed an overwhelming 97% consultants request postoperative radiographs. Some consultants commented that they use the radiograph to determine the weight-bearing status. However, only 17% of the consultants actually made this decision on the basis of the radiograph. The clinical impact of the radiograph is therefore minimal. While some surgeons would argue that these radiographs should be taken postoperatively for medico-legal reasons, the Royal College of Radiologists in their guidelines for doctors state: "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" (2). It could be argued that check radiographs following hip hemiarthroplasty are required for surgical feedback and for follow up, but again such indications would not be 'clinically justified' according to the aforementioned statement. Only 14% of the respondents routinely followed up the patients after hemiarthroplasty surgery. The use of the check radiograph as a follow-up tool is therefore questionable. One could possibly advocate the role of the postoperative radiograph in this circumstance as a means of ensuring a high level of 'quality control' for patients. This argument could hold particularly well as many such procedures are performed by junior orthopaedic trainees. However, such operations are often supervised by senior colleagues, thus providing the quality control at the most important juncture, intra-operatively. This should mean that unless specifically indicated, there is to be no place for routine postoperative radiographs. It is extremely rare for a hemiarthroplasty to be revised purely on the appearance of a check radiograph unless clinical symptoms coexist. Obtaining a postoperative film does place a significant demand on already stretched hospital resources. Ward staff and porters accompany the patient to the radiology department. In addition there is the radiation exposure to the patient as well as the cost of the radiographs (3) and use of the radiographer/radiology time to consider. Of even greater concern is the discomfort experienced by the patient in moving from the ward to the radiology department; transfer onto and off the table and back to the ward.

It is clear that appropriate clinical grounds need to be established before requesting routine postoperative films. As reported before, of the five revision procedures during the same admission, in only one patient was the check radiograph found to be the first indication of a problem. In this patient, the radiograph revealed incongruous reduction of the hip hemiarthroplasty. It could be argued that soft tissue interposition can be excluded by diligent postreduction assessment of soft tissues and stability. Even if this case is considered, then only one of 1265 patients had a change of management based on a routine check radiograph. In one patient, the check radiograph revealed that the hip screw was too long. However, careful review of the intra-operative films revealed the screw was long even then. This error should have been picked up in the operating theatre and corrected immediately. In three cases, the clinical picture prompted a radiograph which diagnosed the problem. Any previous routine postoperative radiographs had no bearing on the management.

Based on the above information, we believe that routine postoperative check radiographs following fracture neck of femur surgery should not be requested, especially if intra-operative radiographs have been taken. Any concerns of metalwork/fracture positioning need to be addressed prior to wound closure, especially considering that the patients are often too frail to undergo repeated anaesthesia and surgical trauma. Weight-bearing status should be stated in the postoperative note and any clinical concerns on the ward should be the driving force for further imaging. This study reveals that even when postoperative films are requested, these are not being used to assess weight-bearing status in the vast majority of cases. The use of check radiographs following hemiarthroplasty should be requested only if clinically indicated or if it were to influence the clinical management of the patient (e.g. weight-bearing status). Many studies have been undertaken to assess the validity of the postoperative radiograph and most stress their use only if clinically indicated (3–5). However, almost all studies restrict themselves to DHS and CS fixation. We include the hemiarthroplasty group as they constitute a large number of hip fracture surgeries and are not normally followed up. In our study, we did not look into intra-medullary nailing fixation of these fractures. None of the previous studies have tried to correlate the use of postoperative radiographs with implant-related complications, as in our study.

**Conclusion**

There is no national consensus on the use of the postoperative radiograph following hip fracture surgery. Their use solely for medico-legal and surgical training purposes is not justified in view of the considerable demand on human resource as well as potential risks of repeated patient irradiation. This view is supported by The Royal College of Radiologists. In light of the advances in intra-operative imaging, following DHS and CS fixation, we recommend the use of radiographs in the postoperative period,
only if clinically indicated. A check radiograph following hip hemiarthroplasty should only be requested if it is to have a bearing on the clinical management of the patient.

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