Polymethylmethacrylate extrusion into the femoral nutrient vessel during arthroplasty: A phenomenon to be aware of

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ABSTRACT

Third generation cementing technique is now commonly used for total hip arthroplasty. The aim of this technique is to sufficiently pressurise the cement and allow maximal penetration of the cement into any remaining trabecular bone to provide a stable fixation of the prosthesis. We report a case where this pressurisation resulted in polymethylmethacrylate retrograde filling of the nutrient vessel and we discuss the controversial diagnosis and current literature surrounding this rare phenomenon.

CASE REPORT

INTRODUCTION

Cementing techniques have advanced since their first use in the 1960s. First generation technique involved simple finger packing of the cement into the femoral canal without the use of a distal medullary plug or cement gun. This usually led to areas of lucency where the cement was absent and consequently the prosthesis was not adequately fixed (1). Modern cementing uses a range of methods to provide maximal penetration of the cement into the remaining trabecular bone namely; pulsetile lavage, hypotensive anaesthetic, adrenaline or hydrogen peroxide soaked sponges down the femoral canal, a medullary plug, a cement gun and pressurisation of the cement using a wedge or surgeons thumb.

A complication of this cementing technique is embolization of fat or cement which may result in hypoxia or cardiac arrest. The majority of studies have concluded the emboli are mainly of a fat origin, however, the incidence is increased in cemented rather than uncemented hip arthoplasty (2-4).

Post operative radiographs are taken for a variety of reasons including confirmation of prosthesis position, cementing technique and to exclude whether a fracture has occurred during reaming or insertion of the prosthesis prior to mobilisation.

CASE REPORT

A 63 year old lady underwent a right hybrid total hip replacement for osteoarthritis. The procedure was performed uneventfully. A cement restrictor was inserted to a depth of 18 cm from the greater trochanter. Two mixes of Palacos R cement (PMMA) were vacuum mixed and inserted using a cement gun placed 2/3 of the way down the femoral canal after 2 minutes and 30 seconds. Further pressurisation occurred with a block and the prosthesis was inserted at four minutes.

Post-operative radiograph demonstrated a small focus of high density material around the tip of the prosthesis which was reported as possibly an old injury with some post traumatic ossification (Fig. 1 and Fig. 2). The area of abnormality measured 175 mm distal to the greater trochanter. An acute fracture seemed unlikely as we had experienced no difficulties during surgery. Unfortunately, in this case preoperative radiographs were centred on the pelvis and

therefore did not show enough of the femur. This meant that a comparison could not be made to exclude an old injury.

A CT of this region showed no evidence of a fracture but evidence of cement tracking up the nutrient vessels (Fig. 3 and Fig. 4). The patient was discharged after 6 days and is progressing well without complications.

DISCUSSION

Schiessel et al (5) reviewed preoperative and post operative radiographs of hip replacements and noted the obvious presence of the nutrient artery canal visible on 26.4% of radiographs. They noted this was 170+/- 25 mm distal to the greater trochanter. The femoral vessels were further evaluated by Farouk et al using 20 fresh human cadavers (6). Blue silicone dye was injected through the common femoral artery. They divided the femur into sixths and consistently identified the nutrient artery and its foramen arising in the third sixth 166 +/- 10 mm from the greater trochanter. Commonly this was a branch of the second perforating artery. Another anatomical study noted that the nutrient foramen contained 1 artery and 2 veins (7).

Other authors have described extrusion of cement at the nutrient foramen (8-11) but only with plain film radiographs. The disagreement within these papers surrounds whether the cement had ruptured a vessel or extruded along a vein or artery. All seem to have occurred in female patients and one paper that found a 0.9%-1.6% incidence of cement extrusion and concluded that they occurred in women of small stature with a small endosteal canal (10). Our case would support this finding. Although a comment on previous studies cannot be made, in this case a Computer Tomography showed the cement to remain within a vessel, but we were unable to determine whether this was venous or arterial in origin. An arteriogram would have examined this further but as a fracture was ruled out by the computer tomography this would have not been of benefit to the patient. The difference on radiographs from this and a fracture are that the cement outlines the vessel within whereas a cortical defect would result in an irregular collection of cement that lies adjacent to the bone (12). Also as the greatest pressurisation occurs during implant insertion rather than during insertion of the cement it was felt that any fracture would not be seen only at the tip but rather at the widest part of the prosthesis.

At present no study has reported any increased comorbidity due to cement extrusion nor has there been any reported ischemia due to his phenomenon. This particular patient has recovered well with no complications 6 months post surgery.

TEACHING POINT

Polymethylmethacrylate extrusion into the femoral nutrient vessel is a rare phenomenon but one that needs to be recognised to prevent any diagnostic confusion with a periprosthetic fracture, to stop delays in patient's mobilisation and to expedite discharge.

ABBREVIATIONS

CT= Computed tomography
PMMA = Polymethylmethacrylate

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FIGURES

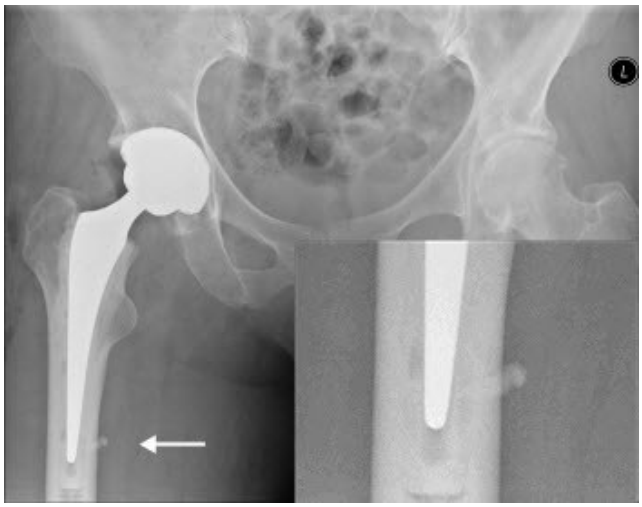

Figure 1: 63 year old female with PMMA extrusion into the femoral nutrient vessel during arthroplasty. AP radiograph of the pelvis demonstrating tubular high density material immediately adjacent to the medial femoral cortex (arrow).

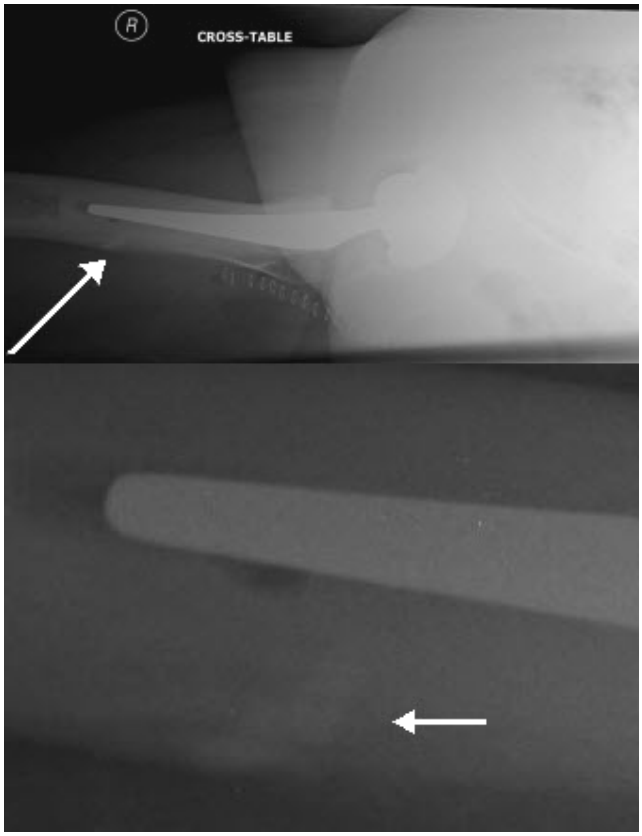

Figure 2: 63 year old female with PMMA extrusion into the femoral nutrient vessel during arthroplasty. Lateral radiograph with arrow highlighting high density region.

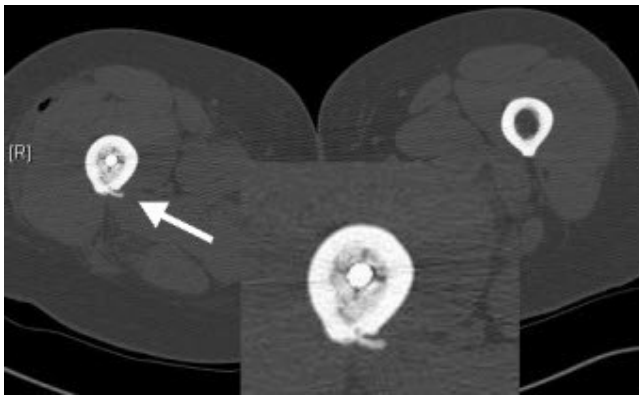

Figure 3: 63 year old female with PMMA extrusion into the femoral nutrient vessel during arthroplasty. Axial noncontrast CT performed at the level of the distal femoral component demonstrating high density cement extruding from a nutrient foramen (arrow).

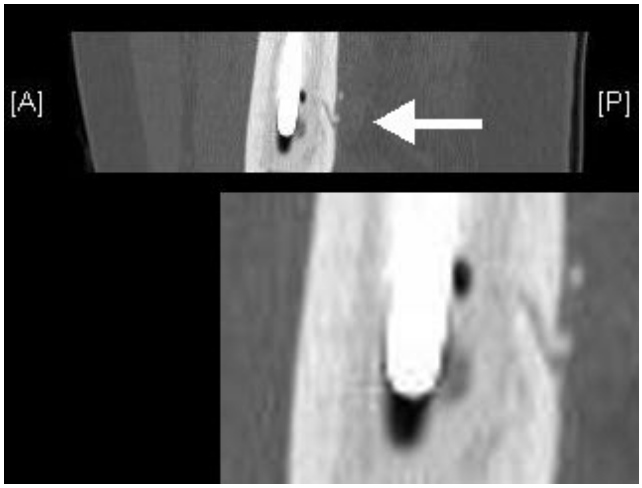

Figure 4: 63 year old female with PMMA extrusion into the femoral nutrient vessel during arthroplasty. Coronal oblique reformatted CT image demonstrating the nutrient canal more clearly with cement extruded from its distal foramen (arrow).

KEYWORDS

Arthroplasty, CT, Computed Tomography, Radiographs, PMMA, Polymethyl Methacrylate

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