FRACTURED CEMENT SPACERS—A REPORT OF TWO CASES

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INTRODUCTION

Cement spacers are being increasingly used for revision arthroplasties. A fracture of the spacer is likely to occur due to fatigue failure unless a hard shell composed of an inert material structurally supports the spacer. We report two cases of failures of the cement spacers, which we believe occurred due to insufficient strength in the articulating cement mould.

CASE 1

A 79 year-old-man attended the accident and emergency department due to severe pain in the hip. He felt a crack in his hip as he bent down to pull a sock up his leg in the sitting position. He underwent a first stage revision about six weeks ago for an infected total hip replacement and an antibiotic loaded cement hip spacer was used to maintain the joint space.

On examination, the left leg appeared shortened and externally rotated. The movements were significantly painful. The distal neurovascular status was entirely satisfactory. The scar over the lateral aspect of the hip had healed well with no local signs of infection and the inflammatory markers were within normal limits. A radiological examination revealed a fracture of the cement spacer at the level of the spacer neck (Figure 1).

Subsequently, a second stage revision was performed. A fracture was found at the level of the junction of the neck and the stem of the spacer. The integrity of the rest of the spacer mould appeared well preserved.

CASE 2

A 76-year-old lady was presented with a history of severe pain following a first stage revision of her infected total hip replacement performed four weeks ago. An articulating antibiotic loaded mould of polymethylmethacrylate (PMMA) cement (Alomed) was used as a spacer for the inter-revision period. The immediate post operative recovery was normal. Full weight bearing

Figure 1. AP view of the left hip showing a fracture of the cement spacer at the level of the neck of the cement spacer mould (Case 1).

mobilisation was commenced shortly after the revision. However, spontaneous onset of severe pain in the hip caused significant restriction of mobility. There was no history of any direct or indirect trauma.

On examination, the leg appeared externally rotated and shortened. The movements of the hip produced severe pain. Examination of the distal leg including the neurovascular status did not reveal any abnormality. The patient remained afebrile throughout, and the inflammatory markers showed a downward trend. A radiological examination of the hip suggested a fracture of the cement spacer mould (Figure 2).

The patient, therefore, underwent a second stage revision after removal of the spacer and showed an uneventful recovery. The level of the break in the spacer and its overall appearance were very similar to that in case I (Figure 3).

DISCUSSION

A methylmethacrylate bone cement spacer keeps the tissue planes intact and prevents soft tissue contracture during the interoperative period of a two-stage revision. More recently, many commercial moulded designs have been introduced that resemble the actual joint

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Figure 2. AP view of the left hip showing a fracture of the cement spacer at the level of the neck of the cement spacer mould (case II).

prostheses, in shape and size. These moulded spacers provide intramedullary support to the weak femur and enable local antibiotic delivery, as well as permit limited mobilization of the patient.[1] It has been shown that if a spacer is used, the patients are almost free of pain and mobile with good leg control, spending two-thirds of the treatment period at home.[2]

However, the mechanical resistance offered by these cement moulds to the weight bearing forces is unknown. Schoellner et al in their study on fabricated moulds showed an average failure load 1550 N on being loaded at 20N/s in a craniocaudal direction.[3]

O'Connor and colleagues,[4] in their invitro study on bone cement, found that there are two specific foci where the magnitude of the strain in the cement mantle approaches values that could lead to early fatigue failure of the cement. These two regions with highest (greater than 1,000 microstrain) strains were the most proximal portions of the cement mantle and near the tip of the femoral component. Although these two regions are recognized areas of high strain and also common sites of cement debonding and cement mantle failure, the strain-gauge studies have shown that the magnitude of cement strains in the proximal portion of the cement mantle were highest especially during stair-climbing. The moulded articulating cement moulds are probably subjected to similar high strains at the level of the spacer neck.

Full weight bearing or excessive movement, as seen in the above two cases, puts the fragile cement insert under tremendous strain and this may lead to fatigue failure.

We, therefore, believe that a construct made of a high strength material should structurally support the spacer and materials that weaken it must be avoided. One study has revealed that the fractures in the cement mantle of a proximal femoral prosthesis are seen by the addition of barium sulphate to render the cement radio-opaque.[5] However, this needs to be investigated by further studies.

Figure 3. The fractured cement spacer mould as removed from the hip.

The moulded cement spacers should, therefore, be treated as just ordinary spacers aimed to maintain the soft tissue planes and length. Full weight bearing mobilisation should be avoided. Commercial designs of the cement spacers may be improved by the addition of a hard shell composed of an inert (non reactive) material with high tensile strength that can withstand weight-bearing forces.

REFERENCES:

1. **Deshmukh RJ, Thevarajan K, Kok CS, Sivapathasundaram N, George SV.** An intramedullary cement spacer in total hip arthroplasty. *Journal of Arthroplasty.* 1998 Feb;13(2):197-9.
2. **Leunig M, Chosa E, Speck M, Ganz R.** A cement spacer for two-stage revision of infected implants of the hip joint. *International Orthopaedics.*1998;22(4):209-14.
3. **Schoellner C, Fuerderer S, Rompe JD, Eckardt A.** Individual bone cement spacers (IBCS) for septic hip revision-preliminary report. *Arch Orthop Trauma Surg.* 2003 Jun; 123(5):254-9.
4. **O'Connor DO, Burke DW, Jasty M. Sedlacek RC, Harris WH.** In vitro measurement of strain in the bone cement surrounding the femoral component of total hip replacements during simulated gait and stair-climbing. *Journal of Orthopaedic Research.* 1996 Sep; 14(5):769-77.
5. **Weber FA, Charnley J**. A radiological study of fractures of acrylic cement in relation to the stem of a femoral head prosthesis. *JBJS.* 1975 Aug; 57(3):297-301.