Importance of pre-operative planning in the use of revision intercalary devices : Case Report

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Citation

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Abstract

The purpose of this case report is to identify the steps needed for pre-operative planning of revision intercalary prosthetic replacement for bone sarcoma, and to discuss some difficulties encountered intra-operatively in such a case.

CASE REPORT

J.Q is a 55-year-old gentleman who initially underwent left mid-shaft humerus intercalary replacement for a pathological humeral fracture through a high-grade leiomyosarcoma. The surgery was performed through an antero-lateral approach in November 2006. A customised, cemented, bi-stemmed coupled device with side-to-side mating junction and 2 set screws was used following templating of the lesion.

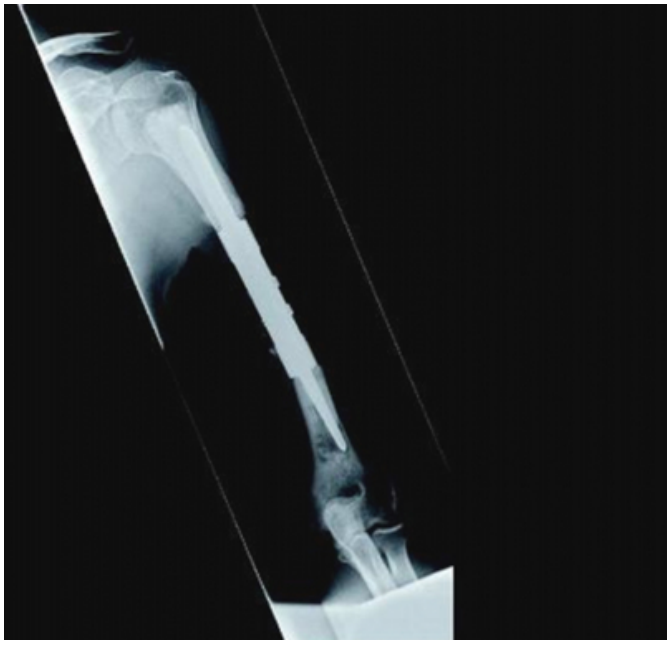
Adjuvant radiotherapy was given to the left humerus, however no chemotherapy was used. Post-operative recovery was complicated by pain and erythema of the wound secondary to radiotherapy but was otherwise uncomplicated.

J.Q had been a very active person who participated in mountaineering and other vigorous exercises. He recommenced most of these activities within 3 months of surgery and approximately 9 months post-fixation he began complaining of instability of his left elbow when his arm was flexed. Blood tests were sent including: full blood count; CRP; ESR; and bone profile, all of which were normal. Radiographs of his humerus at this stage did not reveal any abnormality and so an MRI scan was performed. This showed some oedema around the distal half of the prosthesis and little else of note. There was no convincing evidence of tumour recurrence or infection.

Dynamic screening radiographs were then undertaken in April 2008. These showed that the distal half of the prosthesis was loose and therefore required revision, but that the proximal half of the prosthesis was apparently well fixed. Subsequent plain radiographs have demonstrated radio-lucency at the cement-bone interface with osteolysis distally (fig 1) in keeping with the dynamic screening findings.

Figure 1

Figure 1 - AP radiograph of humerus showing osteolysis and loosening of prosthesis distally



A custom made distal intercalary prosthesis was fabricated to mate with the proximal half of the original prosthesis again with 2 set screws; however an anti-rotation plate with a unicortical screw hole was requested in addition to enhance stability.

An antero-lateral approach through the previous incision was utilised. This provided good exposure to the prosthesis set screws and allowed adequate evaluation of rotational alignment. During surgery, it was again noted that only the distal prosthesis was loose and unstable whilst the proximal

component was well fixed. Therefore it was decided to retain the proximal component and replace only the distal component. As the proximal half of the prosthesis was not being replaced, rotational alignment of the revision prosthesis was fixed. Intra-operatively this resulted in the anti-glide plate being positioned posteromedially (fig 2 and 3) and thus necessitated additional posterior and medial soft tissue release that would not have been required had the plate been placed antero-laterally; as the lateral aspect of the humerus had already required exposure to remove the initial distal prosthesis.

Figure 2

Figure 2 - Intra-operative photographs showing medial dissection and anti-rotation plate placed against medial shaft of humerus

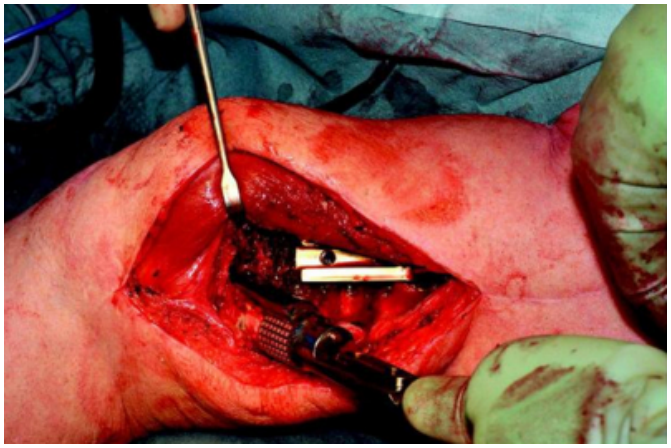


Figure 3

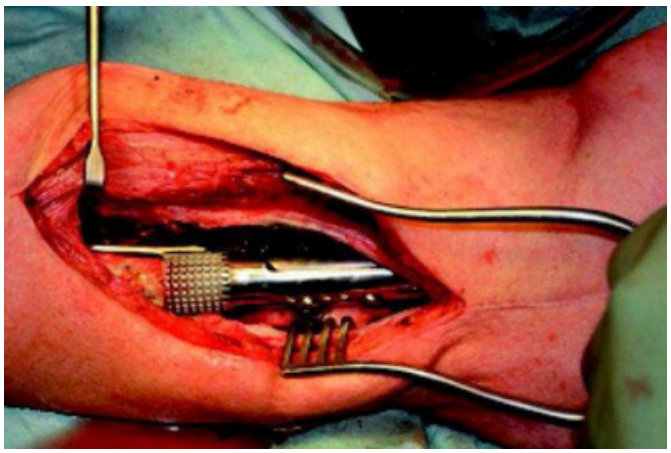
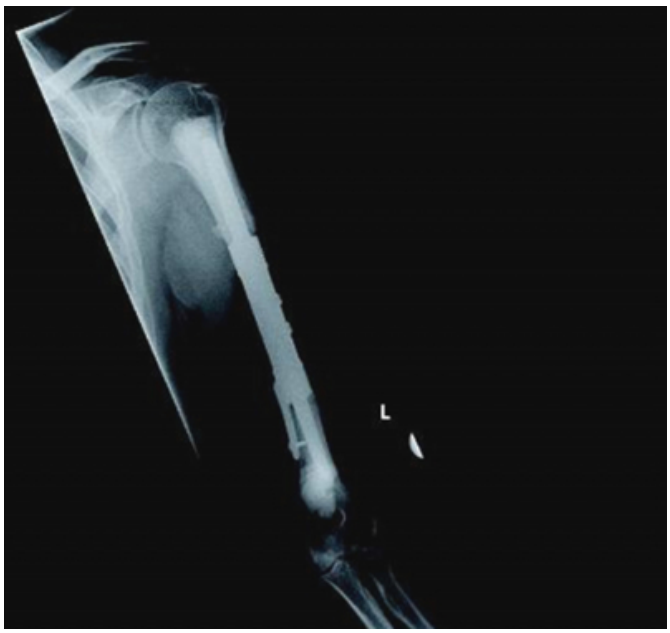


Figure 4

Figure 3 - AP radiograph of the humerus showing revision intercalary prosthesis with medial anti-rotation plate



There were no post-operative complications and recovery was uneventful.

DISCUSSION

When planning revision of an intercalary prosthesis there are many steps that need to be undertaken.

First it is important to take a full history. This should note the type of tumour encountered in the primary procedure, the approach used, and any adjuvant therapy. This is important as treatments such as adjuvant radiotherapy may cause increased scarring of tissues and affect the revision approach. Localised and systemic symptoms are important to elicit as features such as pain, weight loss, and malaise may be indicative of recurrence or infection. Lifestyle factors and co-morbidity are also important, as patients may tolerate symptoms rather than have revision surgery if they have low functional demand or significant co-morbidity.

During examination, soft tissue changes, neurovascular compromise, or evidence of instability or movement at the prosthesis and surrounding bones and joints should be noted. The presence of swelling or localised pain may point to infection, loosening, or recurrence. Systemic examination is important to assess co-morbidity, fitness for surgery, and the possibility of metastatic spread/disease progression.

Baseline blood tests should be taken and include full blood count, CRP, ESR, and bone biochemistry. This is important

as an adjunct to try and differentiate aseptic loosening from infection and or recurrence.

Plain radiographs of the limb showing both the joint above and below should always be taken. This is important to assess size and alignment of the original prosthesis, method and adequacy of original fixation, and adequacy of remaining bone stock.

Thus requirements for revision prostheses can be assessed.

The overall picture guides further imaging and investigation such as ultrasound, bone scan, CT, MRI, aspiration and biopsy.

When using standard bi-stemmed intercalary prostheses, implants can be inserted in any position that allows correct rotation of the limb. This is also the case in revision surgery if both components are being replaced. However in this case only the distal half of the prosthesis was being revised; therefore rotation of the device was fixed by the position of the set screws in the proximal prosthesis.

In such a situation it is important to evaluate the rotational alignment of the well-fixed component pre-operatively as its rotation/position will affect the approach used and subsequently the design of the revision prosthesis (eg. addition and placement of anti-rotation plates). This can be done using standard radiographs taken in the AP and lateral planes at 90 degrees to one another; as this allows assessment of set screw position relative to both the joint above and the joint below and therefore relative to the limb rotation overall. Once this is known the approach can be planned to allow access to the screws and therefore allow implantation and coupling of the device.

Intra-operative tissue samples should also be taken for both microbiology and pathology.

CONCLUSION

The above case report identifies all the steps necessary in the planning of inter-calary revision surgery and some possible difficulties that may arise during placement of such a prosthesis.

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