

Arthroplasties of hips and knees ankylosis in an adolescent with acute lymphoblastic leukaemia

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ABSTRACT

Acute lymphoblastic leukaemia (ALL) is the most common malignancy in children, representing one third of all paediatric malignancies. Patients are often at high risk for complications due aggressive chemotherapy regimes required for treatment. Musculoskeletal complications include septic arthritis, osteonecrosis, osteoporosis, avascular necrosis and bony ankylosis. We report the case of a 16-year-old boy with ALL who developed osteonecrosis of multiple bones on a background of septicaemia, resulting in bony ankylosis of both hips and knees. He was treated with bilateral conversion of ankylosed hips (one hip to total hip replacement, the second hip to Girdlestone arthroplasty) and bilateral ankylosed knees to total knee replacements. He remained well in remission five years after the last surgery. Our case highlights the possible musculoskeletal complications of ALL.

Keywords: Ankylosis, arthroplasty, complications, leukaemia, sepsis

INTRODUCTION

Acute lymphoblastic leukemia (ALL) is the most common malignancy in children, representing one third of all paediatric malignancies. Due to aggressive chemotherapy regimes that include steroids, patients are at high risk including osteoporosis, septic arthritis, osteonecrosis and avascular necrosis. ¹ Bony ankylosis is defined as total loss of joint movement with fusion of the articulating bones. ² Causes include autoimmune dis-

eases, infective conditions and deliberate arthrodesis to fuse a diseased joint for treatment of pain and deformity in uncontrollable sepsis. ³ After about 20 years, 35% to 75% of patients with hip ankylosis develop back pain, 17% to 28% develop contralateral hip pain, and 24% to 57% develop ipsilateral knee pain. ⁴ In view of the associated morbidity it is rewarding to both patients and doctors to restore movement in these ankylosed joints. We report a case of an adolescent with ALL who developed osteonecrosis of multiple bones on a background of septicaemia, resulting in bony ankylosis of both hips and both knees.

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CASE REPORT

A 16-year-old boy who was diagnosed with ALL-T cell lineage (January 2005) was referred to the Orthopaedic department by the oncologists for joint pains during the re-induction phase of chemotherapy. He was commenced nine months previously the Hong Kong ALL-97 chemotherapy protocol (HKALL 97).⁵ In the consolidation phase of the chemotherapy regime, blood cultures isolated *Pseudomonas cepacia* which was treated initially with ceftazidime and later with meropenem.

Radiographs showed grade I Ficat classification⁶ osteonecrosis of both heads of humeri. Symptomatic treatment was initiated. Radiographs that were repeated a month later showed progression to grade II osteonecrosis of heads of both femora with acute-on-chronic slipped upper femoral epiphyses, right side worse than the left and grade II osteonecrosis of both femoral and tibial condyles (Figure 1).

The right hip was drained and pinned in situ using external fixator. Tissue and fluid culture showed no organisms. Two weeks later, cannulated screws fixation of the left hip in situ was done. Both surgeries were covered with antibiotic (Ceftazidime) prophylaxis. Once all clinical and laboratory parameters indicated no sepsis in the right hip, the

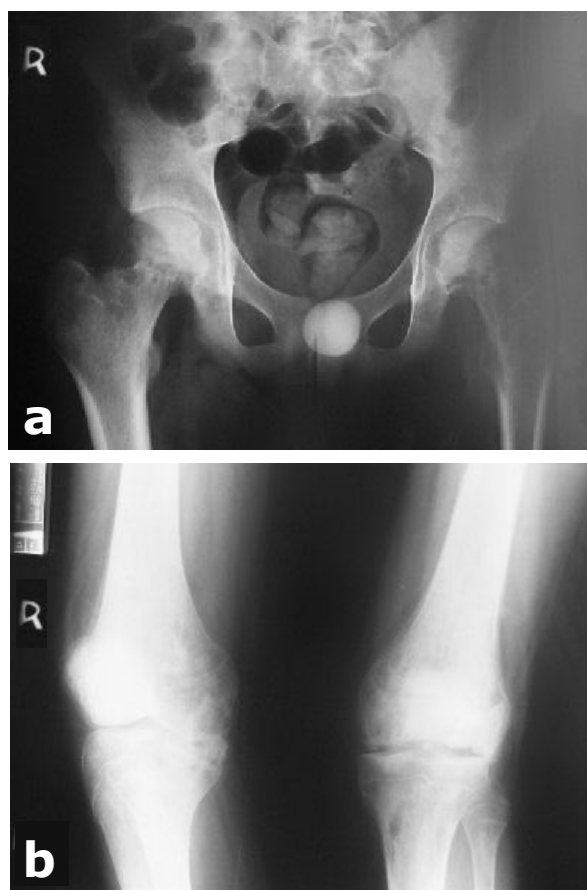


Fig. 1: a) Anterior posterior (AP) view showing Grade II osteonecrosis of both femoral heads with slipped upper epiphyses, b) AP view grade II necrosis of the tibial condyles and c) lateral view of right knee showing osteonecrosis.



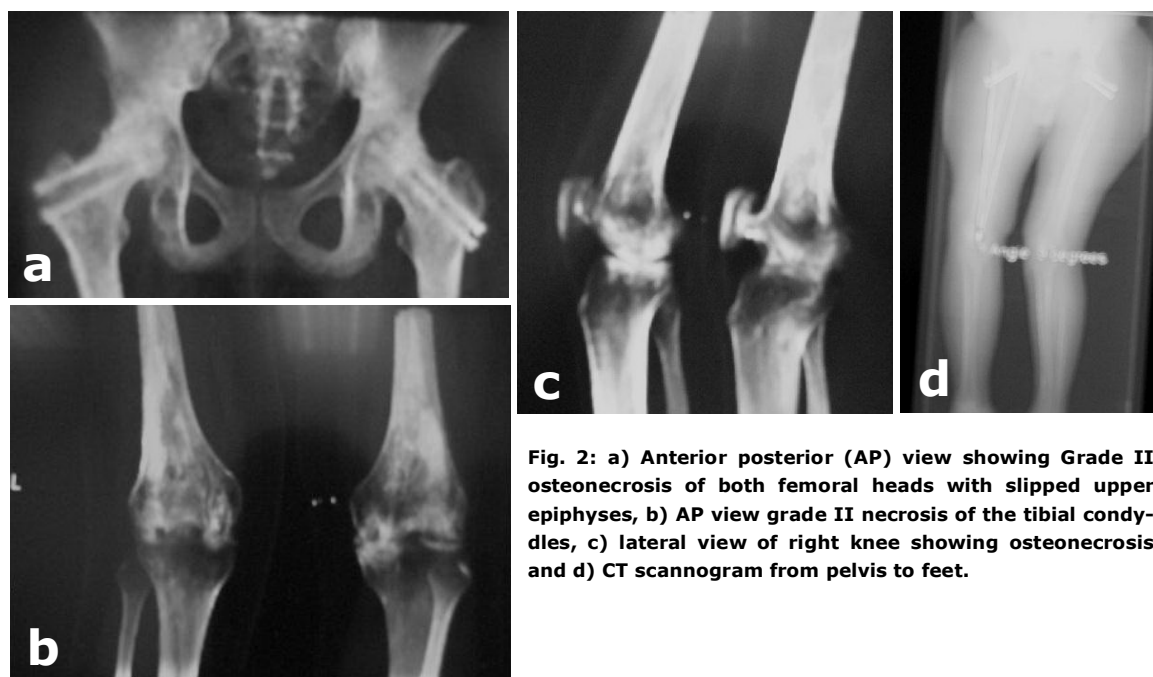


Fig. 2: a) Anterior posterior (AP) view showing Grade II osteonecrosis of both femoral heads with slipped upper epiphyses, b) AP view grade II necrosis of the tibial condyles, c) lateral view of right knee showing osteonecrosis and d) CT scanogram from pelvis to feet.

external fixator was converted to cannulated screws after 10 weeks (Figure 2). After this, early intensive physiotherapy was initiated. In view of the generalised osteoporosis, calcium lactate 300mg t.i.d, Fosamax (Bisphosphate ®, Roche, Switzerland) 70mg weekly and Alfacalcidol (1 α -Hydroxycholecalciferol) 0.25 mcg b.i.d was commenced. Unfortunately despite the extensive support from family, medical social worker and the rehabilitation team, both hips and knees progressed into

ankylosis.

By 18 months, both hips had undergone bony ankylosis in flexion of 30°, adduction of 20°, and external rotation of femur of 15°. Both knees were ankylosed in flexion of 15° and valgoid angulation of 15°. Movement was impossible at both hips and knees and he was wheelchair-bound. The patient and family were then counseled regarding total joint replacements. They were informed of the surgeries and possible complications. It was further explained that the surgeries would be staged, initially starting with the total hip replacements (THR) and later proceeding to total knee replacements (TKR). Repeat radiographs were carried out before surgery. repeat radiographs of the pelvis, both hips including lateral, obturator oblique and iliac oblique views, both knees, CT scanogram pelvis to feet and CT of both hips and both knees were all carried out (Figures 2a-d).



Fig. 3: Total right hip replacement and left Girdlestone inter-positional excision arthroplasty.

He underwent a right THR through the

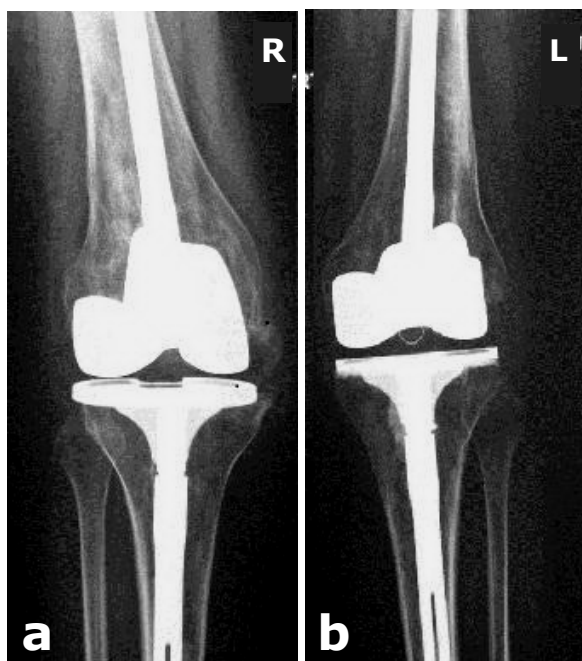


Fig. 4: Bilateral total knee replacements.

Hardinge lateral approach. A cementless porous coated femoral stem with oxinium head (Smith & Nephew Synergy) and Reflection FSO outer shell (Smith and Nephew) with appropriate sized polyethylene inner liner was used. Six months later a left THR was planned but on removing the cannulated screws, pus was observed from one of the screw holes. Hence THR was abandoned, and Girdlestone interpositional excision arthroplasty was done.

Two weeks after the surgery he was able to walk with Zimmer frame for a distance of about 50 meters with assistance for transfers. With the Girdlestone operation on the left side, there was shortening of the left lower limb by 2 cms, which was managed with left shoe raise. One year after the bilateral hip arthroplasties, right TKR was performed. The joint was exposed using Insall's modification of Coonse and Adams patellar turndown approach.^{7,8} Smith & Nephew Genesis II long stemmed cruciate stabilised tibia and femoral

conversion module components were inserted, with standard polyethylene tibial articular insert. The patellar undersurface was resurfaced with polyethylene. The lateral retinaculum was left partially open to improve flexion and patellar tracking.⁸

Post-operatively a continuous passive motion machine was used with knee flexion, 0° to 30° for two hours daily initially and increased progressively to 90°. He was mobilized full weight bearing with Zimmer frame though active straight leg raising and flexion was delayed until four weeks to allow soft tissue healing. By six weeks full gait training was commenced.

One year after the last surgery, he could walk independently with the aid of two elbow crutches. Flexion at the right hip was up to 70° and the left hip up to 65°. Abduction of the hips was 30° on either side. Internal and external rotations were 15° on either sides. Active flexion of the right knee was 65°, and left knee 50°. Five years after the last surgery, he is well and is in remission from the ALL.

DISCUSSION

Our case highlights the challenges faced with managing patients with serious conditions like ALL. The underlying condition places the patients at risk of many complications including orthopaedic problems. Furthermore, the condition itself carries high morbidity and mortality risk. The treatment itself, especially with steroid therapy, renders patients particularly at risk for infectious and non-infectious complications of the musculoskeletal system. Our patient developed multiple joint complications that had resulted in severe ankyloses and

required staged multiple procedures. Furthermore, he developed a septic complication that required a change in the initial planned surgical treatment.

In bilateral ankylosed hip and knee joints, restoring movement to the hips first by THR before proceeding to TKR ensures restoration of pelvic and spinal posture, which will help the patient's ability to stand, transfer, and balance on both lower limbs when the knee replacements are carried out later. It is also desirable to perform THR first because TKR beneath a hip arthrodesis will be under abnormal stress. The correction of the hip deformity realigns the limb better making TKR easier.

The use of long stemmed conversion and uncemented porous coated prosthesis is well established. This preserves bone stock, improves longevity of prosthesis, and reduces the need for revisions.^{10, 11}

The risk of perforation of the femoral canal in hypoplastic and osteopenic bones can be minimised by first introducing guide wire into the canal during both TKR and THR.¹² Sequential reaming is done under image intensifier guidance to the desired stem diameter of prosthesis before routine broaching to accept the true prosthesis. Another pitfall in operative procedures on such patients is possible metaphyseal/diaphyseal mismatch, hence the need to have a full range of prostheses available in theatre for this type of operation.¹³

One year after the last surgery, our patient's mobility and quality of life has improved tremendously. The functional outcome

is encouraging although not comparable to primary arthroplasties of the hips and knees for osteoarthritis. He continues to regain movement in all the joints replaced. The gait also continues to improve

In conclusion, our case highlighted some of the challenges in the management of orthopaedic complications of patients with haematological malignancies undergoing treatment. Every effort should be made to manage these patients aggressively as the results can be rewarding for both patients and treating clinicians.

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Brunei Darussalam — Healthcare in Pictures



Mothers leaving the Kampung Ayer Health clinic using the designated marine transport with their infants after their routine medical check (Picture from the 1953 Brunei annual Report).