

Reconstruction Of A Medial Tibial Plateau Defect Using A "Pillar" Bone Graft – A Report of Two Knee Reconstructions

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ABSTRACT

A technique of reconstructing a large tibial plateau defect has been described using a solid bone graft as a pillar to hold up the tibial component of a total knee replacement. The advantage of using a solid bone graft is that there is good initial structural support for the tibial component. This enables early mobilisation. This method has worked well in the two knees reported. Other methods of reconstructing a tibial plateau defect are discussed.

Keywords: tibial plateau defect, reconstruction, bone graft, total knee replacement

CASE REPORT

A 65-year-old man had advanced osteoarthritis of both knees, with pain for ten years. About 30 years ago, he had an episode of septic arthritis of both knees. *Staphylococcus pyogenes* was isolated, and he was treated for the infection. He subsequently had no recurrence of infection.

On examination, he had genu varum of 15° on the right and 25° on the left. Limitation of movement was 10° to 120° on the right knee and 15° to 100° on the left knee. X-rays (Fig 1) confirmed osteoarthritis of both knees. He was placed on the waiting list for bilateral total knee replacement.

The patient had to be admitted earlier than his scheduled time, due to a stress fracture of his left tibia (as a result of severe genu varum). This was treated with AO plating and iliac crest bone grafting.

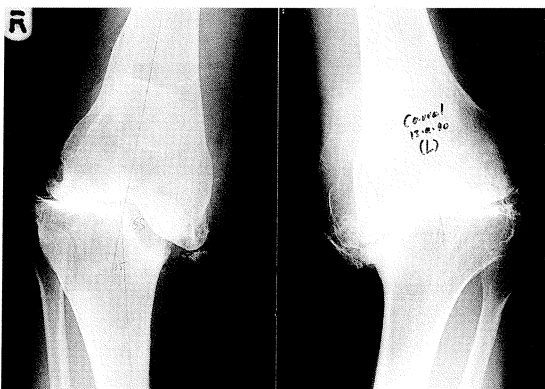


Fig 1 - AP X-ray of both knees: Large defect in both medial tibial condyles, with severe bilateral osteoarthritis.

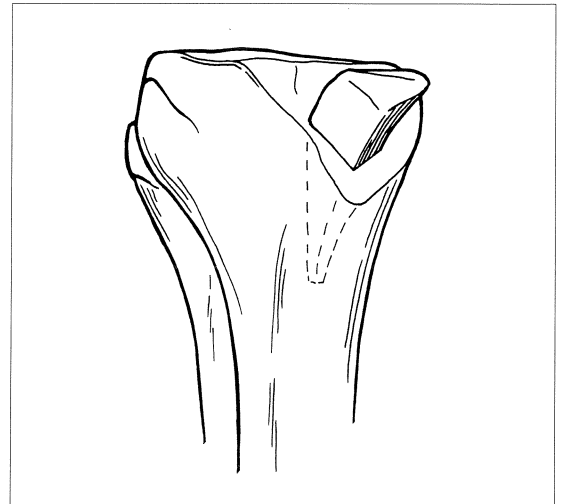


Fig 2 - Diagrammatic representation of the "pillar" bone graft in the medial tibial condyle.

Three weeks later, he underwent a right total knee replacement, followed two weeks later by a left total knee replacement.

At each arthroplasty, there was haemarthrosis with no evidence of sepsis. Clearing of osteophytes and extensive soft tissue release was done. An Insall Burnstein prosthesis was used for each knee.

Additionally, there was a large defect in each medial tibial condyle and this had to be reconstructed using bone graft. We created a pillar by using a peg of intercondylar bone from the femur and placed this firmly into a hole drilled into the medial tibial plateau (Fig 2 & 3). Additionally, several shelves of bone graft were placed, all fashioned from the femoral and tibial cuts.

Post-operative progress after each of the total knee replacement was very good (Fig 4). The patient was nursed in cricket bat splints for five days after which his knee was put on continuous passive motion and he started partial weight bearing with a walking frame. Without his doctor's permission, he started full weight bearing at six weeks after the first knee was replaced.

It is now 3 years after the first total knee replacement. He has two straight lower limbs which have mobile, painless knee joints with a range of movement of 0° to 100°. He walks without aids.

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Fig 3 - Intra-operative picture of "pillar" bone graft after it has been placed in the medial tibial condyle.

DISCUSSION

This patient had a large tibial plateau defect in each knee. There are various methods of reconstructing the defect. Dorr et al⁽¹⁾ wrote that if a tibial defect (especially a peripheral defect) occupies 50% or more of the component support surface, or requires a cement column of more than 5 mm, such a patient should have a bone graft in preference to a cement wedge.

Sculco⁽²⁾ described a technique of reconstructing a tibial condyle defect using a solid cancellous bone graft and fixing it with screws. Insall⁽²⁾ described another technique of converting the tibial defect into a trapezoid and filling it with a mirror image solid bone graft which is self locking.

Bone chips and milled bone graft are not commonly used to reconstruct the bone surfaces at the knee joint. This is unlike the case of hip arthroplasty where the areas to be reconstructed are contained areas which can hold the packed bone chips well (in a fashion similar to Exeter impaction grafting technique or Sloof impaction grafting techniques).

Lotke et al⁽³⁾ concurred with Dorr et al⁽¹⁾ that cementation techniques were not suitable for defects which were more than 5 mm deep. Lotke et al⁽³⁾ showed that cementation techniques were good in their series of 59 patients with defects of less than 5 mm deep, in which there was only one mechanical failure. The relatively large volume of cement used for larger defects is known to increase thermal necrosis at the cement bone interface, and the 2% net shrinkage of the methylmethacrylate during polymerisation probably accounts for the radiolucent lines present beneath most of the large cement wedges, thus affecting the cement bone interface.

Rand⁽⁴⁾, in his experience of using metal wedge augmentation, commented that metal wedges do not

require incorporation by the host, as do bone grafts. Modular wedges were suitable for defects of 3-10 mm depth. It is the present authors' opinion that if larger defects are encountered and wedges are used, intramedullary stems should be attached to prevent shear and toggle forces causing loosening of the tibial prosthesis when the patient weight bears.

Custom prostheses may also be used for severe defects of the tibial plateau. However, they are expensive. Lotke et al⁽³⁾ stated that even with the computer assisted designs, the amount of bone loss in all directions is unpredictable prospectively. Therefore, with an inexact fit, bone may be unnecessarily sacrificed and cement might still be required to fill the defect. Custom prostheses seem to be successful in those knees with deep defects involving more than 50% of a plateau and in revision surgery, where other modalities of treatment have a limited role.

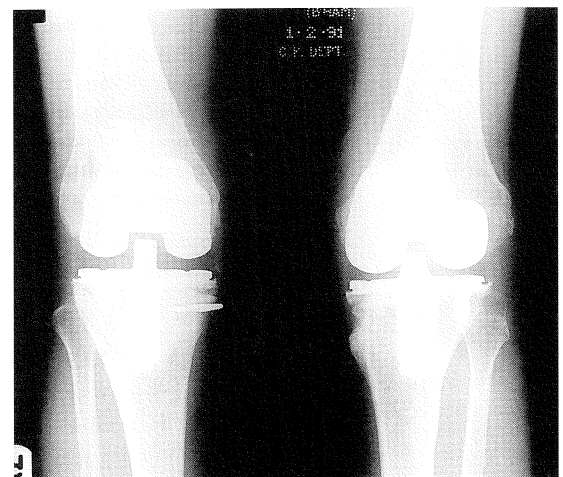


Fig 4 - Two straight legs at 3 months post-operation.

CONCLUSION

A simple and inexpensive technique of reconstructing the tibial plateau has been described using a solid bone graft as a pillar to hold up the tibial component of a total knee replacement. The advantage of using a solid bone graft is that there is good initial structural support for the tibial component. This enables early mobilisation. This method has worked well in the two knees we treated.

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