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Case Report

Successful revision of an infected and challenging knee replacement: A case report

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ABSTRACT

Introduction: Internal rotation of the femoral component is detrimental to the functional results of total knee replacement. However, recent concepts test the limits of internal rotation that may be acceptable. We present an unusual case of an early revision of a total knee replacement for severe internal rotation of the femoral component leading to severe restriction of movement, further complicated by infection and gross instability.

The case: A 63-year-old diabetic lady with a 4-month old knee replacement had persistent pain, instability, flexion of only 10°, and a seropurulent discharge. She needed a staged revision. Because of a femoral internal rotation of between 30 and 40°, the second stage required a reconstruction of the anteromedial aspect of the femoral condyle using structural bone graft to reproduce external rotation and a hinge for stability. The patient has since recovered well and has regained good function with no recurrence of sepsis 22 weeks post op.

Conclusion: We present in this case a rare revision for an unusual amount of severe internal rotation of the femoral component needing a bone graft reconstruction at a location where metal augments are not usually available, further made complex by multiple other complications.

1. Introduction

Revision for infection in total knee arthroplasty is a challenge. However, when one is faced with having to revise an infected total knee implant further complicated by severe femoral component internal rotation contributing to severe restriction of range of motion, and associated with complete collateral incompetence and instability, the challenges multiply. We present one such rare case where all these issues have come together. An informed consent has been obtained from the patient. And the requisite ethics approval from the hospital for the publication of this material has been obtained.

2. History

A 63-year-old lady was admitted on August 8, 2022, with pain, persistent discharge from the front of the knee, restricted range of movement and difficulty in walking after a total knee replacement done elsewhere in April 2022.

She has been a diabetic and hypertensive with pain in both her knees for 10 years. She had undergone a total knee replacement of her L knee in April 2022. She continued to have pain in her knee with severe restriction of the range of motion post operatively. The pain and swelling increased with continued physiotherapy with no increase in range of motion. Eventually, her skin broke down on the lateral aspect of the skin incision revealing a sero-purulent discharge. She was treated with antibiotics, with which the discharge stopped only to recur.

2.1. Relevant clinical examination

At the time of hospitalization, she had a sinus on the lateral aspect of the incision with a seropurulent discharge. Her knee was tender, and slightly warm. She had low grade fever, with a temperature of 99 deg F. She had a flexion of the knee of 10° from full extension with gross opening of the medial joint line on Valgus stress. She was walking with the aid of an invalid walker.

3. Investigations

Her culture was negative for bacterial growth. Her CRP was 7.4 mg/l (normal less than 6) after the antibiotic treatment prescribed prior to hospitalization. Her radiographs (Fig. 1) showed significant rotational malalignment of the femoral component but no component loosening.

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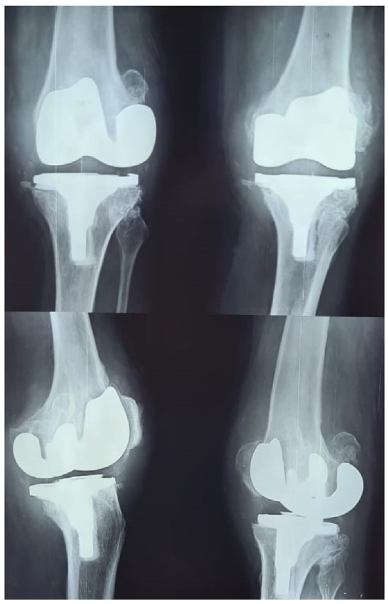

Fig. 1. Radiograph of the L knee – AP (left top), lateral (left bottom), external oblique (right top) and internal oblique (right bottom) views showing significant rotational malalignment of the femoral component.

4. Stage 1 revision

At surgery for the stage 1 revision, the femoral component was seen to be severely internally rotated with the tibial component aligned to the femoral component in internal rotation of at least 30–40° (Fig. 2). There was unhealthy granulation tissue in the joint which was sent for culture.

There was gross instability of the joint due to collateral incompetence. The components were explanted preserving native bone, sent for wash and sterilization by autoclave. The joint was debrided meticulously and washed. The poly insert was discarded, the re-sterilized femoral and tibial components were reused as temporary spacers. The femoral component was cemented late using a cement mixed with 3.5 gms of Vancomycin powder and 2 gms of ceftriaxone powder. The tibial component was used as a scaffold to support the same cement, with the cement taking the place of the poly liner as a spacer articulating with the femoral component (Figs. 3 and 4).

The wound was temporarily sealed with a Vacuum dressing. On the 5th post operative day, when repeat cultures also did not grow any bacteria, the Vacuum dressing was removed in the operation theatre under strict aseptic precautions and the joint was washed again and closed. The patient was then treated with antibiotics until the CRP came to normal and was discharged with oral antibiotics and insulin.

4.1. Stage 2 revision

The patient was re-hospitalized for a planned stage 2 revision after 4 weeks, after her wound showed no signs of infection, and CRP was normal.

The revision was planned with a hinged prosthesis to manage instability. However, correction of the significant internal rotation of the femoral component needed a building up of the anteromedial bone stock of the femoral component after taking the bone cuts for a hinge. Most implant designs offer metal augments for the posterior and distal femoral condyles. This patient however, needed a building up of bone stock along the anteromedial aspect of the distal femur. This was done with a bone block of a thickness of about 13 mms and a width of about 8 mms. Since the bone block was thin, it was stabilized using 2 k wires (Fig. 5).

Tibial and Femoral metaphyseal sleeves with stems were used for added rotational stability and a rotating platform poly insert was used (S-

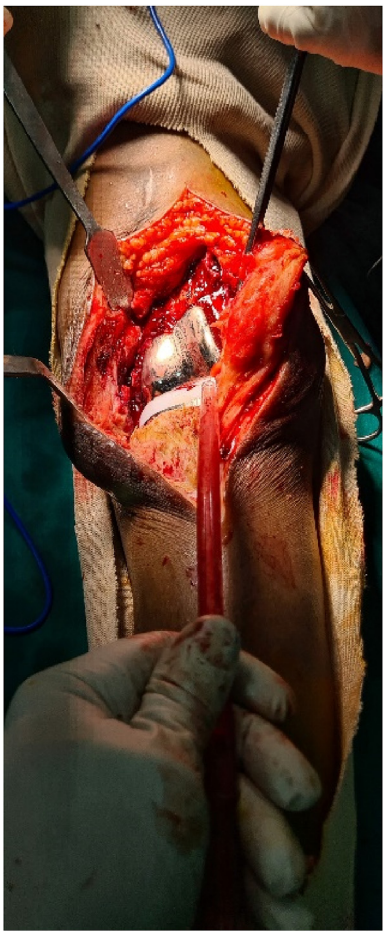

Fig. 2. Per operative image with the knee extended, and a suction tube marking the medial third of the tibial tuberosity and the patella held up using a forceps, showing between 30 and 40° of internal rotation of the femoral component.

Fig. 3. Autoclaved femoral and tibial components repositioned as spacers with antibiotic mixed cement acting as a spacer on top of the tibial component.

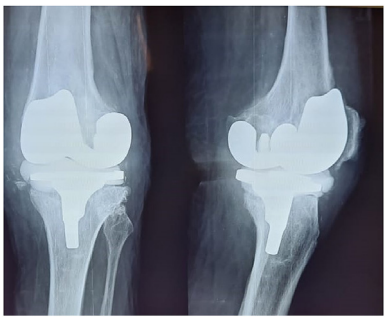

Fig. 4. Post op radiograph of the knee AP and Lateral views showing the antibiotic covered re-sterilized implants acting as temporary spacers.

Fig. 5. Per-operative image showing a large bone block used as a graft to build up the antero-medial femoral bone stock to support the implant. Bone cement was used as the filler for the residual bone voids.

ROM NOILES – DEPUY) (Fig. 6). A small longitudinal crack seen in the anterior cortex of the femur was stabilized with a cerclage wire.

5. Post operative period

The wounds healed uneventfully. The patient was mobilized immediately, but ambulation was deferred until 6 weeks. The patient developed a post-operative common peroneal nerve palsy with foot drop and hence was given a foot drop splint to aid ambulation. At the last follow up at 22 weeks post op, she was walking without support, had mild pain, had a flexion of 100°, had recovered grade 4 power of dorsiflexion of the ankle, and has had no recurrence of sepsis.

6. Discussion

Providing for 3° of external rotation of the femoral component in total knee replacement is considered essential for patellar kinematics, symmetricity of the medial and lateral flexion gaps, preventing anterior femoral notching, anterior knee pain and range of motion.[1] The basis of this concept of 3° has been the work of several authors[2] which suggest that the *Trans*-epicondylar axis is on an average 2–3° externally rotated when compared to the Posterior condylar axis. However, other authors[3] have suggested that although this average may be 2–3°, there is a wide range of approximately 10° between internal and external rotation in the angle between these two axes in individual patients, and that implanting a femoral component in 3° of external rotation in comparison to the Posterior condylar Axis will result in only 51% of implants being within $\pm 2^{o}$ of the Trans epicondylar axis and will render 23% of femoral components internally rotated compared to the Trans Epicondylar axis. This has resulted in newer advances in robotics and newer concepts in alignment questioning the need for a standardized 3° external rotation of the femoral component. In a review of 3048 knee arthroplasties,[4] it has been suggested that an external rotation of less than 2° of the femoral component was a risk factor for failure. In a report of revisions involving internal malrotation of femoral components,[5] the patients were divided into those with a good range of motion of more than 90° but with flexion instability and to those with stiff knees of less than 90° of range of motion, both with pain. In this study, the mean internal malrotation of the femoral component was only 7.1°, and the maximum, only 10. Another report of 22 early revisions for femoral component malrotation[6] also reports good results of revisions. The study however does not quantify the degree of internal rotation of the femoral component. Both the reports,[5,6] identify anterior knee pain, restricted range of motion and instability as among the consequences of component malrotation.

The internal rotation of the femoral component in our case was between 30 and 40° as is obvious in the image (Fig. 2). A search of the literature did not reveal any report describing revision for such a gross internal rotation of the femoral component. Also, the report mentioned above [5] relies on removing more bone on the anterolateral aspect of the femoral condyles and building up the posterolateral condyles with metal augments to correct the malrotation. In our case, this was obviously not an option since the degree of internal rotation meant having to build up bone along the Antero – medial aspect of the condyle, for which metal augments are not available. Although one wonders what may have led

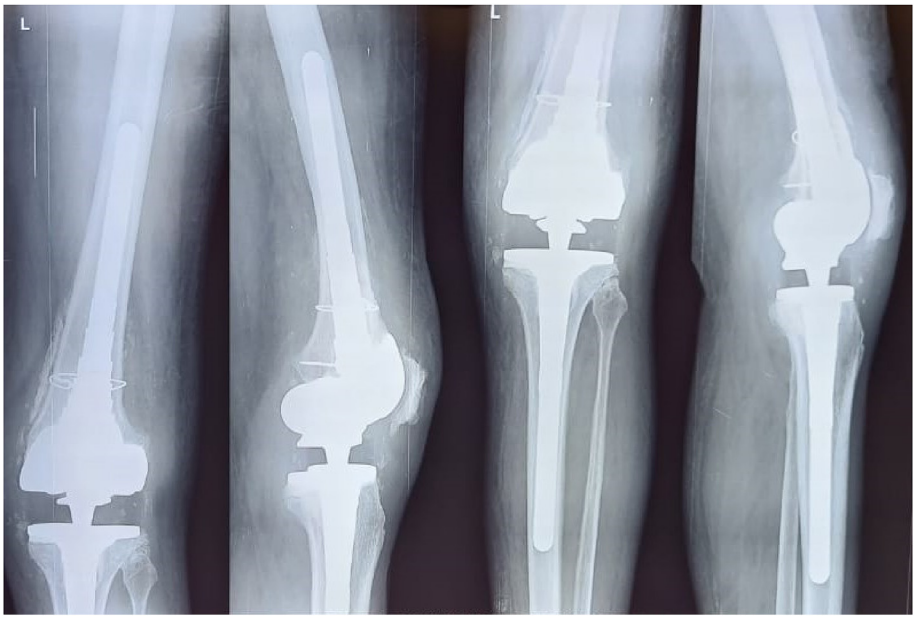

Fig. 6. Post operative radiographs of the distal femur with knee and knee with proximal leg, AP and Lateral views, showing a stable hinged prosthesis.

the previous surgical team to commit itself to such an error in alignment, the consequence of this error has been that the patient had only 10° of flexion and severe anterior knee pain probably due to the patella impinging on the lateral margin of the femoral component and instability. This suggests that, although a few degrees of internal rotation may be tolerated without much consequence to function, excessive internal rotation as shown here is obviously detrimental. Besides, given the recently changing concepts, defining a degree of internal rotation that may be acceptable appears to be a work in progress and may well vary between patients depending on their ligament and bone anatomy. In addition, the gross internal rotation of the femoral component probably had other consequences in the form of compromise of the femoral insertion of the medial collateral ligament leading to instability and severe loss of bone along the anteromedial femoral condyle.

We present this case since these are an unusual series of complications that have presented together in a single case. Such gross internal rotation of the femoral component needing revision is quite rare and has not been reported before. We also would like to present the need for building bone using a bone block along the anteromedial aspect of the medial femoral condyle, fixed with 2 k wires and filling residual voids with cement to provide stability for the rotating hinge implant as well as for the bone graft to incorporate. Most implant designs provide for metal augments to offset bone loss along the posterior and distal aspects of the femoral condyles but not along the anterior aspect.

The author is building a series of revisions using the autoclaved femoral and tibial components, with antibiotic cement on the back side of the femoral component, and the tibial base plate acting as a scaffold for antibiotic cement to be used as an articulating insert temporarily while delivering local antibiotics, to help control sepsis. Although in this case, the gross internal rotation malalignment precluded movement, the purpose of reusing autoclaved tibial and femoral components is to give an adequate temporary prosthetic joint for the patient to use during the interlude between the stages. Although a static spacer may have served the purpose well enough, in the author's hands, autoclaved components as temporary spacers have worked well and the same is being collected as a series.

The author has significant experience in the use of vacuum assisted closure (VAC) in the control of bone and joint infections in trauma and other settings and is now in the process of building a series in the use of VAC in the control of prosthetic joint infections. The benefits include a relatively hypoxic environment inhibiting microbial growth and encouraging neovascularization, and thereby increasing delivery of systemic antibiotics, while at the same time, keeping the local site devoid of purulent fluid collection. In revisions for prosthetic joint infections, VAC may also provide a window for the cultures to arrive, so that the joint may further be instilled with the appropriate antibiotic prior to closure over a drain. The author has employed VAC successfully in at least two cases of early prosthetic joint infections where implants were retained with poly exchange after joint debridement and VAC assisted staged joint closure. The use of VAC in the current instance, has been an extension of that series.

7. Conclusion

We have presented an unusual revision of a primary total knee replacement complicated by multiple factors leading to a failure of the primary surgery. These factors include severe internal rotation of the femoral component causing severe anterior knee pain, skin and soft tissue break down, leading to seropurulent discharge, severe restriction in range of motion of the knee and severe instability in the knee. Such a complex revision needs proper planning, availability of varying degrees of constraint, and plans to build bone stock in an unusual location along the anteromedial aspect of the femoral condyle.

Statement on funding

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Informed consent

An informed consent has been obtained from the patient's family for the publication of this case.

Author contributions

One author: Conceptualization, Formal analysis, Investigation, Writing – original draft, Writing – review and editing.

Declaration of competing interest

None.

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