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Case report

A rare case of oxidized zirconium - All polyethylene tibia unicompartmental arthroplasty failure: A case report

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ABSTRACT

Oxidized zirconium (Oxinium) implants has been claimed as the best material in terms of wear reduction. However, longevity of an all polyethylene uni knee arthroplasty (UKA) has been a long debate. We reported a rare case of 74 year old female who was performed all polyethylene UKA 6 years prior and fell 3 months prior. After the incident, patient was wheel-chair ridden afterwards. There was no evidence of fracture upon conventional radiography examination. Conversion of UKA to total knee replacement (TKA) was performed and patient was able to walk with aid after the surgery. The failed Oxinium all polyethylene UKA failure in this case is suspected due osteoarthritis progression.

1. Introduction

Oxidized zirconium implants (Oxinium; Smith and Nephew, Memphis, TN) were developed to increase the longevity of the replaced knee by reducing the rate of polyethylene wear and minimize the risk of metal allergy [1,2]. However, there have been inconsistent results regarding the long term survivorship of all polyethylene tibia Uni-compartment Knee Arthroplasty (UKA). Several studies reported an acceptable long-term survival and patient outcomes for a medial fixed all polyethylene tibial bearing UKA [3–5]. Bruce et al. reported a survival of 85% at 10 years for patient less than 70 years, and 92.4% for patients older than 70 years [3]. However, another study showed a high rate of early failure between 2 and 5 years with a 10-year survival rate of 85.5% (78.6–92.4 95% CI). Several risk factors observed were age < 65 years and patients with BMI > 30 kg/m^2 [6].

Most common modes of failure were tibial-sided failure, and unexplained pain leading to revision. The pain might be contributed due to the increased repetitive microfracture and bone remodelling caused by elevated proximal tibial strain [7]. This event will cause changes in local cancellous bone architecture and tibial subsidence, or aseptic loosening with ongoing pain.

There are several alternatives to manage a failed UKA but one must choose wisely because the patient most of the times had already felt mentally devastated. Total knee arthroplasty (TKA) revision is often the treatment of choice due to the tibial subsidence as the most common mode of failure with a very satisfying result [8]. Revision TKA is a technically demanding procedure due to the loss of bony landmark following prior surgery and bone defect following implant removal.

This is the first reported case of a failed Oxinium-all polyethylene tibia UKA after 6 years treated successfully by revision TKA. Mode of failure was unexplained pain which might be due increased bony remodelling at the medial proximal tibia compartment.

2. Case presentation

This case was reported according to the SCARE guidelines [9]. A 74 years old female with left knee pain came to the outpatient clinic due to the restricted movement of the left knee since 3 months prior injury. Patient was slipped on the bathroom floor in a sitting position without impact to the left knee. After the incident her left knee felt constantly in pain despite analgesics and steroid injection at the previous hospital. Patient had been performed UKA on her left knee 6 years prior and TKA

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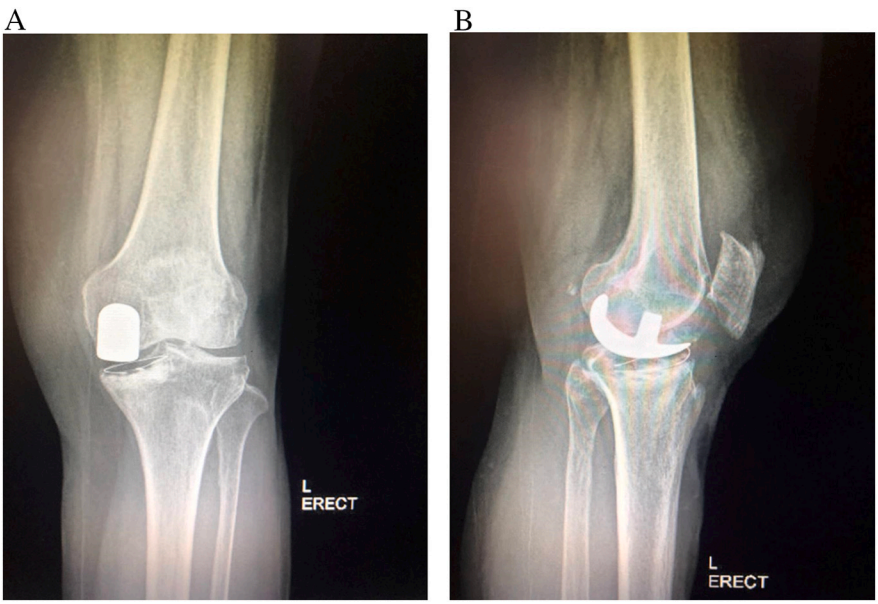

Fig. 1. A, Anteroposterior (AP) and B, lateral view of left knee showing soft tissue swelling and osteophyte formation at the posteromedial tibia.

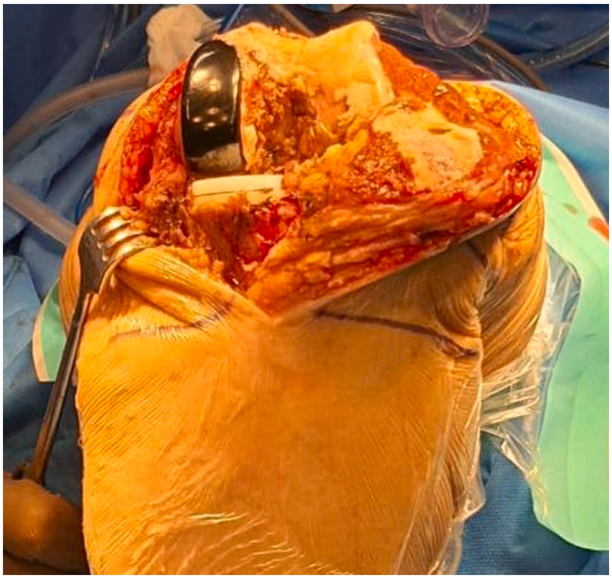

Fig. 2. Intraoperative finding showed destruction of the lateral compartment.

Fig. 3. Implant removal showed osteophyte formation at the posteromedial border of the polyethylene tibia.

of her right knee 10 years prior. There was no history of previous medical condition nor routine drug consumption of this patient.

Patient was slightly overweight with body mass index (BMI) of 25. Upon examination the left knee was swollen without bruise or redness, tender to touch with a Visual Analog Scale (VAS) score of 5–6, and range of motion (ROM) was 30–45°. She had her right knee performed TKA 10 years prior also but there was not any complaint. She had been mobilizing using wheel chair for the past 3 months but was able to walk normally 3 months prior without aid.

Radiographic result showed soft tissue swelling and osteophyte formation of the posteromedial compartment (Fig. 1) and UKA revision with TKA was planned for the patient.

Surgery was performed after epidural and spinal anaesthesia, using the common midline incision and medial parapatellar approach for TKA. Intraoperatively we found a well fixed implant but destruction of the lateral compartment (Fig. 2) and osteophyte formation surrounding the polyethylene tibia at the posteromedial tibia compartment (Fig. 3).

The prior implant was removed and the femur was cut at a 9 mm measurement and tibia was cut at the height of the medial tibia plateau then femoral and tibial component were fitted and 15 mm insert was implanted. Patient was stable upon extension and full flexion. The wound was closed layer by layer leaving a vacuumed drain. Postoperative radiograph was obtained showing good alignment and well fixated implant (Fig. 4).

The day after the surgery patient physiotherapy was started in bed and patient able to do active range of motion (ROM) of 0–45°. Three days after the surgery, ROM was improved to 80°, the vacuumed drain was removed, patient was taught to walk using walker and then discharged home. Fifteen days after surgery, the suture was removed, patient came with minimal pain and ROM improved to 90°.

The following six months after surgery patient did a whole limb scanogram and the radiograph result showed a perfect alignment after

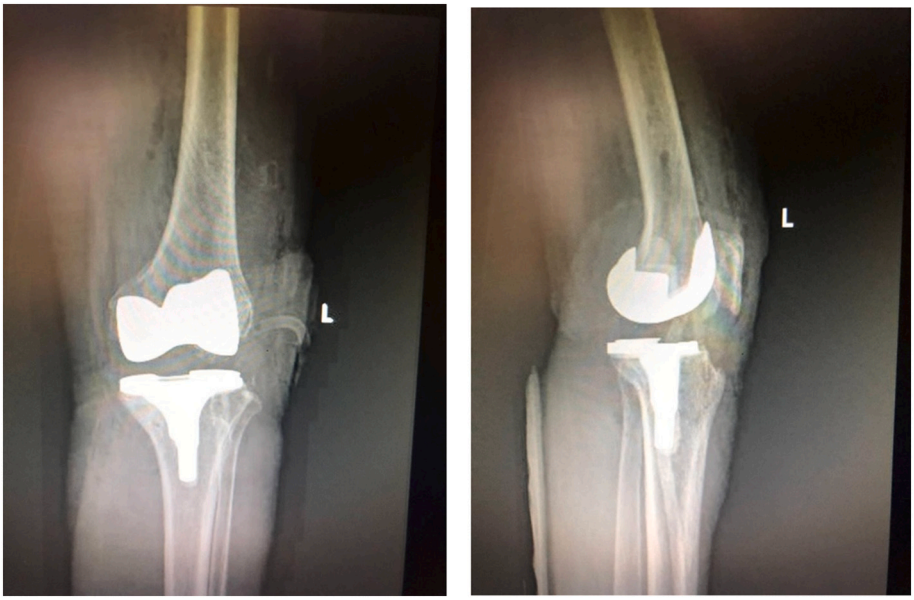

Fig. 4. Postoperative radiograph showing well implanted TKA.

revision TKA (Fig. 5). Patient was pain free, with an ROM of 0–120 and was able to walk without aid.

3. Clinical discussions

There have been various results regarding the survival of all polyethylene tibia results. Several studies mentioned a good long-term survival of 90–92% within 10–15 years using a minimum polyethylene thickness of 9 mm [10,11]. Heck et al. stated that components of 6 mm thickness have been associated with early clinical failure [12], while Scott et al. [13] showed that components until 10 mm still exhibited higher tibial strain compared to metal-backed tibia UKA with an increased risk of additional tibial resection and lesser cancellous bone strength. In our case, we found a thickness of 8 mm polyethylene tibia which might be inadequate to withstand the tibial strain going on the medial compartment.

Survivorship as low as 56% at 7 years (32–75 95% CI) for the all polyethylene tibia compared to 93.8% (77.3–98.4 95% CI) has been reported in one study [14]. The significantly lower survival rate for the all polyethylene type was probably due to the higher tibial strain at the adjacent bone compared to the metal-backed implants [6]. There have been controversies regarding the actual mechanism of higher revision rate in all polyethylene tibia but the most common modes are aseptic loosening, progression of osteoarthritis and unexplained pain [3]. In this study, the progression of osteoarthritis precipitated by history of trauma renders the patient to be wheel chaired-bound and decided to do revision surgery. However, the correlation between the rate of osteoarthritis progression and UKA materials is yet to be explained.

Newer study evaluated the use of bone scintigraphy to measure the bone uptake in all polyethylene UKA. A “hot” uptake depicts persistent bone marrow edema and pain which might help to understand the mechanism of pain in an all polyethylene tibia [15]. However, more studies are needed to elaborate the role of bone scan for UKA more.

4. Conclusion

We reported a rare case of failed Oxinium all polyethylene UKA failure which is caused by osteoarthritis progression and treated well with revision TKA.

Consent of patient

Written consent has been informed to the patient prior to publication.

Provenance and peer review

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Ethical approval

Not needed.

Funding

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Guarantor

LAP is the guarantor of this study.

Research registration number

N/a (this is not the ‘First in Man’ study nor an intervention study).

CRediT authorship contribution statement

LAP: Conceptualization, Methodology, Data curation, Supervision
IHD: Writing - Original draft preparation, Investigation
AFK: Writing - Original draft preparation, Investigation
WW: Investigation, Software, Validation
JF: Writing - Reviewing and editing.

Fig. 5. Scanogram showing perfect alignment post revision TKA (left).

Declaration of competing interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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