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Surgical Technique

Debridement, Antibiotics, and Implant Retention for an Early Periprosthetic Infection After Unicompartmental Knee Arthroplasty: A Technical Note

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ABSTRACT

Early periprosthetic joint infection in unicompartmental knee arthroplasty (UKA) is shown to have a detrimental effect on the success of UKA surgery not only because of the sequences of the infection but also due to the other healthy lateral compartment. It is well known that Oxford meniscal bearing UKA is a very precise procedure that the use of any excessive force may have an injurious effect on the future prosthesis stability with a higher risk of bearing dislocation. This technical note aims at describing how to deal with a case of early periprosthetic joint infection in a female patient who underwent debridement, wash, implant retention and change of the mobile bearing insert including the demonstration of a difficult step during this procedure.

Introduction

The use of unicompartmental knee arthroplasty (UKA) as a treatment option for anteromedial arthritis is increasing worldwide [1–3]. Despite being one of the most successful procedures in the last 3 decades [4,5], UKA still has some unique complications that need special management. Oxford meniscal bearing UKA (Oxford partial knee; Zimmer Biomet, Warsaw, IN) is now gaining increasing popularity because of its excellent long-term survival and lower complication rate than fixed-bearing UKA [2,3,6], with bearing dislocation remaining the most common complication following Oxford meniscal bearing UKA [7].

Periprosthetic joint infection (PJI) is a devastating complication in the setting of any knee arthroplasty [8]. Fortunately, the rate of infection in UKA is comparably lower than that in total knee arthroplasty (TKA), reportedly ranging from 0.1% to 0.8% [9–11]. Early PJI after UKA is detrimental with only few studies reporting results of debridement, antibiotics, and implant retention (DAIR) after PJI in UKA [9,12–14]. Because of the rarity of studies focusing on PJI after UKA and the gap in knowledge despite those studies, we do not know for sure whether the treatment of PJI after UKA should follow the same steps as TKA, where a 2-stage revision is usually recommended for established infection, or whether less-aggressive procedures such as DAIR might be used. In addition, the presence of normal cartilage in the 2 other compartments represents a major concern about the ideal treatment of PJI after UKA. Moreover, the noxious effect of infection on native cartilage and subsequent progressive arthritis is a unique mechanism of failure after performing DAIR in UKA when compared with TKA [13,15].

Despite the ongoing advances in joint replacement instruments and techniques, revision and DAIR procedures remain relatively difficult and require precise and good preoperative planning [16,17]. In this technical note, we describe in detail the steps of a successful DAIR procedure in the setting of PJI of an Oxford meniscal bearing UKA case. We are also addressing a tip on how to remove the polyethylene mobile bearing insert as a part of the DAIR procedure. Removal of the bearing from a well-balanced knee is usually a quite difficult step, and to our knowledge, this technical note is the first to describe in detail management of mobile bearing UKA DAIR procedure including how to easily remove a mobile bearing insert.

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Surgical procedure

A 55-year-old woman presented to the outpatient clinic with bilateral anteromedial arthritis more on the right side, and the patient underwent meniscal bearing UKA on the right side (Fig. 1).

One week after the surgery, the patient presented to the outpatient clinic with discharging wound and soaked dressing. So DAIR with exchange of the polyethylene bearing was done.

The DAIR procedure was performed under spinal anesthesia with the patient in the supine position and her right knee free on the operating table, and the knee was exposed through the same minimally invasive medial approach which was previously used in the primary surgery (Fig. 2).

Skin incision with refreshment of skin edges was done, and culture sensitivity aspiration was performed before opening the joint.

For the polyethene bearing removal (which was 3 mm in height), a hole in the anterior rim of the bearing with a 3.2 mm drill bit was made, following which we used a 6.5 mm tap for the cancellous screws (Fig. 3) to have a good purchase in the polyethylene bearing, and then the knee was flexed to 110° to facilitate its removal by pulling the cancellous tap which is anchored to the polyethylene insert (Figs. 4 and 5).

After removal of the bearing, vigorous joint irrigation with sterile normal saline and povidone-iodine was performed while other potentially caustic irrigation solutions were avoided to protect the native cartilage. Thorough debridement and total synovectomy were then done without the involvement of the articular cartilage in the debridement process. Refreshment of the patellar tendon edges with ultimate care not to injure the healthy lateral and patellofemoral compartments.

Before insertion of a new bearing, a trial was done to test any change in flexion and extension gaps that may have occurred during the DAIR procedure, and we used a 4-mm bearing to be inserted instead. Eventually, a suction drain with positive pressure was inserted, and wound closure was done.

The patient was discharged 2 days after the operation on parenteral antibiotic according to the culture and sensitivity test that was performed and continued for one and a half months.

At 1-year follow-up, the patient had full knee extension and near-normal range of motion (110° flexion) with no signs of infection and no pain. The Oxford Knee Score at 1 year improved to 40 compared to 25 preoperatively.

Discussion

Treatment for UKA PJI is associated with a high risk of reoperation because of reinfection, implant loosening, and disease progression [12]. Although treatment of UKA PJI with DAIR was associated with a lower survivorship (regarding reinfection) at 5 years than 2-stage exchange with conversion to TKA [12], it is recommended that

Figure 1. Preoperative and postoperative radiographs with anteromedial osteoarthritis and unicompartmental knee arthroplasty.

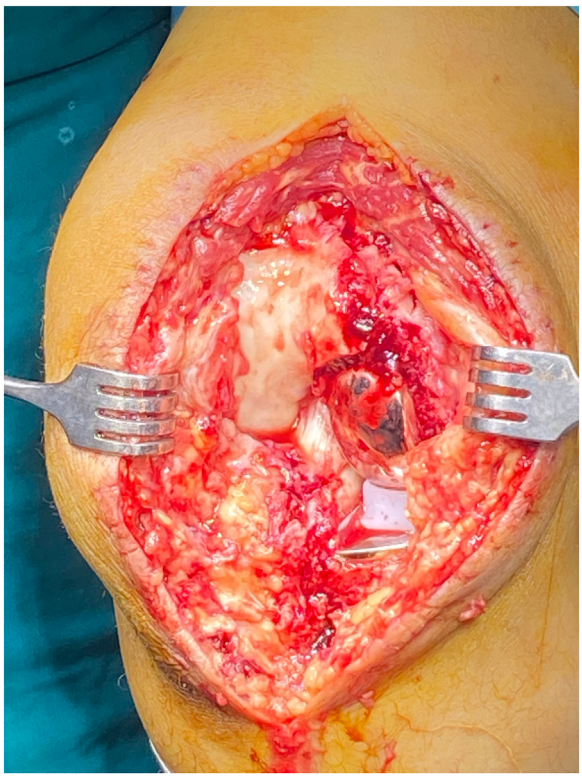

Figure 2. Using the same minimally invasive medial parapatellar approach.

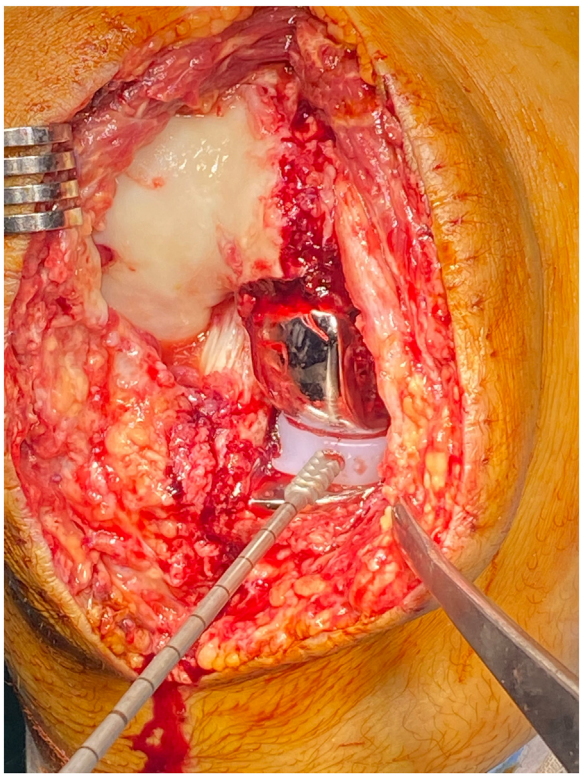

Figure 4. Removing the insert.

patients who had a longer duration of PJI or had more severe host and extremity status should receive 2-stage exchange and that those who had a shorter duration of PJI should receive DAIR [17,18].

Hernandez NM et al. [12] reported a survivorship free of PJI of 61% at 5 years in patients treated initially with DAIR. These results are quite similar to those obtained when DAIR is performed for infected TKA. The failure risk of the DAIR procedure after UKA in their study was 39% which is comparable to the failure risk (26%-48%) of DAIR after TKA as reported by some authors [16,18,19].

Chalmers BP et al. [9] reported 76% survivorship free from persistent PJI at 1 year which is relatively low compared with 2-stage revision but still consistent with the results of DAIR after TKA.

Aseptic reoperation after DAIR procedures was reported to be high [9,12]. Hernandez et al. [12] reported a high rate of aseptic reoperations, where 2 out of the 7 patients (who underwent DAIR) had aseptic conversion to TKA at a mean of 4 years secondary to early lateral compartment degeneration. This compared to only 1 patient out of the 4 who received a 2-stage revision for early aseptic femoral loosening. These results show that the normal cartilage in the normal compartment can be seriously affected by the present infection even more than occurring in septic arthritis with accelerated progression of arthritis and cartilage damage.

Accelerated progressive arthritis in the other compartments as reported by Hernandez et al. [12] may be partly due to the aggressive debridement of articular cartilage at the UKA DAIR

Figure 3. Showing the 6.5 mm tap for the cancellous screws that was used to remove the insert.

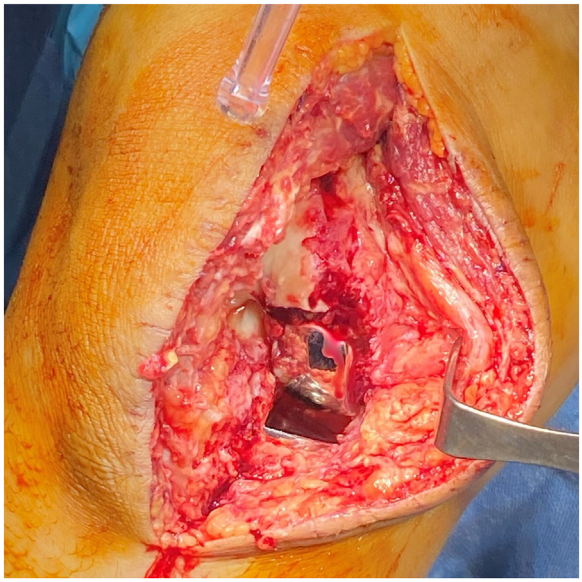

Figure 5. After debridement, irrigation and insert removal.

procedure which was considered to be important for success in infection eradication. Nevertheless, it is still debatable whether debridement of articular cartilage is necessary because treatment of native septic arthritis has been reported to be equally successful with arthroscopic irrigation alone [20]. Another important detail is the irrigation solution which will be used during the DAIR procedure in UKA and its possible cytotoxic effect on native cartilage. Contrary to what was expected, a recent study outlined that povidone-iodine was less toxic to human chondrocytes than other commonly used irrigation solutions [21].

A major concern during the DAIR procedure in meniscal bearing UKA is the removal of a well-fixed mobile bearing without doing harm to the remaining healthy structures such as the medial collateral ligament, the anterior cruciate ligament, and the healthy cartilage laterally [9,12]. It is well known that Oxford meniscal bearing UKA is a very precise procedure that the use of any excessive force may have a detrimental effect on the future prothesis stability with higher risk of bearing dislocation. In fact, this step is considered the most important step in the procedure as polyethylene must be removed to wash the undersurface of the prothesis and to reach the posterior compartment [9,13]. Excessive force in this step may lead to iatrogenic rupture of medial collateral ligament, mismatch in flexion-extension gaps (with subsequent risk of dislocation of the newly implanted insert in the future), injury to the healthy lateral compartment, and damage to the femoral and tibial components by instruments that may be used to remove the bearing.

Conflict of interest

The authors declare there are no conflicts of interest.

For full disclosure statements refer to https://doi.org/10.1016/j.artd.2022.06.009.

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