A New Technique for Articulated Cement Spacers in Infected Total Knee Arthroplasty

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Abstract

Chronically infected total knee arthroplasty (TKA) represents a surgical challenge with many potential complications. The standard of care is a 2-stage reimplantation.

This report describes a modification of the first stage using the protocol described by Hofmann and colleagues in 1995. This modification was developed by the senior author (GPD) in response to episodes of tibial subluxation and postoperative instability detected between the first and second stages. This modification utilizes a rotating platform all polyethylene tibial component insert with a keel that offers a more stable construct which allows increased stability of the component.

Employing this technique, we have had good clinical results with an average knee flexion of 105º, no cases of tibial component migration or subluxation, or recurrence of infection.

Insall and colleagues[1] were the first to describe a 2-stage reimplantation as a treatment for infected total knee arthroplasty (TKA). In their index series, the prosthesis along with all of the cement was removed, no antibiotic impregnated cement spacer was used, and the patient underwent a course of 6 weeks of antibiotics before final reimplantation. They reported good results with the most common complication being extensor lag.

Articulating antibiotic loaded cement spacers of the knee were first described by Hofmann and colleagues[2] in 1995. The first stage involved irrigation and debridement of all necrotic tissue, synovectomy, and removal of all components and cement. After adequate debridement, an articulating spacer was devised. The articulating spacer was made by cleaning and autoclaving the removed femoral component. This was reinserted during the same operation and articulated with a new tibial polyethylene insert and sometimes a new all polyethylene patella component with the pegs removed (40%). A thin tibial polyethylene insert was used rather than an all-polyethylene tibial component so that a large amount of antibiotic-impregnated cement could be placed between the insert and bone.[2]

This technique was found to improve range of motion, soft tissue health, and significantly decrease the risk of infection.[2] Emerson and colleagues[3] compared static versus mobile spacers in the staged treat-

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Figure 1. X-ray, anteroposterior left knee, articulating cement spacer (A) and x-ray, lateral left knee articulating cement spacer with anterior migration (B).

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Figure 2. Intramedullary cement dowels for femur and tibia.

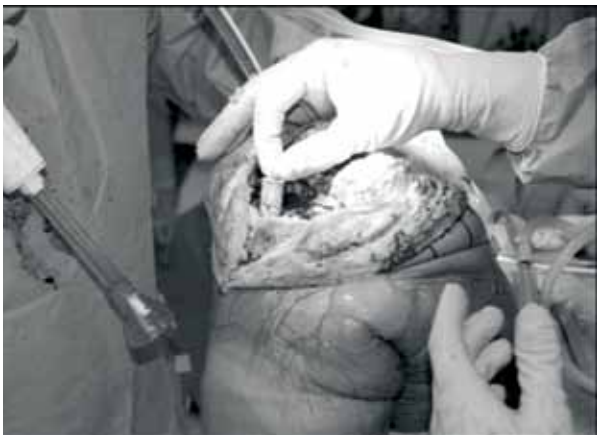

Figure 3. Placement of cement dowel placed into tibial canal.

ment of infected TKAs and found improved range of motion in flexion prior to implantation of 73.4˚ and 93.7˚, respectively.

One complication occasionally encountered with articulating cement spacers is tibial component migration and subluxation during flexion of the knee (Figures 1A and 1B). This subluxation can cause pain, instability, decreased range of motion, and wound compromise. In an attempt to rectify this, we utilized a rotating platform all polyethylene component with a keel instead of the standard polyethylene liner as described by Hofmann.[2] It has been our experience that this modification complements the basic principles of the Hofmann technique by minimizing postoperative tibial component migration or subluxation.

Materials and Methods

Patients identified by laboratory and clinical data as having a deeply infected TKA were consented for the first of a planned 2-stage revision. Twelve patients for a total of 14 knees, including 2 patients with bilateral involvement, underwent placement of an articulating spacer with the addition of a keeled poly. The study included 8 women and 4 men with an average age of 67 years (range, 59-83 years). All patients received parenteral antibiotics in the perioperative period.

Figure 4. All poly tibial component in place with placement of flashed femoral component.

Figure 5. Cruciate retaining polyethylene rotating platform tibial component with keel shortened.

The first stage involved irrigation and debridement of all necrotic tissue, synovectomy, and removal of all components and cement. Intramedullary cement dowels were fashioned and placed into the femoral and tibial canals respectively (Figures 2 and 3). The femoral component was cleaned of all cement and debris, sterilized, and then reinserted during the same operation (Figure 4). This was articulated with a cruciate retaining all polyethylene rotating platform tibial component of the correct size. The keel was shortened to accomodate the tibial cement (Figure 5). Antibiotic cement (DePuy Orthopaedics, Inc, Warsaw, Indiana) (GMV with 1 g Gentamicin) plus 3 g of Vancomycin and 2 g of Tobramycin was then loosely cemented between the prosthesis and bone.

A standard physical therapy program was initiated postoperative day one. Patients were allowed to weight bear as tolerated and were encouraged in active range of motion. Upon discharge, antibiotics were continued for 6 weeks. Reimplantation occurred at 3 months. All patients were evaluated in the clinic at 2, 6, and 12 weeks postoperatively, at which time measurements of knee range of motion and radiographs were performed (Figures 6A and 6B).

Results

The average time from first stage to second stage revision was 12 weeks (range, 11-14 weeks). No cases of

Figure 6. X-ray, anteroposterior right knee, with rotating platform all poly tibial component (A), and x-ray, lateral right knee, with rotating platform all poly tibial component (B).

reinfection or radiographic evidence of tibial component migration were identified. Average knee range of motion prior to final component placement was 105º with a range of 80º to 120º.

Conclusion

We report encouraging early results using this protocol for 2-stage treatment of an infected TKA. A clear advantage of an articulating mobile spacer is preservation of joint motion, which aids to prevent postoperative soft tissue contractures and loss of tissue planes.[4] No cases of tibial polyethylene migration or subluxation have occurred since utilizing this modified technique with a keeled body. We have utilized this technique with encouraging results and believe it to be a reproducible method of obtaining increased fixation and stability of the articulating spacer.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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