

AAOS 2011 Focus

Redefining Success in

Revision TKA Surgery



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Addressing bone loss with porous-coated metaphyseal sleeves

University of Pittsburgh study finds early sleeve survival may suggest long-term ingrowth.



Michael R. Pagnotto

SAN DIEGO – Bone loss caused by osteolysis presents challenges to orthopedic surgeons, and with a projected 600% increase in revision total knee arthroplasty (TKA) procedures by the year 2030,¹ surgeons need more reliable revision techniques that fill large defects and provide a durable construct. Current options include cement, augments, bone grafts, custom prostheses and metaphyseal fixation techniques.

One way to fill defects and achieve stability is by using tibial and femoral metaphyseal sleeves to aid short-term bony ingrowth, according to one study.²

At the 2011 annual meeting of the American Academy of Orthopaedic Surgeons (AAOS), **Michael R. Pagnotto, MD**, discussed his group's findings for patients with severe bone loss. Surgeons evaluated 54 total patients who had 53 tibial sleeves and 32 femoral sleeves implanted. Short-term outcomes showed evidence of bony ingrowth, but researchers continue to track long-term results.

"We found that early stability can be achieved using our broach technique, and porous-coated metaphyseal sleeves may be used in revision total knee with [Anderson Orthopaedic Research Institute (AORI)] type 2 and 3 bone loss" (Figure 1).

Methods

Conducted at the University of Pittsburgh with Drs. Lawrence Cressett and Brian Klatt, Pagnotto's study was a 57-month (December 2003 to September 2008), institutional review board (IRB)-approved retrospective review. After reviewing patient histories and radiographs, Pagnotto's team identified 58 patients with a mean age of 67 (41 to 90). Four patients were lost to lack of follow-up, resulting in 54 patients studied.

The two most prominent preoperative diagnoses were infection and loosening. Surgeons categorized bone loss, which yielded mainly AORI type 2A and 3 tibial bone defects, with femoral defects classified primarily as type 2B. Tibial defects were categorized

as type 2 or 3 in 98% of patients, and femoral defects were categorized as type 2 or 3 in 90% of patients.

Outcomes

Overall, "sleeve survival [was] 92% on the tibial side (49 of 53) and 97% on the femoral side (31 of 32) at a 25-month follow-up. All 49 of 49 tibial sleeves [and] 31 of 31 femoral sleeves had radiographic evidence of ingrowth," Pagnotto said (Figure 2).

He also noted that 15 patients (28%) required reoperation for any reason. However, only four patients required sleeve removal, two for infection and two for aseptic failures.



Figure 1: A broach technique establishes fixation, while a Morse taper bonds the implant to the sleeve.

Source: Pagnotto MR



Figure 2: All tibial and femoral sleeves showed stability and radiographic evidence of ingrowth.

Source: Pagnotto MR

Pagnotto briefly highlighted two reoperation cases to demonstrate the patients' short-term progress.

In the case of a 62-year-old woman, she presented 2 months after sleeve implantation with severe tibial pain in her right knee, which had been operated on several times prior. At 5 months, she was revised and found to have a loose tibial sleeve. One year following her revision, she had improved clinically and showed signs of stable ingrowth (Figure 3).

In a second case, when a 57-year-old man presented with instability, he was treated with an isolated tibial revision using a metaphyseal sleeve. Nine months postoperatively, he was treated with open debridement with retention of components for an acute infection. However, at 30 months, he required a two-stage revision, at which point his tibial component was found to be loose.

"At 30 months, he was revised in a two-stage manner. At that time, his cultures were negative and infection markers were negative, so we are calling this aseptic failure," Pagnotto explains. "However, you can certainly make an argument that this is really a culture-negative infection" (Figure 4). Nevertheless, when surgeons implanted a new sleeve, the patient showed improvement, ingrowth and stability 1 year after re-revision.

Long-term outcomes

Pagnotto stressed the limitations of his study, which was a retrospective review that lacked objective clinical data and a proper control group. Regarding long-term outcomes, he closed with a comparative radiograph of an 82-year-old woman's knees. Her left knee was revised in 2002 with stems, augments and cement, and her right knee was revised in 2007 with press-fit tibial and femoral metaphyseal sleeves (Figure 5).

"The question is, from 2002 to 2007, is this progress? Ultimately, only time will tell."

References

1. Kurtz S, Ong K, Lau E, Mowat F, Halpern M. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. *J Bone Joint Surg Am.* 2007;89(4):780-785.
2. Pagnotto M, Fedorka CJ, McGough RL, Crossett LS, Klatt BA. Revision total knee replacement with porous-coated metaphyseal sleeves. Paper presented at: the American Academy of Orthopaedic Surgeons 2011 Annual Meeting; February 15-19, 2011; San Diego. *Note: one or more of the authors of this paper identified the following potential conflicts of interest: consulting/royalty payments and institutional research support related to products discussed (DePuy Orthopaedics, Inc.).*

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Figure 3: Five months after revision with tibial and metaphyseal sleeves, the tibial sleeve was revised and found to be loose. One year postoperatively, this patient showed signs of ingrowth and clinical improvement.

Source: Pagnotto MR



Figure 4: Nine months after tibial revision, this patient was treated for an acute infection. At 30 months, he was revised and found to have a loose tibial component. At 1 year, his implants were stable.

Source: Pagnotto MR



Figure 5: This patient's knees were revised 5 years apart, the left with stems, augments and cement in 2002, and the right with press-fit tibial and femoral sleeves in 2007.

Source: Pagnotto MR

Summary

- Overall sleeve survivorship was 92% (tibial) and 97% (femoral) at a 25-month follow-up.
- All tibial and femoral sleeves showed radiographic evidence of biological ingrowth.