Cemented Stems are Requisite in Revision Knee Replacement

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Obtaining rigid prosthesis fixation in bone loss can be a significant challenge during revision total knee replacement (TKR). Stemmed prosthetic components off load stresses at the damaged metaphyseal interfaces, bypass bone defects, and provide additional prosthetic surface area for fixation. Relatively little long-term data exists documenting the durability of stemmed revision TKR and controversy remains as to whether these stems should be cemented or uncemented (press-fit).

It is important to note that the indications and surgical techniques for cemented and press-fit stems differ. Depending on the prosthesis system used, the technique and philosophy of press-fit stem design varies significantly. The choice between press-fit or cemented stems has primarily been based on personal philosophy and vague surgical indications for each specific technique. No prospective studies compare these two techniques in patients with similar amounts of bone loss, but it is likely that cemented stems are used more commonly in severe cases of bone loss or when higher degrees of articular constraint are deemed necessary. Press-fit stems require more length (75-150 mm) and should engage the diaphysis to achieve stabilization of the tibial tray, which is equivalent to a short stem cemented into the metaphyseal region.

**ADVANTAGES AND DISADVANTAGES**

The advantages of press-fit stems are that they facilitate more accurate limb alignment and are easier to revise when compared with cemented stems. The disadvantages include potential malalignment in medullary canal deformities, the absence of true long-term fixation, and an increased incidence of “end of stem pain.”

The design and surgical technique of press-fit stems has changed over the past two decades. The use of porous coated stems for true biologic fixation has largely been abandoned due to difficulties associated with implant removal. The majority of press-fit prosthetic designs include placing cement on the cut surfaces in the metaphyseal region of the femur and tibia and press-fitting fluted diaphyseal intramedullary rods. Most reports describe the use of modular titanium implants whereas others describe the use of cobalt chrome stems. The differences in outcome between these designs is unknown. Although controversial, caution is advised regarding the use of press-fit stems with high articular constraint due to the potential for an increased incidence of aseptic loosening.

The advantages of the cemented stems include potential long-term stem fixation, more easily accommodated canal deformities, and when used, antibiotic-loaded cement extends into the medullary canal. Typically, cemented stems are much shorter than press-fit stems. The use of cemented stems has been advocated for implants with higher articular constraint. The disadvantages of cemented stems include potential for malalignment associated with the use of short stems and the difficulty of extraction should implant removal be required.

**CLINICAL RESULTS**

The primary difficulty in comparing the results obtained with press-fit and cemented stems is the variability in the extent of bone loss, the differences in surgical techniques, and the lack of standardized criteria for assessment of outcomes associated with revision TKR. Most of the reported results are only mid-term follow-up studies, and few long-term follow-up studies exist.

The clinical results obtained with press-fit stems are primarily short-term or mid-term follow-up. The clinical results obtained with cemented stems are primarily short-term or mid-term follow-up.
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inserts and were being treated with a two-stage reimplantation protocol for deep infection.

Haas et al8 reported an 8% mechanical failure rate in 76 press-fit revision TKRs at 3.5-year (range: 2.9 years) follow-up. Gofton et al2 et al reported a 93.5% survivorship at 8.6 years in a group of 89 press-fit revision TKRs followed for an average 5.9 years (range: 4.8-6.6 years). Finally, Shannon et al4 reported an overall 16% mechanical failure rate at an average 5.8-year (range: 2.1-10.6 years) follow-up in 63 press-fit revision TKRs.

Murray et al3 originally reported on 40 cemented stemmed revision TKRs followed for 4.9 years (range: 2.9-9.3 years). At follow-up, no revisions or loose implants were reported. Whaley et al,2 in a subsequent follow-up of these patients, reported only 2 revisions for aseptic loosening and 1 additional tibial implant with for cemented stems was 53 months (range: 24-135 months) and 61 months (range: 24-142 months) for the press-fit stems. The stems were evaluated for loosening and categorized as stable, possibly loose, and definitely loose. Among the cemented stems, 93% were stable, 7% were possibly loose, and none had definite loosening. None of the cemented stems had mechanical failure and required revision. Of the press-fit stems, 71% were stable, 19% were possibly loose, and 10% were definitely loose. Of these loose implants, 8 were femoral and 2 were tibial. Four of these loose press-fit stems had already been revised at follow-up. This difference between stability of cemented and press-fit stems was statistically significant (P=.0001).2

CONCLUSION

Based on the literature, the mechanical durability of cemented stemmed revision TKR is superior to that of revision TKR with press-fit stems. Wiedel14 reported 17 revision TKRs with porous coated stems at average 5.6-year follow-up (range: 2.4-10 years). In this small series, only 1 (6%) implant required revision surgery for aseptic loosening.14 Vince and Long13 reported 44 press-fit revision TKRs followed for 2.6 years with an overall 7% revision rate. The failures in this series were primarily in knees for radiographic loosening for an overall 11-year 95.7% survivorship with no aseptic loosening. Ten-year survivorship free of revision and mechanical failure was 94%.5

Fehring et al2 analyzed the results of cemented and press-fit stems in 113 revision TKRs with a total of 202 stemmed femoral or tibial implants. Of these 202 stems, 107 were cemented and 95 were press-fit stems. The overall follow-up mechanical durability of cemented stemmed revision TKR is superior to that of revision TKR with press-fit stems. Although the surgical techniques and designs of press-fit stems have changed recently, no available data exist to suggest that the results obtained with these newer designs will be an improvement over older designs. Based on the recent reviews of these two techniques at our institution,4,5 where a 16% mechanical failure rate of press-fit stems occurred at 6-year follow-up compared with a 4.3% mechanical failure rate at 11 years with cemented stems, we use cemented stemmed implants in the majority of our revision TKRs. Future studies should compare the results of cemented and press-fit stemmed implants in a homogeneous revision TKR patient population with similar surgical indications that are standardized for bone loss severity and the degree of prosthetic articulak constraint.

REFERENCES