Cemented Tibial Stems are Not Requisite in Revision

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The function of a tibial stem in revision total knee replacement is to resist varus-valgus or anteroposterior tilt of the tibial tray. It is necessary to resist shear stress on trays with more constrained polyethylene articular surfaces. Tibial stems are also needed when there is soft or absence of metaphyseal bone or if a thick spacer or bulk bone graft is used.

Should stems be cemented or press-fit? If they work equally as well, why cement the tibial stem? Revision of a failed cemented stem would be more difficult and time-consuming. Unfortunately, revisions of some tibial components will always be necessary regardless of the fixation mode of the tibial stem due to instability, poly wear induced osteolysis, or infection. So why complicate the next revision unnecessarily?

CEMENTED STEMS
A cemented tibial stem increases the contact area between the stem and bone, producing a custom-like fit. The tibial diaphysis is normally anterior and medial to the center of the tibial plateau, so cementing allows centralized tibial stems to fit all tibias. A cemented tibial stem provides some rotatory resistance if not perfectly smooth. Use of cement also allows the addition of local antibiotics. However, a cemented stem is more difficult to remove and more bone loss can occur if revision is required.

A stem cemented to the tibial endosteal cortex produces a stress riser effect at the tip that increases the risk for a periprosthetic fracture. A cemented tibial stem may cause stress shielding if the stem is distally fixed. This can compromise the long-term fixation of the implant. The closer the tip of the cemented stem gets to the tibial cortex, the more likely some load will be transferred from the tibial tray. Twenty- and 40-mm stems produce no proximal stress shield-
ing, but a 60-mm stem transfers load to the cortex at the tip of the stem, which can cause stress shielding.

PRESS-FIT STEMS
A press-fit tibial stem is easier to remove and maximizes bone stock retention if revision is required. Pain at the tip of press-fit stems is a concern, but it can also occur with cemented stems. Barrack et al reported diaphyseal pain in 14% of patients with press-fit stems and 19% of cemented stems, but a greater intensity of pain was reported in the press-fit stem patients.

Cemented tibial stems have...
been shown to have a 96% component survival for aseptic loosening at 11 years without evidence of stress shielding. Shannon et al\(^6\) reported a 10% incidence of revisions of press-fit stems for aseptic loosening. But the press-fit stems used in this series varied from 40-150 mm, with an average 85 mm. The canal fill varied from 67%-100%. It is not clear which stems failed, but it would be predictable that they would have been the shorter, poorer canal filling stems. Haas et al\(^7\) reported only 3% progressive radiolucent lines around revision tibial components with uncemented stems. Bertin et al\(^8\) had no progressive radiolucent lines and no loosening in their series of revisions with press-fit stems.

**Personal Experience**

My experience is with 256 revision knees using the Natural-Knee (Zimmer, Warsaw, Ind) revision system. The tibial stems with this system have a unique conical shaped tibial stem that is attached to the revision tibial tray with a medial and anterior offset. The conical shaped stem relies on three-point stability and allows use of a longer stem without diaphyseal isthmus reaming. The pointed tip is also less likely to have end of stem pain. The tibial tray has four peripheral pegs for added rotational stability. Most tibial trays were cemented. A tibial stem, to be functional, requires independent stability in the tibial metaphysis and diaphysis. The stems in this series were either noncemented with impaction bone grafting or partially cemented in the metaphyseal area. The average follow-up was 3.5 years (range: 2-12 years). The average tibial stem length was 137 mm. No revisions for aseptic loosening occurred. Seven percent of tibial trays had partial radiolucent patterns and 0.4% had complete radiolucent. No patients had end of stem pain.

**Summary**

Tibial stems are necessary in most total knee revisions to share the load and protect the fixation interface of the tibial tray. Successful use of a tibial stem requires independent stability of the stem with or without cement. Some additional geometry on the undersurface of the tibial tray such as peripheral pegs or fins is necessary to provide additional resistance to rotatory stresses if the stem is not cemented. Cementing the tibial stem works. However, with the excellent results of cementless stems, who would want to deal with cement removal in those few cases of loosening or the occasional case with infection or instability? The disadvantages of a press-fit stem are not seen with modern tibial stems, such as with a long conical stem with an offset attachment to the tibial baseplate as used in this series. Cement is not necessary!

**References**


