Clinical Expectations for Cementless Partial Knee Replacements

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Abstract

Partial knee arthroplasty has a long and successful clinical history in treating patients with unicompartmental osteoarthritis. Due to improvements in the reliability and repeatability of clinical results, as well as the continued growth of the outpatient surgery center, partial knees have made a resurgence. Furthermore, with recent advances in materials, manufacturing, and technology innovation, cementless partial knees are expanding on the global market; and have been identified as a means for treating a younger, more active patient population. Although still relatively new to the US, cementless partial knees have been in clinical use in Europe for nearly 20 years. Over this period, a significant amount of clinical research has been conducted and as a user of cementless partial knees, it is particularly important to understand the similarities and differences between these and their cemented counterparts.

Radiolucent Lines and Partial Knee Replacement

One particularly well-known clinical finding is the occurrence of radiolucent lines (RLL's). RLL's tend to be present at the periprosthetic interface of cemented and cementless tibial trays for both PKA and TKA, respectively (1,2,14,15). Physiological radiolucent lines typically:

- Occur within the first-year (including for well-fixed implants)
- Have well-defined, sclerotic borders, particularly in cemented PKA
- Have a thickness of 1mm or less
- Are not progressive

Literature suggests that the incidence of radiolucency is less in cementless implants when compared to cemented. Unlike the cemented RLL, these tend to gradually reduce in size and prevalence over time in cementless PKA (3,4,14). Furthermore, clinical data has demonstrated that physiological radiolucent lines are not indicative of implant loosening and should not be interpreted as such (5,6). In addition, there has been no correlation between patient pain scores or clinical outcomes and the presence of RLL's (1,5). Therefore, the clinical guidance suggests when pain occurs in the presence of radiolucency, it should not be interpreted as a sign of implant loosening (6,7,14).

Early clinical experience with the Engage Partial Knee System is generally consistent with that of the established literature. A subset of patients who undergo the cementless PKA procedure may present radiolucencies under well-aligned AP and Lateral radiographs (Figure 1A). Similar to previous cementless PKA implants, the prevalence of these tends to decrease over-time; and when presented in combination with pain, should not be interpreted as implant loosening. Furthermore, side-by-side comparison of X-ray and CT imaging show tibial implants with RLL's are actually well-approximated to the bone when analyzed using CT (Figure 1B); further validating the previous findings that RLL's are not associated with loosening.

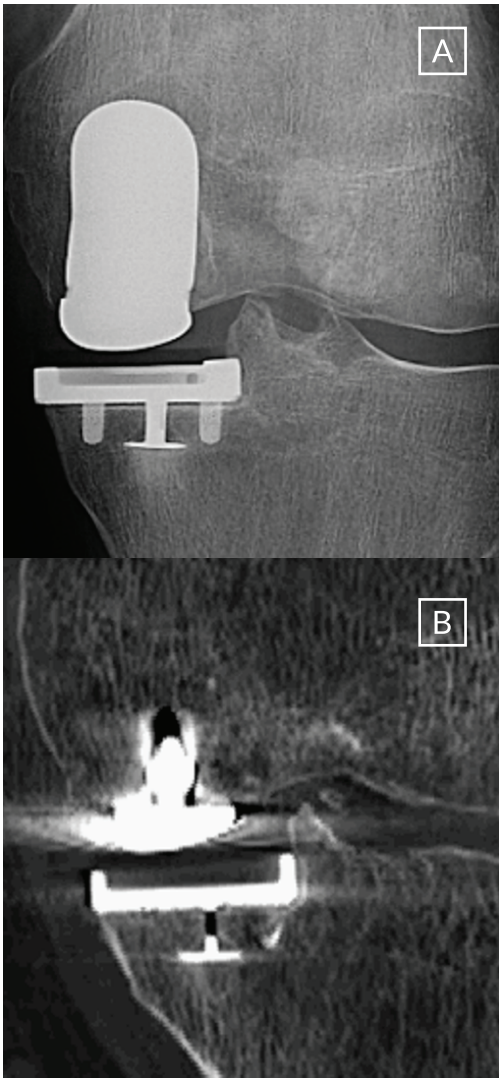

Figure 1. (A) Aligned A/P radiograph of a 60 year-old male patient with a left medial PKA at approximately 5 months post-op demonstrating a physiologic RLL. (B) Coronal CT image of same male patient demonstrating a well-integrated tibial tray on CT. Both X-ray and CT were taken on the same office visit.

Cementless VS. Cemented Fixation Strategy

Unlike cemented implants which achieve immediate fixation upon curing of cement, which has been shown to degrade over time (16,17), cementless implants gradually increase their fixation by taking advantage of the healing properties of bone. Osseointegration occurs naturally into the porous surface of the prosthesis over time. During the osseointegration process, it has been well-documented in both TKA and PKA that patients may experience residual soreness or pain as the bone remodels into and around the implants (8, 9, 10). Furthermore, cementless PKA studies noted that medial pain is common during the remodeling phase and may be a function of the changes in medial tibial stresses. (6, 11) This further suggests that revision surgery in the first two-years after implantation should be avoided unless there is obvious evidence of failure (12). Early patient pain has been reported to resolve itself during the first post-operative year and has been directly attributed to bone remodeling (6, 13).

Clinical Summary

The clinical advantages of cementless PKA including elimination of cementation errors, loose cement debris and foreign bodies, reduced 3rd body wear, decreased risk of aseptic loosening, and lower overall revision rates are all well-known. It is important, however, to appreciate the clinical differences associated with a long-term biologic fixation strategy relative to traditional cement fixation. There may therefore be a need for pre-operative patient discussions around the recovery process and specifically the potential remodeling soreness or pain.

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