

POSTER 38

Cemented versus uncemented tumor endoprostheses at the knee, a systematic review and meta-analysis

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Background:

Outcomes following endoprosthetic reconstruction (EPR) at the knee have been widely published in the literature. Method of stem fixation has been widely debated and there is still no currently agreed upon technique that is considered superior. While several studies have been performed to assess long-term durability of endoprostheses at the knee following cemented or cementless fixation, few studies have compared these methods of fixation directly.

Questions/Purpose:

The purpose of this study was to systematically review the available evidence to compare surgical outcomes among patients undergoing EPR with cemented or uncemented implants following tumor resection at the lower extremity. We asked the following questions: (1) What are the projected rates of devices failure for EPRs following tumor resection? (2) Do uncemented devices provide superior fixation compared with cemented devices? (2) Does use of hydroxyapatite collar provide additional protection from construct failure when compared to standard devices?

Methods:

A primary literature search was performed in PubMed, which identified 772 studies related to reconstruction of the lower extremity with an endoprosthesis at the knee. After review of manuscripts, 44 studies met inclusion criteria. Data from these studies were collected and proportions were calculated. Proportions were transformed using the logit transformation when calculating effect sizes. Given the diverse patient populations and treatment modalities utilized in these studies, a random effect model was chosen. The amount of heterogeneity, T^2 as well as I^2 , and Cochran Q statistic of these data was calculated using the restricted maximum-likelihood estimator. Subgroup analysis was conducted when all subgroups had greater than two studies. Comparisons were conducted without assuming common variance, except in the case where one subgroup had ≤ 5 studies in it. For comparison studies, effects size was calculated as a log odds ratio. Funnel plot symmetry and possible evidence of publication bias was assessed using Egger's regression and rank correlation test

Results:

Uncemented EPRs were associated with a higher rate of mechanical failure [(7.9%) 95% CI, 5.6-11.1 versus (4.6%) 95% CI, 3.4-6.2; $p=0.02$, figure 1], but had statistically comparable rates of aseptic loosening [(5.9%) 95% CI 3.7-9.2 versus (8.9%) 95% CI 6.9-11.4; $p=0.11$] and infection [(9.5%) 95% CI 7.0-12.7 versus (6.6%) 95% CI 4.9-8.9; $p=0.10$] versus cemented EPRs. Utilizing four studies with comparison data, use of hydroxyapatite collars was associated with lower aseptic loosening [Odds Ratio, 0.96; 95% CI, 0.23-0.04, $P<0.001$]. Eggers regression test ($p<0.001$) and ranked correlation test ($p=0.022$) revealed significant funnel plot asymmetry and is suggestive of publication bias.

Conclusion:

In conclusion, findings from this analysis indicate that cemented endoprostheses at the knee are associated with lower rates of mechanical failure, while aseptic loosening and implant survival rates are comparable among cemented and uncemented implants. Hydroxyapatite coated collars appear to reduce risk of aseptic loosening substantially. Despite these findings, they are based exclusively upon Level IV evidence. Future prospective large multi-center trials are needed to further elucidate the impact of various implant characteristics.

Mechanical Failure

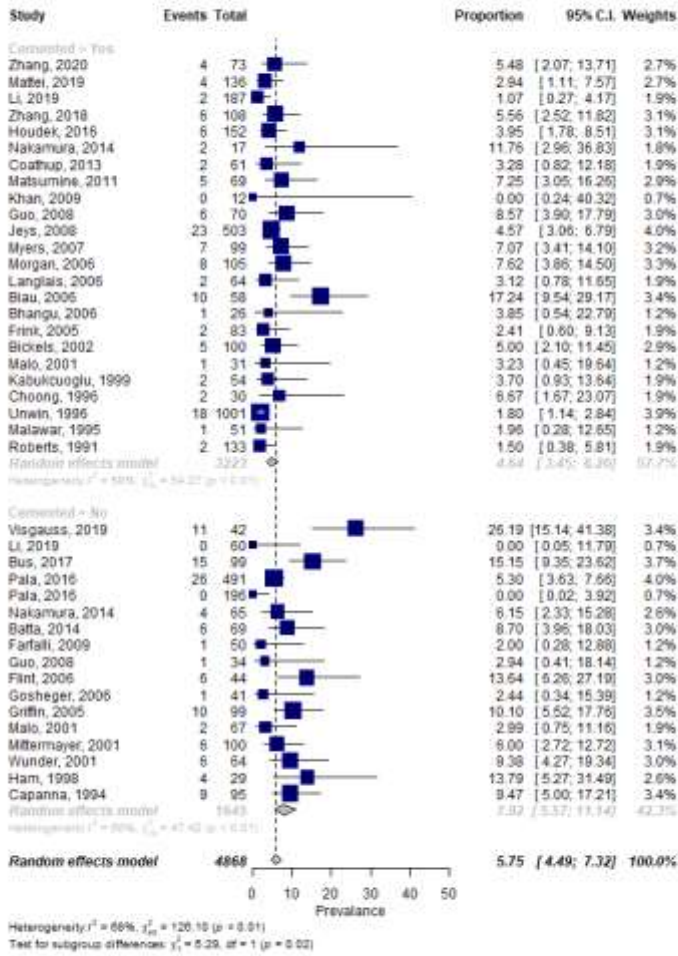


Figure 1: Forrest plot comparing rates of mechanical failure between studies that utilized cemented devices (top) and press fit devices (bottom). Subgroup and overall summary proportions are represented by grey diamonds at the bottom of each section.

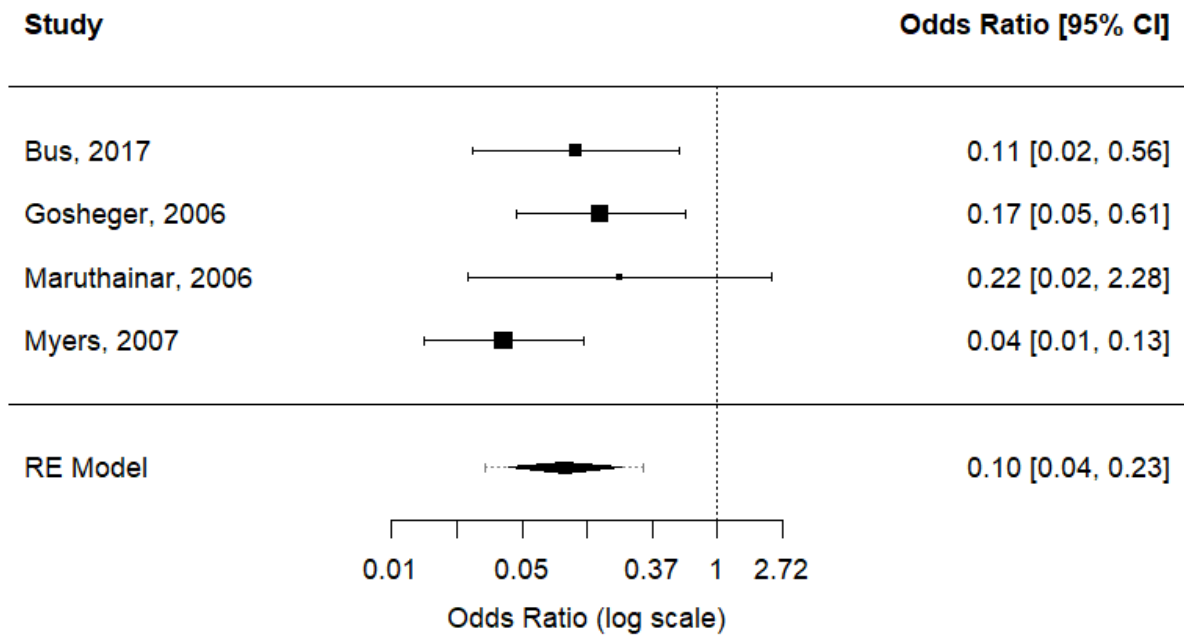


Figure 2: Forrest plot representing odds ratios for the use of hydroxy appetite collars. Odds ratios less than 1 represent a protective effect of hydroxyapatite collars. Pooled odds ratio from a randoms effect model is represented as a black diamond at the bottom of the figure.