

POSTER 37

Custom reconstruction lowers risk of mechanical failure following pelvic tumor resection: A Meta Analysis and Systematic Review of the Literature

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Background:

Reconstruction of the pelvis following tumor resection presents a major surgical challenge with associated high rates of complications. Considerations for reconstructive options include patient age, functional status, and remaining native anatomy. Given the rarity of these procedures, comparison studies across types of reconstruction at the pelvis are limited.

Questions/Purpose:

The objective of this study was to perform a review of the literature and meta-analysis to assess complication rates associated with different reconstructive options. We asked the following questions: (1) What are the pooled rates of complications following pelvic reconstruction for primary tumors? (2) Does one reconstructive option provide protective effects from complication? (3) what role does resection type play on complication rate?

Methods:

Inclusion criteria were peer-reviewed studies with a minimum of ten patients, which reported on implant(s) used and associated patient outcomes. Thirty-one studies representing 607 patients were included. Effect size was calculated for each of the Henderson failure modes (Type 1 – soft tissue, Type 2 – aseptic loosening, Type 3 – mechanical failure, Type 4 – infection, Type 5 – local recurrence) using the random effects model with residual maximum likelihood estimation of variance, and a meta-analysis of proportions was conducted. Additionally, region of resection was included (when available) utilizing the Enneking-Dunham classification. Major reconstruction methods utilized in the literature were: saddle, allograft prosthetic composite, autograft, stem and cup, and custom prostheses.

Results:

For type 1 complication (soft tissue) the overall summary proportion was determined to be 8.14% (CI 5.05, 12.87). Meta-regression showed positive association between the year a study was published ($p=0.0013$), average age of patients ($p=0.0345$), and study average follow-up time ($p<0.001$). Overall summary proportion for type 2 complication (aseptic loosening) was found to be 7.29% (CI 3.98, 13.00). Meta-regression revealed a positive association between the percentage of II+III resections within a cohort and type 2 complications ($p=0.0002$). Meta-analysis revealed a statistically lower rate of mechanical failure ($p=0.03$, figure 1) in studies that utilized custom prostheses. Modeled rates of mechanical failure in this group were 2.5% (CI 6.23, 0.98) when compared to the overall summary proportion of 7.22% (CI 11.29, 4.54). Meta regression revealed a positive association of mechanical failure and percentage of type II+III (periacetabular and ischial) resections in the study (0.0045). Summary proportion for infection was found to be 22.25% (CI 18.30, 26.77) with no differences detected between reconstruction method. Finally, the summary proportion type 5 complication (local recurrence) was found to be 20.66% (CI 16.57, 25.46). Meta-regression showed associations with mean age ($p=0.0175$), average follow-up ($p=0.0162$), and percentage of I+II+III resections ($p=0.0388$).

Conclusion:

This analysis shows a lower incidence of mechanical failure for patients who underwent reconstruction with a custom prosthesis. Additionally, patients who underwent type II+III resection were at increased risk for aseptic loosening and mechanical failure, regardless of reconstructive method.

Type 3 Failure

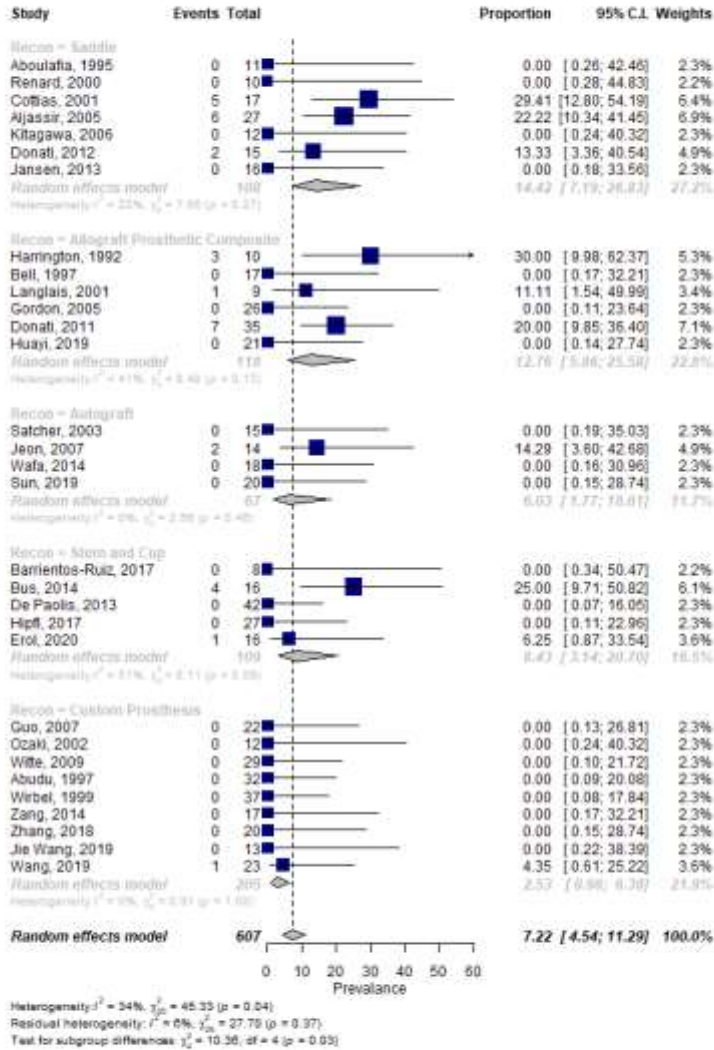


Figure 1: Forrest plot of mechanical failure of by reconstruction type. Summary proportions of complication rates are depicted as a grey diamond at the bottom of each section.