# Return to Work After Proximal Humerus Reconstruction: A Systematic Review and Meta-analysis

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INTRODUCTION:

Proximal humerus reconstruction (PHR) is a complex oncologic procedure that has lasting impacts on patient autonomy and quality of life. Return to work (RTW) outcomes can serve as a meaningful marker for postoperative reintegration and functional recovery following oncologic limb-salvage reconstruction. This review aims to quantify RTW outcomes following PHR to better inform post-operative recovery.

METHODS:

Following PRISMA guidelines, we searched PubMed, Embase, and Cochrane Library (2000–2025) for studies reporting on PHR. Case reports, cadaveric, and animal studies were excluded. Three reviewers independently screened and extracted data, including demographics, tumor etiology, reconstruction technique, length of resection, neoadjuvant/adjuvant treatments, postoperative protocols, complications, functional outcomes as measured by Musculoskeletal Tumor Society Score (MSTS), mortality, and RTW status. Primary outcome was the RTW rate, defined as the number of patients who returned to work divided by the total number of patients who were alive at final follow-up and not retired at the time of oncologic diagnosis. A random-effects meta-analysis was utilized to pool the rate of RTW after PHR across studies. Mixed-effects meta-regression was employed to evaluate the differences in RTW rate among reconstruction techniques. All analyses were conducted in R (version 4.3.3, Vienna, Austria).

RESULTS:

Seven studies were included for data extraction. The final cohort included 104 patients with an average follow-up of 5.0 years (range, 0.5-18.0). PHR techniques included endoprosthetic reconstruction (30, 28.8%), reverse total shoulder arthroplasty (TSA) (21, 20.2%), allograft prosthetic composite construct (42, 40.4%), and arthrodesis (11, 10.6%). PHR was most performed for osteosarcoma (29, 27.9%), chondrosarcoma (27, 26.0%), and giant cell tumor (21 ,20.2%). There were 40 total reported complications, most frequently for fracture (12, 30.0%) and delayed union or non-union (9, 22.5%). Average duration of postoperative immobilization was 4.0 weeks (range, 0.0-12.0), with active range of motion exercises typically beginning around 5.3 weeks (range, 3.0-6.0) postoperatively. The average length of resection (reported in four studies) was 10.5 cm (range, 5.0-21.0). The mean MSTS score across six studies was 22.1 (range, 13.0-29.0). The pooled RTW rate across all seven studies was 74.8% (95% CI: 52.2%–88.9%). Compared to endoprosthetic reconstruction (72.3%), RTW was significantly higher with allograft prosthetic composite constructs (83.3%, p=0.004) and with arthrodesis (84.3%, p=0.059). Reverse TSA had lower RTW rates, but this was not statistically significant (67.2%, p=0.138).

DISCUSSION AND CONCLUSION:

This meta-analysis found a high RTW rate after PHR, which varied by type of reconstruction. While the findings show promising functional reintegration for patients, heterogeneity in surgical indications, adjuvant therapy, rehabilitation protocols, as well as small sample sizes, limit definitive conclusions. Standardized reporting of RTW outcomes after PHR is needed to better assess functional recovery and guide shared decision-making in limb salvage procedures.

**Figure 1.** Flow diagram presenting systematic review process used in this study.

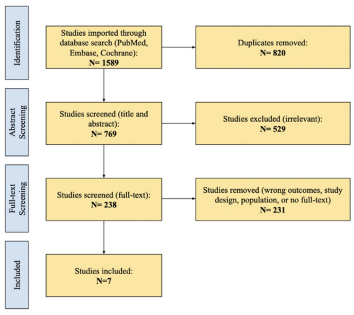


**Figure 2.** Overall return to work after proximal humerus reconstruction.

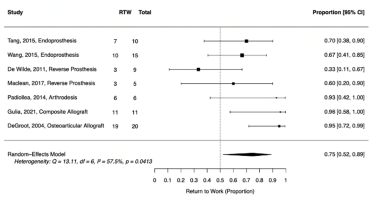


**Figure 3.** Return to work by reconstruction type.