Can cemented femoral stems be used during revision total hip arthroplasty?

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Response/Recommendation:

Cemented femoral stems can be used during revision total hip arthroplasty (THA), particularly in patients with capacious femoral canal, when the use of uncemented stem is not possible, and in older patients with shorter life expectancies.

Level of Evidence: Moderate

Rationale:

In this review, we analyzed the outcomes of six studies that included both cemented and uncemented stems for revision total hip arthroplasty (THA) (Table 1). The most frequently encountered complications leading to the need for re-revision were aseptic loosening, dislocations, periprosthetic fractures, and infections. A common effect model based on four studies indicated that the use of a cemented stem significantly increased the risk of aseptic loosening (risk ratio [95% CI]: 0.54 [0.41-0.71], $p < 0.001$). Additionally, another common effect model from six studies suggested that cemented stems elevated the risk of periprosthetic fractures (both intra- and post-operative) (risk ratio [95% CI]: 0.66 [0.44-1.00], $p = 0.048$). Conversely, a random effect model from six studies demonstrated that cemented stems might offer substantial protection against dislocations (risk ratio [95% CI]: 2.45 [1.20-4.98]). Our analysis of infection rates did not reveal any statistically significant advantage of one stem type over the other (risk ratio [95% CI]: 1.37 [0.96-1.96], $p = 0.081$).

The increasing number of revision hip arthroplasties is posing difficulties in the clinical setting, further compounded by the fact that the patients requiring these procedures are getting younger [1–4]. Younger patients typically have markedly superior bone stock and bone quality which makes them ideal candidates for the use of uncemented femoral stem [5]. Instead of the more traditional cemented femoral stems, uncemented designs are gaining popularity especially in patients without substantial loss of bone support [6]. Use of uncemented femoral stems in patients with sufficient metaphyseal support has been proposed to be superior in preserving bone stock for potential future revisions by allowing long-term biological fixation and having a more anatomic stress distribution pattern [7,8]. The ability to fine-tune soft tissue balancing, femoral anteversion, and offset with modular uncemented stems, simplifies the revision procedure and broadens the indications for their use [9].

The advantages of uncemented stems during revision THA are numerous [10]. However, concerns about the widespread adoption of uncemented stems originate from the increased early re-revision rates due to dislocations associated with subsidence and a higher risk of intraoperative periprosthetic fractures. These risks are exacerbated by stress shielding in presence of less bone stock, necessitating longer stems to facilitate diaphyseal anchorage [5,11]. Thus, cemented stems still appear to be a valid option particularly for patients with larger femoral bone defects [6,10,12]. Cemented revision stems, compared to uncemented ones, are traditionally associated with lower intraoperative periprosthetic fracture risk and reduced subsidence, resulting in lower early to mid-term revision rates [6,10,12–14]. However, they appear to be prone to aseptic loosening in the long-term, increasing the revision rates, reaching the revision rates of uncemented stems [12,13]. Consequently, they are considered a better option for older patients with shorter life expectancies.

Despite numerous published articles on the topic, stem choice remains open for debate and often relies mostly on surgeon experience and familiarity. Available scientific evidence is limited by heterogeneity, with various implants, techniques and indications being adopted [15]. Registries provide a broad picture with large cohort sizes; however, they are prone to be limited in portraying differences in bone defect sizes and experiences of different centers. Hence, the reported data is often contradictory, making individualized choices challenging for the surgeons. A review of the literature considering standardized data, would help clarifying the advantages and disadvantages of each method, facilitating a more accurate choice of revision stems.

References

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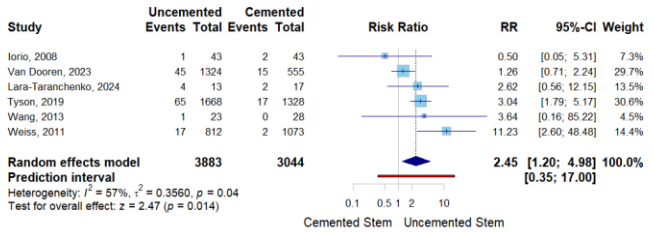
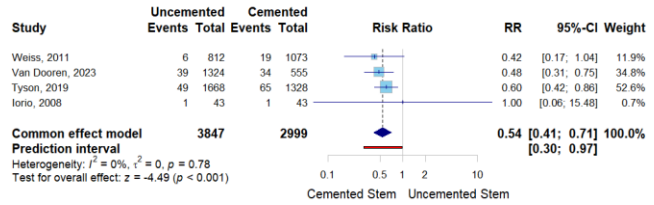
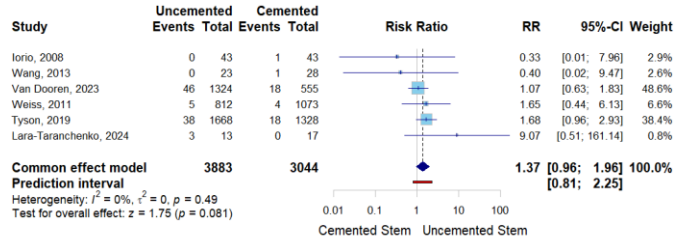
Table 1: Baseline Characteristics of the Reviewed Articles								
Ref. Author	**Country**	**Journal**	**Study Type**	**Centers**	**Number of stems**	**Patient Sex (M%)**	**Patient Age (SD)**	**Follow-up Duration**
Iorio [9], 2008	USA	The Journal of Arthroplasty	Prospective	Single	Cemented: 43, Uncemented: 43	Cemented: 17 (40%), Uncemented: 27 (63%)	Cemented: 67.5, Uncemented: 71.2	Cemented: 9 years, Uncemented: 7 years
Weiss [13], 2011	Sweden	Acta Orthopaedica	Retrospective	Multiple	Cemented: 1073, Uncemented: 812	Cemented: 544 (51%), Uncemented: 443 (55%)	Cemented: 76 (9), Uncemented: 72 (11)	Cemented: 4.2 years, Uncemented: 3.4 years
Wang [16], 2013	China	Scientific Reports	Retrospective	Single	Cemented: 28, Uncemented: 23	Cemented: 13 (46%), Uncemented: 16 (70%)	Cemented: 68, Uncemented: 64.3	Cemented: 6.1 years, Uncemented: 5.5 years
Tyson [12], 2019	Sweden	Acta Orthopaedica	Retrospective	Multiple	Cemented: 1,328, Uncemented: 1,668	No. Females: Cemented: 748 (56.3) Uncemented: 955 (56.6)	Cemented: 74 (9), Uncemented: 72 (10)	Cemented: 7.5 years, Uncemented: 5.5 years
Van Dooren [10], 2023	The Netherlands	Acta Orthopaedica	Retrospective	Multiple	Cemented: 555, Uncemented: 1324	Cemented: 144 (26%), Uncemented: 419 (32%)	Not Reported	Mean: 4.1 years
Lara-Taranchenko [17], 2024	Spain	European Journal of Orthopaedic Surgery & Traumatology	Retrospective	Single	Cemented: 17, Uncemented: 13	Cemented: 8 (26,7%), Uncemented: 4 (13.3%)	Cemented: 82.8 (6.0), Uncemented: 78.4 (8.6)	Mean: 1 year



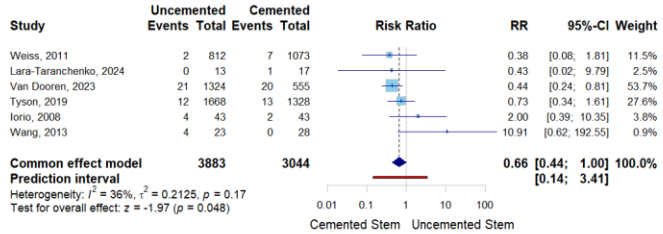
Dislocation



Aseptic Loosening



Infection



Periprosthetic fractures