

# CORR Insights®: Does the Risk of Death Within 48 Hours of Hip Hemiarthroplasty Differ Between Patients Treated with Cemented and Cementless Implants? A Meta-analysis of Large, National Registries

Charles N. Cornell MD<sup>1</sup>

## Where Are We Now?

Orthopaedic surgeons have not reached a consensus regarding the choice between cemented and uncemented fixation of the femoral stem when performing hemiarthroplasty for treating femoral neck fractures. The cemented stem provides better pain relief, overall quality of life, and reduced

risk of subsequent periprosthetic fracture [3-5, 7-9, 16], but cemented fixation is associated with a higher risk of perioperative mortality when compared with uncemented fixation [13, 14]. In most reports, when a cemented group is compared to uncemented groups, the cemented cohort tends to be older with higher degrees of comorbidity, as reflected by higher ASA scores [13, 14]. Although patients with more (and more severe) comorbidities are more likely to die within a year of hip fracture surgery, at least one study [13] found that the use of bone cement rather than an uncemented prosthesis may have a strong, independent association with the risk of death during that first year.

Bone cement implantation syndrome (BCIS) is characterized by the sudden development of hypotension and potentially fatal cardiac arrest that occurs shortly after cement injection and pressurization. Although there is some evidence that an immune-mediated response to free monomer may play a role [2], the most compelling evidence suggests this is a mechanical syndrome caused by embolization of marrow contents that impedes right-sided heart

circulation [11, 13, 14]. And while minor manifestations of this reaction to cementing can be documented in as many as 30% of patients undergoing cemented arthroplasty, only a small fraction result in serious life-threatening hypotension, hypoxia, or cardiac arrest [2, 11, 13, 14]. Most studies clearly link the risk of severe BCIS to underlying patient comorbidities [2, 11, 13, 14]. High-risk patients typically are older, ASA Grade 3 or 4 with renal failure, with cardiopulmonary disease or pulmonary metastases. Unfortunately, these patients typically have poorer bone quality and a higher risk of postoperative falls, increasing their risk of developing periprosthetic fractures when uncemented stems are implanted [3-5, 7-9, 16].

In the current study, Dahl and Pripp [1] perform a meta-analysis using the large databases of five countries to address the association between cement and the relative risk of mortality following cemented hemiarthroplasty for treating femoral neck fracture. They found that the use of cement was associated with a higher risk of mortality at 48 hours postoperatively, with a pooled relative risk ratio of 1.6. This suggests the number needed to harm was one in 183 patients. This should be put in context of the possible 17-fold increase in the hazard ratio for reoperation when a uncemented stem is


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C. N. Cornell , Professor of Clinical Orthopedic Surgery, The Hospital for Special Surgery, 535 East 70th Street, New York, NY 10021, USA, Email: cornellc@hss.edu

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<sup>1</sup>Professor of Clinical Orthopedic Surgery, The Hospital for Special Surgery, New York, NY, USA

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used [4]. It should also be noted that the individual studies involved in the analysis by Dahl and Pripp had large variations in results prior to pooling. Still, the authors concluded, correctly in my view, that they cannot recommend against using cement because of its benefits, including less postoperative thigh pain, better mobility, and a reduced risk of periprosthetic fracture requiring reoperation [3-5, 7-9, 16].

### Where Do We Need To Go?

This study speaks to the dilemma of reducing surgical risk but providing the most effective surgical procedure. The benefits of using cement in this setting are well documented [3-5, 7-9, 16]. The challenge is to reduce the risk of mortality from BCIS. To do this, we need to better understand the comorbidity profile of at-risk patients and learn whether there are any modifiable factors that can be quickly improved during their preparation for surgery. Although there is some evidence that modern cement techniques reduce the risk of BCIS [2, 11, 15], we need to understand how best to prevent embolization. This may involve steps beyond using a cement plug, thorough cleaning of the canal, use of vacuum mixing to remove free monomer, and retrograde cement insertion to reduce the build-up of intramedullary pressure. Using low-viscosity cement [15] and inserting a vena cava filter [6] have shown promise but only in animal models. Finally, the most effective anesthetic steps to prevent and respond to the syndrome need to be clarified. There are benefits to adequate hydration and correction of hypovolemia as well as the use of ionotropic agents during the crisis [2, 11], but protocols to prevent the syndrome specially addressing the highest risk patients

have not achieved widespread consensus. I would suggest that a specific anesthetic and surgical protocol for this procedure needs to be developed and disseminated such that all surgical teams can apply it globally.

### How Do We Get There?

In my view, many of the advancements in orthopaedics have been the result of subspecialization with a high concentration of care in high-volume centers. But perhaps by necessity, hip fracture care has not been regionalized, and much of the care of patients with hip fracture is provided by nonspecialized orthopaedic surgeons and anesthesiologists [12]. Given the large burden of hip fractures, the obvious realities and benefits of prompt surgery, and the pain and cost of transferring patients, it's hard to imagine centralizing hip fracture care in the United States. Additionally, there are financial incentives (at least in the United States) not to transfer patients, as these are bread-and-butter procedures that are quick and remunerative for surgeons. Still, medical centers that create specialized services and clinical pathways designed specifically for hip fracture are showing improved survival and functional recovery [10]. Whenever possible, hip fracture care should be prioritized within any institution with care delivered by devoted medical, surgical, and anesthetic specialists. The creation of specific hip fracture treatment pathways in higher volume centers will allow interested subspecialists to achieve volumes of experience that will permit clinical studies addressing unanswered questions, such as the dilemma surrounding BCIS in these patients. The development of such

centers requires a congregation of sufficient numbers of high-risk patients in specialized centers to better prepare, prevent, and treat BCIS. Collaboration between centers would further address this challenge, providing the case volumes that would offer improved clinical pathways and surgical-anesthetic protocols. Hopefully, success in these centers could then be disseminated to the community hospitals where the majority of patients with hip fractures currently are treated.

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