***CORR* Insights®: Complications of Cemented Long-stem Hip Arthroplasties in Metastatic Bone Disease Revisited**

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Where Are We Now?

Metastatic bone disease occurs in patients who often are older, sicker, and more debilitated than patients without such disease. Many patients with metastatic cancer have spent considerable time, effort, and resources on their treatment prior to the diagnosis of metastasis. As surgeons, we do not wish to add any more to the treatment burden than is necessary. Therefore, when surgery is called for, we seek to perform one durable operation that relieves pain, preserves function, and minimizes complications in these patients. Too little surgery may be quick and easy, but provides poor durability. Too much surgery may provide a more durable reconstruction, but at the cost of unnecessary postoperative morbidity. Predicting the future response of

the disease to systemic treatment, radiation therapy, and bisphosphonates adds further complexity to the decision. Conventional wisdom suggests that in the risk/benefit analysis, prophylactically stabilizing the femur with a long stem is preferable, preventing the need for a second operation. Case reports of intraoperative death attributed to a large monomer load and marrow embolization raised concerns about the safety of this technique. In the current study, Price and colleagues reported transient cardiopulmonary derangements, but concluded that long-stem femoral implants are an appropriate surgical option, and remain their preference. However, another recent *CORR*® publication [1] found a lack of disease progression in patients with tumors other than myeloma and renal cell carcinoma, along with a similar rate of physiologic non-fatal complications. This led the senior author to state in the Editor's Spotlight/Take 5 interview [2], "I have been less aggressive with putting in long-stem cemented femoral components that protect the entire femur." The unanswered questions are how often does a metastasis actually develop distal to the tip of a conventional femoral stem? If it happens often enough — such that conventional wisdom is right — are there specific techniques or subgroups of patients that will allow for safe use of long cemented stems?

Where Do We Need to Go?

The current study is a retrospective review of a series of long (300 – 350 mm) cemented femoral stems for metastatic disease. The authors reported transient systemic effects, but no serious complications attributable to the operation, and suggest that use of a long suction-irrigation tip and cement in a low viscosity state are techniques that

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make the operation safe. Others have suggested drilling a ventilation hole in the diaphysis of the femur to decrease pressure buildup in the canal as the stem is inserted. As pointed out in the discussion, others use noncemented stems and conventional length cemented stems. In order to resolve the controversies, we would need to know how often metastases develop distal to the tip of short femoral stems? A rigorous cost and quality-adjusted-life-year analysis for the different treatment options might help patients decide between potentially too much or too little surgery. In order to resolve the disparate results in the literature, future studies should stratify patients with the Charlson Comorbidity Index (CCI), which is a predictor of surgical complications in patients with lung, colorectal, and breast carcinoma. We do not know the health status of patients in this or previous publications. Gauges to measure the rate of disease progression and prior responsiveness to treatment are also needed. A patient with a rapidly progressing tumor with a poor prior response to radiation might be better off with a long stem, whereas a patient with a more indolent disease responsive to adjuvant modalities might do fine with a short stem. Accurate prediction of remaining lifespan would also help optimize treatment.

How Do We Get There?

Many questions remain regarding the optimal treatment of metastatic disease of the femur. Beyond short or long femoral stems, there is controversy regarding the role of

resection of proximal femur metastases with endoprosthetic reconstruction compared to intramedullary rodding or long stem arthroplasty, particularly for lung and renal cell carcinoma. The onus is on clinical researchers in orthopaedic oncology to design and conduct the studies to answer the relevant questions — the first being the likelihood of developing a metastasis distal to a short femoral stem. In my opinion, there is enough equipoise to justify a one arm observational study to determine the incidence of this event. Disease severity would be measured taking into account rapidity of progression and responsiveness to treatment. A second study by an investigator committed to long stems in which comorbidities are quantified could specifically determine the risk of complications for subgroups based on the CCI or some other measure. One could then seek to balance, in patients of varying CCIs, the risks of intra- and perioperative physiologic derangements (including the cardiovascular risks associated with cementing a long stem) and death, against the possibility of requiring reoperations for metastases distal to the stem.

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