Editorial

Management of Vancouver B2 peri-prosthetic femoral fractures: following the evidence

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This study by Shi (1) is one in a series of studies that have demonstrated the effectiveness of long-stem revision arthroplasty supplemented with cerclage for the management of Vancouver B2 peri-prosthetic femur fractures after total hip arthroplasty (THA). No randomized trials exist addressing the optimal management of such fractures; instead, management guidelines have been developed based upon accumulation of level IV evidence. This study reported the outcomes of 14 patients after a mean of 5.2 years. All patients had clinical and radiological fracture union within 6.5 months and no adverse events were reported. A mean Harris hip score of 83 points is above what has been typically reported for revision THA (2).

The widely accepted Vancouver classification system for post-operative peri-prosthetic fractures of the femur has proven to be quite practical and has an established treatment algorithm (3-6). Type B fractures, including those around or just below the stem, are treated very differently based upon their sub-classification. Type B1 fractures occur around a well-fixed stem and may not require prosthesis revision, whereas type B2 fractures occur around a loose prosthesis most likely require revision arthroplasty. However, confirming prosthesis stability is not always straightforward using pre-operative radiographs alone.

The largest series of peri-prosthetic fractures came from the Swedish National Hip Registry in 2005 (7). This widely regarded study reported on 555 Vancouver B2 fractures, of which nearly 91% were treated with revision arthroplasty with or without additional fixation. While 16.8% of patients with a revised prosthesis required further surgical intervention, 38.5% (20 of 52) of the patients treated with open reduction and internal fixation alone required further surgery. The need for prosthesis revision has been challenged; a recent study showed comparatively effective results for eight patients treated with a locking compression plate alone (8). However, a fracture associated with a loose stem is likely the byproduct of an underlying pathological process, such as particle wear and osteolysis (9,10). This pathologic interface between the bone-cement-prostheses or bone-prosthesis must be removed and replaced. Similar to hip fractures, the 1-year mortality following peri-prosthetic fracture may be substantially higher when treated with osteosynthesis compared with revision arthroplasty (30–32% *vs.* 10–12%) (7,11-15). This may result from immediate full weight bearing and improved mobilization of patients undergoing revision arthroplasty, which can prevent deconditioning (11-13).

While long-stem revision arthroplasty was originally performed with cemented prostheses, the current consensus points to the superiority of uncemented technique for fixation of the femoral component. A recent systematic review reporting on two decades of experience demonstrated 43% higher risk for adverse outcomes with cemented femoral fixation (16). Many other studies have also reported a high failure rate with cemented stems (17), and a well-known study from the Mayo clinic showed a lower complication rate for extensively coated uncemented stems (18). Cemented components have a higher risk for nonunion due to cement interposition between the fracture fragments, and thus are only indicated for cases of severe osteoporosis (19). The femoral component used in the current study, the SLSPlus™ (Smith and

Nephew, Switzerland), is a long tapered stem that can be hydroxyapatite coated or uncoated, and the taper provides axial stability. While stem subsidence is a common risk for failure, this can be avoided by sufficiently filling the canal. For uncemented stems, adequate fixation is best achieved distally along an intact diaphysis. Of note, it is recommended that the fracture be bypassed by at least two cortical diameters with a long stem (>4 cm). Despite consistently good outcomes, longer stems could have been used in the current study to maximize distal fixation.

In the sentinel Swedish registry study, there was little difference in the need for further intervention between patients treated with revision arthroplasty alone (15.7%) and those supplemented with fracture fixation in addition to revision (17.6%) (7). However, a more recent systematic review reported a significantly lower rate of complications when supplementing revision with fracture fixation (16). Initial placement of a cerclage wire just distal to the fracture can prevent further propagation of the fracture fragment during reaming or stem insertion (20). Cortical strut grafts can also be used to enhance rotational stability for unstable transverse fractures or in patients with insufficient cortical bone (21-23). The compression cerclage system used in the current study allowed for placement of fitted bands just below the lesser trochanter and down at the level of the fracture site.

The major shortcomings of this study were the lack of a comparison group and small sample size. Without a comparison group, it is difficult to make valid inferences with regard to the association of high outcomes scores and the current method of management. While other studies exist using alternate methods, the study cohorts are likely too heterogeneous for a fair comparison. Based on previous studies, we would have expected two patients in a group of 14 to require further intervention; however, there were none. A larger number of patients would ensure that this observation was not simply due to random chance alone.

This study demonstrates the great utility of treating Vancouver B2 fractures with long-stem revision arthroplasty and cerclage. In order to conclude that this management solution is the optimal method for management of such fractures, a prospective, randomized controlled trial involving multiple medical centers could be beneficial.

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Footnote

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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