LETTER TO THE EDITOR

Challenges of Plate Fixation for Vancouver Type-C fractures after a Well-fixed Hip Arthroplasty Femoral Stem

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Dear Editor

The fixation of distal femoral fractures (Vancouver type-C fractures; Figure A) following a well-fixed hip arthroplasty femoral stem has become a challenging issue for orthopedic surgeons due to the interprosthetic biomechanical effects (e.g., negative, positive, and torsional strains). Surgeons have adopted a range of constructs, such as distal femoral locking plate, to overcome these difficulties (1, 2).

To minimize the risk of interprosthetic fracture between the femoral stem and femoral plate, many surgeons prefer to overlap the lateral plate with the tip of the well-fixed femoral stem or the proximal femoral component, along with soft tissue sparing techniques using long plates [Figure B]. On the other hand, other surgeons prefer to separate (non-overlap) the plate from the femoral stem. However, the superiority of overlapping the plate over non-overlapping is not well demonstrated in any high-quality studies.

It is probable that the heterogeneity of these fractures, particularly with regard to the length of fracture, has limited research to support the better method. For example, a short fracture is likely to be well-treated by a non-overlapping plate (separate fixation). However, in these cases, the precise distance and position between the end of the lateral femoral plate and the tip of the well-fixed hip arthroplasty femoral stem remained unclear, thereby requiring further research (1, 4-6). In distal femoral fractures, the plate is typically placed as distal as possible to maximize the implant fixation in the distal fragment.

Arthroplasty component design can certainly affect the most distal position available for the plate; however, variable angle plates may allow flexibility for directing screws around a stem or box of the femoral component without compromising distal fixation. In the setting of interprosthetic femoral fractures, the use of a short plate is accompanied by concerns. In this regard, the space between the plate and femoral component causes excessive stress. Accordingly, there is evidence showing that shorter plates are associated with a higher rate of complication (7).

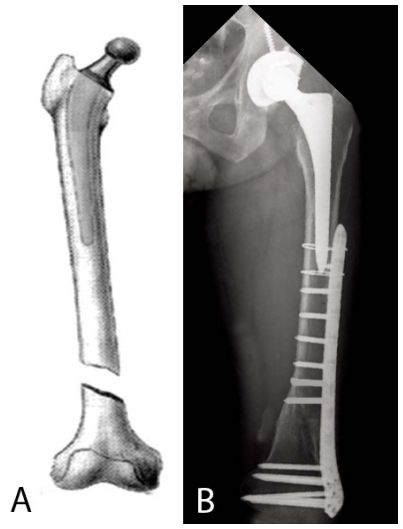

Figure 1. A) Postoperative Vancouver type-C periprosthetic femoral fracture (adapted from an Open Access article by Hwang KT and Kim YH (3), B) anteroposterior radiograph of the left hip of a 67-yearold male with a Vancouver type-C fracture following hip arthroplasty.

For the fixation of Vancouver type-C fractures, several attempts have been made to determine an optimal location for a lateral locking plate relative to a well-fixed

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femoral stem. For example, Kempthorne et al. found that overlapping the femoral stem by two or more stem diameters with the femoral plate could not only reduce the interprosthetic torsional, compressive, and tensile strains but also provide better protection for secondary intra- and peri-prosthetic fractures (5). In contrast, Kubiak et al., observing no significant difference between the 8-cm gap and the overlapped construct, concluded that it is possible to leave a distance of more than 8 cm between the locking plate and femoral stem in the absence of regional osteopenia. In addition, Kubiak et al. recommended that overlapping the two implants could decrease strain and increase strength in a falling model (8).

In conclusion, the plate fixation of distal femoral fractures (Vancouver type-C fractures) following a well-fixed hip arthroplasty femoral stem is a challenging practice. However, there is a paucity of evidence in this domain to support surgeons. Consequently, several questions remain to be answered by future studies. In this regard, the following questions need to be resolved:

- How much interprosthetic space between implants is safe?
- Is it necessary to overlap the distal tip of the femoral stem with the plate?
- What is the best configuration of plate fixation screws regarding the femoral stem?
- How far should the proximal plate construct extend between the plate and the stem?

It should be also noted that each case must be considered on an individual basis and that no single approach can address all fractures. Surgeons must individualize several issues, including fracture location, surrounding bone structure, stability of the implant, poor bone stock, and patient functionality.

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