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CORR Insights®: Lateral Opening-wedge Distal Femoral Osteotomy: Pain Relief, Functional Improvement, and Survivorship at 5 Years

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Where Are We Now?

The information in the study by Cameron et al. [1] represents an excellent addition to the current literature on distal femoral osteotomies that is largely dominated by medial closing-wedge techniques.

This CORR Insights® is a commentary on the article “Lateral Opening-wedge DFO: Pain Relief, Functional Improvement, and Survivorship at 5 Years” by Cameron and colleagues available at: DOI: 10.1007/s11999-014-4106-8.

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Currently, lateral opening-wedge and medial closing-wedge distal femoral osteotomies have been effectively used to provide substantial relief in painful knees with significant valgus ($>10^\circ$ to 15° between the anatomic and mechanical axes). While medial closing-wedge high tibial osteotomies have also been utilized in these patients, this approach has produced less reliable pain relief and may cause iatrogenic joint line obliquity and subsequent instability [2]. Fortunately, multiple studies have demonstrated good outcomes following varus-producing distal femoral osteotomies including TKA conversion rates of 6.1% at 10 years [4] and Knee Injury and Osteoarthritis Outcome Score improvements from 31 preoperatively to 69 postoperatively [3].

Controversy exists, however, regarding the most reliable approach to the varus-producing distal femoral

osteotomy, specifically, medial closing-wedge versus lateral opening-wedge. Prior data have suggested an increased rate of hardware irritation, delayed osteotomy healing and more meticulous preoperative planning with the lateral opening-wedge distal femoral osteotomy technique [3, 5]. However, the lateral opening-wedge distal femoral osteotomy may have advantages including a single osteotomy cut, possible reduced neurovascular risk, and improved correction control due to increased flexibility during intraoperative corrective degree adjustments. Other questions exist including: (1) What are the specific indications and subsequent outcomes of the varus-producing distal femoral osteotomy for joint restoration and valgus gonarthrosis? (2) Which distal femoral osteotomy technique (lateral opening-wedge versus medial closing-wedge) may optimize these outcomes?

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Where Do We Need To Go?

The current study addresses many of the aforementioned controversies.

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Specifically, this article documented a 3% nonunion rate with no delayed unions [1], which is significantly less than a prior study suggested [3]. This nonunion occurred in the arthrosis subgroup and was ultimately treated with conversion to TKA. All other patients (30/31) demonstrated complete radiologic union by 6 months postoperatively. These data suggest that current concerns regarding distal femoral osteotomy nonunion may be overstated or overemphasized as a potential postoperative complication. Alternatively, concerns regarding increased reoperation rate and hardware irritation following lateral opening-wedge distal femoral osteotomy appear to be well founded. The current study documented a 52% postoperative reoperation rate. Specifically, hardware removal was required in 19% of the patients. The current data also suggests that the theoretically improved intraoperative correction that is afforded by the lateral opening-wedge distal femoral osteotomy technique does not actually occur in practice. In fact, only 47% of patients that had postoperative alignment radiographs were within the correction goal of $\pm 3^\circ$ from the desired neutral mechanical axis. Fortunately, however, this study effectively highlighted the safety of the lateral opening-wedge distal femoral osteotomy technique as no postoperative infections, nerve

palsies, or wound complications were noted. Improved outcomes were also seen in both the joint preservation and arthritis groups. Notably, 5-year survivorship was much higher in the joint preservation group (92%), as compared to the arthritis group (74%), suggesting the utility of the lateral opening-wedge distal femoral osteotomy technique in this specific patient subpopulation. However, as this is the first article to evaluate these subpopulations, it is difficult to draw rigid conclusions at this time.

These controversies leave the following questions remaining for future study: (1) What patient populations and specific knee pathologies may be optimally treated with isolated or concomitant distal femoral osteotomy with specific focus on chondral restoration versus already present arthrosis? (2) Are lateral opening wedge and medial closing wedge distal femoral osteotomies equal or should one be preferentially used? (3) How can we optimize the osteotomy correction accuracy?

How Do We Get There?

The data by Cameron et al. [1] aids in addressing the first question regarding which population is most effectively treated with distal femoral osteotomy by documenting that good clinical

outcomes can be obtained following a lateral opening-wedge distal femoral osteotomy—particularly in patients in whom concomitant joint restoration procedures are utilized. I would like to congratulate these authors on stratifying the two separate populations, as this represents a crucial contribution in recognizing these distinctly different patient populations and provides preliminary data that may aid in answering this initial question. Further study is necessary in this area including identifying which specific procedures are aided by concomitant distal femoral osteotomy and which are not. Prior studies regarding a high tibial osteotomy for gonarthrosis and joint preservation have suggested that increased valgus correction may be important in the setting of moderate to severe arthrosis, while neutral correction may be optimal in the setting of chondral restoration. Future studies regarding the correction effect following distal femoral osteotomy on patient outcomes with similar pathology in the lateral compartment will be important.

While the current study unquestionably adds to the previous paucity of data regarding outcomes and complications following distal femoral osteotomy and therefore assists in answering the second question regarding which distal femoral osteotomy technique may be optimal, the

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small study size remains an issue. Future large-scale studies are necessary to address this significant limitation. Since distal femoral osteotomies are not exceedingly common, a multicenter study design would address this limitation. This multicenter study design may enable a direct comparison of lateral opening-wedge distal femoral osteotomy to medial closing-wedge distal femoral osteotomy, which could help address this significant controversy.

Lastly, obtaining accurate osteotomy correction following distal femoral osteotomy and high tibial osteotomy continues to represent a significant complication. The current article highlights this difficulty despite the use of lateral opening-wedge distal femoral osteotomy that is suggested to allow a more accurate correction. This data suggests that using the lateral opening wedge distal femoral osteotomy technique may not represent the best answer to the aforementioned third question regarding which technique optimizes osteotomy correction

accuracy. Further study is clearly required in this specific area. Utilization of computer-assisted navigation for correction accuracy has produced promising results [6] in this regard. However, no data exists to identify the most accurate correction method. Future studies should allow direct comparison of correction accuracy among lateral opening-wedge distal femoral osteotomy versus medial closing-wedge distal femoral osteotomy and computer assisted navigation versus intraoperative alignment guides.

The data obtained from these future studies will undoubtedly improve our understanding of and ability to treat patients with valgus malalignment and lateral compartment focal chondral pathology, meniscal deficiency or generalized gonarthrosis.

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