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CORR Insights®: No Clinically Important Differences in Thigh Pain or Bone Loss Between Short Stems and Conventional-length Stems in THA: A Randomized Clinical Trial

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Where Are We Now?

The study by Won et al. [9] addresses a concerning complication after THA, namely thigh pain in conjunction with a cementless femoral stem. In their prospective, randomized study, 100 patients were randomized to receive either a short-length or standard-length, titanium, flat, tapered stem from the same manufacturer (Zimmer Biomet, Warsaw, IN, USA). Thigh pain was evaluated with a 10-point VAS scale, and bone mineral density was assessed with dual-energy x-ray absorptiometry (DEXA) scans. At a minimum of 5 years of follow-up, the authors could detect no difference in thigh pain, Harris hip scores, or loosening between the two groups, while the DEXA scans showed a slightly smaller decrease in bone density in Gruen Zones 2, 3, and 5 in the shorter-stem group.

Thigh pain after THA can result in impairment and patient dissatisfaction. The incidence and etiology of stem-related thigh pain has remained somewhat elusive over a generation, and while many researchers have implicated design features such as stem material [2, 7], stem size [8], stem shape [6], and extent of porous coating [5], I'm not aware of any high-quality studies that have answered these questions. It seems that the challenges of stem fixation and durability have been solved, with published high survivorship rates across many stem designs. Despite excellent survivorship, manufacturers continue to develop new designs to address the practical challenges that surgeons face. Over time, stems have gradually become shorter to facilitate implantation and avoid the implantation of diaphyseal bone, and stems have been designed with reduced shoulders to spare trochanteric bone and facilitate implantation with muscle-sparing approaches. Additionally, some stems now use different types and extents of coating. Once thought to be a design taboo, collars have been added to certain tapered cementless stems to enhance early stability [3, 4]. Although this evolution in design may appeal to surgeons, any design change may have unexpected consequences on other metrics such as rates of fixation, periprosthetic fracture, and patient-reported thigh pain. Furthermore, most new implant designs come with an additional cost, so a higher cost combined with the possibility of deterioration in outcomes makes the development of new designs somewhat perilous.

One example is illustrated in a study by Amendola et al. [1]. This study reported a single surgeon's experience with a new, shorter, titanium tapered stem. Although ingrowth was excellent in their 261 hips, 16% of patients reported mild thigh pain, 9% reported moderate-to-severe pain, and one patient underwent revisions for severe thigh pain. Because of these results, the senior author abandoned the use of the

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product. Unfortunately, it remains unclear why the stem in that study had this unfortunate outcome. Curiously, the design of this stem resembles many similar products on the market that have lower published rates of thigh pain [6, 9]. This illustrates one current conundrum—researchers haven't reliably pinpointed the factors that contribute to stem-related thigh pain in the presence of an aseptic, well-fixed stem.

This well-done Level I study by Won et al. [9] has addressed one specific question related to one specific product regarding stem-related thigh pain: does a shorter version of the same stem reduce (or increase) the rate of patient-reported thigh pain? The answer shown from the results of this study was convincingly no, with several other metrics also demonstrating no difference in outcomes between the shorter and longer stems. Interestingly, despite identical results, the authors recommended in their conclusion that the longer stem be used because of its longer track record. Some, like myself, may have come to the opposite conclusion: that with identical 5-year outcomes, either stem could be used, and preference may be given to the shorter version for ease of insertion and bone preservation.

Where Do We Need To Go?

What really causes stem-related thigh pain? Is it the stem's length, shape, material, or extent of coating? This study by Won et al. [9] has shown that stem length, at least in this implant design, does not appear to independently increase the rate of thigh pain. I surmise that it may not be any one design feature that changes thigh pain, and it remains a challenge to isolate just one design feature in a randomized study. In addition, it can be a challenge to pinpoint whether the pain in question is related to the stem or another exogenous source. Often a diagnosis of exclusion, stem-related thigh pain is a challenge to diagnose and even harder to treat. In cases in which pain is confined to the anterolateral thigh and infection has been ruled out, then it's paramount to evaluate for bony ingrowth. The absence of bone ingrowth would be one of the most common and important sources of implant-related thigh pain. I think ultimately we may discover that the implant that causes the least amount of pain for the patient is the one that best replicates the normal weight-bearing pattern of the proximal femur, distributing the forces across the bone to mimic how the native femur performs, but this is speculative. A bone-friendly metal, with fixation methods that replicate native load-sharing patterns, will likely cause the least amount of symptomatology.

The conclusions of this study [9] were only reached because of a substantial work effort (for which the authors should be commended). Any researcher who has enrolled patients in a prospective, randomized trial studying a hip or knee implant will understand the immense challenges of study conception, enrollment, and follow-up, especially years later. Quality studies like this are few and far between, primarily because of how difficult and expensive they are to complete. While we'd all like to solve the conundrum of stem-related thigh pain by performing similar studies comparing every facet of stem design, this is unrealistic in today's environment. We can continue to count on quality Level I data to guide our decision-making, but it's paramount that we develop other data sources to supplement voids in information. The mining of big data has the potential to do so.

How Do We Get There?

One potential alternative to randomized studies like this one [9] is the availability of large datasets, and one of the newest, the American Joint Replacement Registry, may address questions such as what causes thigh pain by collecting the right combination of data. The American Joint Replacement Registry is currently implementing the collection of patient-reported outcomes, and these data could help identify which products are providing the best outcomes. The simple addition of a VAS pain scale for thigh pain could prove extremely valuable in comparing rates of thigh pain between different devices and help gain insight into which design features in which patients provide the best performance.

This is one of the many exciting prospects of our new national registry, potentially gaining insight into some of the more intriguing questions regarding the products we use. Instead of relying on the retrospective summary of one master surgeon's experience (who often designed the product in question), we are now able to observe the ways in which large numbers of products perform over a wide spectrum of surgeons, hospitals, and geographies. Of course, to do so, the right information must be gathered at the right time, and this remains one of the challenges of the American Joint Replacement Registry and other registries. How are the data obtained, when should they be collected, and what specific data should be targeted? Conceivably, with the right questions, registries could shed light on many of our most vexing questions, including the generational conundrum of stem-related thigh pain.

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