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CORR Insights

CORR Insights®: Two- to 4-year Followup of a Short Stem THA Construct: Excellent Fixation, Thigh Pain a Concern

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Where Are We Now?

Clinicians have proposed the use of short femoral stems to preserve bone stock and improve load-transfer characteristics of cementless THAs. They expect this approach to decrease the frequency of thigh pain, offer less stress shielding, and lower the risk of periprosthetic fracture compared to conventional cementless stems. Additionally, shorter stems can be adapted to minimally invasive approaches, as they facilitate insertion and reportedly limit perioperative complications, specifically periprosthetic fractures [8].

To date, however, it remains unclear whether short femoral stem THAs perform as well as their standard-sized counterparts in a durable way. The longest followup studies (10 years or longer) have been reported for short femoral implants either with a tight metaphyseal design [7, 9] or with a neck-preserving concept [4, 5], in patients with a mean age of 52 years to 73 years. Using these systems, researchers found acceptable stem revision rates (0% to 3.4%) for aseptic loosening [4, 5, 7, 9].

The work by Amendola and colleagues confirms that an excellent metaphyseal fixation can be obtained using a Tri-Lock Bone Preservation Stem (BPS) (DePuy, Warsaw, IN, USA), as illustrated by the ideal femoral bone ingrowth observed and an absence of major stem migration. However, in the current study, this procedure resulted in 25% of patients reporting thigh pain, which is associated with decreased function, notably in young patients, after a mean of 3 years. These observations led the authors to abandoning the use of the Tri-Lock BPS.

Although a well-documented radiological followup is presented, the authors did not evaluate a quantitative parameter, such as the amount of stem subsidence, making it impossible to relate pain to the degree of eventual stem migration. Nevertheless, the current findings should encourage hip surgeons to be attentive to this uncommon complaint.

Where Do We Need To Go?

Is stem mechanical behavior a factor regarding the high proportion of thigh

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pain reported in the current study? Generally, short-stem concepts are based on metaphyseal anchoring leading to bone remodeling in the proximal part of the femur. Using the Tri-Lock BPS, Albers and colleagues [1] found all but one stem out of 126 THAs to be osseointegrated after a mean of 5 years, which is in line with the observations by Amendola and colleagues. A finite element analysis combined with a dual-energy x-ray absorptiometry analysis conducted on the Metha neck preserving stem (B. Braun Aesculap, Tuttlingen, Germany) confirmed that stress shielding and bone mass loss occurred slightly in the proximal regions of the femur and were associated with a preservation of diaphyseal bone density [6]. Taken together, these data indicate that smaller stems with a proximal anchorage ultimately achieve stable metaphyseal fixation with limited stress shielding.

Thigh pain following a cementless THA has been associated with continued subsidence of the femoral stem and localized stress at the tip of the stem [2]. Also, male patients are more prone to develop thigh pain after cementless THA, with increased severity, perhaps as a consequence of higher stress and activity.

Currently, there is no established relationship between stem migration and thigh pain. Still, stem subsidence has been regularly reported following short-stem THAs. Previously published studies [1, 10] suggest that primary stability may not be achieved in a substantial proportion of patients undergoing short-stem THAs.

With the observation that four stems failed to become successfully ingrown after the end of the current study period, questions remain regarding patient selection, and notably, if THA with a short stem may be suitable for patients with lower bone quality or abnormal anatomy of the proximal femur. In this context, further studies should thoroughly explore the range of suited indications, bone remodeling after longer followup, and long-term survival rates.

How Do We Get There?

Recent experience in the field of hip arthroplasty revealed that attractive concepts such as hip resurfacing or ultra-short femoral implants [3], may fail to achieve their promise. To determine whether there is any clinical benefit associated with the use of short stems in THAs, future studies will need to follow and report on large patient groups at long term. Those studies should define "thigh pain" clearly, ideally using a validated score designed for the purpose. Once properly defined, we should prospectively assess thigh pain following short-stem THAs. While the level of pain may be difficult to measure because it varies with activity, a validated functional score will help us to ascertain the clinical performance of such implants. A randomized controlled trial combining the efforts at several specialized centers using the same implants, with cementless standard-sized stems as controls, would of course be ideal. The criteria of inclusion, such as age, femur type, and quality of bone stock should be strictly defined, in order to limit selection bias.

Although 10 year- to 16 year-survival rates have been reported with short stems [4, 7, 9], we need stronger evidence to determine whether short stems represent a safe alternative to traditional long-stem designs. It is my hope that a national joint registry, such as the American Joint Replacement Registry, and international joint registries, such as the Nordic Arthroplasty Register Association will help to confirm these findings, as well as determine the risk factors associated with short-stem THA failures. Until then, surgeons and researchers should closely examine their patients and promptly report any concern regarding short-stem THAs.

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