

Comparison of various Cementless femoral Stems in Total Hip Arthroplasty

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Introduction

Total hip Arthroplasty is becoming routine procedure for various hip diseases, such as osteonecrosis of the femoral head, development dysplasia hip, and hip arthritis [1]. The evolution of various femoral stem design, fixation methods, size, and bearing surface of implants for total hip replacement have led to considerable improvement and survival in the implant life in turn leading to a great change in the quality of life of patient. The need to determine the most optimal combinations of Total hip Arthroplasty implant is based on various factors like age, bone quality and even financial constraints. In primary Total hip Arthroplasty, basically the Cementless stems comes in 2 types of prostheses, which are available as: conventional stems are a standard length of ~150mm, compared with Short Stems, which are <120mm in length [2].

Conventional Cementless implants in total hip Arthroplasty have shown excellent clinical results; however, it is unclear whether Short Stem prostheses can obtain the same clinical and radiological outcomes. With conventional femoral stems proximal stress shielding and thigh pain often occur after surgery. Advantages in case of Short-stem prostheses are less resection of the femoral neck, helps in having a physiological load pattern in the proximal femur, reduce stress shielding, and aids bone conservation. Hence these are beneficial for young patients as it conserves bone mass and extend the service life of prostheses. Also providing favourable conditions for revision. The short stems are mainly based on metaphyseal fixation. Few authors conducted meta-analysis found strong evidence indicated no difference in HHS and WOMAC when comparing Short Stems to Conventional Stems after Total Hip Arthroplasty.

From their studies, it was found that the short follow-up time (6 weeks) did not influence the heterogeneity of the pooled results of HHS and WOMAC. And meta-analysis found that there were no significant differences in the presence of femoral offset and leg-length discrepancy. Short Stem prostheses achieved the same clinical and radiological outcomes as conventional implants, and were superior in terms of reducing thigh pain. But whether the

postoperative thigh pain applied in 2nd-generation Cementless prosthesis still needs further large-scale multicenter studies with longer follow-up to confirm [3]. Short-stem hip Arthroplasty (SHA) was designed to preserve bone stock and provide an improved load transfer. To gain more evidence regarding the load transfer, this review analysed the periprosthetic bone remodelling of SHA in comparison to standard hip Arthroplasty. Periprosthetic bone remodelling is also present in SHA, with the main bone reduction observed proximally. However, certain SHA stems show a more balanced remodelling compared to Total Hip Arthroplasty, arguing for a favourable load transfer. Also, the femoral length where bone remodelling occurs is clearly shorter in SHA [4].

In another study which has compared the bone quality by using Bone mineral density noted the following findings - With a mean follow-up was 3.35 years in two groups. Bone mineral density was significantly increased in femoral zone 1 but slightly decreased in zone 7 in the short, metaphyseal-fitting stem group. In the conventional metaphyseal and diaphyseal-fitting stem group, bone mineral density was markedly decreased in both zones 1 and 7. Clinical and radiographic results were similar between the 2 groups. No hip in either group required revision of the components [5]. One of the studies on ultra short stems came out with following findings: At follow up into the second decade, ultra short stems showed no differences from conventional cCementless stems in terms of validated outcomes scores or fixation, while showing slightly less stress shielding and less thigh pain, although this difference may not have been clinically important; in the conventional group, thigh pain was mostly mild, and there were no differences in hip scores. Reduction of stress shielding may reduce the long-term risk of periprosthetic fracture, but this was not shown here. Future studies might document the reduction of the long-term risk of periprosthetic fracture by reduction of stress shielding [6].

Finally to conclude choosing the right kind of femoral stem, the surgeon should keep an optimal distribution of stress in proximal femur, implant design should have maximal preservation of bone without compromising stability and for long term survival. So

with the recent trend going towards maximal bone preserving and Cementless fixation, there are results with an array of stems showing difference in results and implant survival. There is a lot of observational data presented in the large National Registry reports which are updated annually (e.g. UK NJR, Australian Registry, Swedish Registry), and have data on important outcomes, even revision rates of hundreds and thousands of patients who have received different variety of prostheses over one decade and more. But still these have shortcomings like delay in reporting, misclassification of outcomes and few missing reports.

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