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**Original article:   
Effect of the femoral stem size on femur bone quality towards THR**

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**Abstract:**

Aseptic loosening of hip joint, after Total Hip Replacement, is one of the critical complications in many cases. To reduce this problem many researchers have carried out comprehensive research on different technical aspects of this issue. One of the approaches is based on improved design of femoral stem related to its shape and sizes. Many authors have found that short sized femoral stem provides better long term results, especially for cementless fixation. But in many cases it is found that the requirement of stem sizes is also dependent on bone density or bone quality, which varies with the age of patient. In present article, computational analysis has been carried out to find the effect of hip stem sizes on femur bone quality, as case study.

The suitable outer geometry of femoral stem was prepared, based on the CT data of femur, using MIMICS and other CAD packages. Two types of stem design were prepared, as with collar and without collar. Each stem was assigned with two different lengths, i.e. short, and long. Thus total four types of femoral stem designs were prepared and those were put inside the femur canal for stress analysis in ANSYS. During analysis the material of femoral stem was assigned as Ti6AL4V and weight of average Indian patient was considered as 60 Kg.

It was found that short sized collarless femoral stem creates very high stress in femur bone, which is favourable towards reducing stress shielding but sometimes it may be threatening for the poor bone quality, i.e. for osteoporotic bone. Hence it can be said that higher or larger sized femoral stem is better for older patients with osteoporotic bone. On the contrary, lower or short sized femoral stem is suitable for younger patients having good quality bone.

Keywords: Femoral stem, Total Hip Replacement, bone quality, short and long stem, Aseptic loosening

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