

VHP-Female version 3.0

Application note #4– Additional Components: Implants included in Model 3.0

1. Activation

Femoral implants may be included by activating additional objects supplied with the model. Simultaneously, some affected tissue objects should be removed from the model. Fig. 1 shows the available femoral implants. All implants originate from the Center for Advanced Orthopaedic Studies, Beth Israel Deaconess Med. Center (BIDMC), Harvard Med. School, Boston, MA, USA.

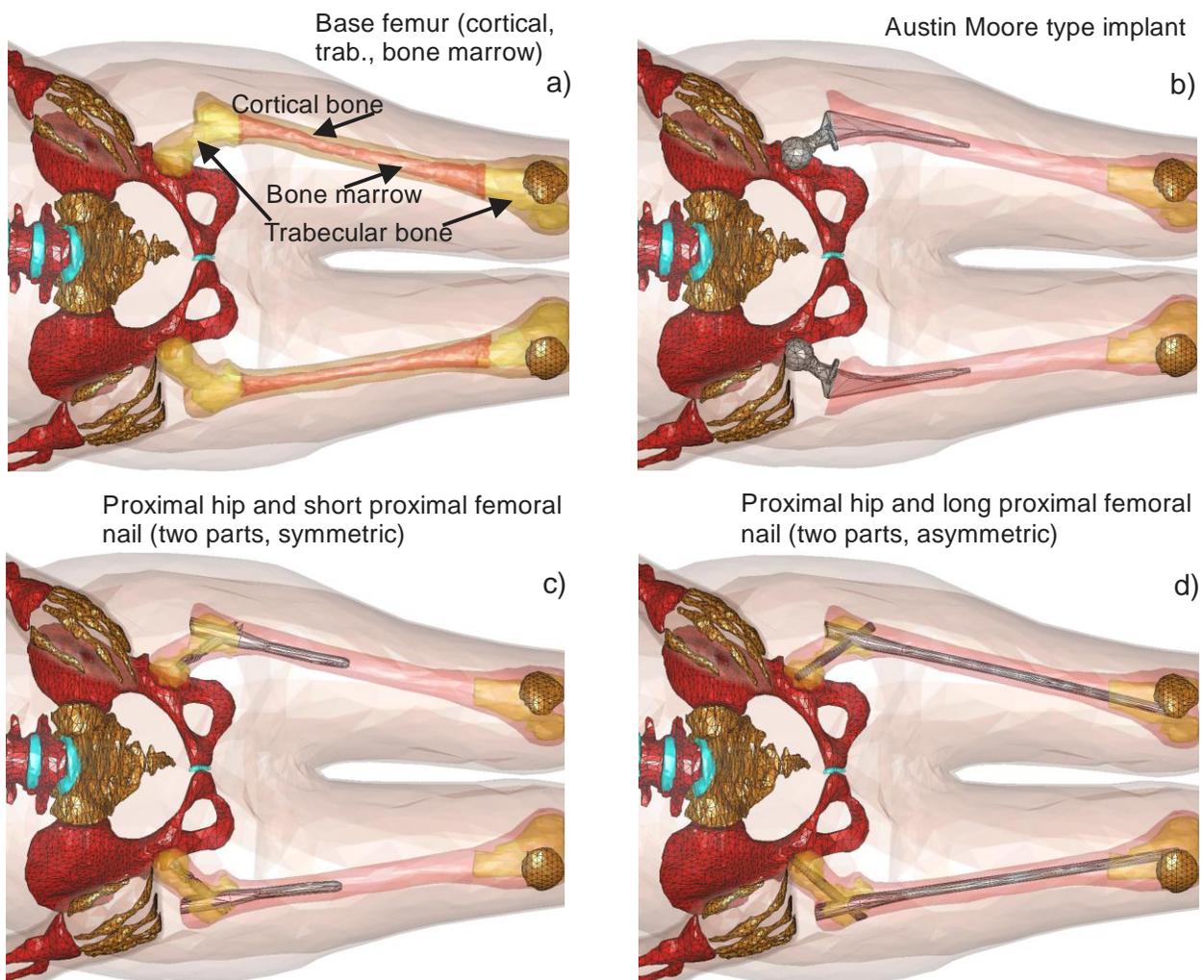


Fig. 1. Available femoral implants. All figures are given for VHP 3.0 BASE version.

2. Embedding implants

For all implants:

Remove objects Femur_Bone_Marrow_Left and Femur_Bone_Marrow_Right from the model. Both tissue objects belong to the Bone Marrow Yellow material group.

To use the Austin-Moore type (modular prosthesis with a separate ball head)

In order to use the left implant:

1. Remove object Femur_Left from the model (material group Bone Cortical)
2. Remove object Trabecular_Left_Upper from the model (material group Bone Cancellous) by making it non-model
3. Add object Implant_Femur_Mod_Left_AMP to the model
4. Add object Implant_AMP_Left to the model

Assign all missing material properties. In order to use the right implant, perform the same steps as above while replacing Left by Right. Note that there is a gap of ~1mm between the implant's femoral shaft and the bone. By default, this gap is filled with the average body properties.

To use the Short Proximal Femoral Nail with Proximal Hip (SI)

In order to use the left implant:

1. Remove object Trabecular_Left_Upper from the model (material group Bone Cancellous)
2. Add object Implant_SI_Left to the model
3. Add object Implant_Trabecular_Left_Upper_SI to the model

Assign all missing material properties. In order to use the right implant, perform the same steps as above while replacing Left by Right. Note that there is a gap of ~1mm between the implant's metal surface and the cortical and trabecular bones. By default, this gap is filled with the cortical bone matter. The implant is thus fully embedded into the cortical bone matter, in contrast to the previous one. Other variations are possible.

Ref: D. S. Parmar, M. M. Porecha, and S. L. Chudasama, "Long proximal femoral nails versus short proximal femoral nails for the management of proximal femoral fractures: a retrospective study of 124 patients," *Eur. J. Orthop. Surg. Traumatol.*, vol. 21, 2011, pp. 159-164.

To use the Long Proximal Femoral Nail with Proximal Hip (LI)

In order to use the left implant:

1. Remove object Trabecular_Left_Lower from the model (material group Bone Cancellous)
2. Remove object Trabecular_Left_Upper from the model (material group Bone Cancellous)
3. Add object Implant_LI_Left to the model
4. Add object Implant_Trabecular_Left_Lower_LI to the model
5. Add object Implant_Trabecular_Left_Upper_LI to the model

Assign all missing material properties. In order to use the right implant, perform the same steps as above while replacing Left by Right. Note that there is a gap of ~1mm between the implant's metal surface and the cortical and trabecular bones. By default, this gap is filled with the cortical

bone matter. The implant is thus fully embedded into the cortical bone matter. Other variations are possible.

In order to correctly embed the implants, femoral and neighboring meshes have been deformed according to medical practice. The guidance of Prof. Ara Nazarian (Center for Advanced Orthopaedic Studies, Beth Israel Deaconess Med. Center (BIDMC), Harvard Med. School, Boston, MA, USA) in this matter is acknowledged.