

Orthopedic Surgical Training Model for AGN1 Local Osteo-Enhancement Procedure (LOEP)

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Osteoporosis is a metabolic disease that reduces the density and quality of bone. As the bone becomes more porous and fragile, there is an increased chance that a fracture may occur. Agnovos has developed a new synthetic biomaterial called AGN1 to replace and restore functionality to osteoporotic bone. In the local osteo-enhancement procedure (LOEP), ANG1 is injected into the femoral head of the patient. Currently, Agnovos employs a customized femur model made by Sawbones as a training model for simulation and training. The purpose of this project is to create an alternative training model for the LOEP surgery that is cheaper, more realistic, and more practical to use. Our model has three principle components: a reusable outer case, disposable femur head and flesh inserts, and a tutorial application. The 3D-printed outer case simulates the upper thigh and holds the bone model in place. The femur head was created by setting polyurethane foam in a silicon mold and coating the shaped foam in epoxy resin. The optimal mixing ratio of the polyurethane foam was determined through a nail-weight impact test. The flesh insert is comprised of Humimic Medical Gel and a thin layer of silicon, simulating muscle and skin, respectively. The application provides an intuitive walk-through of the training procedure using our model. We met our goal of developing a cheaper alternative to the \$70 Sawbones model. The total one-time cost of our case was \$53.35, and the cost for a set of disposable femur head and muscle inserts is \$12.07. Our femur model is watertight, allowing trainees to perform the irrigation and aspiration steps of the LOEP procedure, and the case itself allows the bone to be easily inserted and replaced during training. Overall, we have created a suitable alternative to the currently-used Sawbones model that is cheaper, more realistic, and easier to use.