Lifecasting in O&P
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Lifecasting, as used in the field of orthotics and prosthetics (O&P), is the process of using various molding and casting techniques to produce realistic analogues of parts of the human body. In order to provide patients with optimal fit and function of fabricated devices, students of O&P must learn to palpate the bony landmarks of sound and residual limbs and to perform proper techniques when creating clinical molds of these structures. Though living models are ideal for learning these techniques, they are often limited in their availability. The degree of lifelike reality offered by existing artificial models is less than satisfactory. As part of a continuing project in lifecasting techniques and materials, O&P students at Eastern Michigan University are working with Professor Frank J. Fedel to create models of residual limbs, from deep to superficial tissue layers, with an unprecedented degree of biomimesis. Techniques explored include mold creation for the face, bust, and extremities; casting; and rectification of the resulting cast. Materials used include alginate, tin-cure and platinum-cure silicone, pourable clay, plaster/Hydrocal, and polyurethanes.

The first installment of the project is a short transradial residual limb attached to a modeled torso. The mold for the model was made from a patient’s residual arm. The model incorporates an articulated ball-and-socket shoulder joint that has nearly identical range of motion to that of the human shoulder. The humerus and residual radius and ulna are made of casted polyurethane. The soft tissue and musculature are represented by expanding soft polyurethane foam. The skin is platinum-cure silicone mixed with deadeners, colorants, and flocking to give it a more realistic appearance, feel, and variation of tissue durometers while palpating.

The second installment is a transtibial residual limb and is currently in progress. The mold for the model will again be made from a real patient. From CT scans of the patient’s residual bones, a stereolithographic femur, tibia, fibula, and patella will be produced and used in the model so the palpable bony landmarks will correspond exactly to the limb’s topography. This installment will also utilize realistic soft tissue representatives and silicone-based skin.

The goal of this project is to provide students with more accurate classroom instructional aids for palpation and casting exercises. It is hoped that the project will be continued by each succeeding cohort in Eastern Michigan’s Orthotics &Prosthetics Master’s Program so that many diverse pathologies and levels of amputation will be represented.

More research will be necessary to determine the efficacy of the addition of this model to the classroom experience.