H18 Design Perspectives for Obtaining Facial Soft Tissue Depths From Cadavers Using a New Approach

Janene M. Curtis, MS, and Owen B. Beattie, PhD, University of Alberta, Department of Anthropology, 13-15 HM Tory Building, Edmonton, Alberta T6G 2H4, CANADA*

After attending this presentation, participants will have an under- standing of potential causes of measurement error in the design and tech- niques of earlier methods in obtaining facial soft tissue depths, and gain an appreciation into the design proposed here to rectify these issues.

This presentation will impact the forensic and medical communities by providing more accurate anatomical data for forensic facial approximation and surgical reconstructions. The newly designed apparatus could poten- tially help to obtain more accurate and precise measurements for future studies of facial soft tissue depths from different cadaveric populations, as well as provide a method to produce a gold standard in which this method could be used to compare other types of methods such as magnetic resonance imaging (MRI), computer tomography (CT), ultrasound, and X-ray in order to provide validation.

Historically, past studies concerning facial soft tissue depth on cadavers have been made using the needle puncture technique, which involves inserting a needle into the flesh with a free hand until the needle strikes bone. The needle is either covered in soot or it contains a piece of moveable rubber. The needle is then removed and a measurement is taken. Sources of meas- urement error of this traditional method may include compression of the skin, variation in the angle at which the needle penetrates the skin, penetration of the bone due to the tip of the needle, and variation in reading a measurement after the needle is removed from the skin.

In order to rectify these problems, the authors have designed a tissue depth apparatus (TDA) which could eliminate these concerns. The TDA is comprised of a micrometer head encased in acrylic glass with an attached blank drill bit. This structure is then situated in an open-faced acrylic glass box and the micrometer head can move in all planes. The micrometer head allows the measurement of a soft tissue depth to be taken directly as soon as the drill bit contacts bone with a consistent amount of pressure. Furthermore, compression problems can be avoided as the micrometer head can be zeroed as the tip of the drill bit first touches the skin surface. Since the micrometer head can be moved in all planes, the drill bit can be inserted into the skin at a consistent angle, perpendicular to the skin.

The needle choice itself is an important part of the design of the TDA. A number of different types and dimensions of needles were tested for their applicability. A blank drill bit enclosed by a hypodermic needle was best suited for this purpose. The drill bit itself is flat bottomed, ensuring that its tip will not penetrate the bone surface when a consistent light pressure is applied, while the hypodermic needle decreases compression forces required to pierce the dermis, enabling one to retest a specific area.

The accuracy and precision of the TDA design were tested initially using two phantom models followed by cadaveric tissue. The results of measurement error based on this method are compared with past results of traditional methods. With modifications, this design could be used on living subjects, to obtain soft tissue depths by ultrasound.

Accuracy, Precision, Phantom Models

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