CHAPTER III

MATERIALS AND METHODS

Materials

1. Specimens

The heads of ox, dog, and man have been collected from different places in 1977 and 1978. Ten heads of ox, Bos sundiacus and ten heads of street dog were collected from the Livestock Trading Cooperation Limited and Department of Rabies Control of Bangkok, respectively. On the other hand, ten Thai man heads were collected from the cadavers from the Department of Anatomy of Mahidol University and Pramongkutklao College of Medicine.

The origin and insertion of each of the four muscles of mastication (i.e. temporalis, masseter, medial and lateral pterygoid muscles) were seperated from each specimens and kept moist in plastic bags for further studies.

2. Photographic Apparatus

A boxlike wooden frame of $1\frac{1}{2}'$ X $2\frac{1}{2}'$ X 2' was constructed for photographs taking with a one square-centimeter glass plate scale where specimens were laid (Fig. 1).

A 35 mm. single lens reflect camera (SLR) with the macrolens was used for reproduction of picture taking in the actual size (1:1).

Other photographic accessories included two photoflooding lamps of 150 watts each, and a tripods for holding the camera.

3. Apparatus for Constructing a Model

Sheets of zinc were used for representation of the aponeurosis, external and internal tendons; whereas silver wires coated with insulated color material were used for representation of the muscle fibers. These materials were soldered together with an electric soldering gun in order to construct the models of each muscle of mastication.

Methods

1. Removing the Masticatory Muscles from the Heads

The deep fasciae covered the temporalis and masseter muscles in man were removed. Sketches and photographs of these two muscles were made in situ. The origins and insertions of both muscles were then cut. Both the lateral and medial surfaces of the isolated muscles were recorded again.

Next, the ascending ramus of the mandible was cut. Again, the deep fasciae and connective tissue were cleaned and removed to display the medial and lateral pterygoid muscles. Both muscles were recorded and then removed from their origins and insertions.

These muscles were preserved and kept in the plastic bags for further studies.

The muscles of the ox and dog were freshed, and therefore, kept in plastic bags in the freezer for a couple of days. Then,

they were fixed and preserved in 10% formalin for 24 hours. Finally, these muscles were removed and recorded in the same way as in the human muscles described above.

2. Study of the Internal Structure

The internal structure of the muscle was then studied by the teasing method (Heinze, 1963; Gagnantadilok, 1976). Each muscle fiber was first isolated by the fine, straight forceps. Then, it was followed as far as possible to its attachments on the internal tendons or the aponeuroses. Finally, each muscle fiber was removed by cutting at its attachments. This procedure has been repeated several times until the internal tendons and aponeuroses were freed. A series of sketches and photographs were made during this study.

The isolated internal tendons of each muscle was then further preserved in 10% formalin for detail studies.

3. Construction of the Models

The results of this study were demonstrated by the constructed models which were used before by Gagnantadilok (1976). Each model was built by the sheets of zinc, which represent the internal tendons or the aponeuroses, and the silver wires, which represent the muscle fibers. The sheets of zinc were cut in the same shape and size as the internal tendons. The silver wires were cut at the actual length. The sheets of zinc and the silver wires were soldered together. Thus, the model represents the three-dimensional shape of the internal structure of the muscle. However, the model is a little larger than the actual specimens, because of the thickness

of the sheets and wires and the technique of soldering methods. In case of a small muscle, the model was constructed two or one and one-half times of the actual size of the specimens.

4. Terminology of the Internal Structure

The terminology of the internal structure of the muscle in this study was based on which established by Gagnantadilok (1976). Such a terminology is concise and logical. The aponeurosis (A) is the external tendon which expands onto the muscle surface. The primary lamina (P) is the internal tendon which arises from the external tendon or from bone and extends within the muscle mass. The secondary lamina (S) and tertiary lamina (T) are the internal tendons which arise from the primary lamina and the secondary lamina, respectively. The subscript o indicates of origin and i indicates of insertion. Due to several external or internal tendons in each muscle, the ordinal number (1,2,3....) stands for the individual external or internal tendons. The number 1 is the lateralmost or anteriormost of the external or internal tendons. The abbreviation of such terminology used in the text and figures are shown in Table 1.

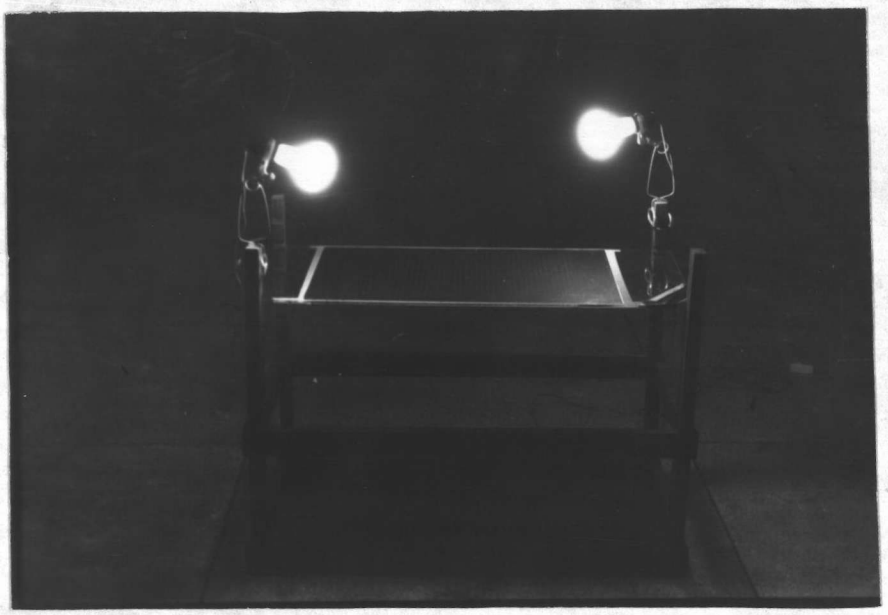

Fig. 1 A boxlike wooden frame of $1\frac{1}{2}'$ X $2\frac{1}{2}'$ X 2' with a one square-centimeter glass plate scale and two photo-flooding lamps of 150 watts each on the top.

TABLE 1

ABBREVIATIONS USED IN TEXT AND PICTURES

Ao = aponeurosis of origin

Po = primary lamina of origin

So = secondary lamina of origin

To = tertiary lamina of origin

Ai = aponeurosis of insertion

Pi = primary lamina of insertion

Si = secondary lamina of insertion

Ti = tertiary lamina of insertion

1,2,3,...= the first, second, third, and ..... layers of muscle fibers

ant. = anterior

post. = posterior

med. = medial

lat. = lateral

dor. = dorsal

vent. = ventral

Fig. = Figure