CHAPTER II

REVIEW OF LITERATURES

The studies of the muscles of mastication have been done for a long time. These muscles in crocodiles were also studied (Poglayen-Neuwall, 1953; Iordansky, 1964). Poglayen-Neuwall (1953) differentiated the portions of the jaw adductors basing on their position in relation to the ramus mandibularis nervi trigemini and the direction of the muscle fibers. It was divided into M. adductor mandibularis externus, M. adductor mandibularis intermediate, and M. adductor mandibularis internus; M. constrictor I dorsalis; and M. intramandibularis. The M. adductor externus was further subdivided into pars superficialis, pars media, and pars profunda.

Iordansky (1964) studied the jaw muscles of crocodiles in details devoted to the investigation of the alternation of the skull in the evolution of the diapsid reptiles. He arbitrarily divided the jaw adductors into only two portions; i.e. M. adductor-external profundus and M. intramandibularis. He also described the intramuscular tendons that inserted into the skull and mandible. Appearently, these two investigators had two different concepts. Iordansky (1964) suggested that the muscle mass should not be divided by the intramuscular tendon while Poglayen-Neuwall (1953) used it as a guide to seperate the muscle.

The studies of the muscles of mastication of the mammals have been done in two different ways. Firstly, it was based on the relationships between these muscles and the skull. Washburn (1947) explained that the coronoid process was self-differentiation. In contrast, some of the investigators (Rogers, 1958; Avis, 1959; Spyropoulos, 1977) stated that the coronoid process differentiated after the differentiation of the temporalis. On the other hand, the differentiation of the masseter was related to the development of the angular process (Horowitz & Shapiro, 1955; Nanda, et al., 1967; Moss & Simon, 1968).

Secondly, it was based on the general outlaying of the muscles. These studies were done in mammals. On studying the temporalis and masseter muscles in some mammals such as apes, dogs, opassums, bats, oxen etc., Allen (1880) suggested that the masseter was generally composed of four layers. The temporalis had a superficial and a deep sets of fibers. In his investigation, he explained only the general structure of both muscles; unfortunately, the internal structures were omitted.

Yoshikawa & Suzuki (1969) studied the comparative anatomy of the masseter in mammals. He divided the masseter into two groups; i.e. proper and improper masseter. The proper masseter was divided into pars superficialis and pars profunda. The pars superficialis was subdivided into the first superficialis, the second superficialis, and the intermediate superficialis. The pars profunda was also subdivided into pars anterior and pars posterior. The improper masseter was divided into maxillomandibularis and zygomandibularis. He

proposed the lamina theory in that the muscle was divided into layers by the internal tendon.

Heinze (1963, 1964, 1969) studied the internal structure of the muscles of mastication in various mammals (i.e. pig, horse, cattle, sheep, goat, dog, cat, rabbit) in details. He suggested that all muscles are composed of the internal tendons which are classified into the tendons of origin and insertion. As a rule every muscle fiber extended slantly from the tendon of origin to the tendon of insertion. Therefore, the muscle diagram was established in order to present his results. In each muscle diagram, it combined a series of cross and longitudinal section througout the muscle. His ideal was different from Yoshikawa & Suzuki's in that the muscle cannot be divided into portions by the tendons. The tendon was inside the muscle known as the internal tendon. He also found that the masseter in mammal was similar to the medial pterygoid muscle. Both of them had a complicated arrangement of the internal tendons. On the contrary, the temporalis had the simplest arrangement.

In 1973, Herring & Scapino studied extensively the anatomy of the muscles of mastication in the miniature pig. He observed the arrangement of the internal tendons and the direction of the muscle fibers between them. He found that the internal tendons of the masseter muscle and the medial pterygoid muscle had a complicated arrangement. The masseter had the lateral and the medial aponeuroses of origin. At the anterior extremity of the lateral aponeurosis, it curved medially into the fleshy fibers, forming the first of series of septa. The medial aponeurosis was the posteriormost septum of

the lateral aponeurosis which became parallel to the lateral aponeurosis and gave off septa of its own. The insertion system consisted of an internal tendon with septal branches, the anterior three of which are relatively independent. The posterior part of the internal tendon of insertion lied between the lateral and medial aponeuroses of origin. The medial pterygoid muscle had two U-shape internal tendons of origin, one enclosed within the other. The outer one gave off seven septa, some of which extended far inferiorly. The inner one extended posteroinferiorly as a single tendon. The insertion system consisted of four overlapping aponeuroses.

Herring & Scapino (1973) presented their results in three-dimensional diagrams. The diagrams demonstrated the aponeuroses and septa of origin, the aponeuroses and septa of insertion, and the relation between the internal tendons of origin and insertion.

Most recently, Gagnantadilok (1976) studied extensively the internal tendons of the muscles of the lower extremity in human. The shapes of the internal tendons and the relationship of the muscle fibers to these internal tendons were described. He also suggested the terminology of the internal tendons. His observations were presented in three-dimensional models.

The review of literatures shows that the studied of the internal tendons of the masticatory muscles of mammals were mostly demonstrated by the diagrams. On the contrary, the three-dimensional models were observed in the muscles of lower extremity in man only. According to the modes of actions of the muscles of mastication in

different mammals, such as the carnivore (dog), herbivore (ox), and omnivore (man), therefore, it is interesting to study the internal structures of these muscles in order to compare and study the structures and functions of these muscles. The results of this study were also presented by the three-dimensional models.