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Computed Tomography of the Buccomasseteric Region: 1. Anatomy

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The differential diagnosis to consider in a patient presenting with a buccomasseteric region mass is rather lengthy. Precise preoperative localization of the mass and a determination of its extent and, it is hoped, histology will provide a most useful guide to the head and neck surgeon operating in this anatomically complex region. Part 1 of this article describes the computed tomographic anatomy of this region, while part 2 discusses pathologic changes. The clinical value of computed tomography as an imaging method for this region is emphasized.

The differential diagnosis to consider in a patient with a mass in the buccomasseteric region, which may either be developmental, inflammatory, or neoplastic, comprises a rather lengthy list. The anatomic complexity of this region, defined arbitrarily by the soft tissue and bony structures including and surrounding the masseter muscle, excluding the parotid gland, makes the accurate anatomic diagnosis of masses in this region imperative if severe functional and cosmetic defects or even death are to be avoided during treatment. An initial crucial clinical pathoanatomic distinction is to classify the mass as extra- or intraparotid. Batsakis [1] recommends that every mass localized to the cheek region be considered a parotid tumor until proven otherwise. Precise clinical localization, however, is often exceedingly difficult. Obviously, further diagnosis and subsequent therapy is greatly facilitated once this differentiation is made.

Computed tomography (CT), with its superior spatial and contrast resolution, has been shown to be an effective imaging method for the evaluation of disorders of the head and neck. Both bony and soft-tissue anatomy, including a delineation of fascial planes and pathology affecting them, may now be imaged accurately, especially with the advent of later-generation high-resolution scanners. The normal and pathologic gross and CT anatomy of the buccomasseteric region and the important diagnostic role this method can play in delineating masses in this complex area have not been addressed previously. We review the pertinent gross and CT anatomy of this region. Various gross anatomic structures not usually seen on CT will also be included in the discussion to provide a solid anatomic basis for the clinical images.

Materials and Methods

Representative CT sections displaying normal anatomy of the buccomasseteric region in both the axial and coronal planes were selected from a large group of patients presenting with complaints referable to other anatomic regions. Scans were obtained on a G.E. CT/T 8800 or Siemens DR-3 scanner after intravenous administration of contrast material. Four or five millimeter contiguous sections were obtained through the area of interest with the head in slight extension, so axial slices were taken parallel to the hard palate as chosen from a preliminary digital radiograph. Coronal slices were similarly chosen from a preliminary radiograph, so they did not traverse metallic fillings whenever possible. A postsialogram CT study was included to display the parotid duct.
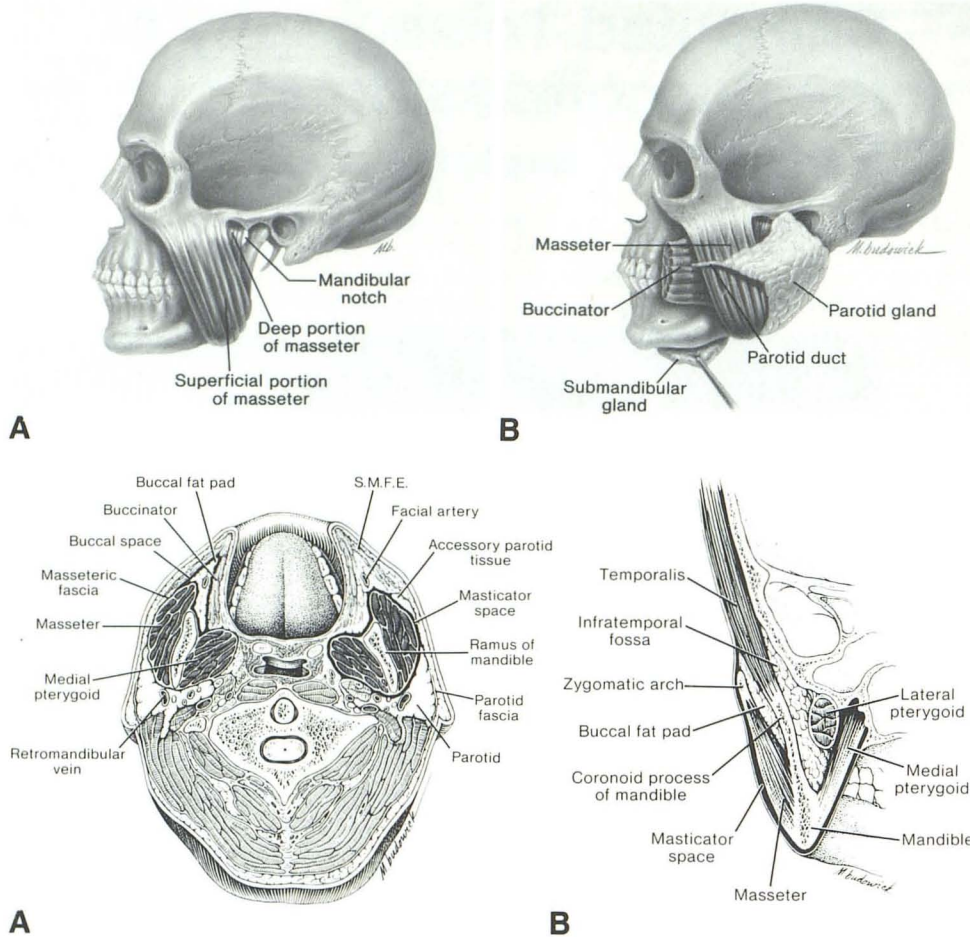
Fig. 1.—**A**, Lateral view of skull showing superficial and deep portions of masseter and its relation to mandibular notch. **B**, Lateral view with parotid gland, duct and buccinator. Note position of submandibular gland.
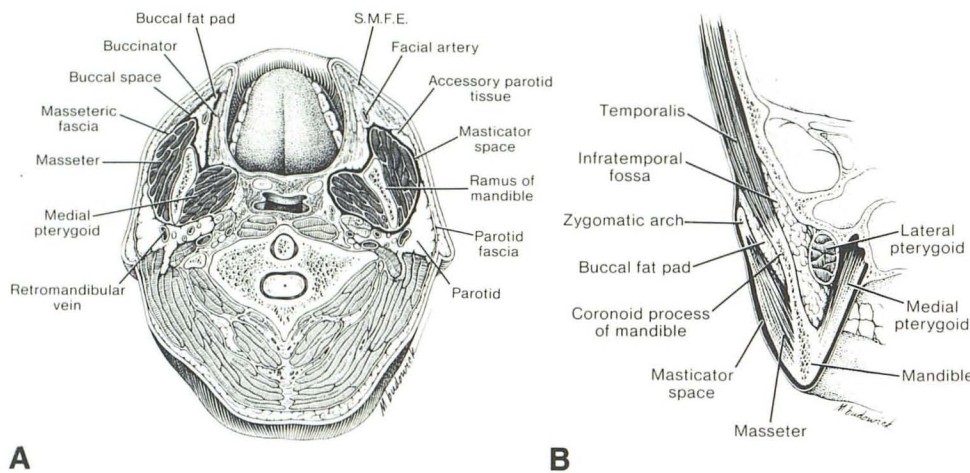

Fig. 2.—**A**, Axial anatomy through midportion of masseter. Parotideomasseteric fascia is made up of masseteric and parotid fasciae. Masticator space (outlined boldly) proceeds medially, encompassing masseter, mandible, and medial pterygoid. Note position of accessory parotid tissue. Buccal space is outlined. Superficial muscles of facial expression (SMFE) comprise mostly zygomaticus major at this level. **B**, Buccomasseteric region in coronal plane. Note position of buccal fat pad both medial and lateral to mandible, contiguous with infratemporal fossa. Also note extent of masticator space (outlined boldly).

Discussion

Gross Anatomy

The largest and central anatomic structure in the buccomasseteric or cheek region is the masseter muscle (figs. 1 and 2). The masseter, the major muscle of mastication, is innervated by the mandibular branch of the trigeminal nerve and derives its blood supply from the transverse facial and masseteric arteries. It is covered largely posteriorly by the superficial lobe of the parotid and anteriorly by muscles of facial expression (figs. 1B and 2A). It is crossed superficially, in a transverse direction, by the parotid or Stensen duct (fig. 1B). The transverse facial artery accompanies Stensen duct, while facial nerve branches, after they exit the substance of the parotid, cross anteriorly both above and below the duct.

The masseter consists of two blended parts, the larger of which is superficial (fig. 1A). It arises from the inferior border and deep surface of the zygomatic arch and inserts on the lateral aspect of the ramus, angle, and coronoid process of the mandible. A branch of the mandibular division of the trigeminal nerve, the masseteric nerve, reaches the muscle from the infratemporal fossa by passing through the mandibular notch (fig. 1A).

The superficial layer of the deep cervical fascia of the head and neck covers the masseter on its lateral surface [2, 3] (fig. 2A). Both the parotid fascia surrounding the gland and the masseteric fascia surrounding the muscle are known collectively as the parotideomasseteric fascia [3]. The masseteric fascia encircles the ramus of the mandible anteriorly and attaches to it inferiorly and posteriorly. It thereby completely encloses the muscle into a space except at its upper deep portion, where this compartment communicates with the space near the insertion of the temporal muscle [3–5].

The various blended superficial muscles of facial expression, innervated by the facial nerve, are situated just anterior and lateral to the masseter and its fascia (fig. 2A). At the midmasseter level, the most prominent is the zygomaticus major.

The buccinator (figs. 1B and 2A), a deep muscle of facial expression, is situated deep to the anterior border of the masseter. It arises from the pterygomandibular raphe of the medial aspect of the mandibular ramus and inserts on the external surfaces of the superior and inferior alveolar ridges near the tooth sockets.

The parotid duct, about 5 cm long, crosses the masseter transversely and turns medially abruptly at the anterior border of the muscle, coursing through the buccal fat pad (see below) and pierces the buccinator (fig. 1B). It opens intraorally into a small papilla opposite the upper second molar. In about one-fifth of normal subjects, an accessory parotid lobule is found,

Fig. 3.—Axial CT section through superior alveo-lar ridge. ZM = zygomaticus major; RMV = retro-mandibular vein.
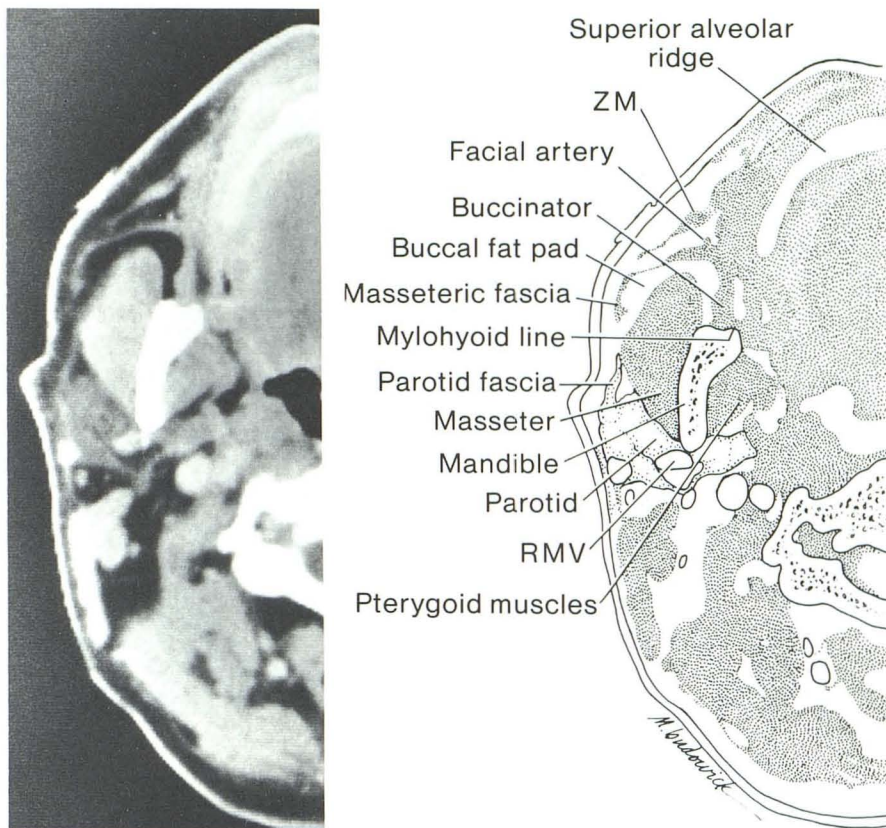
which is separated from the main gland by a short distance of up to 6 mm. This accessory gland is situated on Stensen duct and drains directly into it. This tissue behaves physiologically and pathologically like the rest of the gland (fig. 2A) [1, 6].

The buccal fat pad, a fairly well circumscribed mass of fat, lies superficial to the buccinator at the anterior border of the masseter [5] (fig. 2). Narrow prolongations of this fat pad extend deeply between the masseter and temporal muscle and into the infratemporal fossa, filling in between the various structures and bony fossae [3]. The facial artery is seen cut transversely on axial sections through the fat pad (fig. 2A).

The fascial spaces of the face are important because they tend to confine early infection; however, because they communicate with each other, an inflammatory process can easily involve multiple spaces [5]: The *masticator space* is formed when a superficial layer of deep fascia covers the masseter laterally, encloses the mandible, and overlies the medial pterygoid medially (fig. 2). Infection in this space can most easily escape superiorly to the temporal spaces, a description of which is beyond the scope of this paper. The *buccal space* includes the buccal fat pad anterior to the masseter and lateral to the buccinator (fig. 2A). This space is limited supero- and inferomedially by the attachment of the buccinator to the alveolar processes of the mandible and maxilla; thus, the roots of the teeth are related to this space. A mouth infection, therefore, extending to the parotid, may involve the buccal space, and conversely buccal space infections may involve the parotid [5] (see part 2) [7]).

CT Anatomy

The masseter is seen closely applied to the lateral aspect of the ramus of the mandible both in coronal and axial planes (figs. 3–6). The two blended parts cannot be distinguished by CT, although the origin and insertion of the superficial part is well seen on coronal section (fig. 6). Posteriorly, the boundary between the muscle-density masseter and the normally lower-density parotid usually is seen easily on CT in the normal state. This distinction is appreciated more easily in the older age group because of normal fatty infiltration of the gland later in life. An enhancing structure within the depths of the parotid adjacent to the posterior border of the mandibular ramus represents the retromandibular vein and is a constant finding (figs. 3 and 5).

Both the parotid and masseteric fascial layers are usually easily discernible on axial CT (figs. 3 and 5), especially when wide windows are used for imaging. The masseteric fascia is rather loosely applied to the muscle, in contradistinction to the parotid fascia.

The zygomaticus major, a superficial muscle of facial expression, is usually seen as a linear band of density arising from the anterior aspect of the masseteric fascia (figs. 3, 4, and 8). The buccinator is seen on axial CT just lateral to the
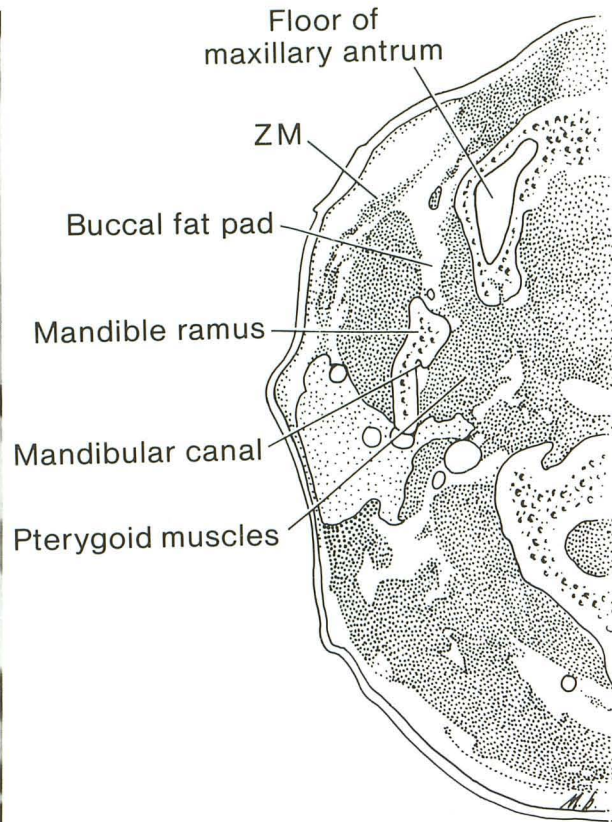
Floor of
maxillary antrum

ZM

Buccal fat pad

Mandible ramus

Mandibular canal

Pterygoid muscles

Fig. 4.—Axial CT section just cephalad to fig. 3 through floor of maxillary antrum. Mandibular canal is seen at this level. ZM = zygomaticus major.

Maxillary antrum

Zygoma

Buccal fat pad
(superior extension)

Masseter
(superior aspect)

Masseteric fascia

Pterygoid muscles

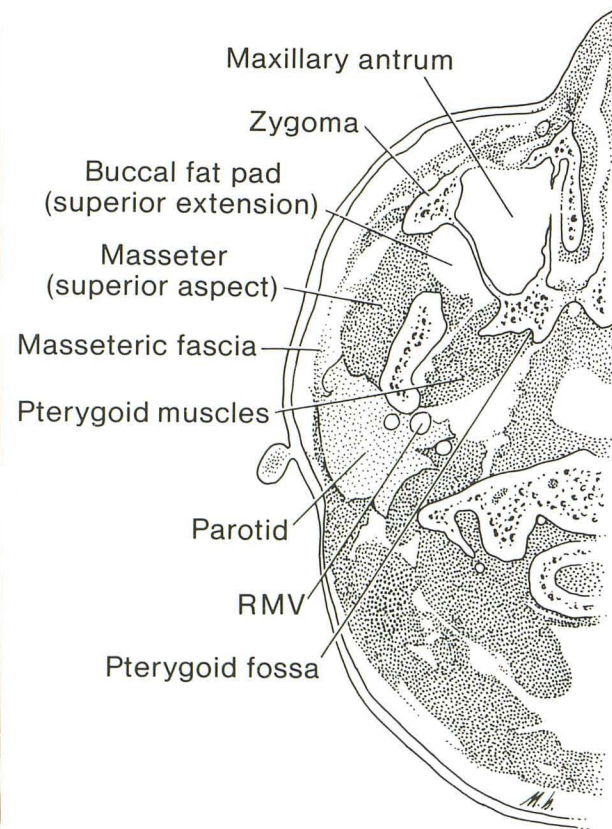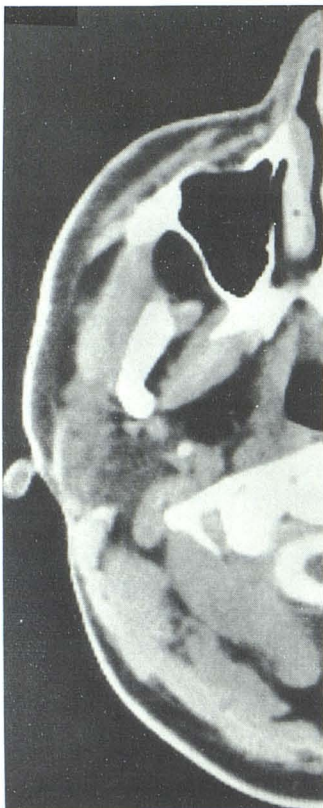Parotid

RMV

Pterygoid fossa

Fig. 5.—Axial CT section just cephalad to fig. 4 through mid–maxillary antrum and pterygoid fossa. Note origin of superior part of masseter from zygoma. RMV = retromandibular vein.

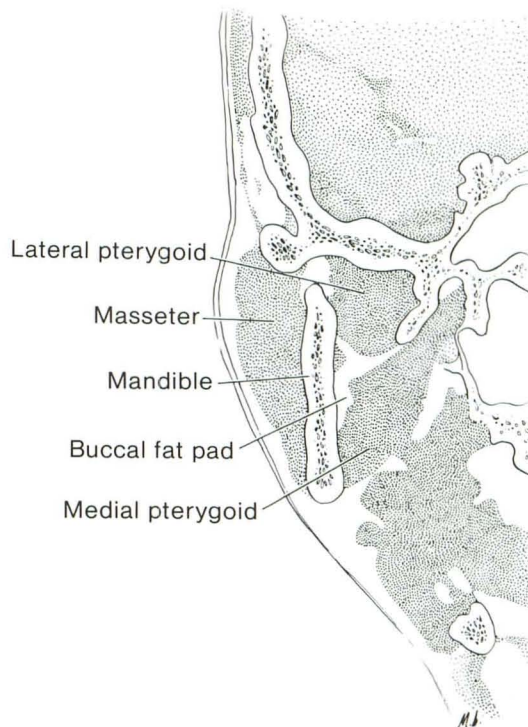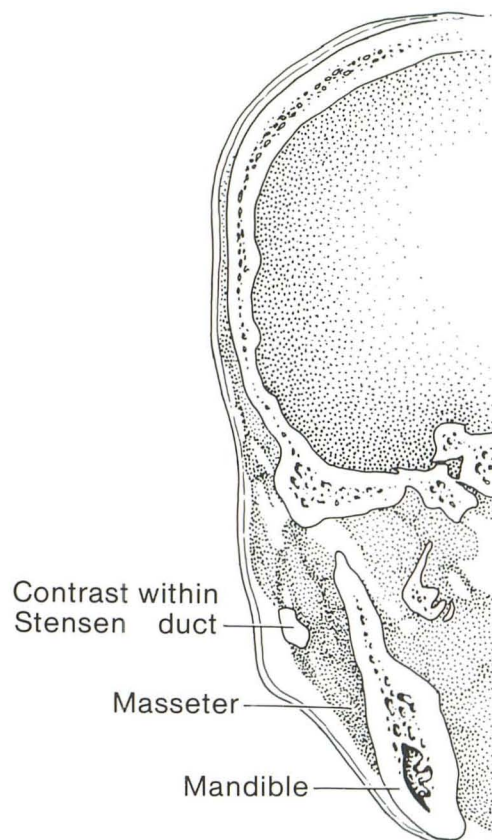Fig. 6.—Coronal CT section through belly of masseter.

Lateral pterygoid
Masseter
Mandible
Buccal fat pad
Medial pterygoid

Contrast within Stensen duct
Masseter
Mandible

Fig. 7.—Coronal view after sialography displaying normal position of Stensen duct and its relation to mid aspect of masseter.

Superior alveolar ridge

Buccinator

Zygomaticus major

Facial artery

Stensen duct
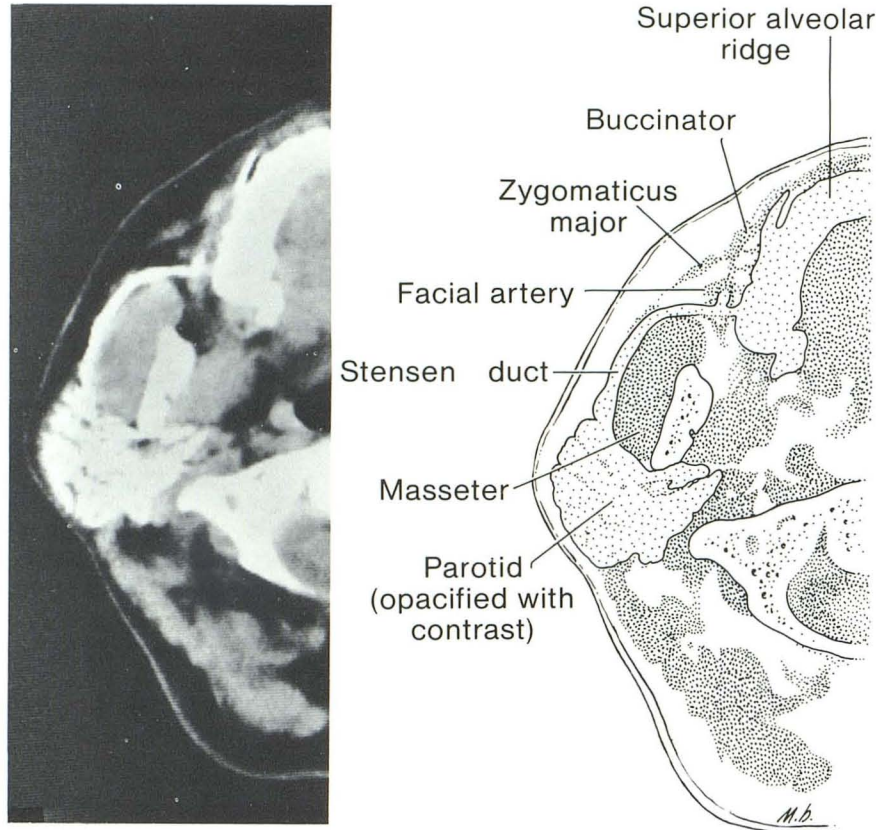
Masseter

Parotid (opacified with contrast)

Fig. 8.—Axial CT section through Stensen duct and parotid gland opacified with sialographic contrast material. Note close apposition of duct to masseter and its abruptly directed medial course as it pierces buccinator to enter oral cavity.

superior alveolar ridge deep to the anterior part of the masseter (figs. 3 and 8). Its origin from the anterior aspect of the pterygomandibular raphe at the mylohyoid line of the mandible is clearly seen (fig. 3). The mylohyoid line, creating the medial boundary of a concavity in the anterior aspect of the ramus, is seen on axial sections through the superior alveolar ridge. An irregular notch, the mandibular canal (fig. 4), is seen on axial sections through the inferior aspect of the antrum. The inferior alveolar vessels and nerve are situated therein. The facial artery is seen transversely as a discrete circle of enhancement on axial sections between the zygomaticus major and the anterior extent of the masseteric fascia (figs. 3 and 8).

Stensen duct is not normally seen without being opacified by contrast material (figs. 7 and 8). Its entire course can be seen in a well placed single axial slice.

The buccal fat pad and its extensions are exquisitely imaged on CT because of their inherent low density (figs. 3–6). Alterations in its density are easily perceived in various disease states (see part 2 [7]).

Part 2 will concern itself with various disease processes

distorting this anatomic arrangement and will discuss the important role of CT in the management of patients with buccomasseteric masses.

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