

Research Article

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The Anatomy of the Intrinsic Musculature of the Tongue in the Early Human Fetus:

Part II, M. Longitudinalis Inferior

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The attachments, course, and inter-relationships of m. longitudinalis inferior of the tongue in the 15-week human fetus are described. These data are compared with those reported in the literature for the adult structure.

In general, the qualitative disposition of lingual musculature is quite complete by this point of development. The division of the muscle mass, by a central decussation, into an anterior and posterior segment was consistently observed in the specimens studied.

Introduction

The m. longitudinalis inferior of the tongue has been referred to also as simply the lingual muscle (M. lingualis) by Zaglas (1850) and the inferior lingual muscle by Testut (1911). It has, likewise, been described variously as being spindle-shaped (Soemmering, 1844), a stout fasciculus (Salter, 1852), a thick bundle (Cruveilhier, 1844), a narrow muscle, oval in cross section (Abd-El-Malek, 1939), and spread out in a conical form from tip to root (Miyawaki, 1973). Jonnesco (1912) cites it as being flattened transversely, but forming an arch, concave anteriorly and inferiorly.

Soemmering (1841), Cruveilhier (1844), Salter (1852), Abd-El-Malek (1939), and Miyawaki (1973) each reported the origin of m. longitudinalis inferior as being at the base of the tongue between mm. genioglossus and hyoglossus. Blandin (1823) cited its fibers as arising in a decussating pattern from the fibrous membrane which unites the tongue with the body of the hyoid bone and, to a lesser extent, from a raphe; Blandin (1823), Testut (1911), and Jonnesco (1912) also described minor attachments of m. longitudinalis inferior to the lesser horn of the hyoid bone. In addition, Testut (1911) observed that the muscle gains fibers from m. pharyngoglossus and the inferior aspect of m. styloglossus. Soemmering (1841) and Cruveilhier (1844) have noted previously the union of m. longitudinalis inferior fibers with those of m. styloglossus along the lateral border of the tongue.

Abd-El-Malek (1939) described three points of attachment for m. longitudinalis inferior. One, a medial attachment, was in conjunction with the ventrolateral fibers of m. genioglossus, while a lateral attachment was to the body and root of the greater cornu of the hyoid bone. Between the medial and lateral attachments, a few fibers were found to join the stylohyoid ligament. Finally, Zaglas (1850) described m. longitudinalis inferior as arising in the dorsal aspect of the root of the tongue as a series of transversely-oriented fiber bundles, extending from the margin of the tongue to its median line.

In contrast to the diversity of origins proposed, there appears to be general agreement in the literature that m. longitudinalis inferior runs anteriorly toward the tip of the tongue. On approaching this area, however, observations again tend to differ. Blandin (1823) maintained that the fibers of one side form a raphe with the fibers of the opposite side. Salter (1852) reported that the muscle inserts "gradually" into the submucous fibrous tissue in the ventral aspect of the tip of the tongue. According to Abd-El-Malek (1939), the muscle rotates inferomedially and merges with the combined fibers of mm. genioglossus, hyoglossus, and styloglossus, to insert into the anterior arch (dense connective tissue) in the ventral aspect of the tip of the tongue.

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The objective of the present study is to investigate the attachments, course, and relationships of *m. longitudinalis inferior* in the fifteen-week human fetus.

Methods and Materials

Twenty-eight human fetuses, determined by physical inspection to be without gross malformation and by staging criteria (Streeter, 1920) to fall within a 15 ± 2 week age range, were selected for this study. Following routine histological processing, the specimens were sectioned at 30 micra in one of the three standard planes of section as follows: coronal (8), sagittal (10), transverse (10).

Alternate sections were stained with a modified Masson trichrome technique and examined microscopically.

Results

In the early fetus, *m. longitudinalis inferior* is a thick structure running in the ventral aspect of the tongue from its root to its tip. It is comprised of two components, anterior and posterior, which decussate in the middle third of the tongue (Figure 1).

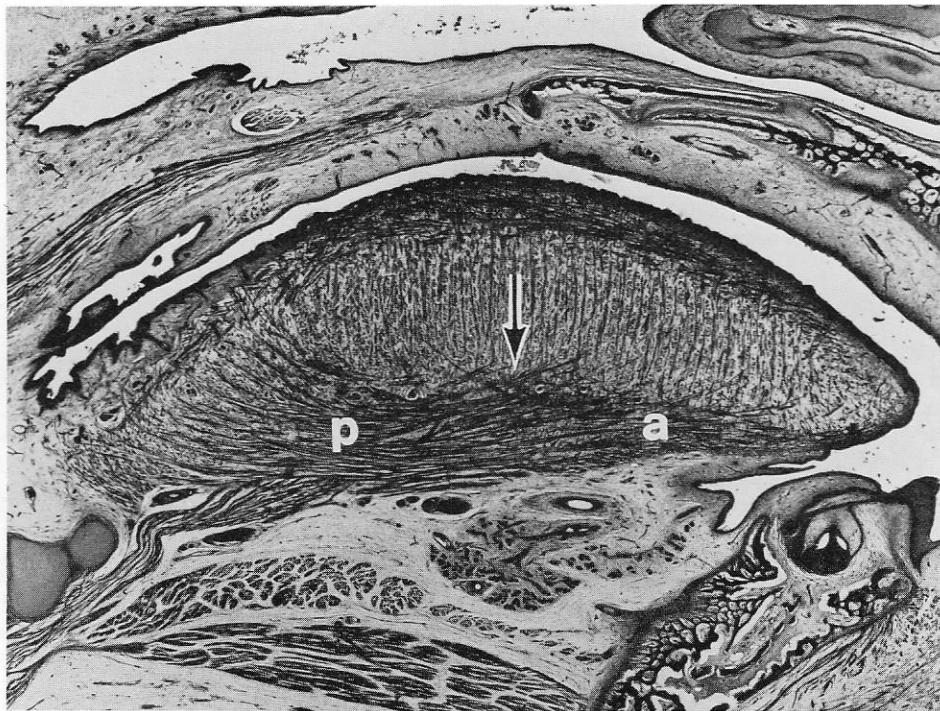


Figure 1. Parasagittal section through the tongue illustrating the two segments (a,p) of the inferior longitudinal muscle. (The tip of the tongue is situated to the right of the photograph.) Note the area of junction (arrow) of the two segments; also the insertions of the fibers of the posterior segment into the lamina propria of the posterior one-third of the tongue. (Specimen No. 3-1573, section No. 416, magnification 10X.)

Of the two parts, the posterior segment has consistently been observed to be the larger. It takes anterior attachment from the anteromedial aspect of the paramedian septum near the center of the tongue. From there it radiates posterolaterally to terminate on the lamina propria of the root of the tongue, generally between foramen cecum and the hyoid bone. Supplemental posterior attachments were also observed as follows: to the hyoepiglottic ligament (in eight specimens), to the perichondrium of the body of the hyoid anlage (in four specimens), and to the lesser horn of the hyoid (in two specimens).

The anterior segment takes its posterior attachment to the posteromedial aspect of the paramedian septum. From there it sweeps anteriorly and inferiorly in an arc to end in the ventral aspect of the tip of the tongue near midline.

M. longitudinalis inferior is bounded by connective tissue sheaths, the lateral and paramedian septa (in the terminology of Abd-El-Malek, 1939). These septa serve partially to separate this muscle from neighboring muscles. The paramedian septum separates the *mm. longitudinalis inferior* and *genioglossus* (medially), while the lateral septum separates *m.*

longitudinalis inferior from the mm. styloglossus and hyoglossus (laterally) (Figure 2). Nonetheless, fibers of m. longitudinalis inferior were observed to interrelate with those of surrounding musculature in several instances. For example, in

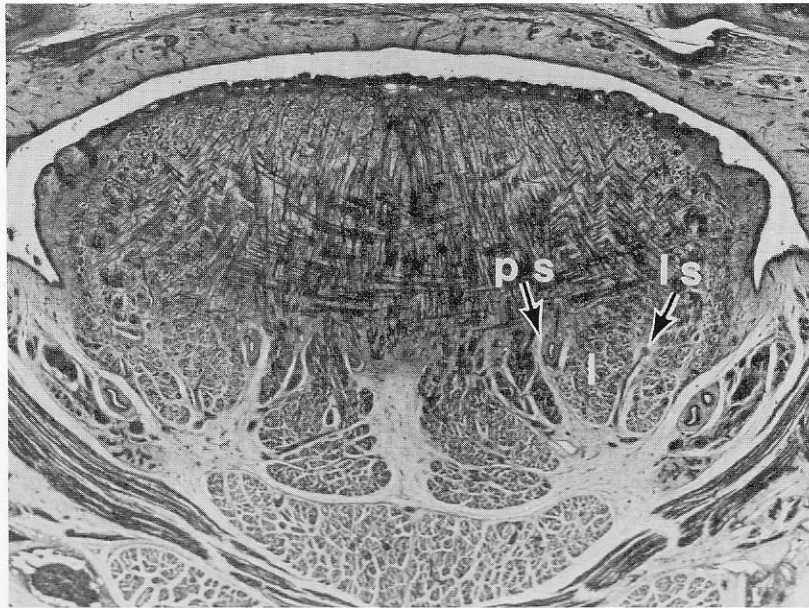


Figure 2. Coronal section through the midpart of the tongue. The inferior longitudinal muscle (I) is separated from m. genioglossus by the paramedian septum (ps) and from mm. styloglossus and hyoglossus by the lateral septum (ls). (Specimen No. 3-1376, section No. 438, magnification 15X.)

the posterior one-third of the tongue, fibers of mm. styloglossus and palatoglossus passed medially into the lateral aspect of the inferior longitudinal bundle. In the anterior two-thirds of the tongue, fibers of the same muscles together with those of m. hyoglossus merged with the inferior longitudinal to course into the ventromedial aspect of the tip of the tongue. Figure 3, for example, illustrates the medial fibers of m. hyoglossus coursing obliquely through the lateral aspect of m. longitudinalis inferior. In three of the sagittally-sectioned specimens (n=10), m. hyoglossus appeared to separate completely the two segments of m. longitudinalis inferior. In the root of the tongue, the posterior extends of the longitudinal fibers curve superiorly to assume an almost vertical direction; here they interweave with genioglossal fibers and, with them, attach onto the lamina propria of the dorsal surface.

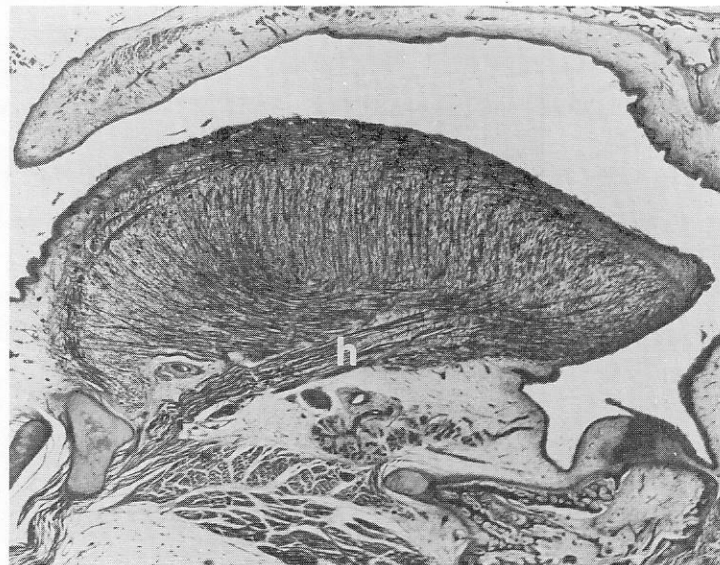


Figure 3. Parasagittal section, located lateral to that in Figure 1, showing the course of m. hyoglossus (h) as it runs distally in the tongue to parallel the anterior segment of the inferior longitudinal muscle. (Specimen No. 3-206, section No. 402, magnification 10X.)

Discussion

The findings of the present study in the fetus accord, in general, with those reported for the adult by Soemmering (1841), Cruveilhier (1844), Salter (1852), Jonnesco (1912), Abd-El-Malek (1939), and Miyawaki (1973), which describe *m. longitudinalis inferior* as a stout bundle which arches from root to tip of the tongue between *mm. genioglossus* and *hyoglossus*.

Although a general posterior attachment of the posterior segment of the muscle to the lamina propria of the base of the tongue is observed here, attachments to the greater horn of the hyoid complex or the stylohyoid ligament (Abd-El-Malek, 1939), or to the hyoglossal membrane or a raphe (Blandin, 1823), are not seen. A termination to the lesser horn of the hyoid apparatus (Blandin, 1823; Testut, 1911) appeared only occasionally. These qualitative differences from attachments recorded for the adult, together with considerable variability in points of posterior attachment within the fetal sample studied, suggest this to be a variable area which may not fully have developed all of its relationships by this time. At the anterior end of the tongue, not only did the inferior longitudinal muscles of either side fail to meet in a midline raphe, but they were separated there, in most cases, by fibers of *m. genioglossus*.

The subdivision of *m. longitudinalis inferior* into an anterior and posterior component has not previously been described in the literature as such, although several previous investigators (Cruveilhier, 1844; Salter, 1852; Abd-El-Malek, 1939; Miyawaki, 1973) employed sectioned material in their work. Oikawa (1973), however, in an English language abstract of a paper based on the study of five-to ten-month fetal specimens, mentions "upper" and "lower" fibers of the *m. longitudinalis inferior* crossing each other in an X-shaped manner near the middle part of the tongue. While the presence of a decussation and its location is suggestive of a similarity to data described above at the three-month stage, it is difficult for the present investigators to perceive a superior-inferior relationship for the muscle bundles in question.

Likewise, although several earlier papers cited the presence of various connective tissue inclusions within the tongue, this aspect of lingual morphology has only relatively recently been considered in any depth by Abd-El-Malek (1939). Both the seeming elusiveness of the segmentation of the muscle in the adult and the more detailed nature of muscular attachment to connective tissue within the tongue suggest areas worthy of further investigation.

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