MINI REVIEW

Morphological study of the parotid duct in human fetuses with special emphasis on the relationship between the buccinator muscle and the parotid duct

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Abstract : Parotid glands secrete about 25% of all saliva produced in the salivary glands. In the presence of a stimulus, the amount of saliva secreted from the parotid gland increases to 50% (1). In human adults, the parotid duct, approximately 6-8 cm long, traverses the masseter muscle and penetrates through the buccinator muscle into the oral cavity. Although various studies have been conducted on the parotid gland, there are only few suggesting the functional roles of the parotid duct, especially of the area penetrating the buccinator muscle. In the present study, we observed parotid ducts of human fetuses to morphologically analyze the function of the buccinator muscles in the flux of parotid saliva. Thirty fetal specimens ranging from five to ten months of age were dissected for anatomical and histological examinations. The area of the parotid duct penetrating the buccinator muscle was fully formed in six-month-old fetuses. Furthermore, this study confirms the existence of thin buccinator muscle fibers underneath the epithelium of the parotid duct's distal portion. Results suggest that the buccinator muscle may play a major role in preventing the reflux of salivary secretions by assisting the contraction of the parotid duct. J. Med. Invest. 56 Suppl. : 255-257, December, 2009

Keywords **:** *parotid duct opening, buccinator muscle, sphincter muscle, human fetus*

MATERIALS AND METHODS

Parotid ducts obtained from thirty human fetuses from the fetal cadaver collection of the Department of Anatomy, Kyorin University School of Medicine, Japan, were prepared. They consisted of the following ages : three five-month-old fetuses, seven six-month-old fetuses, six seven-month-old fetuses, eight nine-month-old fetuses, and six ten-month-old fetuses. Their ages were determined by measuring their body lengths. These specimens were perfused with 10% formaldehyde fixative. After removing the facial skin, each parotid duct from the entrance of the buccinator muscle to the opening of the oral cavity along with its surrounding buccinator muscle was removed en bloc (Fig. 1).

Twenty specimens were cut open from the entrance of the buccinator muscle toward the opening of the oral cavity under a dissection light microscope for morphological examination prior to scanning electron microscope (SEM) observation. After conductive staining with tannin-osmium (1%) solution, we dehydrated them with alcohol and used the t-butyl alcohol freeze drying method for preparing

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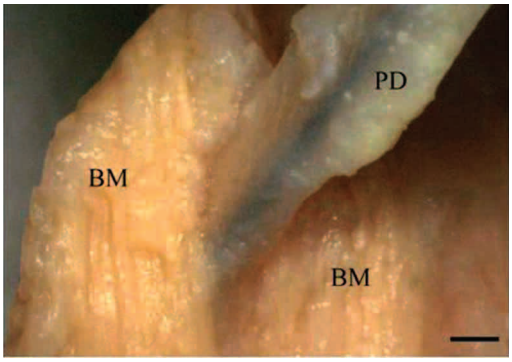

Figure 1 : Magnified view of a fetal parotid duct (PD) penetrating through buccinator muscle (BM). Scale bar=1.00 mm

the SEM specimens. Ten specimens were prepared as paraffin sections and stained with hematoxylin eosin (HE) for histological examination. They were examined under a light microscope, and photographs were taken with a digital camera (Keyence VHX-600, Japan). No distinction was made between male and female cadavers.

RESULTS

In all fetuses we observed between ages five and ten months, skeletal muscle fibers originating from the buccinator muscle extended to the parotid duct opening. Magnified SEM observation revealed bundles of thin buccinator muscle fibers in the wall underneath the epithelium of the parotid duct near the oral cavity opening (Fig. 2)

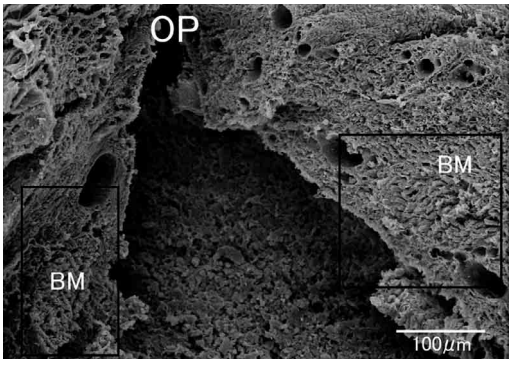

Figure 2 : Highly magnified view of the parotid duct opening area. Cross section of dissected parotid duct wall shows fibers originating from buccinator muscle (BM). The boxed area shows BM fibers invading the connective tissue of parotid duct wall near the opening (OP). Scale bar=100 μm.

Highly magnified picture shows striated muscle (Fig. 3).

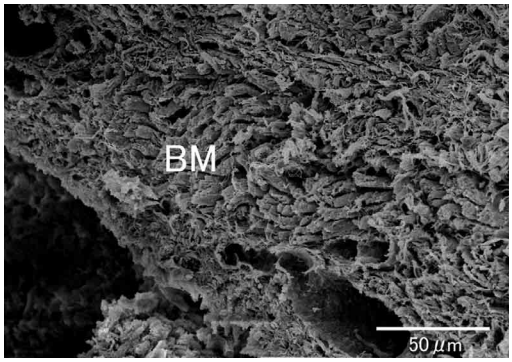

Figure 3 : Highly maginified buccinator muscle (BM) fiber of boxed area in Fig. 2. Scale bar=50 μm.

Our histological examination of cross and longitudinal sections of the same area in five-month-old fetus confirmed that buccinator muscle fibers indeed extend to the parotid duct opening (Fig. 4).

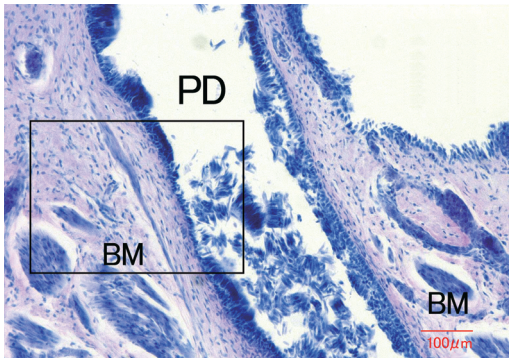

Figure 4 : Longitudinal section of a five-month-old fetus' parotid duct (PD). Scale bar=100 μm.

Furthermore, we observed bundles of buccinator muscle fibers running in various directions embedded in the epithelium layer of the parotid duct wall (Fig. 5).

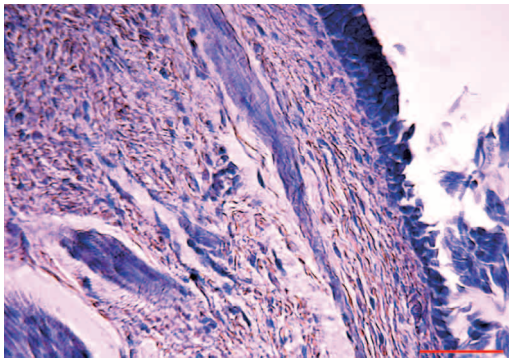

Figure 5 : Highly magnified view of the boxed area in Fig. 4. Scale bar=50 μm.

DISCUSSION

Kang investigated the anatomical and functional relationships between the parotid duct and the buccinator muscle in salivary secretion, 2006 (2). H. Kutta described the antimicrobial defense mechanism of the human parotid duct in transporting salivary secretions into the oral cavity, 2006 (3). Findings in our present study using fetuses ranging from five to ten months of age substantiate the view that the buccinator muscle plays a major role in preventing the reflux of salivary secretion by assisting the contraction of the parotid duct opening (4). They also support our proposal that the sphincter function of the buccinator is developed at as early as five months of gestation in humans. The connective tissue which surrounds the epithelium of the fetal parotid duct wall increases its elasticity with age as more elastic fibers are produced and existing fibers grow. Likewise, buccinator muscle fibers adhering to the duct wall also grow with age. Each fiber grows gradually along with functional developments of organs in the oral cavity. Oral cavity muscles of an infant further develop after birth from sucking, swallowing, and occluding (5-7). As a fetus actively begins swallowing and sucking at seven months of gestation and a newborn infant actively begins sialorrhea, the parotid duct becomes even more involved in other oral cavity functions.

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