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Updated anatomy of the buccal space and its implications for plastic, reconstructive and aesthetic procedures

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Summary *Background:* The buccal space is an integral deep facial space which is involved in a variety of intra- and extra-oral pathologies and provides a good location for the harvest of the facial artery. The age-related anatomy of this space was investigated and compared to previous reports.
Methods: We conducted anatomic dissections in 102 fresh frozen human cephalic specimens (45 males, 57 females; age range 50–100 years) and performed additional computed tomographic, magnetic resonance and 3-D surface volumetric imaging studies to visualize the boundaries and the contents of the buccal space after injection of contrast enhancing material.
Results: The mean vertical extent of contrast agent injected into the buccal space was 25.2 ± 4.3 mm and did not significantly differ between individuals of different age ($p = 0.77$) or gender ($p = 0.13$). The maximal injected volume was 10.02 cc [range: 3.09–10.02] without significant influence of age ($p = 0.13$) or gender ($p = 0.81$). The change in surface volume was 3.64 ± 1.04 cc resulting in a mean surface-volume-coefficient of 0.87 ± 0.12 without being statistically significant influenced by age ($p = 0.53$) or gender ($p = 0.78$).

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Conclusions: The facial artery was constantly identified within the buccal space whereas the facial vein was found to course within its posterior boundary. The buccal space did not undergo age-related changes in volume or size which highlights this space is a reliable and predictable landmark for various plastic, reconstructive and aesthetic procedures.

Introduction

The buccal space, extending from the mandible to the zygomatic arch and from the masseter muscle to the corner of the mouth, is still poorly understood although it plays a pivotal role for various plastic, reconstructive and aesthetic procedures. Due to its integral location in the face this space is affected by various facial tumors,[1–5] adenomas,[6,7] hemangiomas,[8] cystic formations,[4] and abscesses[9,10] emerging both from intraoral and extra-oral locations. This space is also crucial for the harvest of donor/recipient vessels being utilized for free, pedicled, or other transposition flaps,[11,12] for intraoral malformation repairs[13] or for reconstructive procedures of the tongue[14] or the alveolar ridge.[15]

The recent trend towards minimally invasive procedures to treat the signs of facial aging has gained increasing popularity. When looking at the period between 2000 and 2016, there has been an eight-fold increase in the use of neuromodulators and a three-fold increase in the implantation of soft tissue fillers.[16] The formation of the jowls as well as the formation of the labiomandibular sulcus has been shown to be related to the anatomy of the buccal space, although a complete understanding of the underlying processes is still elusive.[16]

Understanding the anatomy of the buccal space is of crucial interest as this deep facial space has close relationships to the facial artery, facial vein, buccal and zygomatic branches of the facial nerve, parotid duct, buccal fat pad (of Bichat), various muscles of facial expression and the superficial musculo-aponeurotic system (SMAS). Reports in the literature however, vary in their descriptions of the boundaries as well as the contents of this space. Whereas most authors agree that the medial boundary is formed by the buccinator muscle and its overlying fascia and the lateral boundary is formed by the SMAS – including the platysma muscle and the mid-facial aponeurotic fascia[17] – opinions are divided for the superior, inferior and posterior boundaries. The posterior boundary is in close proximity to the masticator space[18] (previously termed as the buccotemporal space[19]) and includes the buccal fat pad (of Bichat), which sometimes is the subject of aesthetic reduction.[20]

The aim of the present study is to investigate the boundaries and the contents of the buccal space and their relationships to the adjacent facial compartments, muscles, ligaments and vessels. This will be accomplished in a representative sample using anatomic dissections and computed tomographic, magnetic resonance and 3D surface volumetric imaging. We will also present anatomic landmarks and guidance for surgical access to assist in the performance of safe and effective procedures for plastic, reconstructive, aesthetic, craniomaxillofacial and otolaryngologic surgeons.

Material and Methods

Sample for anatomic dissections

The sample used for the anatomic dissection part of this study was previously described in detail.[21] In brief, 72 fresh frozen human cephalic specimens (32 males, 40 females) with a mean age of 75.2 ± 10.9 years and a body mass index 24.2 ± 6.6 kg/m^2 were objectively investigated. Of those, 71 cadavers were Caucasian and one (1.4%) was African-American. None of the investigated specimens had previous facial surgery nor any relevant disease affecting the integrity of the facial anatomy.

Sample for radiographic imaging

The computed tomographic and magnetic resonance imaging part of this study was carried out in an additional 30 fresh frozen human cephalic specimens. This sub-sample consisted of 17 females and 13 males, with a mean age of 78.3 ± 14.2 years [range: 50–100] and a mean body mass index of 23.1 ± 5.3 kg/m^2.

Anatomic dissections

All 102 cephalic specimens were dissected at the Surgical Course Center, Salzburg, Austria. The dissection procedure was based on a layer-by-layer identification of facial structures. The major focus of this study was to identify the boundaries of the buccal space, its contents and the relationship with the adjacent deep facial fat compartments, the muscles of facial expression, motor branches of the facial nerve and the facial vessels. During the imaging part of this study, colored dye was injected into the buccal space and into the neighboring deep facial fat compartments; this facilitated delineation of the extent, contents and bordering structures of the buccal space.

Radiographic imaging

The buccal space and the adjacent deep facial fat compartments (deep lateral cheek fat, deep medial cheek fat and deep pyriform space)[22–24] were injected using a 20G 70 mm sharp needle with colored radiopaque material. The material consisted of Visipaque™ 320 (Iodixanol, 320 mg/ml, GE Healthcare, Little Chalfont, United Kingdom) and Resource® ThickenUp™ Clear (Nestle HealthCare Nutrition GmbH, Vienna, Austria) and was specifically composed to obtain similar viscosity as commercially available soft tissue fillers. The facial fat compartments were injected transcutaneously