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The marginal branch triangle: Anatomic reference for its location and preservation during cosmetic surgery

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KEYWORDS
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Summary *Background:* Many studies have been dedicated toward bettering the understanding of the anatomy of this branch and the relative danger zone. However, most of these articles have focused on identifying the location of this branch based on its trajectory and associations with deep structures, causing some difficulties for aesthetic surgeons to identify its location during facial aesthetic surgery. Here, we present the concept of the marginal nerve triangle; its contents, relations and clinical applications in cosmetic surgery are discussed.
Methods: This is an anatomical study performed using 64 hemifaces from 32 Peruvian fresh cadavers (25 men and 7 women). They were dissected manually and observed macroscopically by the authors. The marginal nerve and the related structures were dissected from its origin to the terminal branches and associated with the described triangular area.
Results: The marginal branch of the facial nerve was found to lie in the described triangle in all cases. This is a triangular area formed by the intersection of three points located at the lateral commissure of the mouth, the mastoid apophysis and a point located over the anterior border of the extracellular matrix (ECM) muscle with a line which intersects the lateral commissure of the mouth and the mandibular groove.
Conclusions: The trajectory of the marginal and cervical branches of the facial nerve can be reliably and easily found at the described triangle following the reference points. This study will help guide surgeons to these branches of the facial nerve as it applies to aesthetic surgery.

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Background

The anatomy of the marginal nerve and prevention of its damage has been well documented; however, most of the published studies used bony landmarks and distances in centimetres in relation with the neck distribution of the nerve.[1–3] In addition, most of them have been performed in less number of cadaver dissections. Traditional descriptions such as Poggiolini's quadrilateral, Finocchietto–Yoel's triangle and Ziarah's modification use a combination of bony landmarks (lower border of the mandible) and soft tissue references. Their applications are mostly related with neck surgeries (such as radical neck dissection).[4,5] These described areas represent only the cervical localization of the marginal nerve but do not include its facial distribution. By contrast, Friteau's triangle and Ginestet's trapeze only consider the facial distribution of the nerve and they are limited to be used as a guide for surgeons.[6] A similar situation can be observed in Seckel's textbook where the nerve's danger zone is also located in the face anteriorly (2 cm below the commissure of the mouth).[7] Aesthetic surgery is not commonly performed at this level, and the utility of this reference is debatable. Focussing on the prevention of this nerve injury in cosmetic surgeries such as rhytidectomy and face and neck liposuction, we present the concept of the marginal nerve triangle; its contents, related structures, and clinical applications in cosmetic surgery are discussed. This triangle represents the area of distribution of the nerve which is in relation with the common aesthetic procedures.

Methods

This is an anatomical study performed using 64 hemifaces from 32 Peruvian fresh cadavers (25 men and 7 women). They were dissected manually and observed macroscopically under loupe magnification (3.5×) by the author.

Anatomical structures were dissected with the mouth closed and the head in rotation to the opposite side, reproducing the patient's position during facial liposuction and facelift (Figure 1). A step-by-step dissection from the superficial layer to the deep layer was involved; all the measurement data were analysed and expressed in centimetres.

The following anatomical landmarks were identified and marked (Figures 1 and 2):

a) Base of mastoid apophysis. Located at the deep plane behind the ear lobe. The main trunk of the facial nerve emerges from stylomastoid foramen; the mastoid process is a good reference point to locate the extracranial origin of the nerve.
b) Lateral commissure of the mouth. This is a facial reference point which represents the insertion of most of the facial muscles. It has been used for localization of other facial nerve branches, such as the zygomatic nerve.[8] These two points represent the highest level described for marginal nerve distribution based on percutaneous facial nerve mapping made by Park.[9]
c) Mandibular groove: As described by Gray,[10] this is a depression located at the lower border of the mandible (intersection of the middle and posterior third of the body of the mandible). It can be easily identified even in obese subjects, and thus represents a point of reference for the facial artery. In addition, this point represents the intersection of the anterior insertion of the masseter muscle and the lower border of the mandible. This point (described here as point X) can be easily located using any of the mentioned structures (Figures 1–3). At this level, the pulsations of the facial artery can be readily palpated by the surgeon at the anteroinferior angle of the masseter muscle. The facial artery is a well-known point of reference for marginal nerve location; however, it may be difficult to find this artery in women (due to the smaller diameter) and obese subjects.[11–13]
d) The anterior border of the extracellular matrix (ECM) muscle: The marginal nerve triangle is a triangular area formed by the intersection of these three points located at the lateral commissure of the mouth, the mastoid apophysis and a point located over the anterior border of the ECM muscle with a line which intersects the lateral commissure of the mouth and the mandibular groove. The marginal nerve and the related structures were dissected from its origin to the terminal branches and associated with the described triangular area (Figures 1 and 2). Location of the X point was measured from the gonium in centimetres and analysed.

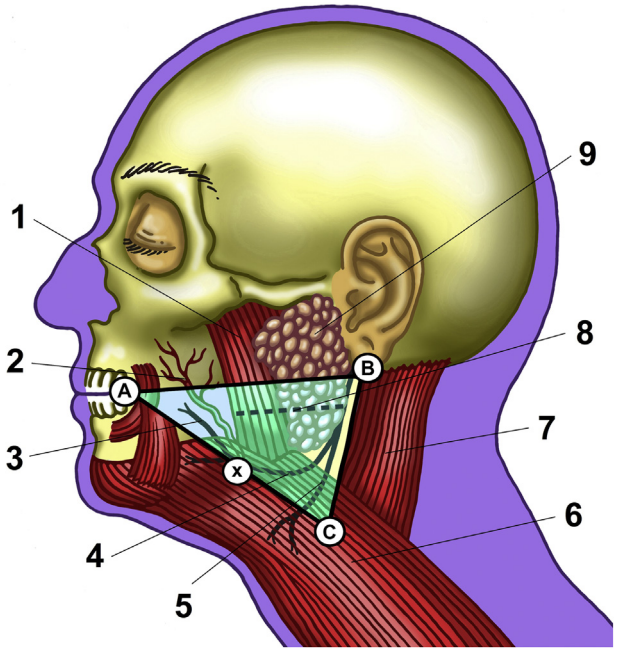

Figure 1 The marginal branch triangle. 1. Masseter muscle. 2. Facial artery. 3. Terminal branches of marginal nerve. 4. Marginal branch of facial nerve. 5: Cervical branch of facial nerve. 6: Platysma muscle. 7: ECM muscle. 8. Facial distribution of facial nerve. 9. Parotid gland. (A: Lateral commissure of the mouth B: Base of mastoid apophysis C: Anterior border of the ECM muscle. X: Mandibular groove).

Results

The distribution of the marginal nerve in the studied population is shown in Table 1. Mean age was 59.77 years. All