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Defining the Safe Entry Point in Deep Plane Facelifting with Novel Landmark for the Buccal Branch of the Facial Nerve

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Background: In deep facial surgery, accurate preoperative landmarking of branches of the facial nerve is helpful in avoiding inadvertent facial nerve injury. The objective of our study was to determine the accuracy at which the intersection point of two bisecting lines that join facial surface landmarks can be used to accurately locate the buccal branch(es) of the facial nerve, specifically at the deep plane entry point (ie, intercept landmark).

Methods: Thirty-three cadavers were dissected to determine the position of the buccal rami relative to the intercept.

Results: Buccal rami crossed the intercept in 12.12% of specimens (0 mm from intercept, n = 4). Buccal rami passed superiorly in 66.67% of specimens (3.71 ± 3.28 mm from intercept, n = 7) and inferiorly in 21.21% of specimens (2.44 ± 0.92 mm from intercept, n = 7). Noteworthy, buccal rami were located within 1 cm of the intercept landmark with 96.97% accuracy (32/33 cadavers).

Conclusions: These data suggest that this novel intercept (1) reliably locates the buccal branch of the facial nerve as it courses distal to the parotid gland, and (2) helps define a "safe zone" for entry into the deep plane where the likelihood of encountering the facial nerve is extremely low. *(Plast Reconstr Surg Glob Open 2024; 12:e5749; doi: 10.1097/GOX.0000000000005749; Published online 17 April 2024.)*

INTRODUCTION

The muscles of facial expression produce movements for facial animation, a pivotal element of nonverbal communication, and play key functional roles in blinking; eye closure; control of tear film over the globe; and in oral competence, both at rest and during mastication.[1–3] Muscles of facial expression are innervated exclusively by the extracranial branches of the facial nerve[1]; injury to the nerve can bestow an appearance that conveys negative emotions of anger and sadness[2] and impair facial functions. For these reasons, when elective surgical procedures are carried out on the face, the utmost care and diligence is required to protect and preserve the integrity and function of the facial nerve. During surgical training, students are taught that (1) the main trunk of the facial nerve exits the stylomastoid foramen and courses anteriorly in the substance of the parotid gland,[4–7] and (2) the main trunk can be located at the level of the posterior belly of the digastric muscle approximately 1 cm anterior and inferior to the tragal pointer.[5] The marginal mandibular branch has been traditionally thought of as being found below the inferior border of the mandible in the posterior half of the mandible before coursing upward. However, a study in 2015 demonstrated that this nerve sits much higher, up to 3.4 mm above the inferior border of the mandible.[8] Interestingly, there is little anatomical description of accurate landmarking of the midface facial nerve branches distal to the parotid gland where deep plane facelift surgery takes place. Zuker's point describes the nerve at the halfway

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point along a line from the oral commissure and the root of the helix.[9] However, this landmark is anterior to the deep plane entry point.

The deep plane facelift is an elective facial rejuvenating surgical procedure that has become more commonly requested by patients due to the rise in social media use by surgeons.[10] During a deep plane facelift, a short skin flap is elevated and then the plane of dissection is carried deep to the SMAS. Entering this space can be distressing for the novice and experienced surgeon alike for fear of injuring the midface branches of the facial nerve, specifically the buccal branch, a branch that innervates the musculature of the lip elevators.[6] Using surface landmarks, surgeons can approximate locations of branches of the facial nerve to reduce risk of injury.

To date, we have found a limited number of studies that attempt to landmark the primary ramus of the buccal branch[3–7,9] and have not found a single study that uses superficial landmarks to predict the location of the buccal nerve as it relates to the deep plane entry point. The purpose of this study was to determine the accuracy of which surface landmarks approximate the location of the buccal branch of the facial nerve at the deep plane entry point, with the specific goal of defining a safe entry zone into the deep plane space of the face.

Takeaways

Question: What is the optimal safe entry point in deep plane facelifting for the precise identification of the buccal branch of the facial nerve?

Findings: We investigated the accuracy of whether the intersection point of two bisecting lines that join facial surface landmarks can be used to accurately locate the buccal branch(es) of the facial nerve at the deep plane entry point using cadaveric specimens. The buccal rami were located within 1 cm of the intercept landmark with 96.97% accuracy.

Meaning: Our novel deep plane entry point helps define a "safe zone" for entry into the deep plane where the likelihood of encountering the facial nerve is extremely low.

METHODS

This study was conducted after obtaining approval from the University of Guelph research ethics board (approval no.: 18-10-043). For the purposes of this study, 33 formalin-fixed cadaveric hemifaces were dissected and measured. Sample size was determined by comparing similar anatomical studies. No participants had prior surgery to the face or cheeks. We chose to dissect only one side of each specimen to prioritize anatomical position. Specimens were selected from the University of Guelph and the University of Ottawa human anatomy laboratories. Participants were excluded if they had a noticeable facial deformity, a known history of parotid cancer, or if there was any evidence of previous substantial trauma to the face. One side of each face was selected based on the rotation of the cadaver's head, choosing the side contralateral to the direction of rotation to best replicate the position of a patient receiving facial surgery.

The intercept was pinned using the following landmarks (Fig. 1). Line 1 was drawn as a preoperative deep plane entry point from the lateral canthus of the eye to the angle of the mandible. A second straight line, line 2, was drawn from the root of the helix of the ear to the perpendicular intersection with line 1. The intersection of these two lines was marked with a pin. Two incisions were made from the oral commissure to (1) a point posterior to the malar eminence in the region of the zygomatic arch, anterior to the tragus, and (2) the angle of the mandible. These two incisions were then connected, and a skin flap was raised medially from this connecting incision, toward the mouth. The pin was carefully replaced with a second pin deep to the skin flap as the dissection progressed. Blunt dissection was used to identify the parotid gland. The buccal rami were then identified as they exited from the anterior border of the parotid gland. The rami were traced anteriorly without liberating any tissue from the specimen (Fig. 2). Comments made about the presence and relationship of the rami to the parotid duct and the transverse facial artery are shown in Supplemental Digital Content 1. (**See table, Supplemental Digital Content 1,** which shows the distance of all primary and secondary rami of the buccal branch from the intercept reported in millimeters. **http://links.lww.com/PRSGO/D163**.) The rami were measured by their distance inferiorly or superiorly to the pin, and measurements were taken using digital calipers. A single measurer took three independent measurements of each ramus two minutes apart. All three

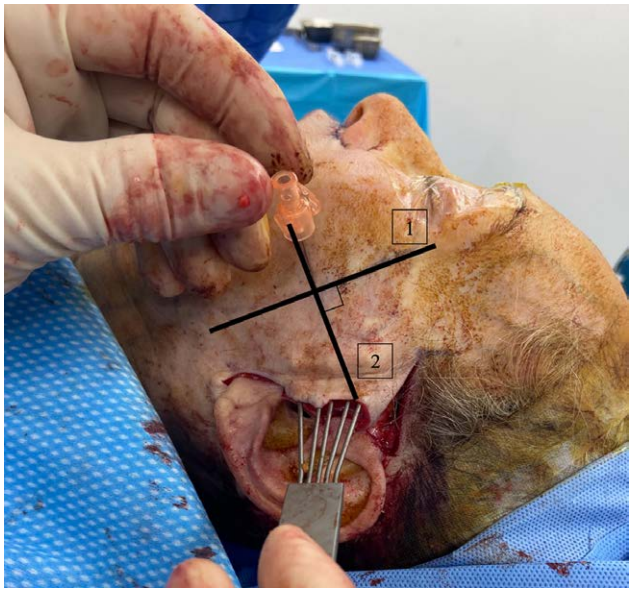

Fig. 1. Landmarking the intercept intraoperatively. Line 1: straight line between the lateral canthus of the eye and the angle of the mandible. Line 2: straight line from the root of the helix to the perpendicular intercept of line 1. *Note: Skin flap elevation intraoperatively makes the line 2 seem more superior than when drawn preoperatively.

Fig. 2. Cadaveric dissection demonstrating branches of the facial nerve.

measurements were reported, and an average was taken of each dataset. All buccal rami discovered within the dissection window were measured. The largest ramus of each sample was labeled the primary ramus. If a smaller arborization was present, it was labeled the secondary ramus.

RESULTS

A total of 33 formalin-fixed cadavers were dissected and measured for the purpose of this study (16 women and 17 men). The range of available ages was 69–95 with a mean age of 81.4 years (provided by the University of Guelph). The ages of the cadaveric specimens from the University of Ottawa were not disclosed. There were no sex differences in the location of the buccal branch of the facial nerve.

The mean distances of all primary and secondary rami of the buccal branch from the deep plane intercept are shown in Table 1. Regarding the distance of the primary ramus of the buccal branch (superior or inferior) from the intercept, 12.12% of specimens (n = 4) had a ramus that crossed the intercept directly (0 mm). In total, 21.21% (n = 7) had a primary ramus inferior to the intercept, and 66.67% (n = 22) had a primary ramus superior to the intercept. The mean distance of the superior rami from the intercept was 3.71 ± 3.28 mm and the mean distance of the inferior rami from the intercept was 2.44 ± 0.92 mm. A total of 32 specimens (96.97%) had rami that were within ±1 cm of the intercept. Of the 33 specimens, 51.51% (n = 17) had a secondary ramus present in the field of dissection as the secondary ramus was always significantly smaller than the primary ramus. Only four secondary rami were inferior to the intercept, ranging from 2 to 9.21 mm, with a mean distance of 5.31 mm. The remaining 13 secondary rami were superior to the intercept, ranging from 0 to 10.86 mm, with a mean distance of 5.64 mm. Collectively, if the secondary rami are included in a collection of all rami examined, four rami crossed the intercept directly, whereas the absolute mean of the remaining primary and secondary rami was 4.26 ± 3.55 mm above the intercept and 3.49 ± 2.31 mm below the intercept. Scatter plots showing the relationship between the primary and secondary rami in regard to the intercept are shown in Figure 3 and Figure 4, respectively.

DISCUSSION

In this study, we set out to identify an accurate, reliable, and reproducible intercept using surface landmarks to help surgeons define a safe entry zone at the deep plane entry as described by Jacono and Rousso.[11] Our finding that the buccal branch reliably falls within 1 cm of the intercept in 96.97% of faces studied is of great clinical usefulness for the deep plane facelift surgeon. The 1-cm radius below the intercept marks the superior border of the safe entry zone. The intercept is marked by drawing a line from the root of the helix to the deep plane entry point, where it crosses at 90-degree angle or perpendicular. The marginal branch can be found below a marking 5 mm above the inferior border of the mandible to delineate a zone of safety for entering the deep plane, where it is highly unlikely to encounter facial nerve rami.[8] The safety triangle zone using these superior and inferior borders is shown in Figure 5.

After the deep plane is opened, dissection can proceed anteriorly and then superiorly in the correct plane with confidence, and the nerve is protected below the parotidomasseteric fascia. The parotidomasseteric fascia serves as a protective layer covering the parotid gland and the facial nerve. By remaining above this layer during dissection, surgeons minimize the risk of injury to the facial nerve and parotid gland, ensuring the preservation of critical anatomical structures. Furthermore, this landmark is useful pedagogy in the operating room when teaching junior surgeons the deep plane facelift surgery. In an era where facelift patients often have increasingly difficult planes and obscured anatomy from previous thread lifts, injectables and energy devices, having reliable surface markers to outline a safe corridor into the deep space is of utmost utility. The senior author uses this landmark in all deep plane facelifts and consistently finds it to be accurate in identifying the nerve devoid region to make the initial incision into the SMAS (Fig. 6). Intuitively, this is where most surgeons

Table 1. Mean Distance of All Primary and Secondary Rami of the Buccal Branch from the Intercept Reported in Millimeters

	Primary Rami Superior to Intercept (mm)	Primary Rami Inferior to Intercept (mm)	Secondary Rami Superior to Intercept (mm)	Secondary Rami Inferior to Intercept (mm)
Mean	3.71	2.44	2.53	5.31
Range	0–11.86	1.12–3.67	0–10.86	2–9.21
SD	3.28	0.92	3.61	2.58

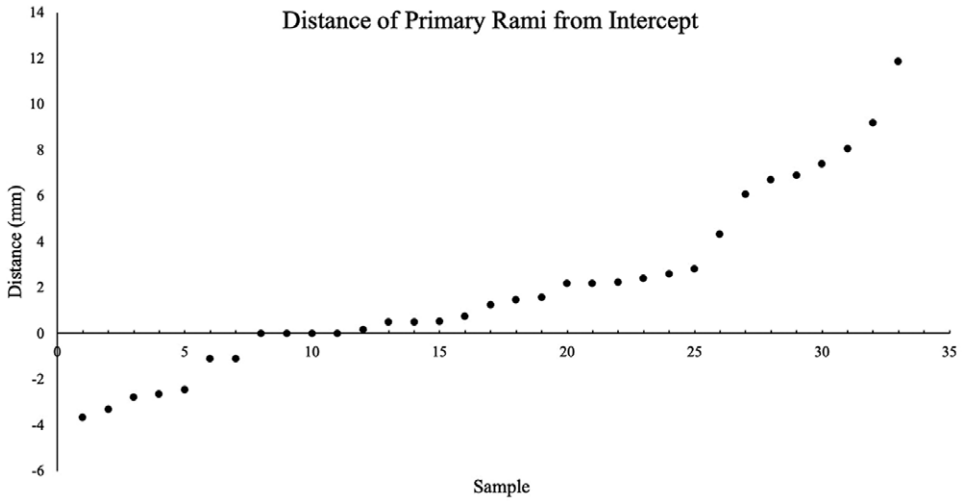

Fig. 3. Scatter plot displaying the distance of primary rami in relation to the intercept measured in millimeters (mm).

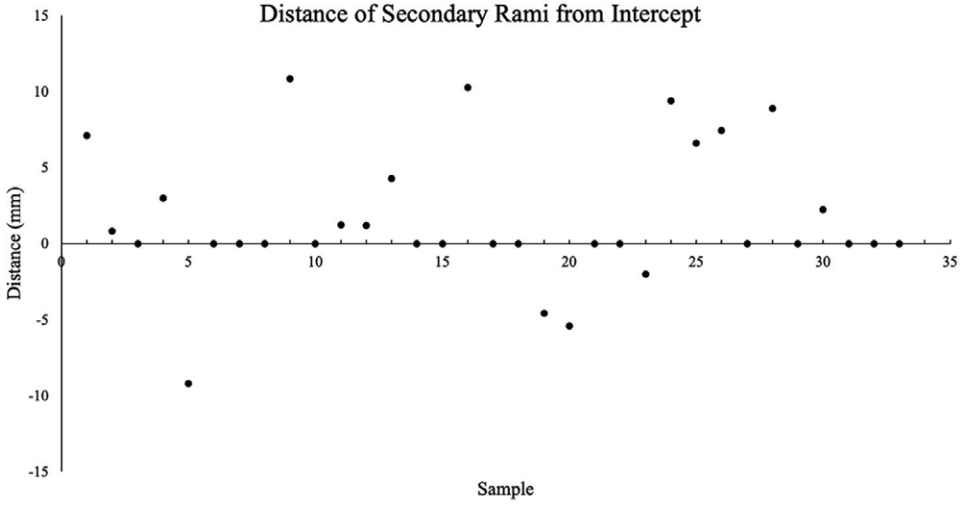

Fig. 4. Scatter plot displaying the distance of secondary rami to the intercept measured in millimetres (mm).

start their deep plane dissection, defining the inferior tunnel below the zygomaticocutaneous ligament, before defining the superior tunnel, followed by ligament release. This study reinforces this practice and gives anatomical measurements to further define this safe corridor of entry.

Our study is not without limitations. Formalin-fixed cadavers present a potential shortcoming, as the fixation process can induce tissue distortion. Some of the variation in measured buccal branches is likely due to this process. However, the senior author has found that during facelift surgery in the deep plane the marking of the intercept reliably predicts the buccal branch location within the 1-cm radius. Further study with intraoperative measurements would add to the precision of the intercept in locating the buccal branch of the facial nerve. Age of the patient may present another confounder because not all ages were available. However, given the location of the extraparotid branches of the facial nerve deep to the parotidomasseteric fascia, there is significantly less gravitational change than in the SMAS and skin to cause an age-related descent of the nerve position.

CONCLUSIONS

Reliable superficial landmarks are helpful in planning safe elective surgical procedures. Our study demonstrates a reliable deep plane entry point intercept to identify the buccal branch of the facial nerve using surface landmarks. We found that the primary rami of the buccal branch could be located within a 1 cm radius of our intercept in 96.97% of the cadaveric specimens sampled. These results demonstrate that a safe entry zone into the deep plane

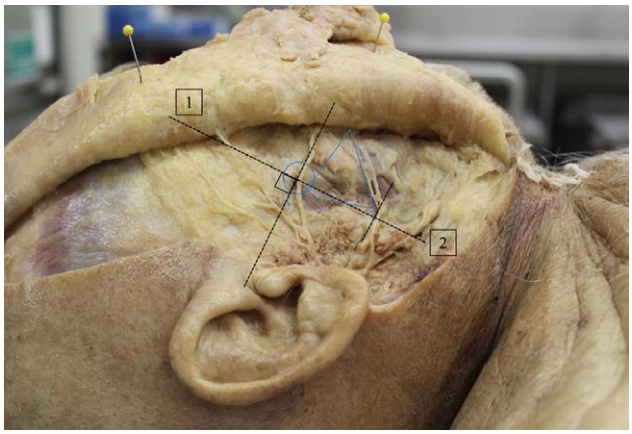

Fig. 5. The safe entry zone into the deep plane (blue triangle) is demonstrated between a 1 cm circle at the intercept (blue) and a line (black) drawn 5 mm above the inferior border of the mandible. This zone is devoid of nerve branches and allows development of the deep plane space.

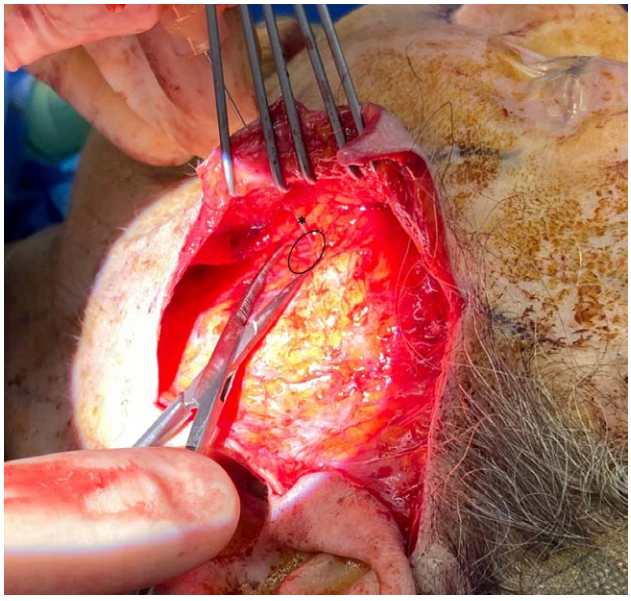

Fig. 6. Buccal branch of the facial nerve identified intraoperatively (circled in black), using the intersect of the deep plane entry point (*marking needle) and the line extending from the root of the helix that crosses perpendicular to the deep plane entry point.

space of the face is found below a 1-cm radius surrounding the intercept of the line drawn from the root of the helix perpendicular to the deep plane entry point.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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