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Cervical Branch of Facial Nerve: An Explanation for Recurrent Platysma Bands Following Necklift and Platysmaplasty

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Abstract

Background: Recurrent platysma bands remain a common problem in neck rejuvenation.

Objectives: The goals of this cadaver study were to document the course of the cervical branches of the facial nerve and investigate the pattern of platysma muscle innervation before and after various platysmaplasty maneuvers.

Methods: A total of 8 fresh cadaver specimens were dissected for a total of 16 hemifaces/necks. After subcutaneous undermining and identification of the main trunk of the facial nerve, the cervical branch was dissected as distally/anteriorly as possible under loupe magnification. The following 4 platysmaplasty maneuvers were each performed on 4 hemifaces/necks: platysma window, extended SMAS with platysma flap, full width platysma transection, and lateral skin-platysma displacement (LSD). Upon completion of the techniques, the integrity of the cervical branches was evaluated.

Results: Contrary to some reports, all specimens in this study had only 1 main cervical branch. There were no branches detectable under 3.2× magnification until branches were given off to the platysma muscle at approximately the location of the facial vessels. The main cervical branch continued distally/anteriorly to the medial edge of the muscle below the thyroid cartilage. After performing the various platysma techniques, all cervical branches were in continuity in all specimens. Specifically, the main cervical branch was in continuity to the medial border of the muscle caudal to all platysmaplasty maneuvers.

Conclusions: Undermining the platysma muscle results in no injury to platysmal innervation unless continued beyond the facial vessels. Recurrent bands are likely related to persistent innervation of the medial platysma, which remains intact cranial and caudal to any described platysmal transection maneuvers.

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The restoration of a youthful cervical contour is a priority in facial rejuvenation procedures, perhaps second only to jowl elimination in terms of importance. Platysma banding is one of the signs of neck aging and a target of surgical neck rejuvenation. However, a study by Pelle Ceravolo found a 45% incidence of recurrent playsmal bands despite the most aggressive platysmaplasty maneuvers described in the literature.[1] A recent study on patients with facial paralysis indicated that there were no platysma bands on the paralyzed side and suggested that denervation of the platysma should be a target in surgical neck rejuvenation.[2]

The goals of this study were to document the course of the cervical branches of the facial nerve and investigate the pattern of platysma muscle innervation before and after various platysmaplasty maneuvers.

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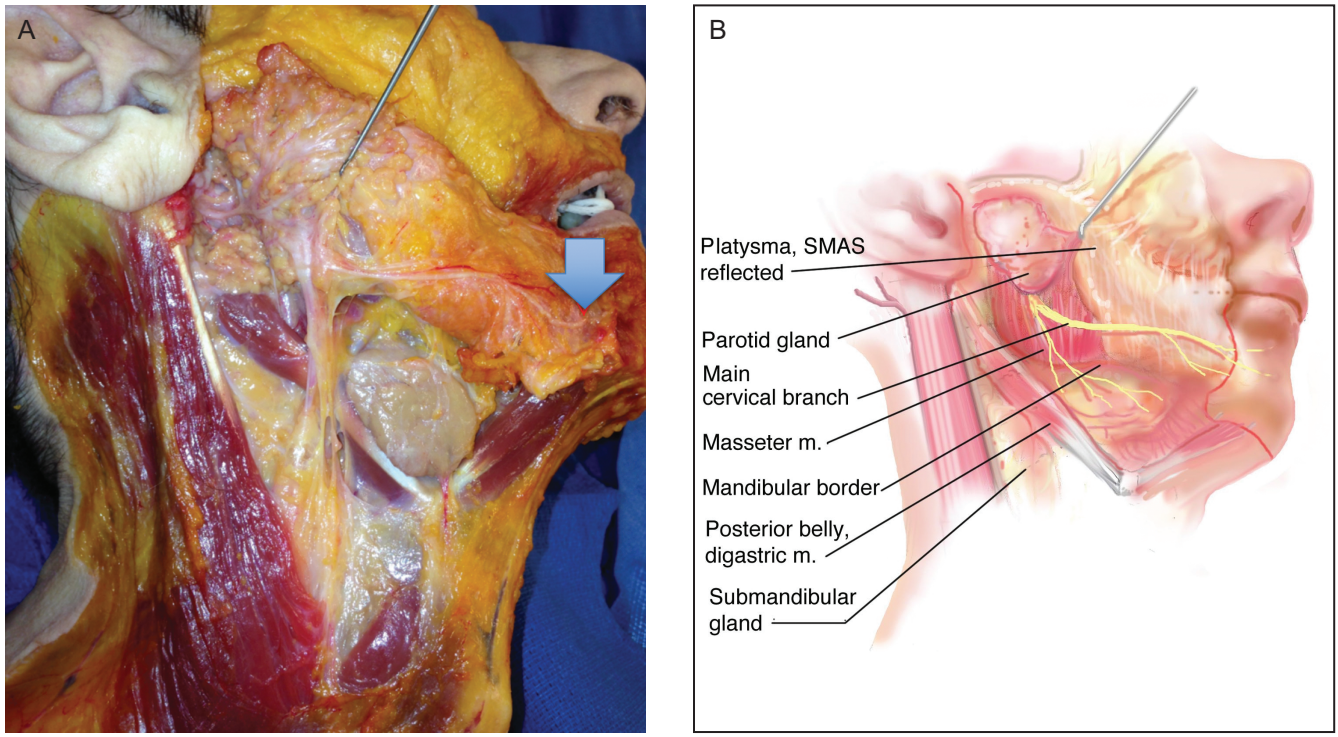

Figure 1. (A) Cervical branch anatomy in a 58-year-old cadaver. The facial nerve has been dissected from its exit at the stylomastoid foramen. With the platysma and parotid reflected cranially (black arrow), the cervical branch is seen extending to the medial/anterior border of the muscle (blue arrow). (B) Illustration of the anatomy.

METHODS

The Institutional Review Board from the University of Maryland Anatomy Board approved the use of cadaver specimens for the purpose of this study. The specimens had no previous history of facial/neck surgery or trauma. A total of 8 fresh cadaver specimens were dissected for a total of 16 hemifaces/necks. The cadavers were dissected between September 2015 and May 2017.

The facial nerve was identified in all specimens as it exited the stylomastoid foramen (Figure 1). The cervicomandibular division was dissected distally, and the cervical branch was identified. The cervical branch was dissected as distally/anteriorly as possible.

Finally, the following techniques were each performed on 4 hemifaces/necks: platysma window,[3,4] extended SMAS with platysma flap,[5] full width platysma transection,[1] and lateral skin-platysma displacement (LSD).[6] The techniques were performed as classically described:

1) Platysma window: 2 cm vertical incision/flap 1 fingerbreadth inferior to angle of mandible and 1 fingerbreadth anterior to sternocleidomastoid
2) Platysma flap without transection: raised in continuity with the extended SMAS flap
3) Full width platysma transection after performing #2 above (extended SMAS): performed horizontally 5-6 cm below the mandibular angle
4) LSD: a 5 cm vertical incision in platysma made 6-7 cm from midline, high point 5 cm from the mandibular border; after blunt dissection, the platysma is divided to its medial border

Upon completion of the techniques, the integrity of the cervical branches was evaluated.

RESULTS

Of the 16 hemifaces, half were male and half were female. The mean age of the cadavers was 56.5 years (range, 41-68 years). The cervical branch was identified in all specimens (Figures 1-2). In all 16 cadaver halves, there was only one cervical branch. There were no branches detectable under 3.2 × magnification until branches were given off to the platysma muscle at approximately the location of the facial vessels. The main cervical branch of the nerve continued distally/anteriorly to the medial edge of the muscle below the thyroid cartilage (Figure 3). After performing the various platysma techniques, all branches of the nerve were in continuity in all specimens. Specifically, the main cervical branch was in continuity to the medial border of the muscle caudal to all platysmaplasty maneuvers (Figures 3-4 and Videos 1-2). The LSD technique is the most likely to result in denervation of the medial platysma since the cervical branch near the medial border of the platysma, while distinctly separate from the muscle, is

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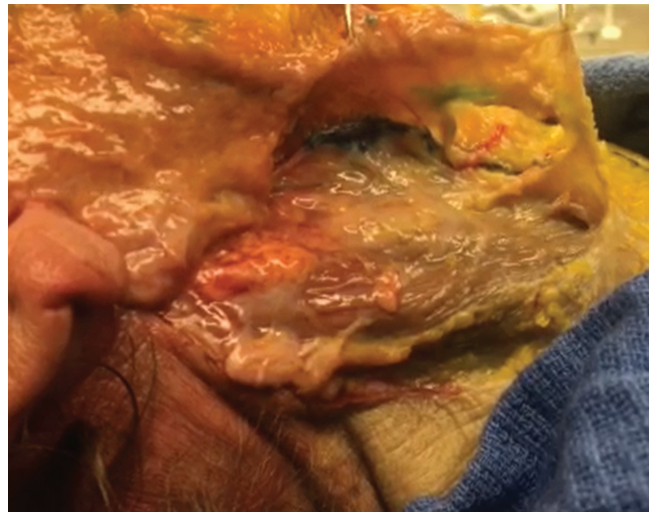

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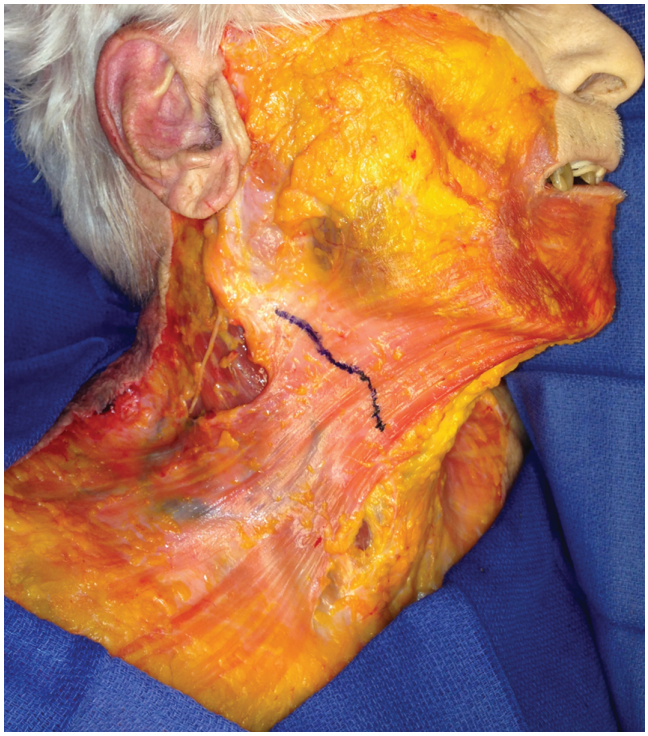

Figure 2. Course of the main cervical branch in a 68-year-old cadaver. The course of the main cervical branch has been marked on the superficial surface of the platysma. Note that it terminates at the medial border of the muscle, caudal to the thyroid cartilage (blue arrow).

in closer proximity to the deep surface of the muscle than it is proximally (laterally), where it is quite deep.

DISCUSSION

After decades of attention to SMAS techniques in the cheek, attention has focused recently on the optimization of neck contouring procedures. While some authors recommend a lateral approach to the platysma,[7] others advocate open neck approaches with medial and lateral manipulation of the platysma, with and without modification of structures deep to the platysma.[8,9]

As Pelle-Ceravolo has so honestly demonstrated in his recent investigations, recurrent platysma banding remains a common problem in neck rejuvenation.[1,6] As Trevidic observed in his study,[2] patients with facial paralysis do not develop platysma bands (although rare reports of platysma accentuation with denervation exist), and he suggested that platysma muscle denervation may be beneficial in preventing recurrence of these bands. This study raises the question of whether intentional denervation of the platysma muscle, and at what level, is worth pursuing in neck rejuvenation.

The topography of the cervical motor branch has been outlined previously as well as the branching patterns between facial nerve branches.[10-12] To our knowledge, this is the first study to characterize the relationship of the nerve to the medial platysma border and to investigate the effect of the various platysma techniques on that innervation.

We selected 4 of the most commonly performed techniques for neck rejuvenation involving the platysma: platysma window, platysma flap in continuity with an extended SMAS flap, complete transection, and the LSD technique. Interestingly, even in the 2 more "aggressive" techniques in terms of undermining and dividing the actual muscle, the innervation to the platysma appears to remain intact both cranial and caudal to any transection maneuvers. The branches to the more cranial portion of the platysma are given off by the cervical branch quite far medially (at approximately the point where the cervical branch crosses the facial vessels) and are not injured unless undermining of the platysma

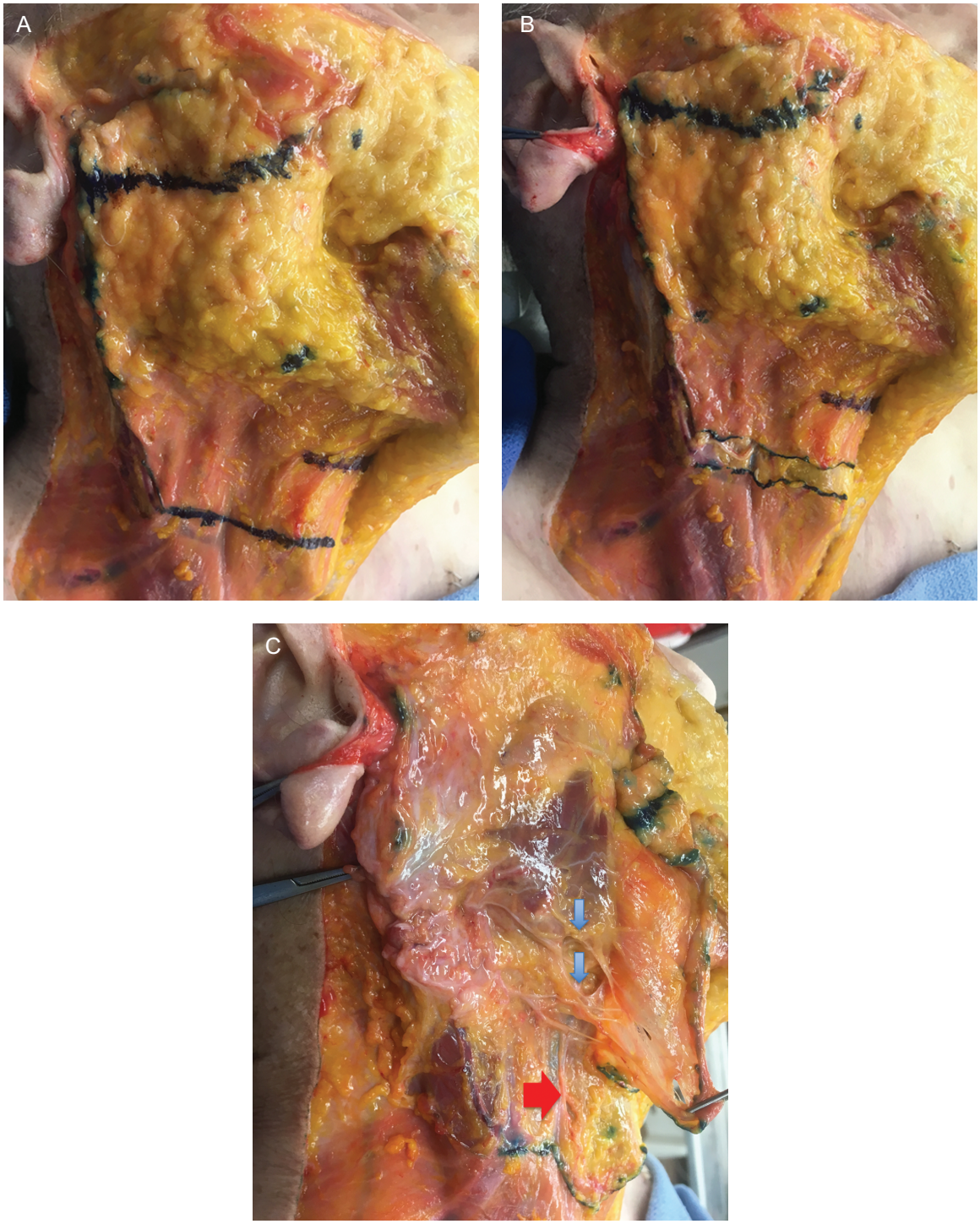

Figure 3. The cervical branch is spared in platysma transection in a 62-year-old cadaver. (A) A full-width platysma transection is planned, and (B) performed. (C) Note that after the full width platysma transection, the main cervical branch is in continuity to the muscle caudal to the plication (red arrow). Also note the branches to the muscle above the plication, indicated by the blue arrow.

muscle extends to this point. The innervation to the platysma caudal to any described maneuvers also remains intact. Hence, the techniques for platysma manipulation described in the literature result in denervation of neither the portion of the platysma above any transection nor the portion caudal to it, possibly explaining the

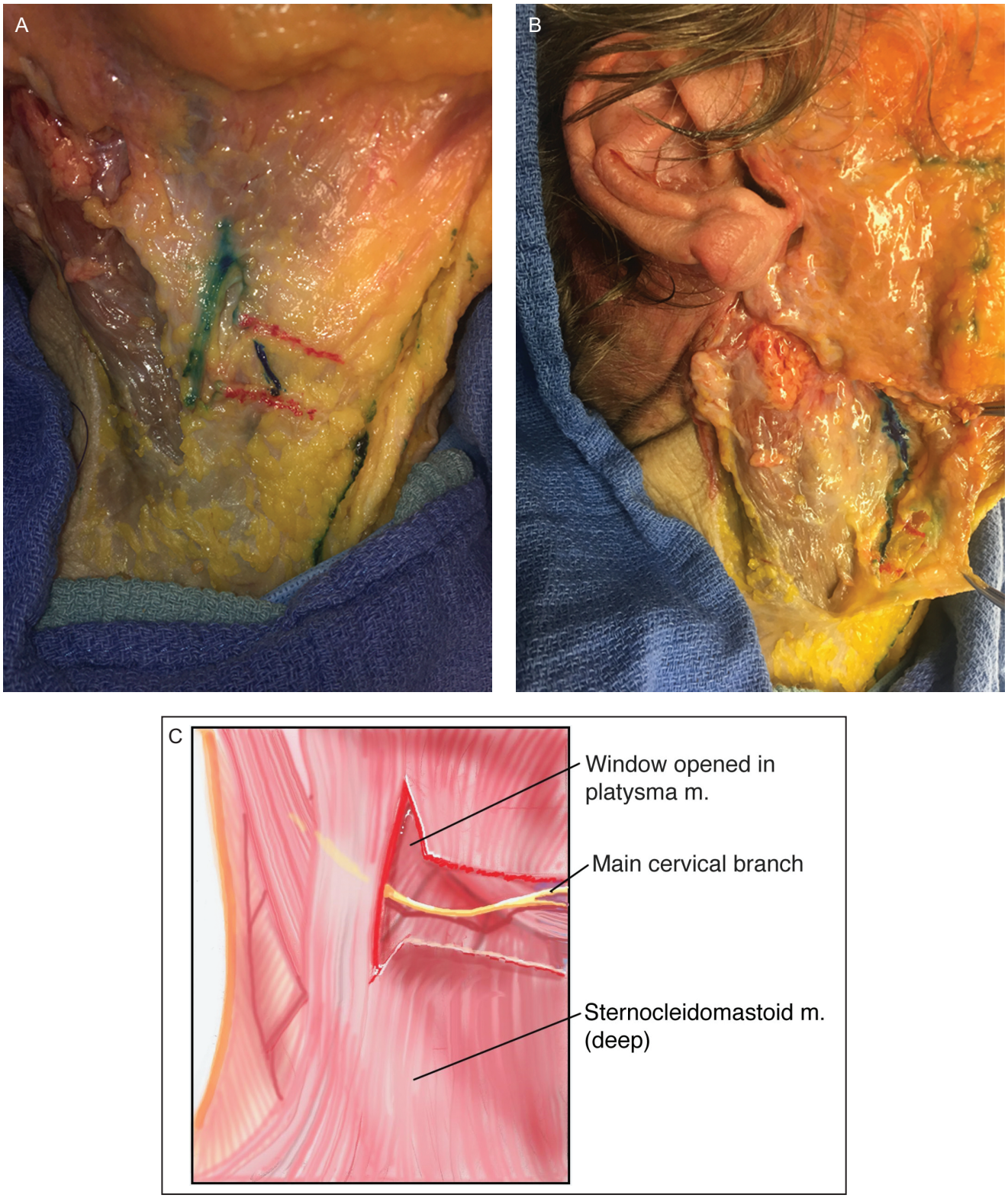

Figure 4. The LSD procedure spares the cervical branch in a 51-year-old cadaver. (A) A lateral skin-platysma displacement approach as described by Pelle-Ceravolo has been performed, and the main cervical branch (blue arrow) is noted to be intact. (B) Platysma reflected showing course of cervical branch (blue arrow). (C) Illustration of the anatomy.

recurrence of bands in both the submental region and lower in the neck.

The question remains: why do certain patients develop recurrent bands and others do not? Primary bands can be attributable to skin excess or muscle hyperactivity; they can also be unmasked due to fat loss in facial aging. Recurrent bands after surgical neck rejuvenation can have a multitude of causes; while recurrent skin laxity is probably most common, persistent muscle innervation or re-innervation are also possibilities. Pelle-Ceravolo observed a 45% incidence of band recurrence at 1 year after medial approximation of the platysma muscles and complete transection,[1] which improved to a 16.5% incidence when using his LSD technique.[6] His study was the largest to investigate recurrent banding with what was considered the most aggressive platysma procedure; the recurrence with other techniques in the literature was not defined. The LSD technique changes the direction of the platysma from vertical to transverse, which may help to explain the decreased incidence of recurrent bands. In addition, the LSD technique requires undermining of the medial platysma at the level of the thyroid cartilage. The cervical branch is in close proximity to the deep surface of the muscle at this level, and unless undermining was performed directly on the deep platysmal surface, inadvertent, but perhaps, serendipitous injury to the cervical branch could occur. This type of injury may not occur with a transection that misses the cervical branch altogether.

If intentional cervical branch neurotomy were to be performed, the intervention could be performed laterally or medially. Lateral neurotomy would require identification of the nerve deep to the platysma, within or beyond the parotid gland. Medial neurotomy would require intervention via the submental incision approximately 2 cm lateral to the thyroid cartilage. Lateral neurotomy would of course result in denervation of the entire platysma, which could lead to unmasking of sub-platysmal structures as the muscle becomes flaccid, while medial neurotomy would result in more selective denervation of the medial platysma below the level of any transection. While smaller connections between the marginal and cervical branches do exist, selective neurotomy of the main cervical branch will less likely clinically influence function of muscles innervated by the marginal branch, as there were no obvious interconnections between the main branch and the marginal. Certainly more aggressive release of retaining ligaments put marginal branches at risk, and this must always be respected.[13,14]

Our findings also raise doubt about the phenomenon of "pseudo marginal mandibular palsy" caused by cervical branch injury described by Ellenbogen and further elucidated by Owsley.[15,16] The platysma innervation identified in our study would not be injured in any routine neck rejuvenation procedure; the branches to the platysma are too far medial to be injured. Therefore, we believe that the pseudo marginal mandibular palsy due to cervical branch injury does not exist; it is more likely due to temporary swelling. The senior author has performed facelifts for 30 years and has never seen an example despite aggressive undermining of platysma, adding to the doubt about this previously described entity.

A limitation of the study is the number of total cadavers dissected. We noted the level of the main cervical branch medially at the level of the thyroid cartilage but did not take precise measurements, as these would vary from specimen to specimen. Additionally a full explanation of band recurrence is not possible in this anatomic-based study; a clinical correlate demonstrating if and where bands recur after a surgical maneuver would be ideal. Future studies could also focus on the topography of the muscle in terms of location of medial vs lateral platysma innervation and its thickness and orientation in different areas (ie, below mandible vs facial portion near the modiolus).

CONCLUSION

Recurrent bands are likely related to persistent innervation of the platysma via the cervical branch of the facial nerve. The course of the nerve extends to the medial platysma border at the level of the thyroid cartilage, and is left intact despite even the most aggressive interventions on the muscle. Surgical interventions that target the nerve should be explored as potential permanent treatments for platysma banding.

Supplementary Material

This article contains supplementary material located online at www.aestheticsurgeryjournal.com.

Disclosures

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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