9 Surgical Techniques for Treatment of the Aging Neck

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Abstract
Early signs of aging can be seen on the neck before they appear on the face. A number of noninvasive procedures are available to reverse the signs of aging in these areas. Although these procedures can delay the need for a facelift, they are less effective on the neck. A neck lift is a highly beneficial and effective procedure to address the major components of aging (skin, muscle, and adipose tissue). We present a systematic approach to analyze and treat the aging neck based on anatomy and individual features. Different techniques are discussed for each particular concern.

Keywords: aging neck, surgical neck lift, facial analysis, neck rejuvenation

Key Points

- The systematic approach guides surgical planning and delivers consistent outcomes with low morbidity.
- Skin excision is the least important step in neck rejuvenation surgery.
- Submandibular resection should be reserved only for severe cases. It should not be a routine procedure.
- We can frame the face and neck, modify angles and shadows, and ultimately create beauty.

9.1 Introduction

When looking at a beautiful face and neck, our eyes are directed to a well-defined mandibular border and the elegant contour of the cervical region.

When considering neck rejuvenation, nonsurgical procedures are less effective and surgical options are the gold standard in this region. Surgical treatments for the aging face and neck result in better and long-lasting outcomes. The traditional idea of lifting the neck to reverse the signs of aging is shortcoming. We believe that modern techniques and refinements allow the surgeon to not only lift the lax tissue but also remodel, sculpt, and even modify and enhance features of patients who are young and attractive. As plastic surgery is constantly evolving, we need to amplify our goals, accept new concepts, and develop a surgical plan at the tridimensional level. We can frame the face and neck, modify angles and shadows, and ultimately create beauty!

The goal of this chapter is to demonstrate the techniques utilized by the senior author in a systematic way. The systematic approach guides surgical planning and delivers consistent outcomes with low morbidity.

9.2 Facial Analysis and Applied Anatomy

The transitional zone between the lower face and neck has unique features. The cervical region has been studied by many authors. As described by Feldman, the cervical region has eight subunits.

The operative planning is guided by preoperative assessment of the anatomical structures and takes into consideration each of the following subunits:

- *Skin*, which covers all subunits. Evaluation of the skin will determine the optimal incision and the direction of the skin pull.
- *Subcutaneous fat*. Careful analysis should be done to determine fat removal, preservation, or fat grafting. Two approaches are considered: closed approach with liposuction or open approach with direct excision.
- *Chin.* Assessment of microgenia, prognathism, and ptosis (▶ Fig. 9.1).
- *Mandibular border and jowls*. Careful analysis of the mandibular contour, jowls, and prejowl sulcus should be done (▶ Fig. 9.2).
- *Submental region.* This is an important area and needs a detailed analysis and accurate diagnosis.

Ellenbogen described the visual criteria of the youthful neck[46]:

- A distinct inferior mandibular border from the mentum to the angle of the mandible with no jowl overhang.
- Subhyoid depression.
- Visible thyroid cartilage.
- Visible anterior border of the sternocleidomastoid muscle, distinct in its entire course from the mastoid to the sternum.

Fig. 9.1 (a–c) The preoperative pictures show a 30-year-old woman with excess subcutaneous fat. The postoperative pictures were taken 4 months after neck liposuction under local anesthesia.

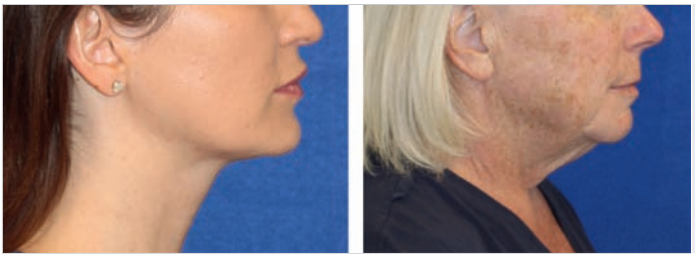


Fig. 9.2 The left picture shows a thin patient with a well-defined mandibular border. The right picture shows a heavy neck with an obtuse cervicomental angle.

- A cervicomental (CM) angle between 105 and 120 degrees (90-degree sternocleidomastoid to the submental line).

We utilize the layered approach for diagnosis and treatment. From superficial to deep, all structures are analyzed. Skin, subcutaneous tissue, platysmal bands, subplatysmal and interplatysmal fat, anterior digastric muscles, and perihyoid fascia and hyoid bone.

- Infrahyoid region. Evaluate the platysmal bands.
- Lateral aesthetic triangle: anterior to the sternocleidomastoid muscle. Evaluate the tissue and the submandibular glands.

- Lateral cervical region (posterior to the sternocleidomastoid muscle). Evaluate skin pull and plan incisions.

9.3 Patient Evaluation and Surgical Goals

- Important considerations and reflections on choosing the best treatment for each particular patient. Skin excision is the least important step in neck rejuvenation surgery.
- Given its cylindrical shape, the removal of adipose tissue in the neck is very important. This is different from the face that should be sculpted in a three-dimensional (3D) manner and treated with redistribution of fat.
- Excision of excess superficial or deep fat should be performed carefully. We must preserve a healthy layer of subcutaneous tissue, approximately 2 mm, to avoid contour irregularities.
- When analyzing the platysma bands, the first step is the differentiation between hypotonic and hypertonic bands (see ▶ Fig. 9.6; Connell BF, personal communication, June 2005)[1,2,3,4,5,6,7]:
  - Hypotonic bands are treated with suturing techniques (▶ Fig. 9.3).
  - Hypertonic bands: The transection of the bands is done with or without suturing in order to transfer them to a more favorable and less visible position. Transection can potentially minimize recurrence.
- Platysma bands can be treated in two ways, separately or in combination[1,2,3]:
  - Lateral traction: Transmission forces are predominantly infrahyoid.
  - Central traction (submental): The forces are transmitted mainly to the suprahyoid region.
- A well-defined CM angle is the most important part of the treatment (▶ Fig. 9.4).
- The end goal of a well-defined CM angle should have not only a technical but also an artistic interpretation. It should be planned specifically for each patient according to their characteristics, especially in relation to gender.[8,9]
- Thinner necks with a good CM angle can be treated by lateral traction alone; however, in the obtuse and heavy necks, the central access should be added.[10,11,12,13]

It is important to note that treatment of the neck can be done alone or in conjunction with facial rejuvenation surgery (▶ Fig. 9.5, ▶ Fig. 9.6, ▶ Fig. 9.7).

9.4 Surgical Techniques

The procedure starts with infiltration of 0.5% xylocaine solution and epinephrine 1:200.00 of the entire cervical area (▶ Video 9.1).

9.4.1 Skin

In the senior author's personal experience, submental or central access is needed in 80% of cases. For this reason, we first turn our attention to the central area; dissection can be blunt with the aid of liposuction cannulas and/or with electrocautery and scissors under direct vision, through the submental incision.

Care should be taken to maintain a good layer of subcutaneous fat in the skin flap; dissection continues to approximately 4 cm from the sternal notch.[6,7,14] Similarly, to the face,[15] the neck has ligamentous attachments and those need to be released for proper mobilization of the skin. The mandibular ligament[16] can be released through submental incision.

9.4.2 Fat Layer

After undermining of the central submental skin flap, wide undermining is performed. The excess subcutaneous fat is excised under direct visualization. We then evaluate interplatysmal fat and distribution of platysma muscle fibers.[17,18]

9.4.3 Platysma Muscle and Subplatysmal Structures

Subplatysmal exposure is achieved with medial opening of the platysma muscle and elevation of the muscle. Dissection proceeds until adequate mobilization of the platysma bands or platysma edges is achieved. When needed, conservative excision of subplatysmal fat is performed. At this point, we evaluate the anterior belly of the digastric muscles and the perihyoid fascia.

In the cases where the CM angle needs improvement, we make a relaxing incision in the perihyoid fascia, which can be above or below the hyoid bone or both.[12,19]

These incisions allow a superior and posterior repositioning of the hyoid bone by the muscular forces resulting from the posterior belly of the digastric muscles and suprahyoid muscles.[3,5] If

Fig. 9.3 (a–e) A 70 year-old patient, 3 months after facelift, neck lift, fat grafting, and CO_2 laser.

Fig. 9.4 (a–d) A 59 year-old patient, 2 months after facelift, neck lift, upper blepharoplasty, brow lift, facial fat grafting, TCA Peel and skincare treatments.

treatment of the digastric muscles is needed, the senior author's first choice is partial excision of the hypertrophic muscles (anterior digastric) with electrocautery, as described by Connell and Feldman.[6,45]

The approximation of the anterior belly of the digastric muscles with PDS 3–0 can be made when they are far apart, when there is a marked intermuscular depression (e.g., by previous over-resection of fat) or when hypertrophy is minimal.[4,6,7] Treatment of digastric muscles presents low morbidity and does not cause any impairment to the masticatory function.

Treatment of the submandibular glands will be discussed in detail later in this chapter.

After treatment of the submental floor, we proceed with medial approximation of the platysma muscle edges. Suturing is performed in one or two layers according to the amount of tension needed.[20,21,22,23,24] The first suture is a simple 4–0 nylon placed at the deepest point of the CM angle. We then proceed with a continuous suture of the

Fig. 9.5 (a–c) A 67 year-old patient, 3 months facelift, neck lift, upper and lower blepharoplasty, brow lift, facial fat grafting, TCA Peel and skincare treatments.

platysma with nylon 4–0 suture, from the hyoid to the menton, in one or two layers. We then perform a full transection of the platysma bands (marked preoperatively) as low as possible.

The last step of the central access is the approximation, without tension, of the platysma bands of the infrahyoid region until just above the lateral transection. Muscle resection is avoided, except in cases with excessive muscle laxity. The skin closure of the submental incision is made with a running 5–0 nylon suture.

We then proceed with skin undermining from the lateral approach utilizing the planned incisions.[10,24,25,26,27]

The retroauricular access allows us to access the lateral edge of the platysma muscle that will be treated alone or together with the elevation of the superficial musculoaponeurotic system (SMAS).[28,29,30,31]

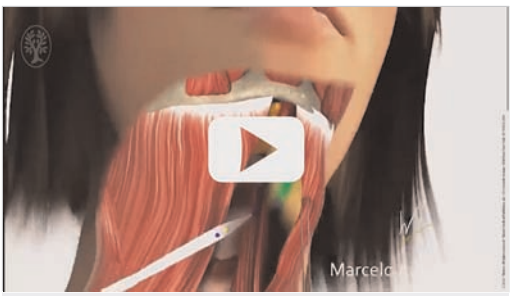
After undermining of the skin flap, we proceed with direct excision of excessive fat present along the mandibular border, jowls, and anterior edge of the sternocleidomastoid muscle.[19]

Lateral traction of the platysma muscle can be performed in two ways:

- Plication without muscle elevation and releases, as described by Pitanguy and others—technically simpler and applied in cases of laxer and thinner necks.[9,11,22] Fixation should be based on fixed points such as the mastoid region and platysma-auricular ligament. However, this technique tends to be slightly less long lasting.[30,31,32,33]
- Partial or total elevation of the lateral edge of the platysma muscle. This technique is longer lasting, and it is used in tight and difficult necks where the plication cannot reach the points for a rigid fixation such as the mastoid region.[3,12,13,20]

Fig. 9.6 (a–d) A 67 year-old - facelift, neck lift, upper and lower blepharoplasty, brow lift, facial fat grafting, TCA Peel and skincare treatment. **(e,f)** A 67 woman showing advanced signs of aging. Postoperative picture 1 year and 2 years after surgery shows improvement of the mandibular border and youthful contours.

Fig. 9.7 (a–c) A 49 year-old patient before and 2.5 months after facelift and neck lift.



Video 9.1 The aging neck: subplatysmal techniques.

After the platysma muscle is mobilized and sutured in place, the redistribution and redraping of the skin is performed, showing the shape and angles created in the submental and submandibular region. It is important to emphasize that skin traction is not so important and that only the excess skin will be excised without tension. This makes it possible to perform shorter scars and often without penetrating the hairline.[9,24,34]

Case examples below performed by the first author, Dr. Munique Maia. No submandibular gland resection was performed in these cases.

9.4.4 Submandibular Glands

The treatment of the submandibular glands has already been purposely left for a separate discussion, due to the strong and conflicting opinions of experienced authors on the subject.[3,5,6,7,17,19,21,35,36]

The first question that comes to the surgeon's mind is whether the bulging in the cervical region is due to a significant increase of the gland by inflammatory or neoplastic processes or whether this occurs from poor positioning and/or ptosis of these glands. Sullivan's studies with magnetic resonance imaging (MRI) mainly suggest ptosis and poor positioning than actual augmentation. However, many surgeons believe in a real increase of the gland due to recurrent episodes of ductal obstruction by stones, which are more common in these glands than in the parotid glands. If there is any doubt in the distinction between benign increase of the gland or malignant neoplasms, we suggest aspiration biopsy with a needle, which yields a high degree of accuracy.[37]

It is important to note that the submandibular glands produce approximately 50% of the total saliva, and this percentage can reach 70% of basal production outside the stimulatory periods such as during meals. The parotid glands are responsible for another 45% and the sublingual glands 5%. Whether by ptosis, poor positioning, or actual increase of the gland due to chronic inflammations, many patients present an evident bulging in this region, which is present in the preoperative examination.

There are different options to treat this deformity:

- Acceptance of the deformity and no treatment.
- *Botulinum toxin injection*: Be careful not to affect adjacent structures such as the lip depressor muscles.[38,39]
- Camouflage with fat graft[4,12] (Connell BF, personal communication, June 2005) and alloplastic mandibular implants.[40]

- Elevation or repositioning of the glands for smaller glands; this is less efficient with a higher recurrence rate.

Several techniques for glandular elevation or repositioning have been described.[30,31,32] The authors' preference is the direct platysma muscle reinforcement as described by Feldman, which, in addition to being performed in the median region, can also be added to other lateral sutures right on top of the lateral protrusion or bulging.[7] This suturing technique can be done continuously vertically or at separate stitches in "figure of eight." This technique is applied in the vast majority of cases, reserving partial resection only for the larger glands (5% of the total cases).

- Partial resection of the glands (more effective but presents more risks).

The first author to propose partial reduction of the submandibular glands was Bruce Connell in 1965 and then in 1976 at the American Society for Aesthetic Plastic Surgery (ASAPS) Symposium in Denver, Colorado (Connell BF, personal communication, June 2005). In 1991, de Pina and Quinta published the first article on partial resection, by lateral incision of the cervicofacial facelift.[41] In 1994, Aston et al published submental access to approach these glands because it is a plane with less vascularization and better access. They proposed partial resection of the superficial lobe, leaving the most functional aspect of the gland and avoiding the more vascularized lateral region, which unites the superficial and deep lobes.[14] This same access was also described by other authors such as Guyuron,[42] Nahai,[33] and Singer and Sullivan,[37] among others.[15]

In the senior author's personal experience, partial resection of the superficial lobe is performed in 5% of cases of face surgery. The submental access is utilized. Three important maneuvers are highlighted to make the procedure safer:

- Opening the glandular capsule, which causes herniation of these glands before resection. This maneuver avoids the larger vessels of the capsule.
- Repair the gland with two or three "U" sutures, with Vicryl 4–0, below the desired resection part. This facilitates exposure of the glands and after the resection is finished, these stitches are tied to prevent bleeding, sialoma, or sialocele.
- Final suture of the capsule to prevent dead space and herniation of the remaining portion of the gland, also with Vicryl 4–0.

Partial resection is probably the most effective and long-lasting treatment of gland bulging; however, undoubtedly it adds morbidity and brings some associated severe risks. In addition to these risks, we should discuss the extent to which we should interfere in the function only for better aesthetic results.[41,43]

The risks associated with partial resection are the following:

- Intra- or postoperative bleeding that is difficult to control.
- Potential risk of injury to the mandibular, cervical, and hypoglossal nerves.[44]
- Risk of salivary fistulas and sialomas, described in the series of experienced authors.
- Risk of dryness of the oral mucosa, especially in patients who have some predisposing factors such as diabetes mellitus, Sjogren's syndrome, dry eye, and others.
- Risk of contour irregularities or lateral depression when the entire superficial lobe is removed.

Therefore, in the authors' opinion, the indication for this procedure should be very judicious, widely discussed with patients, and reserved only for severe cases. It should not be a routine procedure.

9.5 Expert Commentary by Dr. Slavin

This is an excellent method analysis of the approach to the aging neck. The authors evaluate each factor that contributes to an aged experience and comment how their technique will correct the aged anatomy.

9.6 Expert Commentary by Dr. Lin

I commend the authors for this systematic and thoughtful review of their approach to the neck. The authors bring up the aspects of neck lifting that relate to careful preoperative planning. Aspects of subcutaneous fat preservation for prevention of contour irregularity that seem like minor points can optimize the postoperative result. I appreciate the thorough discussion of submandibular gland management, which continues to be an active topic of discussion even decades after it was introduced.

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