

## Non-Surgical Neck Contouring

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### Research Article

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### Abstract

Neck skin laxity is a frustrating result of aging. Traditionally, Rhytidectomy or facelift has been the only available option. While lifting remains the cornerstone of neck contouring, there has been an increasing demand among patients for less invasive procedures. Patients are seeking treatment with little or no downtime, less side effects as well as fewer incisions. The market has responded widely to this, with the emergence of wide spectrum of non-invasive skin tightening devices with different modalities.

Targeting the ideal patient with the appropriate modality is a challenge. Not only deep knowledge of each technique with its possible risks, but also thorough understanding of the aging process as well as addressing the patient's concerns are all important factors which help in this decision making. In this article, we outline different non-surgical neck contouring options and highlight the differences. The discussion focuses on the choice in between surgical and non-surgical contouring, as well as combing different modalities together.

**Keywords:** Aging; Skin laxity; Cosmetic; Neck-lift; Skin tightening; Contouring; Rejuvenation; Resurfacing; Non-invasive; Non-surgical; Minimally invasive; Rhytidectomy; Laser; Radiofrequency; Ultrasound; Botox; Thread lifting; Fillers.

### Introduction

Demand for a youthful appearance is dramatically increasing, and the armamentarium available to the aesthetic physician can range from non-invasive procedures to major invasive plastic surgery.

Throughout the aging process, the characteristics of the skin changes, with loss of elasticity and the natural ability to retain its moisture. The visible wrinkles and sagging of the skin are only two, out of the many, deleterious outcomes of skin aging.

The neck often ages more noticeably than the face and is one of the most disturbing, undertreated areas for patients to seek aesthetic advice.

Unfortunately, there are not many options directed towards treating the aging neck. The options are limited and the evidence is scarce.

### Physiology of Aging

Numerous attempts have been tried at counteracting the signs of aging. In term of skin laxity specifically, the gold standard of treatment remains rhytidectomy or

facelift. However, there has been a dramatic paradigm shift towards non-surgical procedures, as the patients seek to achieve skin tightening with no or minimal downtime.

Like the rest of the body, the skin undergoes natural changes as it ages. The aging process involves multiple layers of the skin and soft tissue, which can include subcutaneous fat, muscle and related bony structures.

The dermis thins with altered collagen and elastin functions. In addition there is weakening of the ligaments and fascia that support the skin. The composition of the subcutaneous fat changes and the muscles undergo atrophy.

In comparison to the face, the skin of the neck is slightly thinner with weaker muscles, soft tissue and bony support. In addition, the neck is usually less addressed to be cared for with sun protection and topical skincare products.

These changes translate to the aging effects that are commonly observed, including brow ptosis, midface deflation, and jowl formation in the face and wrinkled skin, loss of neck definition, excess fat in neck, with platysmal bands.

Many cosmetic procedures are directed towards providing a more youthful looking face, with a lower predilection to include the neck.

A youthful neck is most often characterized by an acute cervicomenal angle and a firm, well-defined jawline. The skin in a youthful neck is smooth and devoid of horizontal or vertical neck lines; has no platysmal bands; no visible submandibular glands; small, non-hypertrophic masseter muscles; and skin that is bright and even in color, with minimal melanin or vascular lesions [1].

### Neck Contouring

Traditionally, most of the non-surgical methods have centered on ablating the epidermis and the dermis, with resultant dermal collagen remodeling together with secondary skin tightening and rhytid improvement. Recent advances in energy-based devices have circumvented this to more targeted treatment with less downtime.

Although non-ablative and fractional lasers have been widely used for neck contouring, other methods, for example radiofrequency, infrared and ultrasound devices,

have also been used with good satisfactory results. In fact, they could produce similar results, if not better, as compared to non-ablative and fractional modalities.

### Material and Methods

A review of literature was conducted in June, 2017 to identify publications discussing Non-surgical neck contouring using the following keywords alone and in combination: Aging, Skin laxity, Cosmetic, Neck-lift, Skin tightening, Contouring, Rejuvenation, Resurfacing, Non-invasive, Non-surgical, Minimally invasive, Rhytidectomy, Laser, Radiofrequency, Ultrasound, Botox, Thread lifting and Fillers. The search was conducted using Ovid, PubMed and Google scholar engines. The retrieved articles were reviewed and relevant publications were selected based on the most recent and the stronger evidence. Only studies published in the last 5 years were included.

### Results

Findings were categorized into the most used non-surgical neck contouring modalities; Radiofrequency, Light-based devices, Ultrasound devices, thread lifting, Botox and fillers.

### Radio Frequency

Therapeutic use of the radiofrequency (RF) technology goes back to the 1920s by Bovie and Gushing, and since then it has revolutionized to cover a wide array of therapeutic and cosmetic indications.

RF functions via emission of electromagnetic current of high frequency that generates heat to both the dermis and subcutaneous tissues in an attempt to tighten the skin. The mechanism induces neocollagenesis, or new collagen formation, which is believed to result in the skin and subcutaneous tissue lift [2].

RF is chromophore independent, which means it could be safely used to treat all Fitzpatrick skin photo-types [3].

In addition to the two main scientific subtypes, monopolar and bipolar RF, new tripolar or multipolar devices have been released into the market, but are only variants of the main ones. Monopolar energy penetrates deep into the skin through travelling to a distant pole, a ground pad is applied directly to the body. Though can cause major discomfort, monopolar RF can produce satisfactory results. Bipolar devices on the other hand emit fast, alternating current through a two electrode

technique. Consequently, the associated discomfort is less when compared to the monopolar devices [3].

In his study on 14 subjects, Nelson et al reported that a course of four to six bipolar RF sessions resulted in skin tightening and rhytid reduction and an observable clinical improvement in about 70% of his subjects. Side-effects were mild and limited to transient erythema, edema, and rarely dysesthesia. No scarring or pigmentary alteration was seen, allowing for a quick recovery time [4].

Recently, Fractional High Intensity Focused Radiofrequency (HiFR) has been introduced to the dermis with insulated micro needles. Clementoni MT et al have studied the effect of three, monthly-based, sessions of fractional HIFR on thirty-three patients with mild to moderate skin laxity of lower face and neck. Patients were assessed for the effect by skin histology post treatment, objective measuring of both cervicomentale and Gnathion angles after six months and patients' satisfaction after 12 months. 81.8% of patients achieved moderate or higher results and 87% of patients were satisfied. Patients had no persistent side effects, with minimal down time [5].

### Light-Based Devices

Light-based devices have become more prevalent over the last decade, and performed to improve skin laxity with minimal risks and negligible recovery times. Appropriate patient selection is important to produce the desired results.

Light-based devices generally have a target chromophore that they aim at in order to produce their desired action. Different devices have different wavelengths and chromophores and thus, serve different functions.

Generally, most of the light-based devices can be used safely if the laser physician had a thorough knowledge of laser physics, indications, complications and ways to deal with them, coupled with an effective training in handling those devices [6].

In general, laser resurfacing treatments fall under one of two categories: ablative lasers and non-ablative lasers.

Ablative lasers such as CO<sub>2</sub> and Erbium removes the upper layer of the skin, allowing the natural mechanism of epidermal and dermal renewal to for a new healthier and better-looking skin, these devices are very effective resurfacing options, but usually quite painful and involve considerable recovery time and possible infectious and pigmentation risks. Fractional technology was developed

to address the shortcomings of ablative and non-ablative device modalities, performing ablation on small microscopic dots of skin, allowing rapid healing with minimal pain and downtime.

Non-ablative lasers on the other hand work by heating up the targeted tissue, without actually destroying it. This lead to minimal discomfort, however less invasive resurfacing effect in comparison to ablative modality.

Infrared devices uses infrared light pulses to safely heat the dermis just below the epidermis to stimulate new collagen production. Adjuvant pre, parallel or post treatment cooling system proved to protect the epidermis making it a more tolerable procedure. Mild transient edema together with skin dryness were reported as adverse effects. Felici M, et al. have examined the use of infrared lights in treating facial and body skin laxity. Out of the 303 patients involved in the study, 80% have reported satisfaction with the results of face and neck tightening [7].

### Ultrasound Devices

Ultrasound waves are another group of techniques that are used for skin tightening and other cosmetic procedures.

Ultrasonic waves induce molecular vibration deep within the tissue, an effect that results in tissue heating deep in the dermis bypassing the epidermal layer.

Two main types are available for physicians; High-intensity focused ultrasound (HIFU) and micro focused ultrasound (MFU). The former is used in medicine and surgery, for example non-surgical ablation of tumors and subcutaneous lipolysis, and the latter is used for cosmetic purposes like tightening the skin. The effect is achieved by targeting facial Superficial muscular aponeurotic system (SMAS) and platysmal [8].

Baumann L et al performed a study on 64 patients looking at the effect of MFU on neck and lower face, he reported improved aesthetic changes at 60, 90, and 180 days after treatment [9].

Side effects include erythema, edema, small areas of purpura, transient post-inflammatory pigmentation and appearance of subcutaneous nodules, All expected to resolve within one to two weeks. Sometimes linear or geometrical striations occur, they are usually responding to topical steroids. More serious reported side effects include numbness and muscle weakness that occurred as a result of nerve neuropraxia [10].

### Thread Lifting

Another new face and neck lifting technique is a procedure called thread lifting, which was designed to accommodate the increasing demand for an effective minimally invasive procedure with fewer incisions and no downtime.

Thread lifting works by providing a continuous mechanical stimulus to the cell, a process known as Mechanotransduction, which induces the production of new collagen and increases the cell metabolism. Mechanotransduction has an impact on cell activity with subsequent tightening of the skin as well as subcutaneous tissue.

The procedure utilizes absorbable and non absorbable sutures in the dermis and subcutaneous to lift lax skin [11]. One study showed that thread lifting has proven safe and effective, and associated with a low risk of complications if performed on patients with mild to modest face sagging, fine wrinkles, and marked facial pores [12].

Side effects include slight post-operation asymmetry that can be later corrected, minor ecchymosis, mild erythema, small hemorrhage, mild transitory aesthesia and mild post-procedure swelling [13].

### Botulinum Toxin (Botox)

Although the subject of botulinum toxin is way beyond the scope of this article, it is worth being briefly mentioned as one of the oldest methods used in the world of aesthetic medicine for face and neck lifts.

Botox is produced by *Clostridium botulinum* bacteria. When a small amount of the toxin is injected intramuscularly, intradermally or subcutaneously, it chemically denervates the muscle by acting on the presynaptic clefts. There are seven types of botulinum toxin, numbered A to G. Type A and B are pathogenic for humans, but are still used commercially and medically.

Botox injection is effective for the following indications; Medial and lateral platysmal bands, poorly-defined jawlines, necklace lines, prominent digastric muscles and prominent submandibular glands [1]. The most common side effect is asymmetry which can cause patient dissatisfaction [14].

### Fillers

The last point to be addressed in this paper is the use of fillers for neck lifting. Like Botox, fillers have long been used in the world of aesthetic medicine.

These products are not only used to fill wrinkles, but also for soft tissue augmentation, reconstruction as well as to influence the aging process at a cellular level.

Fillers can be either natural or synthetic. Hyaluronic acid fillers, one of the most commonly used groups of natural fillers, are indicated for facial rejuvenation and enhancement of facial features.

Synthetic soft tissue fillers usually provide volume replacement, but have an additional biostimulatory effect to support for facial volumization.

The use of fillers in neck cervical rejuvenation is limited since the skin of the neck is relatively thin. However, in a selected group of patients who have significant fine rhytides and horizontal lines, very dilute subdermal injections of particulate biostimulants, for example polygalactic acid, can result in new collagen formation and mild to moderate thickening of the dermis [1].

Montes JR et al have reviewed the literature of facial injectables, and concluded that proper patient selection together with appropriate product selection coupled with a skillful injection technique are essential to achieve a satisfactory outcome. They recommended the use of Calcium hydroxylapatite for patients who presents with volume loss requiring volumetric augmentation, rather than superficial line filling [15].

### Discussion

Unlike other parts of the face, there is no standard that has been developed to measure the outcome of neck lifting. Another challenge is the availability of only low level evidence targeted towards the science of neck contouring. Those among many others have complicated the topic of choosing a suitable neck contouring modality.

Thorough understanding of different non-surgical modalities, together with their physics and targeted tissue, as well as their possible side effects is fundamental to use the appropriate tool to achieve the best overall outcome.

THERAPY		MECHANISM	Targeted tissue	SIDE EFFECTS
RF		high-frequency radio waves	Dermis and subcutaneous	Transient erythema & edema
LIGHT-based DEVICES	ablative	targeting a chromophore	Epidermis and dermis	Painful, long downtime, pigmentations & infection
	Non-ablative		Dermis	Temporary lightening or darkening of the skin, Scarring, Swelling, Redness & Infection
	Infrared devices	infrared light pulses	Dermis	Transient edema and mild skin dryness
Ultrasound devices		Ultrasound waves	Dermis and subcutaneous tissues down to platysma	erythema, edema, striations, transient post-inflammatory pigmentation, subcutaneous nodules & temporary nerve affection
Thread lifting		mechanical stimulus	Dermis and subcutaneous tissue	ecchymosis, swelling, erythema, small hemorrhage & mild transitory anesthesia
Botox		Chemical denervation	Muscle	Asymmetry
Fillers		Mechanical filling and neocollagenesis	subdermis	Allergy, filler irregularity/ migration, infection, granulomas & rarely tissue necrosis

Table 1: Compares different non-surgical modalities.

### Surgical Vs Non-Surgical

A long lived debate in the era of cosmetic medicine is surgical vs non-surgical approaches. Neck contouring is no exception to the statement.

Although rhytidectomy remains the gold standard for consistent long-term results in facial rejuvenation, many patients are seeking alternatives to surgical procedures due to the associated downtime, morbidity and cost. To summarize the value of non-surgical to surgical approaches in neck contouring, the following points have been concluded:

- Minor Jawline contouring can be achieved via dermal fillers and Botox. However, for an observable, major effect, surgery is the definitive standard option.
- To address one issue, for example, platysmal bands, Botox can prove effective. Unfortunately, the contributing factors to neck aging are multiple (for example platysmal bands, tissue laxity and cervicomental angle distortion) and require a method that would address more than one modality of the aging process, for instance surgery again.
- Although, in the submental region, liposuction can yield a good outcome, the use of adjuvant minimally invasive methods (for example, energy-based devices) can sometimes produce even better results.

Al-Niaini, et al. have studied the various treatment options for skin tightening in face and neck in one of their articles and provided a similar conclusion [16].

### Combination Therapy

Deeper understanding of the intrinsic and extrinsic factors leading to the aging process of the face and neck is required. The aging process penetrates across different tissue planes, which lead to the development of a 3-dimensional approach to face and neck rejuvenation. The combination of multiple aesthetic modalities is sometimes needed for superior clinical results. Multiple studies have shown that a variety of different combination treatments can be effective.

Face-lifting only addresses ptosis and atrophy of facial tissues. It has no effect on the quality of the neck skin itself. Additionally, it is not the ideal management technique for fine wrinkles, sun damage or irregular pigmentation. Despite this, facelifts are the most effective treatment for most patients aged 40 and above. The belief that injectables can be used as an alternative to surgery or a mean to delay surgery is incorrect and would not produce dramatic effects anyway.

Alexiades-Armenakas M has assessed 12 patients who underwent a combination of laser-assisted liposuction and minimally invasive skin tightening using neodymium-doped yttrium aluminium garnet (Nd: YAG) laser device of the submentum and neck. He made the conclusion that it was both safe and effective in the treatment of excess fat and skin laxity of the submentum and neck regions [17].

In 2014, a multidisciplinary group of key opinion leaders in the core aesthetic specialties from all over the world have created guidelines for the use of combined botox with Hyaluronic acid fillers to address aspects of facial aging. Volume restoration with fillers ameliorated facial folds and contours. Weakening of over-contracting muscles with botox improved hyper dynamic rhytides. The lower face was viewed as most appropriate for combined treatments [18].

Another study by Keramidis E, et al. have studied the effect of Radiofrequency-assisted Liposuction for Neck and Lower Face in 55 patients concluded that it represented a safe procedure to achieve significant improvement of the skin laxity and fat deposits in the cervicomenthal zone and jowls [19].

### Conclusion

In conclusion, the subject of neck contouring is lengthy and complicated due to the lack of enough evidence and difficulty in measuring a standard desired outcome.

The options are surely vast and range between both surgical and non-surgical methods. Additionally, multiple combinations have proven effective. In addition to knowledge of each patient's unique undesirable issues, detailed understanding of the various available devices as well as their possible side effects is crucial to achieve desirable outcomes.

Choosing in between the different treatment modalities is a challenging decision-making process. Patient's age, other comorbidities, the nature and severity of the cosmetic issue, previous management, willingness to surgery, downtime, as well as cost and patients expectations are important factors guiding this decision-making process [16].

Overall, the effects of non-surgical modalities are modest at best. Surgery remains the most effective modality, and once indicated, it cannot be replaced or delayed by any of the other non-surgical options.

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### References

1. Mulholland RS (2014) Nonexcisional, minimally invasive rejuvenation of the neck. *Clin plastic surg* 41(1): 11-31.
2. Araújo AR, Soares VP, Silva FS, Moreira TS (2015) Radiofrequency for the treatment of skin laxity: myth or truth. *An Bras Dermatol* 90(5): 707-721.
3. Sadick NS, Malerich SA, Nassar AH, Dorizas AS (2014) Radiofrequency: an update on latest innovations. *J Drugs Dermatol* 13(11): 1331-1335.
4. Nelson AA, Beynet D, Lask GP (2015) A novel non-invasive radiofrequency dermal heating device for skin tightening of the face and neck. *J Cosmet Laser Ther* 17(6): 307-312.
5. Clementoni MT, Munavalli GS (2016) Fractional high intensity focused radiofrequency in the treatment of mild to Moderate laxity of the lower face and neck: A pilot study. *Lasers surg med* 48(5): 461-470.
6. Al-Niaimi F (2016) Laser and energy-based devices' complications in dermatology. *J Cosmet Laser Ther* 18(1): 25-30.
7. Felici M, Gentile P, De Angelis B, Puccio L, Puglisi A, et al. (2014) The use of infrared radiation in the treatment of skin laxity. *J Cosmet Laser Ther* 16(2): 89-95.
8. Fabi SG (2015) Noninvasive skin tightening: focus on new ultrasound techniques. *Clin, Cosmet Investig Dermatol* 8: 47-52.
9. Baumann L, Zelickson B (2016) Evaluation of Micro-Focused Ultrasound for Lifting and Tightening Neck Laxity. *J drugs dermat* 15(5): 607-614.
10. MacGregor JL, Tanzi EL (2013) Microfocused ultrasound for skin tightening. *Semcutan med surg* 32(1): 18-25.
11. Lovreglio R, Fabbrocini G, Delfino M (2016) The Nonsurgical Thread Lift for Facial Rejuvenation. *Nonsurgical Lip and Eye Rejuvenation Techniques* pp: 85-95.
12. Suh DH, Jang HW, Lee SJ, Lee WS, Ryu HJ (2015) Outcomes of polydioxanone knotless thread lifting for facial rejuvenation. *Dermatol Surg* 41(6): 720-725.

13. Savoia A, Accardo C, Vannini F, Di Pasquale B, Baldi A (2014) Outcomes in thread lift for facial rejuvenation: a study performed with happy lift™ revitalizing. *Dermatol ther* 4(1): 103-114.
14. Wanitphakdeedecha R, Ungaksornpairote C, Kaewkes A, Rojanavanich V, Phothong W, et al. (2016) The comparison between intradermal injection of abobotulinumtoxinA and normal saline for face-lifting: a split-face randomized controlled trial. *J Cosmet Dermatol* 15(4): 452-457.
15. Montes JR, Wilson AJ, Chang BL, Percec I (2016) Technical Considerations for Filler and Neuromodulator Refinements. *Plast Reconstr Surg Glob Open* 4(12): e1178.
16. Al-Niaini F, Bloom JD (2015) Evaluating the Cosmetic Patient: Understanding which Patients Benefit from Minimally Invasive Procedures versus Those that Require Surgery or Lifting Procedures. *Curr Dermatol Rep* 4(2): 49-55.
17. Alexiades-Armenakas M (2012) Combination Laser-Assisted Liposuction and Minimally Invasive Skin Tightening with Temperature Feedback for Treatment of the Submentum and Neck. *Dermat Surg* 38(6): 871-881.
18. Sundaram H, Liew S, Signorini M, Vieira Braz A, Fagien S, et al. (2016) Global Aesthetics Consensus: Hyaluronic Acid Fillers and Botulinum Toxin Type A-Recommendations for Combined Treatment and Optimizing Outcomes in Diverse Patient Populations. *Plast reconstr surg* 137(5): 1410-1423.
19. Keramidas E, Rodopoulou S (2016) Radiofrequency-assisted Liposuction for Neck and Lower Face Adipodermal Remodeling and Contouring. *Plast Reconstr Surg Global Open* 4(8): e850.

