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Research Article

COMPARISON OF VARIOUS INVASIVE AND NON-INVASIVE TECHNIQUES USED FOR FACIAL REJUVENATION IN UPPER THIRD OF FACE: A SYSTEMATIC REVIEW

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ABSTRACT

Background: The demand for facial reanimation has now spread from celebrities to common man. Complete facial rejuvenation refers to not only surgical procedures but also optimization of skin. This is achieved via invasive techniques like blepharoplasty, lateral brow canthopexy and rhytidectomy and other noninvasive techniques like botox, fillers, lasers and deep heat therapy. **Objective:** The aim of this review was to compare the effectiveness of various invasive and non-invasive techniques for facial rejuvenation in upper third of face. **Participants:** Patients with clinical presentation of facial aging in upper third of face in the age group of 40-70 years. **Results:** All the patients were satisfied with minimally invasive procedures as compared to invasive interventions. The success of any facial reanimation technique depends upon the type of technique, severity of the signs of facial aging and patient compliance. **Conclusion:** The minimally or non invasive techniques for facial rejuvenation including Botox, Fillers, Laser and Deep heat therapy are satisfying modalities with fewer complications and better patient compliance as compared to invasive procedures.

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INTRODUCTION

Facial rejuvenation is a cosmetic treatment or procedure with the intent to restore a youthful appearance to the human aged face. Aging is a complex process involving two crucial factors: volume loss all over the face, and repetitive movements of muscles that cause wrinkles and furrows. The first apparent signs of facial aging are frequently limited to the upper face and eyes.

The face is subdivided into "horizontal thirds" by Da Vinci fashion as upper face (from trichion to glabella), middle face (glabella to subnasale) and lower face (subnasale to menton).¹

The upper face is a dynamic, lively and attractive area of the face which includes the forehead, eyebrows, glabella, upper eyelids and the lateral canthal ligaments. Hence it is important to consider these anatomical boundaries in attempts of upper third facial rejuvenation.²

Facial rejuvenation can be accomplished through either surgical and/or non-surgical alternatives. Earlier in the past, various invasive surgical procedures dominated facial rejuvenation but in the present scenario there is a profound tendency of less or minimally invasive procedures which

provide many benefits being quicker, simpler, safe with long lasting results. The trend in cosmetic surgery over the past few years has been shifted towards minimally invasive procedures according to the literature.⁴

Traditional invasive procedures for facial rejuvenation, included rhytidectomy, blepharoplasty, lateral canthopexy, brow lift, and skin resurfacing, whereas the various minimally invasive procedures or agents for facial rejuvenation includes hydrodermabrasion, turmeric, fillers such as hyaluronic acid, platelet rich plasma (PRP), Botulinum toxin, laser resurfacing and many more.⁷

Achieving the patient's desired expectation depends not only on sound surgical skill and judgement, it also depends mainly on intercommunication between the surgeon and patient. Factual disclosure of what can reasonably be attained is crucial and can avoid patient dissatisfaction.⁹

So far, no systematic review on the comparison of invasive and non-invasive techniques for facial rejuvenation in upper third of face have been performed. Therefore, the aim of this review was to gather and evaluate, in a systematic manner, available data on the various techniques of facial rejuvenation, both

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invasive and noninvasive and draw a conclusion with regards to its effectiveness in upper one-third of face.

MATERIALS AND METHODS

Focussed Question

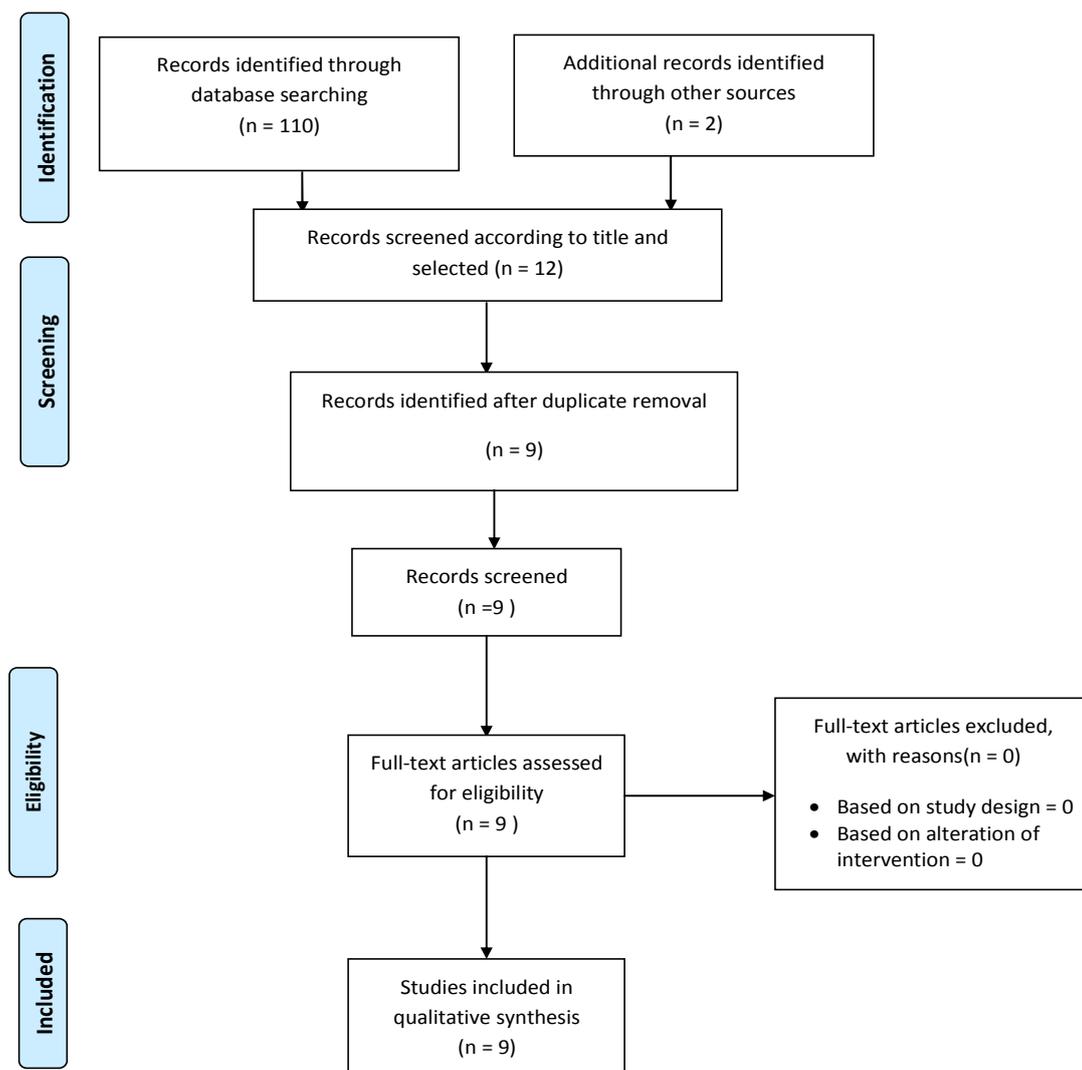
What is the efficacy of Invasive techniques when compared to Non-invasive techniques in aged patients showing signs of aging for facial rejuvenation involving the upper third of the face?

Eligibility criteria

The Inclusion criteria were all articles in English or those having detailed summary in English, studies published between 1st January 2006 and 31st November 2016, randomized controlled trials, clinical papers and series with essential data on facial rejuvenation, elderly patients with an age range from 40 to 70 years, studies that provide information of facial rejuvenation of upper third of face, studies with a follow up of upto 1 year. The Exclusion criteria were reviews, abstracts, editorials, letters, in vitro studies and studies on patients with any debilitating systemic disease.

Search strategy

Two Internet sources of evidence were used in the search of appropriate papers satisfying the study purpose: the National Library of Medicine (MEDLINE PubMed) and the Cochrane Central Register of Controlled Trials (CENTRAL), Google Scholar and manual search using DPU college library resources. All cross reference lists of the selected studies were screened for additional papers that could meet the eligibility criteria of the study. The databases were searched up to and including November 2016 using the search strategy. Following keywords were used, "Facial Rejuvenation", "Invasive" and "Noninvasive". The initial search consisted total of 110 articles out of which 23 articles were selected after duplicate removal. The papers were screened independently by two reviewers (KG and LS). At first the papers were screened by title and abstract. As a second step, full text papers were obtained when they fulfilled the criteria of the study aim. Any disagreement between the two reviewers was resolved after consenses. For full-text screening, all the inclusion criteria were taken into consideration. Finally a total of 9 articles were included which met all inclusive criteria



RESULTS

Study ID	Author & Year of Publication	Location	Study design	Sample size	Invasive/ Non-invasive	Clinical presentation	Intervention	Complication	Conclusion	Outcome
1	Benjamin A. Bassichis et al, 2006	Dallas, Texas	Case series	24	Non-invasive	Periorbital skin laxity and rhytids	use of nonablative radiofrequency device to rejuvenate upper one-third of face	1 patient had one treatment area that had a redness due to cooling mechanism	The ThermaCool TC nonablative radiofrequency device of upper one-third of face provide brow elevation in majority of patients.	Compared to the control group, the post-treatment measurements were improved.
2	G.E.Anastassov et al 2006	NY, USA	Clinical paper	20	Invasive	Dermatochalasis, skin hooding of upper eyelids, lateral canthal descent & orbital festooning	Upper and lower eyelid blepharoplasty	1 female patient -mild postoperative ectropion which resolved later. Prolonged postop oedema common.	Upper and/or lower blepharoplasties are effective procedures for rejuvenation of periorbital region.	all of the patients were satisfied with the outcomes of the surgery
3	Benjamin A. Bassichis, 2007	Dallas, Texas	Clinical study	Not mentioned	Invasive	eyelid asymmetries or ptosis	Cosmetic upper-lid blepharoplasty	most serious complication is retro-orbital hemorrhage with visual loss. Others may include infection, excess skin removal, blepharoptosis, hollowing of soft tissue above lid crease	The keys to successful upper-eyelid surgery are careful facial analysis, a thoughtful conceived surgical plan and meticulous operative technique.	
4	V. Ilankovan, 2010	Dorset, UK	Clinical paper	200	Invasive	Ptosis of lateral brow and hooding of upper lids	Lateral brow lift	No known complication	A simple technique which does not require expensive equipment and reduces the risks that arise from large incisions and extensive dissection	Patient satisfaction due to minimal incisions which result in shorter and aesthetically pleasing scars.
5	V. Ilankovan, 2012	Dorset, UK	Invited Paper	Not mentioned	Invasive and Non-invasive	Multiple lines on forehead, glabella and crow's feet, lateral and medial brow ptosis, hooding of upper lid, medial fat herniation and prominence of lacrimal glands	Surgical : upper blepharoplasty, lateral canthopexy and open or closed brow lift Non-surgical : Hydrodermabrasion, Turmeric, Filler, Hyaluronic acid, Botulinum toxin .	Not mentioned	To have a thorough understanding of different surgical and non-surgical options for rejuvenating the upper face to achieve an unoperated outcome with a healthy looking forehead.	
6	R. Sicira et al, 2013	Spain	retrospective study	25	Invasive	Facial lipotrophy, hemifacial atrophy, localised soft tissue atrophy, post-oncological and post radiotherapy sequelae.	autologous fat grafting	Allergic reaction postop oedema.	This technique improves final results in facial reconstructive surgery when volume defects exist	The mean of each patient was 2 (1-5).
7	Soni Nanda, 2013	Delhi	retrospective study	Not mentioned	Non-invasive	Aging face with lines & wrinkles.	Botulium toxin injection and Hyaluronic acid fillers	Botox-Ptosis of upper eyelid, Brusing, diplopia, ectropion or drooping lateral lower eyelid HA filler- depressed scars and persistent erythema	BTX A and HA fillers can prove to be a very satisfying modality, both for doctor and patient for upper face rejuvenation.	BTX A and HA fillers can prove to be very satisfying modality for upper face rejuvenation
8	Michael Kane, 2014	NY, USA	Clinical series	Not mentioned	Non-invasive	Rhytides and periorbital skin laxity	Nonsurgical periorbital and brow rejuvenation by dermal fillers and skin resurfacing	Tear trough	One deformity should not be singled out when rejuvenating the periorbital. The best results are obtained when the entire periorbital area is treated at the same time.	Using hyaluronic acid fillers, three tissue layers within the periorbital can be injected to produce maximally beneficial results and minimize the risk of adverse effects. 587 of 1089 face lifts received PRP and 926 of 1089 underwent a superwet technique. 10 hematomas were recorded, 6 in the group that did not receive PRP compared to 4 who did receive PRP.
9	Christopher R. Costa et al, 2014	Dallas and California, USA	retrospective study	1089	Non-invasive	laxity of skin on forehead	Superwet technique	None	This technique showed excellent outcomes with a hematoma rate of 0.9%. The superwet technique allows for improved safety and visualisation with improved hemostasis.	

DISCUSSION

The upper face occupies about one third of the surface area of whole face of approximately 61.9 mm². Facial rejuvenation of the upper one third of face is most commonly done because the forehead and brows get affected sooner in aging including wrinkles and lines. Invasive and Non invasive techniques for facial rejuvenation involving upper third of face includes Blepharoplasty, Lateral canthopexy, brow lift, skin resurfacing, hydrodermabrasion, botox, fillers and nonablative tissue tightening procedures.

Blepharoplasty is the is the plastic surgery operation for correcting defects, deformities, and disfigurations of the eyelids; and for aesthetically modifying the eye region of the face operation for correcting defects, deformities, and disfigurations.¹² A blepharoplasty procedure usually is performed through external surgical incisions made along the natural skin lines (creases) of the upper and the lower eyelids, which creases then hide the surgical scars from view, especially when affected in the skin creases below the eyelashes of the

lower eyelid. According to the technique applied by the plastic surgeon, the incisions can be made from the conjunctiva, the interior surface of the lower eyelid, as in the case of a transconjunctival blepharoplasty¹⁰

Lateral canthopexy can be done under local anesthesia, sedation or general anesthesia. A 2cm incision is placed 2cm behind the hairline in the temporal region at about 45⁰. Once the skin has been incised, a curved artery forceps is used to dissect bluntly through the superficial temporal fascia and the superficial layer of deep temporal fascia until the glistening, immobile fascia is reached. A Howarth periosteal elevator is inserted into this pocket, directed towards the supraorbital rim and the arcus marginalis released by blunt dissection. The elevator is then swept superomedially to break the attachments of the temporal ligaments. Then the immobile temporal scalp is retracted superolaterally to raise the brow to the desired height. A vertical incision is made through the full thickness of the scalp in the middle; this cut is dictated by the overlap of the scalp between the proximal and distal parts. A diamond-shaped piece of the scalp is excised. The scalp ends are

apposed with staples or sutures. Sutures are removed 10 days postop.⁷

Hyaluronic acid (HA) fillers are used most commonly for soft tissue augmentation because of the low immunogenicity, high safety and easy removal by hyaluronidase injections. HA is injected in the subgaleal glide plane between the brows at the mid procerus level between the supratrochlear vascular arcades using a 1ml syringe. Treatment typically lasts for atleast 10 to 12 months depending on the type of HA filler injected.⁹

Benjamin Bassichis in 2006 conducted a study in Dallas, Texas on 24 patients with clinical presentation of periorbital skin laxity and rhytids. In this study they used a nonablative radiofrequency device ThermoCool TC TM to rejuvenate upper one-third of face which provide brow elevation in majority of patients. Out of 24 patients, 1 patient had a complication of redness due to cooling mechanism.³

G.E.Anastassov in 2006 conducted a study in NY, USA on 20 patients with clinical presentation of Dermatocholasis, skin hooding of upper eyelids, lateral canthal descent and orbital festooning in which Upper and Lower eyelid blepharoplasty was carried out. Thus study concluded that blepharoplasties are effective procedures for rejuvenation of periorbital region. The complications of this procedure is prolonged postop edema which was common. Besides 1 female patient developed mild postop ectropion which resolved later.⁴

V. Ilankovan in 2010 conducted a study in Dorset, US on 200 patients with clinical presentation of Ptosis of lateral brow and hooding of upper lids on which lateral brow lift was carried out. It was concluded that it is a simple technique which does not require expensive equipment and reduces the risk that arise from large incisions and extensive dissection. The outcome was patient satisfaction due to minimal incisions which result in shorter and esthetically pleasing scars.⁵

R.Sieira *et al* in 2013 conducted a retrospective study on 25 patients with clinical presentation of facial lipotrophy, hemifacial atrophy and localized soft tissue atrophy in which autologous fat grafting was carried out. They concluded that this technique improves final results in facial reconstructive surgery when volume defects exist. The common complication included were allergic reaction and postoperative edema.⁶

Soni Nanda in 2013 conducted a retrospective study in Delhi for patients with clinical presentation of facial aging due to wrinkles and lines in which Botulinum toxin injection and Hyaluronic acid fillers were administered. They concluded that both BTX A and HA fillers proved to be a very satisfying modality both for the doctor and patient for upper face rejuvenation. The complications were rare which included ptosis of upper eyelid, bruising, depressed scars and persistent erythema.⁷

Micheal Kane in 2014 conducted a clinical study in NY, USA for patient presenting with rhytides and periorbital skin laxity in which he carried out nonsurgical periorbital and brow rejuvenation by dermal fillers and skin resurfacing. The advantage of using hyaluronic acid fillers is that three tissue layers within the periorbital can be injected to produce maximally beneficial results and minimize the risk of adverse effects.⁸

Christopher R in 2014 conducted a retrospective study in Dallas, USA on 1089 patients with clinical presentation of laxity of skin on forehead in which he used a Superwet technique which is defined as infiltration of platelet rich plasma solution greater than 50 to 100 cc per side. The solution was mixed preoperatively and included 30 ml of 0.5% lidocaine and 1.5 ml of epinephrine mixed with 300 ml of normal saline. This was injected subcutaneously using an autofill syringe and a 22-gauge spinal needle. Almost 80 to 120ml of fluid was injected per-side. The endpoint for delivery was the presence of moderate uniform skin turgor without blanching of the skin. This technique showed excellent outcomes with a hematoma rate of 0.9%. It allows for improved safety and visualization with improved hemostatis.⁹

To summarise the studies selected by us, most of the studies, 4 were clinical case series^{3,4,6,10} and 3 were retrospective studies^{8,9,11} and 2 were invited papers. Most of the studies had patients with common clinical presentation of skin laxity and ptosis of brows for which blepharoplasty or lateral brow lift were carried out invasively or Botox or fillers were used noninvasively. The complications of invasive techniques included Retro-orbital hemorrhage⁵, postop infection or tear trough¹⁰ whereas those of noninvasive techniques were minimal including allergic reaction and postoperative oedema⁸.

CONCLUSION

The non-invasive techniques of facial rejuvenation including botox, fillers, laser and deep heat treatment are recently becoming popular due to being less time consuming, compliant to the patient and having less complications as compared to the more invasive techniques involving surgery although the quality of this evidence is limited. Hence we would recommend that more studies in this field be done so that the implementation of noninvasive techniques for facial rejuvenation in the near future is carried out.

As very few randomised control trials are performed on this study, we would seek studies with high quality evidence based randomized control trials with conclusive objective results in future.

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