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Micro focused Ultrasound with Visualization: A Novel Approach for Periorbital Rejuvenation

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Abstract

Purpose: The infraorbital area is a challenging indication for the aesthetic provider but frequently requested by patients. To determine whether microfocused ultrasound with visualization (MFU-V) may offer a non-invasive alternative to surgical techniques, the author collected data from a series of patients treated in her practice.

Methods: This case series included subjects who presented with mild-to-moderate skin laxity in the periocular area with or without additional anomalies such as malar edema and malar mounds. Subjects received one session of MFU-V therapy using the 7.0/3.0 mm and/or 7.0/1.5 mm transducers depending on the severity of the presenting condition. Photographs were taken at baseline and at the patient's subsequent office visit.

Results: A total of five female patients were included, ranging in age from 42 to 54 years old. With the exception of one subject who had received prior botulinumtoxin treatment, all of the patients were aesthetic treatment naïve. Improvements in periorbital appearance were observed in all patients including visible skin tightening, improved skin appearance, and reduced malar mounds and edema. MFU-V was particularly effective at reducing the appearance of severe malar mounds. Treatment was well tolerated and no complications were observed.

Conclusions: MFU-V offers a well-tolerated, non-invasive approach to improve the appearance of the eye area in subjects with periorbital skin laxity and malar mounds, including severe.

Keywords: Skin laxity; , Vascularization; Periorbital Rejuvenation; Skin tightening

Introduction

Rejuvenation of the infraorbital region is a common reason for aesthetic consultation either because of aging-related soft-tissue changes or congenital defects that make an individual more prone to under eye shadows or puffiness. In younger individuals, there is a smooth transition between the infraorbital region and the mid-cheek, but with age the boundaries become more pronounced with the appearance of unwanted features such as tear troughs, palpebro-malar grooves, and malar edema, mounds or festoons [1]. Some individuals may be congenitally predisposed to these features, while in others they occur with age as a result of skin and subcutaneous fat atrophy and displacement, repetitive muscle movements, and enlargement of the orbital bony space [2,3]. In both groups, the defects are worsened by extrinsic factors such as sun damage and smoking. The infraorbital region is complex anatomically with its own septa and ligaments, fat compartments, muscles, vascularization and lymphatic drainage [4]. In addition, the thin delicate skin in this area leaves little room for error. Hollows and grooves may be treated with hyaluronic acid (HA) fillers, but they must be placed on the periosteum below the orbicularis oculi muscle to avoid a risk of visible material [5]. More superficial placement of filler can also result in malar edema. This is a frequent complication of the lateral infraorbital area and occurs when HA filler is trapped between the malar septum and the skin, blocking lymphatic drainage vessels [6].

Patients with severe malar mounds or festoons are generally recommended for lower lid blepharoplasty [7]. Complications of this procedure may include under correction (not enough skin or fat removed, or muscle not tightened sufficiently) or overcorrection, which can change the lower eyelid contour and lead to retraction and greater exposure of the sclera. In both cases, additional surgery may be required to smooth out the lid-cheek junction [8]. Surgical incisions and dissections can also increase the risk of malar edema as a result of damage to the superficial lymphatic system in the infraorbital area. Aesthetic providers are constantly searching for new, non-invasive methods to rejuvenate the periorbital area. One such approach is micro focused ultrasound with visualization (MFU-V, Ultherapy). This technology delivers ultrasound energy at pre-selected depths below the skin's surface. Absorption of the ultrasound energy causes intermolecular vibration and heat production to temperatures of around 65°C, causing collagen denaturation and initiating collagen synthesis, without injuring the skin's surface [9]. MFU-V received FDA approval in 2009 for non-invasive eyebrow lift and has since demonstrated collagen-stimulating properties and improvements in skin laxity in a variety of aesthetic indications, including three studies in which it was evaluated for treating periorbital skin laxity [10-12]. To explore the potential of MFU-V for the infraorbital area, this case series presents results from patients with a range of undereye manifestations from skin laxity to severe malar mounds. Patients of this type have not been included in previous studies of MFU-V, but may benefit from its skin tightening and tissue lifting effects. Potential explanations for the treatment results observed are also presented.

Relevant Anatomy

The infraorbital area is bounded by the medial canthus medially, the lateral canthus laterally, and the inferior border of the orbicularis oculi muscle (Figure 1) [13]. Three anomalies in this area that cause malar bulges or bags are malar edema, malar mounds and malar festoons (Table 1). While not mutually exclusive the three terms help delineate the pathophysiological mechanisms underlying each anomaly.

Malar edema is fluid accumulation over the malar eminence. It arises because of compromised lymphatic drainage in the superficial sub orbicularis oculi fat, which is separated from the deep fat compartment by the malar septum. Malar edema may occur as a result of cardiac, renal, or hepatic insufficiency, hypothyroidism, allergies, and surgical or periorbital cosmetic injections [13]. If the latter are injected superficially to the malar septum, they can further impede lymphatic drainage resulting in fluid accumulation and malar edema [6]. Some individuals may also have a congenital abnormality that results in compromised lymphatic drainage in the infraorbital area. Malar mounds are chronic swellings between the infraorbital rim and the zygomaticocutaneous ligament (1). This permanent soft tissue bulge usually contains fat or orbicularis oculi muscle, due to either descent or hypertrophy. Like malar edema, malar mounds can be congenital [14].

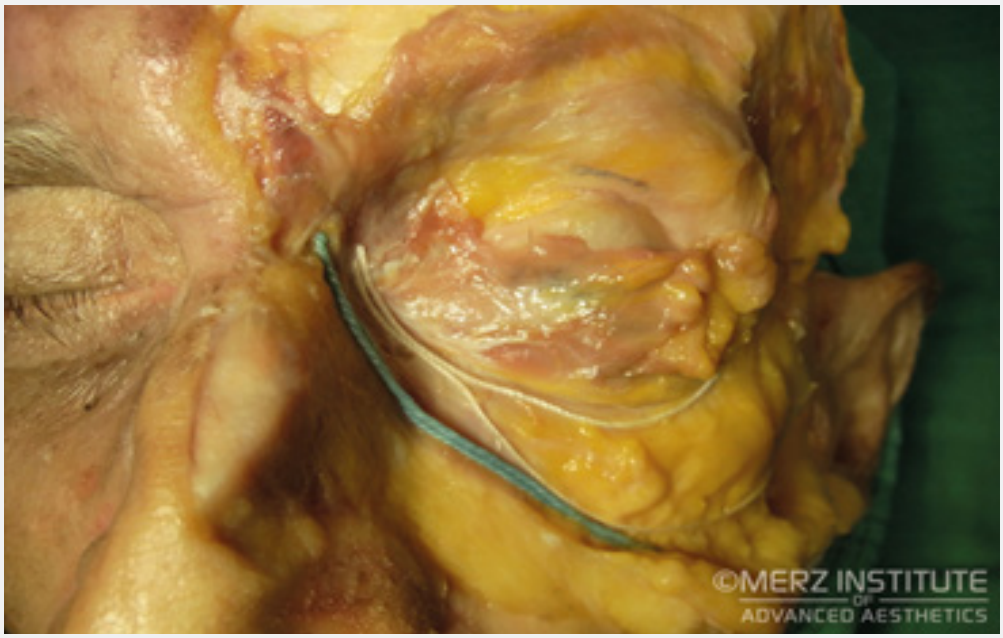

Figure 1: Artwork depiction of the prezygomatic space bordered superiorly by the orbicularis retaining ligament (ORL) and inferiorly by the malar septum and zygomaticocutaneous ligament (ZCL). The malar septum courses inferiorly to a point just distal the inferior border of the orbicularis. Sagittal section of the prezygomatic space, reprinted with permission from artist Warren Noel, MD (plastic surgeon, Paris, France). SOOF, suborbicularis fat.

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Table 1: Definition of Infraorbital defects.

Term	Definition
Malar edema	Fluid that collects over the malar eminence, below the level of the infraorbital rim. It often varies in severity and can worsen after salty meals or in the morning.
Malar mound	Chronic soft tissue swelling or bulge over the malar eminence situated between the infraorbital rim and midcheek.
Malar festoon	Hammock of lax skin and orbicularis muscle that hangs between the medial and lateral canthi and may or may not contain herniated fat.

Malar festoons are acquired with age and described as hammocks of lax skin and orbicularis oculi muscle that hang between the medial and lateral canthi and which may or may not contain herniated fat. Festoons are more often found in older adults and are thought to represent a progression of malar edema and malar mounds [1]. The malar septum defines the inferior border of the area where festoons develop. It is a thin impermeable membrane that extends from the inferior orbital rim to the cheek skin [15]. From its origin at the rim, the malar septum crosses the SOOF (creating both a superior and an inferior SOOF), penetrates the orbicularis oculi muscle, and finally interdigitates with fibrous septa to insert into the mid cheek dermis. This fascial structure acts as a relatively impermeable barrier that allows tissue edema to accumulate above its cutaneous insertion [6].

Case Studies

The following five individuals were treated with MFU-V for a range of periorbital indications. In all cases, treatment was restricted to outside the orbital rim. Pain relief consisted of topical 10.5% lidocaine cream, oral 500 mg metamizole (Novalgin) and oral 500 mg paracetamol.

Case 1

This 42-year-old female with no prior history of malar edema received MFU-V for a brow lift and rejuvenation of the periorbital area in February 2021. Her only previous aesthetic treatment was botulinumtoxin around the eyes, 2.5 months before MFU-V. She received one MFU-V treatment session with a combination of the 7 MHz/3.0 mm narrow and 7 MHz/1.5 mm transducers. The protocol for the 7.0/3.0 mm transducer was 30 passes from the eyebrow towards the hairline in three columns between the mediopupillary line and the lateral canthus (10 passes per column). The periorbital area was treated with the 7.0/1.5 mm transducer with 15 passes around the eye from the mediopupillary line to the zygomatic arch. Treatment results from the 2.5-month follow-up visit are shown in Figure 2. The patient's next follow-up is scheduled for Autumn 2021.

Figure 2: Case 1: a 42-year-old woman before and 2.5 months after MFU-V treatment to the brow and periorbital area.

Case 2

This patient received MFU-V treatment in the periorbital region in November 2018 at the age of 47 years old, and prior to that had received no aesthetic treatments. She demonstrated some skin laxity indicated by a positive pinch test, but no malar edema or mounds. She received one treatment session with the 7.0 MHz/3.0 mm transducer and 50 passes around each eye from the mediopupillary line to the lateral canthus and on the lower eyelid. Follow-up visits were performed at 3 and 6 months. Treatment results at 11 months are shown in Figure 3.

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Case 3

This 49-year-old female received MFU-V in June 2019 for a range of periorbital indications including skin laxity, bilateral blepharochalasis, and slight, left-side brow ptosis. She demonstrated some skin laxity indicated by a positive pinch test, but no malar edema, and had received no prior aesthetic treatments. She received one MFU-V treatment session with a combination of the 7 MHz/3.0 mm and 7 MHz/1.5 mm transducers. The left upper eye with slight brow ptosis was treated with the 7.0/3.0 mm transducer and 40 passes, and the right eye with 35 passes both in 4 columns in a direction from the brow towards the hairline. The 7.0/1.5 mm transducer and 15 passes were used to treat the area around the eye from the mid-pupillary line to the zygomatic arch. Treatment results at 8 months are shown in Figure 4.

Figure 3: Case 2: a 47-year-old woman showing the periorbital area before and 11 months after MFU-V treatment. This patient was also treated for the infraorbital area.

Figure 4: Case 3: a 49-year-old woman showing the periorbital area before and 8 months after MFU-V treatment.

Case 4

This patient received a single MFU-V treatment to the periorbital region in April 2018 at the age of 46 years old, and prior to that had received no aesthetic treatments. She had no skin laxity, but demonstrated malar edema which was worse in the morning and improved during the day. She reported that she had experienced this since the age of around 25-years-old. Her treatment protocol used both the 7.0/3.0 mm and 7.0/1.5 mm

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transducers. The protocol for the 7.0/3.0 mm was 50 passes round the eye from mediopupillary line to the lateral cantus and under the lower eyelid The 7.0/1.5 mm transducer was used to treat the same area with 30 passes. Treatment results at 4 months are shown in Figure 5.

Case 5

This 54-year-old female received MFU-V for rejuvenation of the periorbital area in May 2019. She demonstrated some skin laxity indicated by a positive pinch test, but no malar edema, and had received no prior aesthetic treatments. She received one MFU-V treatment session with a combination of the 7 MHz/3.0 mm narrow and 7 MHz/1.5 mm transducers. The protocol for the 7.0/3.0 mm narrow transducer was 30 passes from the eyebrow towards the hairline in three columns between the mediopupillary line and the lateral canthus (10 passes per column). The periorbital area was treated with the 7.0/1.5 mm transducer with 15 passes around the eye from the mediopupillary line to the zygomatic arch. Treatment results from the 7-month follow-up visit are shown in Figure 6.

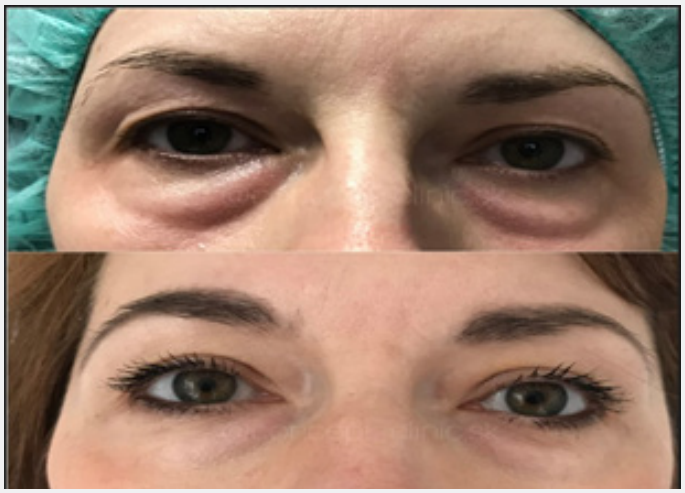

Figure 5: Case 4: a 46-year-old woman showing the periorbital area before and 4 months after MFU-V treatment.

Figure 6: Case 5: a 54-year-old woman showing the periorbital area before and 7 months after MFU-V treatment.

Safety and tolerability

None of the patients experienced adverse events and all have subsequently returned or are scheduled to return for repeat treatments to the periorbital and/or other facial areas.

Discussion

This case series demonstrated the potential of MFU-V for the treatment of a range of periorbital indications with visible improvements in brow height, upper eyelid and periorbital skin

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tightness, palpebromalar grooves and malar mounds after only one treatment session. The benefits observed were a result of MFU-V as no other aesthetic treatments were performed in the same treatment session or during the follow-up period. Pain during the procedure was satisfactorily managed with application of topical anaesthetic and oral analgesics. At subsequent follow-ups none of the patients reported any adverse events in line with other small-scale studies which have demonstrated the safety of MFU-V in the periorbital area [10-12]. The complex anatomy and thin skin of the eye area make it a challenging area to treat for the aesthetic practitioner and plastic surgeon alike, but it remains one of the most frequently requested areas for rejuvenation [16]. While wrinkles can be effectively addressed with botulinumtoxin and HA fillers, accumulation of fluid, fat, and excess lax tissue in the form of malar mounds and festoons are not easily resolved. Blepharoplasty with lipectomy is often performed to correct the latter issues, but this surgical technique requires considerable down-time and can be associated with complications, inconsistent results and recurrence [1,13,14]. As a result, there is currently no consensus on the best treatment approach for these defects, surgical or non-surgical.

MFU-V induces skin tightening through the initiation of neocollagenesis and elastogenesis, with associated benefits on skin quality and tone [White et al, 2007]. While it is currently off-label for the periorbital region, several small-scale studies have investigated its skin-tightening properties in this area [10-12,17]. Studies in Asian patients have reported that the 1.5 mm MFU-V transducer is effective for tightening the thin skin of the lower eyelid [11,17]. while the 3 mm MFU-V transducer targets the orbicularis oculi muscle and the orbital septum [11,12,17]. Tightening of these structures was associated with improvements in the appearance of malar mounds and the contour of the lid-cheek junction. This was demonstrated subjectively based on the results of physician assessment and patient satisfaction questionnaires [11,12], and objectively via measurements of degree of malar mound protrusion on pre- and post-MFU-V computed tomography images [11]. In studies that have performed pre- and post-treatment biopsies, histological analysis confirmed regenerated and increased collagen and elastin fibres in the reticular dermis [12]. The 3.0 mm transducer may also improve the appearance of malar mounds by condensing excess fat.

In the current case series, dual depth MFU-V treatment was particularly effective in the patient with severe malar mounds (Case 4). It is hypothesized that MFU-V tightens the suborbicularis oculi muscle and septum as well as the overlying skin, with the reduced tissue space limiting the area of lymphedema. The patients with less severe presentations (Cases 1, 3, and 5) received no under eye treatment. In these cases, superficial skin-tightening treatment of the lateral periorbital area (from the mediopupillary line to the zygomatic arch) with the 1.5 mm transducer alone was sufficient to improve the patient's periorbital appearance. Follow-up visits ranged from 2.5 to 11 months. At the earliest time-point, the skin-tightening benefits of MFU-V are only just beginning to become apparent. MFU-V triggers physiologic neocollagenesis, and the collagen remodelling phase can take up to a year or more [18]. Previous studies in which MFU-V has been used to treat the periorbital area assessed efficacy at periods ranging from 3 to 6 months [11,12], but MFU-V has previously demonstrated efficacy in other indications for periods of 1 year or [19], and in the authors experience most patients return for repeat treatments at around the 1-year mark.

While the current case series evaluated MFU-V alone, in some patient's optimal rejuvenation of the periocular area requires both skin tightening and addition of volume. A small case series evaluated treatment results in the infraorbital area after MFU-V alone and followed 3-months later by injection of a cohesive polydensified matrix hyaluronic acid (CPM-HA) gel. Both patients and physicians reported satisfaction was high after MFU-V alone, but judged improvements in periocular skin laxity and tear trough appearance to have improved even further with a combined approach [10]. The findings from the current case series demonstrate the potential of MFU-V for the treatment of a range of periorbital indications of varying severity. Advantages over surgical procedures include limited down time and low risk of adverse events. The patients in the current study were young (age 42-54 years) and had not received prior aesthetic treatments, other than botulinumtoxin in one patient. Similar patient characteristics (<50 years old, no previous treatment or surgery to the periorbital area) were reported in the study by Pak et al. [11] who demonstrated the benefits of MFU-V for lower eyelid rejuvenation in a group of 15 Asian patients. Further studies are now warranted to determine whether these characteristics define the optimal patient population for treatment of the under-eye area, and whether they are influenced by factors such as age group, skin type, gender, and severity of existing anomaly.

Conclusion

MFU-V offers a non-invasive and well-tolerated approach for rejuvenation of the periorbital area, one of the most challenging regions of the face to treat. A single treatment session led to improvements in skin laxity and was very effective at reducing the appearance of severe malar mounds.

References

1. Kpodzo DS, Nahai F, McCord CD (2014) Malar Mounds and Festoons Review of Current Management. Aesthet Surg J 34(2): 235-248.

2. Lee JH, Hong G (2018) Definitions of groove and hollowness of the infraorbital region and clinical treatment using soft-tissue filler. Arch Plast Surg 45(3): 214-221.

3. Roh MR, Chung KY (2009) Infraorbital dark circles: definition, causes, and treatment options. Dermatol Surg 35(8): 1163-1171.

4. Mojallal A, Cotofana S (2017) Anatomy of lower eyelid and eyelid-cheek junction. Ann Chir Plast Esthét 62(5): 365-374.

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5. Van Loghem J, Sattler S, Casabona G, Sebastian C, Sabrina GF, et al. (2011) Consensus on the Use of Hyaluronic Acid Fillers from the Cohesive Polydensified Matrix Range: Best Practice in Specific Facial Indications. Clin Cosmet Investigate Dermatol 14: 1175.
6. Funt DK (2011) Avoiding malar edema during midface/cheek augmentation with dermal fillers. J Clin Aesthetic Dermatol 4(12): 32.
7. Phoebe LKW (2017) The troublesome triad: festoons, malar mounds, and palpebral bags. J Cosmet Med 1(1): 1-7.
8. Goldberg RA, McCann JD, Fiaschetti D, Simon GJB (2005) What causes eyelid bags? Analysis of 114 consecutive patients. Plast Reconstr Surg 115(5): 1395-1402.
9. White WM, Makin IRS, Barthe PG, Slayton MH, Gliklich RE (2007) Selective creation of thermal injury zones in the superficial musculoaponeurotic system using intense ultrasound therapy: a new target for noninvasive facial rejuvenation. Arch Facial Plast Surg 9(1): 22-29.
10. Barbarino SC (2021) Combination Approach to Tear Trough Deformities and Under Eye Appearance Using Micro Focused Ultrasound with Visualization and Hyaluronic Acid Filler. Am J Cosmet Surg 38(3): 156-162.
11. Pak CS, Lee YK, Jeong JH, Kim JH, Seo JD, et al. (2014) Safety and efficacy of ulthera in the rejuvenation of aging lower eyelids: a pivotal clinical trial. Aesthetic Plast Surg 38(5): 861-868.
12. Suh DH, Oh YJ, Lee SJ, Ji-Ho R, Kye-Yong S, et al. (2012) A intense-focused ultrasound tightening for the treatment of infraorbital laxity. J Cosmet Laser Therap14(6): 290-295.
13. Newberry CI, Mccrary H, Thomas JR, Cerrati EW (2020) Updated management of malar edema, mounds, and festoons: a systematic review. Aesthetic Surg J 40(3): 246-258.
14. Asaadi M (2018) Etiology and treatment of congenital festoons. Aesthetic Plast Surg 42(4): 1024-1032.
15. Pessa JE, Garza JR (1997) The malar septum: the anatomic basis of malar mounds and malar edema. Aesthetic Surgery J 17(1): 11-17.
16. Surgeons ASP (2020) Palstic Surgery Statistics Report.
17. Chan NP, Shek SY, Yu CS, Ho SG, Yeung CK, et al. (2011) Safety study of transcutaneous focused ultrasound for non-invasive skin tightening in Asians. Lasers Surg Med 43(5): 366-375.
18. Velnar T, Bailey T, Smrkolj V (2009) The wound healing process: an overview of the cellular and molecular mechanisms. J Int Med Res 37(5): 1528-1542.
19. Werschler WP, Werschler PS (2016) Long-term efficacy of micro-focused ultrasound with visualization for lifting and tightening lax facial and neck skin using a customized vectoring treatment method. J Clin Aesthetic Dermatol 9(2): 27.

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