The periorbital area (Figure 1) is the aesthetic epicentre of the face; its delicate critical structures and intricate anatomic relations pose a unique challenge for even the most experienced aesthetic practitioner. The thin fragile eyelid skin and mobile orbicularis oculi lend themselves to the possibility of overfilling and Tyndall effect, whilst the complex vascularity can result in visible bruising and swelling, having a negative impact on the patient experience. Vascular compromise and visual loss are devastating complications that must be avoided at all costs. Mid-facial ageing is a combination of the ‘gravitational theory’ (vertical descent of soft tissues due to ligamentous attenuation) and the ‘volumetric theory’ (relative volume loss and gain of neighbouring fat compartments of the face). In 2007, Rohrich and Pessa published their seminal study on the facial fat compartments. This not only serves as a road map to understanding facial ageing, but has also revolutionised how we rejuvenate the ageing face. To successfully navigate the hollows and troughs of the periorbital zone, it is vital to understand how ageing in one sub-zone affects the other, rather than non-specific targeting of the tear trough or cheek.

Using an anatomical guide to the deep and superficial facial fat compartments for volume restoration, in multiple key areas, results in a naturally harmonious rejuvenation to lift and fill the central face (eyelid, eyebrow, temple, cheek and mid-face).

**The lid-brow junction**

Eyebrows form the lower boundary of the upper third of the face. They are often most aesthetically pleasing when they are positioned at the superior orbital rim, with a gentle arc which peaks at the middle and lateral third (this arc being flatter in men). The ideal ‘club-shaped’ female brow is positioned 3-5mm above, whilst the ‘T-shaped’ male brow should lie at the level of the supra orbital rim. The lid-brow junction is convex in youth, due to the retro orbicularis oculi fat pad (ROOF), the temporal fossa fat pad and superficial lateral orbital fat pad, which contributes to eyebrow and upper-lid volume. When people reach their mid 40’s, there is bony recession of the superior orbital rim and the upper lid orbital sulcus looses soft tissue volume. This is typically in the middle third and the entire brow extending onto the temple and the lateral orbital area, possibly due to deflation of the superior and lateral orbital superficial fat compartments and the ROOF.

The resultant brow ptosis occurs laterally more than medially, mainly due to the weight of unsupported tissue mass over the temporal fossa in association with lateral orbitalis oculi and corrugator muscle activity (brow depressors), lack of frontalis contraction in the lateral brow (brow elevator), and also from gravitational pull of the heavy cheek and lateral facial tissues. Lambros has shown the deflator effects of volume loss can cause an illusion of facial soft tissue descent, thus brow descent is often overestimated. Recent studies suggest that eyebrows can actually remain level or may even elevate with age.

**Differentiating descent from deflation**

Volumetric deflation of the upper-lid and lid-brow junction causes a ‘flatness’ replacing the ‘convex’ fullness of this zone accompanied by an alteration in the drape of upper-lid skin. Landmarks for brow position are based upon underlying bony anatomy; the superior orbital rim is easily palpable and serves as a fixed landmark for the medial head of the brow. Deflation due to soft tissue volume loss can present as temple hollows, with skeletonisation of the lateral orbital rim and clipping of the eyebrow tail (Figures 2a pre- and 2b post-rejuvenation). Upper eyelid deflation can present as ‘medial A-shaped hollow’ or localised central and lateral hollowing of the upper lid sulcus, with the development of an extra fold of skin above the natural eyelid skin crease (Figures 3a and 3b).

**The lower lids and infraorbital junction**

As the infraorbital area is really a continuum of the mid face, treatment of this zone must include assessment and treatment of the related subzones in the mid-face. On the deep surface of the orbicularis muscle, at the superior border of the malar region, lays the medial compartment of sub orbicularis oculi fat (SOOF) and further...
Treatment tips
1. Consider restoration of volume in the temple, brow and upper lid sulcus at three to four points, with the lateral canthal area as an optional extra (Figure 4).
2. Use a soft filler, which can be moulded.
3. The superior sulcus area needs very small aliquots injected supra periosteally along the supraorbital rim, above the orbital septum, staying lateral to the supraorbital notch.
4. The temple hollows need larger volumes, placed into the superficial fascia of each temple behind the frontozygomatic process, to soften the bony contour of the lateral orbital rim.

Infraorbital zone:
As the superficial inferior fat pad overlies the infraorbital rim and it tends to deflate early, it should be assessed and treated in three zones

Zone 1: The tear trough extends inferolaterally from the medial canthus to the medial corneal limbus.
Zone 2: The middle infraorbital groove extends from the medial to lateral corneal limbus.
Zone 3: The lateral infraorbital groove extends from the lateral corneal limbus to the lateral canthus.

Mid-face sub zones:
Zone 4: The infraorbital hollow lies directly under zone 2 and over the infraorbital foramen, which corresponds to the deep midfacial fat compartment.
Zone 5: The infrazygomatic or sub malar hollow corresponds to the medial SOOF.
Zone 6: The malar mound corresponds to the lateral SOOF.

Lateral Canthal area: Where ROOF continues caudally as SOOF.

Tear trough treatment tips:
1. Treat mid-face zones 4, 5 and 6 first, placing a rigid filler pre periosteal. This can decrease the need for treatment in the medial tear trough.
2. Use small aliquots of soft filler in zone 1, place filler pre periosteal but deep to the muscle.
3. Avoid over volumisation in zones 1 and 2 as this causes a sausage-like bulge in what is naturally a gentle depression.
4. Palpate the infraorbital bone and place filler below septum (not behind or above it), as this will only worsen any eye bag.

Periorbital vascular anatomy
Branches of the external carotid artery (ECA) provide the blood supply to the face with the exception of a mask-like area of the central forehead, upper eyelids and the upper part of nose, which are supplied though the internal carotid system (ICA) by the ophthalmic artery. Vascular anastomoses between ECA and ICA are danger zones for the aesthetic practitioner as inadvertent intravascular injection can lead to vascular compromise and permanent blindness.

Vascular watershed areas (Figure 6)
The infraorbital foramen: Infraorbital vessels arise from maxillary branch of external carotid which anastomose with branches of the ophthalmic artery. The supraorbital notch and glabella: Supraorbital and supratrochlear, infratrochlear and external nasal branches of ophthalmic artery anastomose with branches of the external carotid artery. The temple area: Superficial temporal artery crosses the zygomatic arch and 2cm above the arch divides into anterior and posterior branches. The anterior branch anastomoses with branches of the ophthalmic artery.

Tips to avoid intravascular injection
1. Mark the vascular watershed and inject ‘on the bone’ in that area.
2. Avoid fast anterograde injections and large volumes.
3. Always aspirate prior to injection.
4. Consider cannulas vs needles, unless using a smaller gauge needle.
5. Choose HA filler as hyaluronidase can be used to remove the product, if there is inadvertent intravascular injection.

Conclusions
A sound anatomic approach to surgery with thorough pre-operative planning remains the basis for achieving successful cosmetic and aesthetic outcomes.

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reconstructive outcomes. This should be no different for non-surgical rejuvenation of the eyelids and adjacent areas, where the injector is well trained with a firm understanding of the facial vascular anatomy, safe injection planes, varied injection techniques and types of filler for achieving pleasing aesthetic results in different anatomical areas. The hyper dynamic periorbital area should ideally be treated with low molecular weight, high viscosity materials which are easier to inject and mould. This area should be assessed with non-flash photography, whilst the patient is seated, to assist with patient education by identification of areas of deflation. Treating the patient whilst seated upright, after marking areas of deflation and key anatomic landmarks, allows for injection in the correct plane, using conservative volumes and avoiding adverse events due to incorrect placement and overcorrection.

Using different injection techniques like retrograde linear threading for the cheek, lateral brow and lateral tear trough region (with a cannula or needle), serial puncture technique (with a needle) at targeted sites like the medial superior region (with a cannula or needle), threading for the cheek, lateral brow and lateral tear trough, overcorrection.

Intraoperative assessment of the facial vascular anatomy, safe injection planes, varied injection techniques and types of filler for achieving pleasing aesthetic results in different anatomical areas. The hyper dynamic periorbital area should ideally be treated with low molecular weight, high viscosity materials which are easier to inject and mould. This area should be assessed with non-flash photography, whilst the patient is seated, to assist with patient education by identification of areas of deflation. Treating the patient whilst seated upright, after marking areas of deflation and key anatomic landmarks, allows for injection in the correct plane, using conservative volumes and avoiding adverse events due to incorrect placement and overcorrection.

Using different injection techniques like retrograde linear threading for the cheek, lateral brow and lateral tear trough region (with a cannula or needle), serial puncture technique (with a needle) at targeted sites like the medial superior sulcus and fanning technique (with a cannula) for the lateral cheek and temple area, helps reduce adjacent tissue trauma and minimizes the risk of intravascular injection. The primary goal of ‘eye-zone’ rejuvenation is restoration of youthful 3-dimensional periorbital topography, so that the eyelids are not harshly demarcated from, but naturally blend into the brow and cheek.

Mrs Sabrina Shah-Desai is an expert oculoplastic surgeon well known for cosmetic eyelid lifts, scarless droopy eyelid correction (ptosis) and revision eyelid surgery. She is highly experienced in non-surgical aesthetic periorbital rejuvenation with botulinum toxin and dermal fillers.

REFERENCES

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