

Aesthetic Units and Zones of Adherence: Relevance to Surgical Planning in the Head and Neck

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Background: Aesthetic units (AUs) and zones of adherence (ZA) have been previously described in the face; however, a systematic classification of AUs and ZAs together with a unified approach to planning surgery has not been previously described for head and neck surgery. The five principles of surgical planning necessitate respect for AUs, ZAs, and flexion creases; correct scar orientation; and replacing tissue “like for like” by adhering to the four “Ts” of reconstruction (tone, texture, type, and thickness of skin and subcutaneous tissue).

Methods: Images of male and female patients and stock images (from iStock) were reviewed and analyzed.

Results: AUs and ZAs were described and tabulated.

Conclusions: Surgical planning necessitates respect for AUs and ZAs and avoidance of maneuvers that will transgress aesthetic unit interfaces or eliminate AUs. An aesthetic atlas of AUs and ZAs is useful for planning surgery, preventing errors, and optimizing aesthetic results. (*Plast Reconstr Surg Glob Open* 2023; 11:e5186; doi: 10.1097/GOX.0000000000005186; Published online 14 August 2023.)

INTRODUCTION

Burget and Menick¹ are credited with describing aesthetic subunits of the nose. It is interesting that the alar sill, while not noted as such, is a zone of adherence (ZA) (see below). Their publication² shows the errors of “patching holes,” and the associated pitfalls of ignoring the principles of aesthetic units (AUs). Gonzalez-Ulloa et al³ and Millard⁴ also previously described AUs of the face and neck. AUs and ZAs of the torso and extremities have been documented and tabulated by Lockwood⁵ and Kirwan.⁶

AUs, ZAs, aesthetic unit interfaces (AUIs), and flexion creases (FCs) are defined as follows:

- A. AU (Tables 1 and 2). AUs are identified as solid blocks of color in Figures 1A, 2A, 3, 4A. AUs are specific aesthetic units of the face and neck, and are characterized by one or more of the following:
 1. An underlying muscle such as the temporalis muscle, as in the temporal fossa (TF).
 2. An AU such as the forehead, lower eyelid, philtrum, ear, or chin.
- B. ZA (Tables 1 and 2 and Figs. 1B, 2B, 3, 4B). ZAs are of two types: linear or diffuse. Linear ZAs have been

previously described.^{5–17} Linear ZAs are well-defined anatomical structures such as the mandibular cutaneous ligament (MCL) or the orbicularis retaining ligament (ORL) and are identified as single black lines in Figures 1B, 2B, 3, and 4B. Linear ZAs occur at the boundary of an AU, such as the superior temporal septum at the superior edge of the TF AU, but the converse does not necessarily apply; for example, there is no ZA at the AUI between the eyebrow and forehead AUs (see also “soft” ZAs under C below).

Diffuse, as opposed to linear ZAs, are shown as zig-zag black lines in Figures 2B and 3. They are manifested as sheet-like diffuse attachments to the skin. Examples are the pretarsal skin of the upper eyelid, the parotid fascia (PF) otherwise called the platysma auricular fascia^{7,11} and the posterior cervical fascia (PCF) named here (Table 2).

- C. AUI (Figs. 1A, 2A, 3, 4A). An AUI is the line where one or more AUs meet, rather like the border between two or more states as in a map of the United States. An AUI may or may not be coexistent with a ZA. For example, there is no ZA between the upper eyelid (UE) and the eyebrow (EB) AU. Alternatively, an AUI may be manifested as a “soft” or “inadequately expressed” ZA (not to be confused with a “soft” AUI with no ZA),⁶ identified as a dotted black line (Figs. 1A, 1B, 2A, 2B, and 5B). Examples of a soft ZA are the ZA between the mandibular margin and the submandibular triangle, identified as the mandibular septum (MS) by Alghoul,⁹

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and the ZA between the subhyoid anterior neck (AN) and the submental triangle, as described by Last.¹¹

- D. FC is a crease caused by muscle movement, or skin redundancy in proximity to a ZA, but not by a ZA specifically. Examples are the horizontal folds at the front and sides of the AN. FCs have been previously described.^{18–26}

From these definitions five guiding principles are extrapolated for the purposes of planning surgery. These are that an incision or scar and the boundaries between flaps be:

1. Anchored at a ZA, for example, pretragal, retro-tragal, preearlobe crease, postauricular crease, labio-mental crease, and submental crease (Tables 1 and 2);
2. At an AUI, for example, supra-tarsal fold, alar crease, base of nose [pyriform aperture (PYR)] (Tables 1 and 2);
3. Concealed within an FC, for example, thyroidectomy incision, and/or positioned to avoid a contracture across a concavity such as the AN, for example, thyroidectomy incision and AN Z-plasty;
4. Orientated according to studies previously published,^{18–26} in particular, those of Courtiss,¹⁸ Webster,¹⁹ and Borges²⁴;
5. As to AU replacement and preservation, tissue should always be “like for like” adhering to the 4Ts: tone (color), texture (smooth/rough, oily/dry), type (hair-bearing vs nonhair-bearing), and thickness of skin and subcutaneous tissue.

Takeaways

Question: How to optimize scar locations, preserve aesthetic units and harness the power of zones of adhesion when performing aesthetic and reconstructive procedures in the head and neck region?

Findings: The five pillars of surgical planning are respect for aesthetic units, zones of adherence, and flexion creases; correct scar orientation; and replacing tissue “like for like” by adhering to the four “Ts” of reconstruction (tone, texture, type and thickness of skin and subcutaneous tissue).

Meaning: Planning head and neck surgery according to these five aesthetic principles provides a simple and practical approach for the practitioner.

An example of non-like tissue replacement is the advancement of bearded cheek skin onto a hairless tragus when using a retro-tragal facelift incision and that of like tissue replacement being the use of upper eyelid skin as a full-thickness skin graft or a Tripier myocutaneous transposition flap in lower eyelid reconstruction.

METHODS

Patients who have presented for aesthetic and reconstructive surgery of the head and neck during the author’s 35 years of plastic surgery practice in the United States and the United Kingdom were reviewed. This article draws

Table 1. AUs and ZAs of the Head and Neck: Frontal View

Anterior Face and Neck			
AU	Abbreviation	Associated ZAs	Abbreviation
Forehead	FHD	Lateral: superior temporal septum	STS
		Superior: hairline/scalp	HL
		Inferior: glabella crease	GL
Eyebrow	EB	No associated ZA	
Upper eyelid skin	UE	Inferior: supra-tarsal fold (levator aponeurosis insertion)	STF
Pre-tarsal skin	PT	Superior: supra-tarsal fold (levator aponeurosis insertion).	STF
Lower eyelid	LE	Inferior: orbicularis retaining ligament	ORL
Cheek	CH	Anterior: lateral aesthetic line of nose	LAN
		Anterior: naso-labial fold	NLF
		Posterior: peri-auricular	PAUR
Nose ^{1,2}	NB	See Burget ^{1,2}	
		Lateral: lateral aesthetic line of nose	LAN
		Lateral: alar crease	AC
		Inferior: pyriform aperture	PYR
Upper lip vermillion	ULV	Superior: vermillion white roll	VWR
Upper lip skin (lateral)	UL	Superior: pyriform aperture	PYR
		Lateral: nasolabial fold	NLF
		Medial: philtral column	PC
Philtrum	PH	Lateral: philtral column	PC
Lower lip vermillion	LLV	Inferior: vermillion white roll	VWR
Lower lip skin	LL	Inferior: labio-mental crease (mentalis insertion)	LMC
		Lateral: mandibular cutaneous ligament	MCL
Chin	CHIN	Superior: labio-mental crease, attachment of mentalis	LMC
		Lateral: mandibular cutaneous ligament	MCL
		Inferior: submental crease	SMC
Anterior neck	AN	Superior: submental crease	SMC
		Posterior: sternocleidomastoid	SCM
		Inferior: supra-sternal notch	SSN

Table 2. AUs and ZAs of the Head and Neck: Lateral View

Lateral Face and Neck			
AU	Abbreviation	Associated ZA	Abbreviation
Temporal fossa	TF	Superior: superior temporal septum	STS
		Inferior: zygomatic cutaneous ligament	ZCL
Parotid fascia	PF	Parotid fascia	PF
		Anterior: masseteric ligament	ML
		Superior: zygomatic cutaneous ligament	ZCL
		Posterior: periauricular	PAUR
External ear	EAR	Anterior: pretragal/retrotragal/earlobe crease	PAUR
		Superior: periauricular	PAUR
		Posterior: retroauricular	PAUR
Posterior cervical fascia	PCF	Posterior cervical fascia	PCF
		Superior: tip of mastoid/superior nuchal line	SNL
		Posterior: nuchal ligament (not illustrated)	NL
		Anterior: sternocleidomastoid	SCM
		Anterior inferior: clavicle	CL
		Posterior inferior: scapula spine (not illustrated)	SCSP

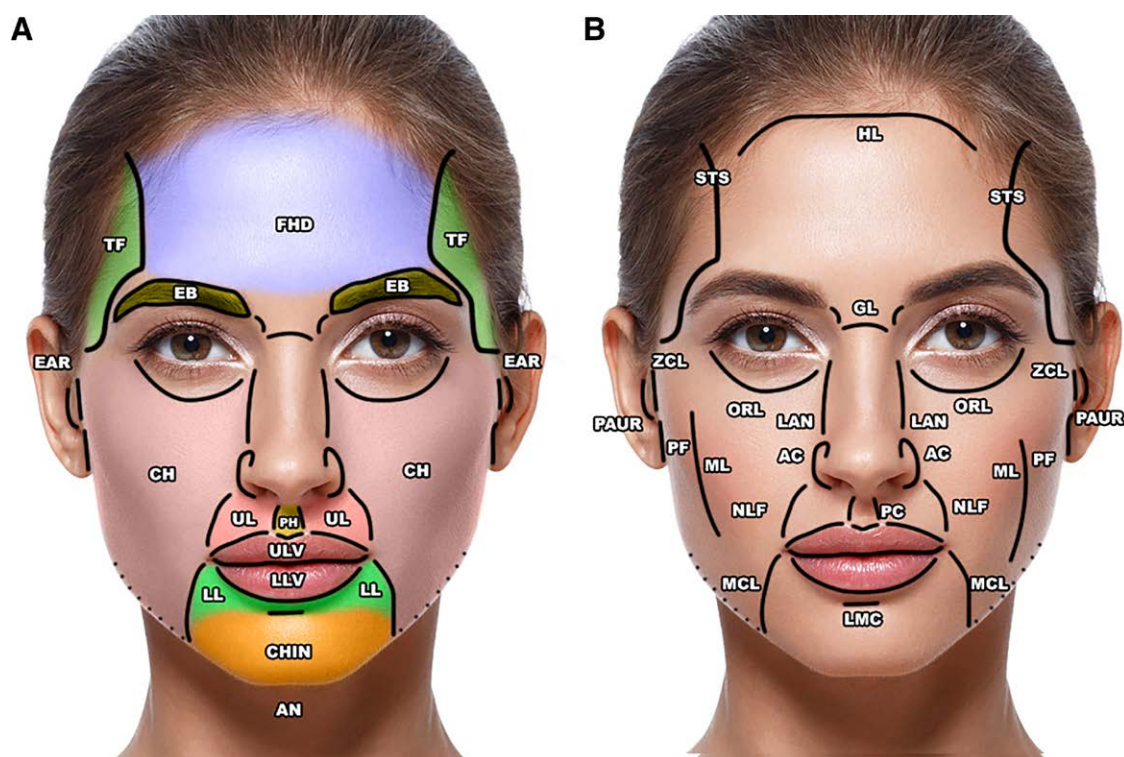


Fig. 1. Aesthetic units and zones of adherence of the face and neck in the frontal view. A, Front view of female face and neck with AUs illustrated. B, Front view of female face and neck with ZAs illustrated. AC indicates alar crease; AN, anterior neck; CH, cheek; CHIN, chin; EAR, ear; EB, eyebrow; FHD, forehead; GL, glabella crease; HL, hairline; LAN, lateral aesthetic line of nose; LL, lower lip; LMC, labio-mental crease; MCL, mandibular cutaneous ligament; ML, masseteric ligaments; NLF, nasolabial fold; PAUR, periauricular (includes anterior, posterior and superior attachments of ear and retro-tragal, and pretragal creases separately); PH, philtrum; STS, superior temporal septum; TF, temporal fossa; UL, upper lip skin (lateral); ZCL, zygomatic cutaneous ligament. Adapted from iStock-624711588.

on the application of solid plastic surgery principles during this time. An analysis was performed of photographs of the author's male and female patients as well as stock images from www.istockphoto.com. Anterior and lateral views of the head and neck are reviewed. AUs, ZAs, and AUIs are shown (Figs. 1–4). AUs are identified as solid

blocks of color; whereas linear ZAs are identified as continuous or dotted black lines. Diffuse ZAs are illustrated with continuous zigzag black lines. AUIs are not labeled. AUs and ZAs are tabulated (Tables 1 and 2). AUs and ZAs of the nose (NS), other than the alar crease (AC), lateral aesthetic line of the nose (LAN) and PYR ZAs, are not

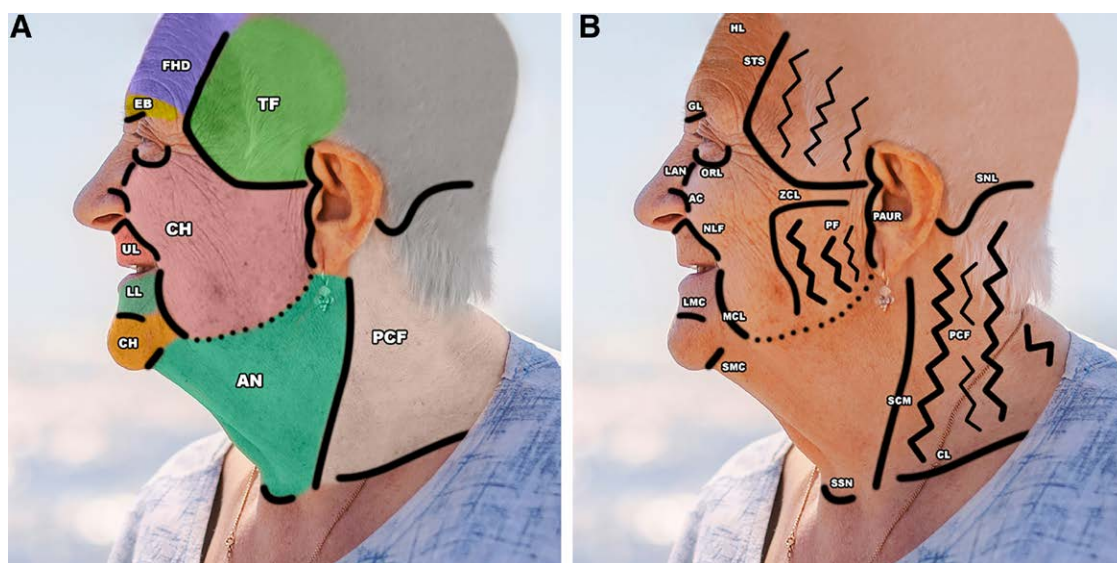


Fig. 2. Aesthetic units and zones of adherence of the face and neck in the lateral view. A, Lateral view of aging face with AUs illustrated. B, Lateral view of aging face with ZAs illustrated. AC indicates alar crease; AN, anterior neck; CH, cheek; CHIN, chin; CL, clavicle; EB, eyebrow; FHD, forehead; GL, glabella crease; HL, hairline; LAN, lateral aesthetic line of nose; LL, lower lip; LMC, labio-mental crease; MCL, mandibular cutaneous ligament; NLF, nasolabial fold; ORL, orbicularis retaining ligament; PAUR, periauricular (includes anterior, posterior and superior attachments of ear and retro-tragal, and pretragal creases separately); PCF, posterior cervical fascia; SCM, sternocleidomastoid; SMC, submental crease; SNL, superior nuchal line; SSN, supra-sternal notch; STS, superior temporal septum; TF, temporal fossa; UL, upper lip skin (lateral); ZCL, zygomatic cutaneous ligament. Adapted from iStock-1412271027.

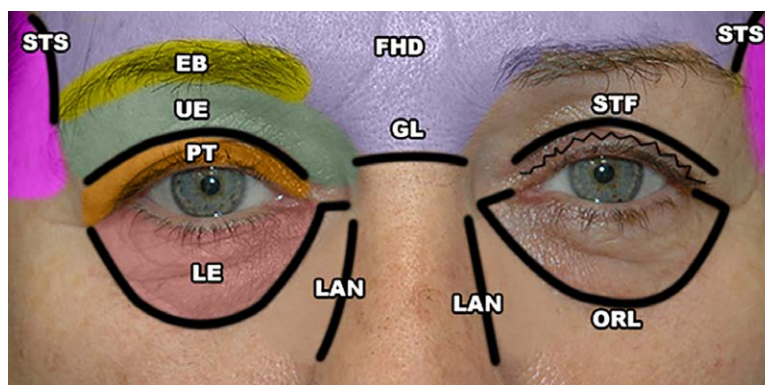


Fig. 3. Aesthetic units and zones of adherence of the periorbital region. Front view of peri-orbital region with AUs (viewer's left) and ZAs (viewer's right) illustrated. EB indicates eyebrow, FHD, forehead; GL, glabellar crease; LAN, lateral aesthetic line of nose; LE, lower eyelid; ORL, orbicularis retaining ligament; PT, pretarsal skin; STF, supra-tarsal fold; STS, superior temporal septum; UE, upper eyelid. .

addressed because they have already been described.^{1,2,12} Similarly, AUs and ZAs of the ear are also omitted, excepting the addition of the global ear AU (EAR) and periauricular ZA (PAUR).²⁷

Patient 1

A 59-year-old White woman presented with a history of upper eyelid and lower eyelid dermatochalasis and herniated fat pads. She had no significant medical history. She was a nonsmoker and nondrinker. The patient requested a bilateral lower blepharoplasty only, although

she subsequently had a bilateral upper blepharoplasty. The patient underwent a bilateral lower external blepharoplasty with the release of the ORL and tear trough ligament and transposition of the medial and middle fat pads, with a lateral canthopexy. Preoperative and postoperative views are shown 5 months after surgery (Fig. 6A, B).

Patient 2

A 68-year-old White woman presented with a history of facial dermatochalasis, retrogenia, and jowling. She had no significant medical history. She was a nonsmoker and

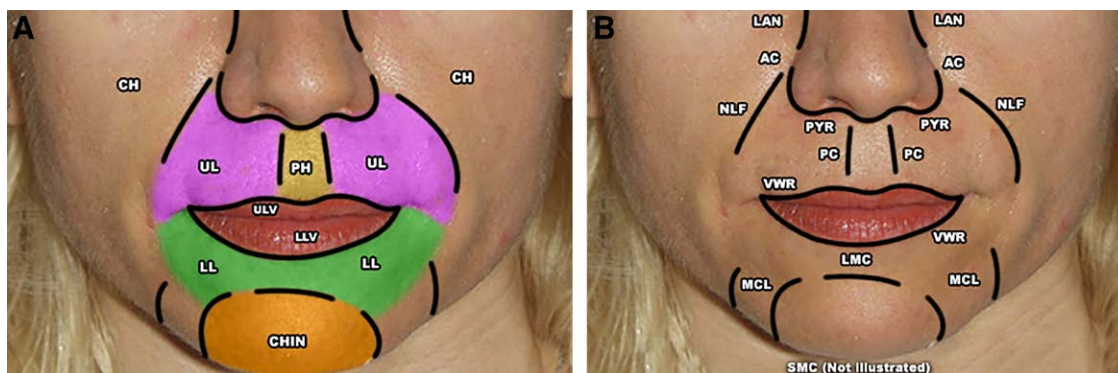


Fig. 4. Aesthetic units and zones of adherence of the peri-oral region. A, Front view of peri-oral region with AUs illustrated. B, Front view of peri-oral region with ZAs illustrated. AC indicates alar crease; CH, cheek; CHIN, chin; LAN, lateral aesthetic line of nose; LL, lower lip skin; LLV, lower lip vermilion; LMC, labio-mental crease; MCL, mandibular cutaneous ligament; NLF, nasolabial fold; PC, philtral column; PH, philtrum; SMC, submental crease, not illustrated, UL, upper lip skin (lateral); ULV, upper lip vermilion; VWR, vermilion white roll.

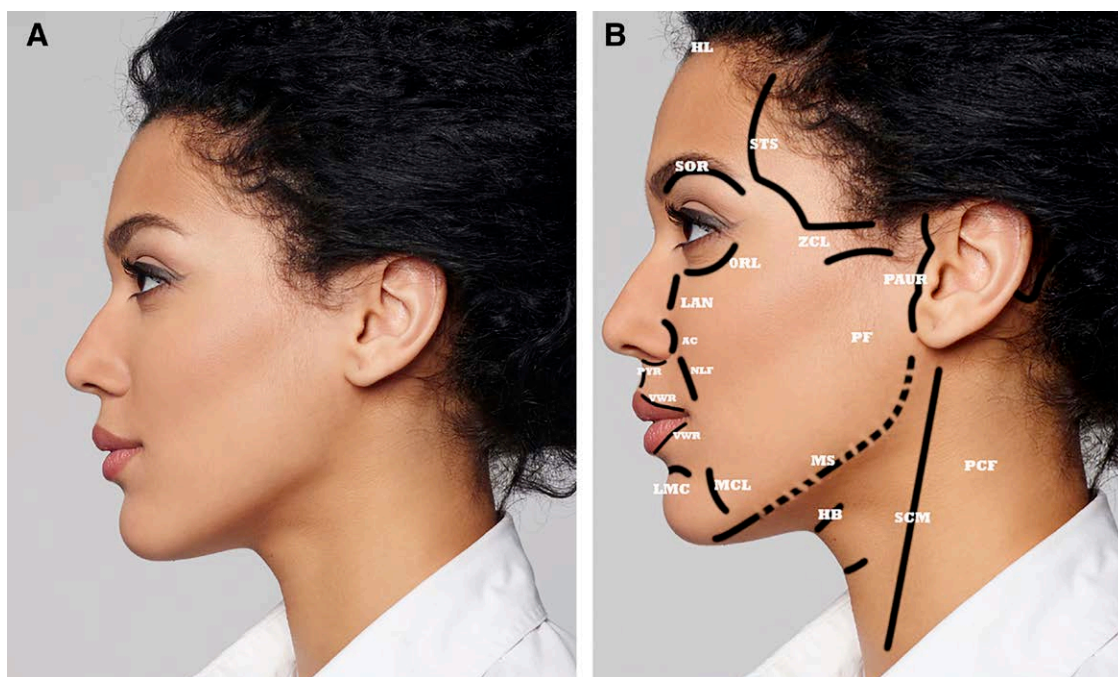


Fig. 5. Lateral view of young adult woman. A, Lateral view without markings. B, Lateral view of same model illustrating well-defined ZAs at the SOR, mandibular margin [mandibular septum (MS)], submandibular triangle, and hyoid bone (HB) with poorly defined ZAs at the inferior orbital rim (ORL), NLF, and MCL. AC indicates alar crease; HB, hyoid bone; HL, hairline; LAN, lateral aesthetic line of nose; LMC, labio-mental crease; MCL, mandibular cutaneous ligament; MS, mandibular septum; NLF, nasolabial fold; ORL, orbicularis retaining ligament; PAUR, periauricular (includes anterior, posterior and superior attachments of ear and retro-tragal and pretragal creases separately); PCF, posterior cervical fascia; PYR, pyriform aperture; SCM, sternocleidomastoid; SOR, superior orbital rim; STS, superior temporal septum; ZCL, zygomatic cutaneous ligament; VWR, vermilion white roll. Adapted from iStock-466807030.

occasionally consumed a glass of wine. The patient had a rhytidectomy with an SMAS-ectomy submental platysmoplasty, chin implant, upper blepharoplasty, and lower eyelid trichloroacetic acid (TCA) peel with the release of the zygomatic cutaneous ligament (ZCL), PF, masseteric ligament (ML), and mandibular cutaneous ligament (MCL). Preoperative view and postoperative frontal and lateral views are shown 12 months after surgery (Figs. 7A, B and 8A, B).

Patient 3

A 52-year-old White woman presented with a history of a long upper lip, atrophy of upper and lower lips, and dependent nasal tip. She had no significant medical history. She had a surgical history of multiple procedures over a 15-year period, including in chronological order: lower eyelid blepharoplasty, open rhinoplasty, endoscopic browlift, facelift, upper blepharoplasty, lower eyelid skin



Fig. 6. Patient 1, a 59-year-old White woman. Preoperative frontal view (A), forward gaze. B, Postoperative frontal view after lower blepharoplasty with external approach to lower eyelid, disruption of ORL and TTL, and transposition of medial and middle fat pad, forward gaze. ORL indicates orbicularis retaining ligament; TTL, tear trough ligament.



Fig. 7. Patient 2, a 68-year-old woman. A, preoperative, front view. B, Postoperative front view, 1 year after facelift, submental platysmaplasty, chin implant, upper blepharoplasty, and lower eyelid TCA peel. Release of ZCL, PF, ML and MCL. Front view. MCL indicates mandibular cutaneous ligament; ML, masseteric ligaments; PF, parotid fascia; TCA, trichloroacetic acid; ZCL, zygomatic cutaneous ligament.

pinch, lower eyelid canthopexy, chin implant, cheek implants, FaceTite, facial and lip fat injections, nasal tip plasty, and previous upper lip shortening, 9 months prior. She was a nonsmoker and nondrinker. The patient had a secondary (short scar) facelift, endoscopic browlift, and upper lip lift with upper and lower lip fat injection. The incision for the upper lip lift is based at the PYR ZA at

the AUI between the upper lip (UL) laterally, philtrum (PH) centrally, and the NS superiorly. Preoperative view and postoperative frontal views are shown 4 months after surgery (Fig. 9A, B). The patient lives in Mallorca, Spain, and has not returned for later follow-up because of the travel restrictions associated with the coronavirus disease 2019 pandemic.



Fig. 8. Patient 2, a 68-year-old woman. A, preoperative left lateral view. B, Postoperative left lateral view, 1 year after facelift, submental platysmaplasty, chin implant, upper blepharoplasty, and lower eyelid TCA peel. Release of ZCL, PF, ML and MCL, left lateral view. MCL indicates mandibular cutaneous ligament; ML, masseteric ligaments; PF, parotid fascia; TCA, trichloroacetic acid; ZCL, zygomatic cutaneous ligament.



Fig. 9. Patient 3, 52-year-old White woman. A, Preoperative frontal view of upper lip and mouth. B, Postoperative frontal view of upper lip and mouth 4 months after a short scar facelift, endoscopic browlift, secondary upper lip lift, and upper and lower lip fat injection. Upper lip lift incision based at AUJ between UL, PH and NS at PYR ZA. NS indicates nose; PH, philtrum; PYR, pyriform aperture; UL, upper lip skin (lateral).

RESULTS

AUs and associated ZAs are tabulated and shown in Tables 1 and 2 and Figures 1–4.

DISCUSSION

“Beauty is our duty”²⁸ must be the plastic surgeon’s mantra and not *primum non nocere* that every medical student learns by rote. Taken logically, *primum non nocere* could be followed, in the field of aesthetic plastic surgery, by simply doing nothing.

It is important to distinguish between aesthetic units and anatomic units. There are numerous texts and publications describing the underlying anatomy and adhesions

of the superficial fascial system to the skin (ZAs),^{5,7–17} and although the underlying anatomy is important, it is not the determining factor in describing overlying aesthetic units. This article describes an “aesthetic atlas” rather than an “anatomic atlas.”

Last described the investing layer of deep cervical fascia (ILDCF), extending from the tip of the mastoid process across the cartilaginous part of the external meatus to the lower border of the zygomatic process of the temporal bone.¹¹ In the front of the neck, the ILDCF attaches to the lower border of the mandible, from the chin to the mandibular angle, and to the hyoid bone.¹¹ The ILDCF splits to enclose the parotid, and its superficial layer is the PF. The anterior superior attachment of the ILDCF is at the zygomatic cutaneous

ligament⁹ and the posterior-superior attachment is between the PCF and superior nuchal line (SNL), behind the ear.¹¹

Courtiss¹⁸ commented that, “Certainly a prime method by which a patient judges the competence of his surgeon is by the appearance of the resultant scar,” and Webster¹⁹ suggested that wrinkle lines should be followed when making skin incisions. Multiple authors have discussed ideal facial, neck, and scalp incisions,^{18–26} and although these “ideal” incision lines frequently coincide with a ZA or an AUI (examples are supra-tarsal incisions for upper blepharoplasty, pretragal, retro-tragal, and postauricular incisions for rhytidectomy, submental incisions for chin augmentation and submental platysma-plasty, and nasal base incisions for upper lip lifting and alar wedge excision), these authors^{18–26} omit descriptions of AUs and ZAs. AUs and ZAs have been described by others to a limited extent.^{2–4}

AUs, ZAs, AUIs, and FCs remain remarkably consistent, regardless of gender, age, body mass index (BMI), or ethnicity, with their associated differences in skeletal structure, skin type, and subcutaneous fat. Skin laxity, fat distribution, and skeletal volume obviously alter with age and BMI, and ZAs generally become more visible with age, further defining AUs and AUIs. Indeed, this is the prime difference between a youthful and an aged face. However, there are exceptions, in that the ORL at the superior orbital rim (SOR), the MS,⁹ and the attachment of the submental skin to the hyoid bone¹¹ become less, rather than more attached, with age, so that the associated AUs and AUIs become less defined or even obliterated (Fig. 5A, B). As a result, in old age, we may develop a “dewlap” (Figs. 2A–B, 7A).

As mentioned above, ZAs occur at the location of facial retaining ligaments and at an AUI, but the converse does not apply. For example, none of the following are consistently associated with a ZA⁹: the inferior temporal septum, the tear trough ligament, and the ORL at the SOR.

ZAs may be linear and occur at an AUI or may be diffuse and fill an entire AU. These AU/ZA combinations are, from cephalo-caudal in the lateral view, the TF, PF, and the PCF.

Beauty is based on aesthetic proportions of the human face.²⁹ AUs and AUIs must be preserved and respected. Failure to do this may lead to a “patchwork”³² appearance where an incision trespasses across the boundary of an AUI³⁰ or even worse, an entire AU is obliterated,¹⁰ somewhat analogous to the effect of severe facial burns,^{3,10} which has the effect of “taking an eraser to the face.”³¹

CONCLUSIONS

The five pillars of surgical planning are the respect for AUs, ZAs, FCs, correct scar orientation, and lastly, replacing tissue “like for like” by adhering to the four Ts.

AUs and ZAs are remarkably consistent, regardless of gender, age, BMI, or ethnicity. ZAs have different architectures (linear and diffuse) and different responses to aging. Some ZAs are consistent throughout the aging process and remain, or are exaggerated as lines of demarcation between AUs; whereas others have differing expressions with age, so that they may no longer function anatomically as a ZA. Examples of the latter are the attachment of the

ILDCF to the hyoid bone and the cricoid cartilage, the ORL at the SOR, and the MS at the mandibular margin.

Diffuse ZAs demarcate an AU and restrict ptosis of the overlying skin with age and obesity. Examples are the TF, PF, and PCF, which are all visible in the lateral view.

Current literature often reflects a disregard for aesthetic landmarks and the concept of AUs, ZAs, and AUIs. This article provides a simple classification of head and neck AUs and ZAs. The five guiding principles as described in the introduction above, are a metaphorical “quantum theory” for aesthetic and reconstructive surgery; combining multiple concepts and anatomical landmarks into one simple, unifying approach that can be applied to all planning and execution of plastic surgery in the head and neck region. It is incumbent upon plastic surgeons to be familiar with these “cartographic” AUs, ZAs, and AUIs as well as the associated five guiding principles of surgical planning. Surgical planning necessitates respect for AUs and ZAs and avoidance of maneuvers that will transgress AUIs or eliminate AUs.

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DISCLOSURE

The author has no financial interest to declare in relation to the content of this article.

PATIENT CONSENT

Patients provided written consent for the use of their images.

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HELSINKI DECLARATION

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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