

The Crest Injection Technique for Glabellar Line Correction and the Paracentral Artery

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Summary: The glabella is a zone that carries a high risk of blindness after performing filler injections. The arteries beneath the glabellar lines were investigated by meticulous dissections in 30 geriatric embalmed cadavers with latex injections into the arterial system. The results showed that the supratrochlear artery, a direct branch of the ophthalmic artery, ascended from the muscular layer of the medial eyebrow along the medial canthal vertical line of the intercanthal vertical zone (53 in 60 hemifaces, or 88%). The dominant single paracentral artery from the radix artery was found within the radix vertical zone (eight out of 30 glabellae, or 27%). Among these, the dominant paracentral artery was near the midline in two cadavers and arose along the radix vertical line in six cadavers. The dominant paracentral artery may be the cause of ocular complications during injections of glabellar lines between the medial eyebrows, especially at the radix vertical lines. The supratrochlear artery might cause ocular complications when an injection is performed close to the medial eyebrows. Pinching to create a skin crest and evert glabellar line for a precise injection is recommended to temporarily occlude the paracentral artery. (*Plast Reconstr Surg Glob Open* 2021;9:e3982; doi: 10.1097/GOX.0000000000003982; Published online 8 December 2021.)

INTRODUCTION

The glabella is a site commonly associated with blindness due to filler injections.¹ Extreme caution is necessary when performing glabellar wrinkle correction to avoid branches of the ophthalmic artery causing direct or primary cannulation.² Our recommended technique, which involves needle realignment, still has a chance of cannulation because of the patency of the artery during an injection.³ This study investigated arteries traveling at the glabella to recognize the risk of ocular complications. Moreover, we recommend an injection technique that enables temporary arterial occlusion and ensures superficial injection, called “the crest injection technique.”

MATERIALS AND METHODS

Thirty embalmed cadavers with red latex injected into the common carotid arteries were dissected. Their age at

death ranged between 59 and 85 years, and 13 were men. Removal of the skin and the subcutaneous tissue at the glabella were carefully performed. The eyebrows were preserved by circumferential incisions and the arteries confined to the radix vertical and intercanthal zones were investigated (Fig. 1). The radix vertical zone (RVZ) represents the central zone between the radix vertical lines. The diameters and distances from the midline at the level of the supraorbital rims of the supratrochlear and paracentral arteries were measured using a caliper.

RESULTS

The supratrochlear artery was found within the medial eyebrow while the paracentral artery traveled between the eyebrows. The supratrochlear artery, a direct branch of the ophthalmic artery, ascended and deviated medially from the muscular layer of the medial eyebrow along the border of the intercanthal zone (53 in 60 hemifaces, or 88%) (Figs. 1, 2). This artery entered the RVZ when the paracentral artery was small. The artery continued from the facial artery in a minority of cases (7 in 60 hemifaces, or 12%). The diameter of the artery was 1.9 ± 1.3 mm and the artery traveled at 10.7 ± 2.6 mm from the midline at the level of the supraorbital rims.

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The dominant single paracentral artery (DPA) from the radix artery was found within the RVZ (8 out of 30 glabellae, or 27%). Among these, the DPA was near the midline in three cadavers and arose along the border of the RVZ in five cadavers. The diameter of the DPA was 1.7 ± 1.1 mm and the artery traveled at 3.7 ± 1.4 mm from the midline. The DPA was not constant and might be absent. The DPA ascended vertically within the procerus muscle to the RVZ. The radix artery branched from the angular artery superior to the medial canthal tendon and divided the DPA in the opposite direction of the dorsal nasal artery. Other minute arteries including branches of the paracentral and supratrochlear arteries formed the glabellar anastomoses.

Takeaways

Question: Are the arteries at the glabella beside the supratrochlear artery at risk of ocular complications during glabellar line injections?

Findings: The paracentral artery was found between the medial eyebrows in 27% of subjects.

Meaning: Pinching to create a skin crest and evert glabellar line for a precise injection is recommended to temporarily occlude the paracentral artery during glabellar line injections.

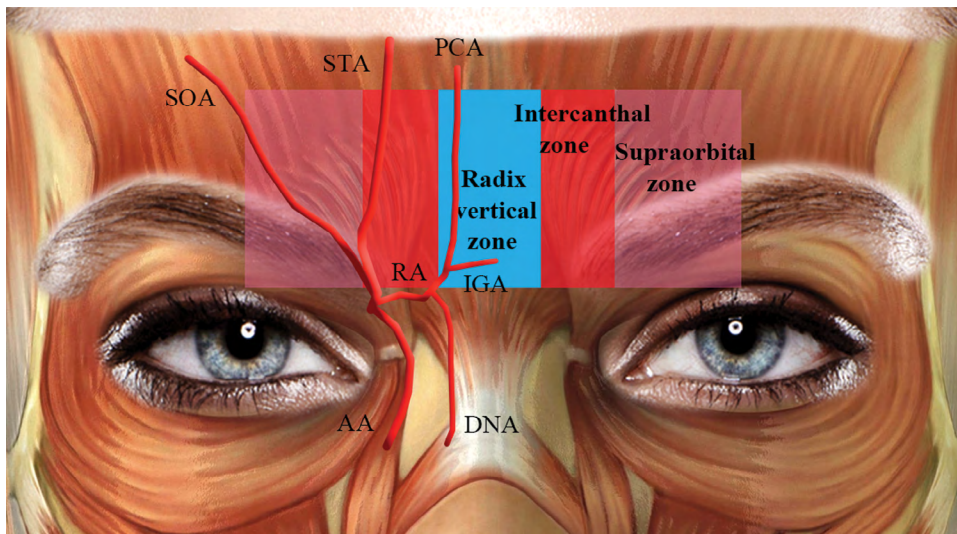


Fig. 1. The forehead branches of the ophthalmic artery relating to the anatomical zones of the central forehead. The RVZ, intercanthal, and supraorbital zones begin at the line connecting both supraorbital rims and end at the lower forehead line in the superciliary depression. The paracentral artery (PCA) is in the RVZ. The supratrochlear artery (STA) ascends as a border of the intercanthal zone. The supraorbital artery (SOA) is in the supraorbital zone. RA, radix artery; IGA, interglabellar anastomosis; DNA, dorsal nasal artery; AA, angular artery.

DISCUSSION

Static glabellar lines are usually present between the eyebrows because of the thick eyebrow fibrofatty tissues, but a line proximity to the midline and glabellar lines above the medial eyebrow can be found. Botulinum toxin injections are preferable to filler injections for glabellar lines because of the safety concern. Knowledge of the supratrochlear artery is well established, but the DPA has been neglected because of its inconsistency due to the fact that DPA is usually absent both in cadaver dissections and ultrasonographic study. Previous studies usually focused on the supratrochlear artery as the cause of ocular complications following injections at the glabellar frown lines.^{4,5} We agree with Koziej et al who suggested that the DPA is the cause of ocular complications following central forehead injections.⁶ Lee et al used ultrasound imaging to avoid filler misinjection into the artery traveling deep to the glabellar wrinkles in 41% of the glabellar lines.⁷ Because ultrasound has limitations to trace the arterial



Fig. 2. Cadaveric dissection shows the supratrochlear and paracentral arteries at the glabella. FBSTA, frontal branch of superficial temporal artery; STA, supratrochlear artery; SOA, supraorbital artery; PCA, paracentral artery; RA, radix artery; DNA, dorsal nasal artery; AA, angular artery.

courses compared to dissection, the DPA was not discriminated from the supratrochlear artery.

Bilateral compressions at the medial corners of the supraorbital rims are effective for preventing ocular complications during glabellar injections, but not skin necrosis^{1,8} (Fig. 3A). The arteries found between the eyebrows travel to a depth of more than 3 mm.^{4,5} However, tortuosity of the artery in the RVZ can make the artery come in proximity to the surface of the skin, which an overconfident injection can encounter.¹ Deep glabellar wrinkles require botulinum toxin injections in both corrugator supercillii muscles as the first treatment.^{3,5} If a static glabellar frown line persists, it can be eliminated by a filler injection. Without sufficient training, a physician could underestimate the depth of the injection and inject filler into the DPA.

The crest injection technique has been used by the first author and has been recommended to others when the glabellar lines need filler with a rare occurrence of ecchymosis. This technique begins with asking the patient to frown after the skin is numbed. Subsequently, the physician pinches the line to bleach the skin. Pinching stretches the skin and everts the line to the top of the skin crest allowing a precise superficial injection (Fig. 3B). (See Video 1 [online], which shows the crest injection technique on the left glabellar line) (See Video 2 [online], which shows the crest injection technique on the right glabellar line.) The crest injection technique has the advantage of enabling temporary occlusion of the DPA between digital pinching. Using this technique, the glabellar frown line can be safely eliminated with the correct placement of filler into the subreticular dermis plane between the skin and subcutaneous tissue. A precise injection can effectively eliminate a deep line using a small amount of less than 0.1 ml filler,

and the thinner skin requires less filler. The line can be evaluated after each injection. This technique may significantly reduce the incidence of skin necrosis and ocular complications relating to glabellar injections. Using ultrasound imaging and a large amount of acoustic gel on volunteers, we can demonstrate that pinching could temporarily occlude the artery at the forehead (unpublished data). Thus, this technique enables safer filler injections.

However, the diameters of the arteries in embalmed cadavers are much smaller than those from ultrasonographic study because of the tissue desiccation. Courses of arteries are still reliable and improve awareness for physicians.

CONCLUSIONS

The paracentral artery found between the medial eyebrows in 27% of subjects may cause ocular complications during glabellar line injections. The crest injection is performed by everting the deep glabellar crease using pinching. Pinching creates a skin crest that temporarily occludes the paracentral artery and facilitates superficial injection.

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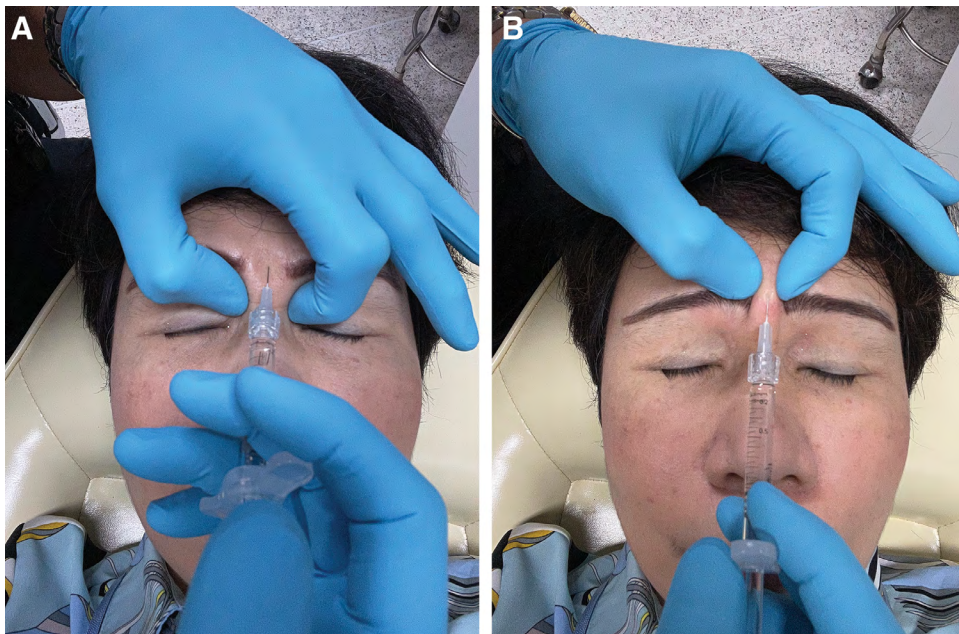


Fig. 3. Recommended technique for filler injections at the glabellar frown lines. A, Bilateral orbitoglabellar compressions to occlude branches of ophthalmic arteries. B, The crest injection technique.

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