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## Special Topic

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# How to Block and Tackle the Face

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Regional blocking techniques as noted in dentistry, anesthesia, and anatomy texts may result in inconsistent and imperfect analgesia when needed for facial aesthetic surgery. The advent of laser facial surgery and more complicated aesthetic facial procedures has thus increased the demand for anesthesia support. Surgeons should know a fail-safe method of nerve blocks. Fresh cadaver dissections are used to demonstrate a series of eight regional nerve-blocking routes. This sequence of bilateral blocks will routinely provide profound full facial anesthesia. Certain groupings of blocks are effective for perioral or periorbital laser surgery. (*Plast. Reconstr. Surg.* 101: 840, 1998.)

Cosmetic surgeons who understand facial anatomy have used this knowledge to block the areas of the face where they intend to perform surgery. Limitation of this knowledge may force the surgeon into a more costly venue such as the operating room and general anesthesia. The ability to block the entire face regionally allows cosmetic procedures such as peeling, dermabrasion, and laser surgery to be performed in the office with light sedation or no sedation. Patients, drawings, and fresh cadaver dissections are used to define the anatomy of the injection.

The choice of local anesthetic depends on the length of procedure and how long postoperative analgesia is desired. The pain of the local anesthetic injection and the area of anesthesia can be influenced by the following: (1) Temperature of the solution. Solution at body temperature hurts less than cool injectate.<sup>1,2</sup> (2) pH of the anesthetic solution. Sodium bicarbonate addition to solution attenuates the pain of injection.<sup>3</sup> (3) Numbers of injections (i.e., using direct approaches for anatomic block instead of multiple regional infiltrative injections). (4) Composition of solution. Addition of hyaluronidase (Wydase; Wyeth-Ayerst Laboratories, Philadelphia, Pa.) expedites the

spread of the anesthetic.<sup>4-6</sup> (5) Rapidity of injection. Rapid infiltration hurts. Also, injecting on the way out seems to hurt less than injecting on the way in.

A set of eight blocks (Table I) is done to anesthetize the entire surface of the face (Fig. 1). \*Note: The figure denotes the eight blocks described in the text. Full face blockade is done in the order given to reduce operator position change. For a specific area, one need only refer to the diagrams below for the exact method (i.e., for just perioral laser, use the infraorbital nerve/mental plus techniques as shown below) (See Fig. 2, *above, left* and *below*, and Fig. 3, *below*).

### THE EIGHT BLOCKS: ANATOMY, EXACT BLOCK METHOD, AND NUMB AREA

#### *Infraorbital*

*Anatomy.* The infraorbital foramen is located on a line dropped from the medial limbus of the iris. If the patient stares straight ahead, the infraorbital foramen is located 4 to 7 mm below the orbital rim on that line<sup>7</sup> (Fig. 2, *above, left*). Prior to the infraorbital nerve exiting the foramen, the anterior superior alveolar nerve branches downward from this infraorbital nerve. However, this branching may be just prior to the foramen or 20 mm behind it. This alveolar plexus supplies sensation to the anterior gingiva and maxillary teeth.<sup>8</sup> This variability of the alveolar branching means that after some infraorbital injections into the foramen, the gums and teeth become numb from the central incisor back to the bicuspid on that side.

*Technique.* The infraorbital nerve travels through a canal or groove in the orbital floor and exits through a foramen, which faces downward and medially. Therefore, even though the

TABLE I  
The 8 Blocks: Key Data

| Block | Nerve                                      |
|-------|--------------------------------------------|
| I     | Infraorbital                               |
| II    | Mental and mental plus                     |
| III   | Supraorbital/supratrochlear infratrochlear |
| IV    | Dorsal nasal nerve                         |
| V     | Zygomaticotemporal                         |
| VI    | Zygomaticofacial                           |
| VII   | Great auricular                            |
| VIII  | V3 block                                   |

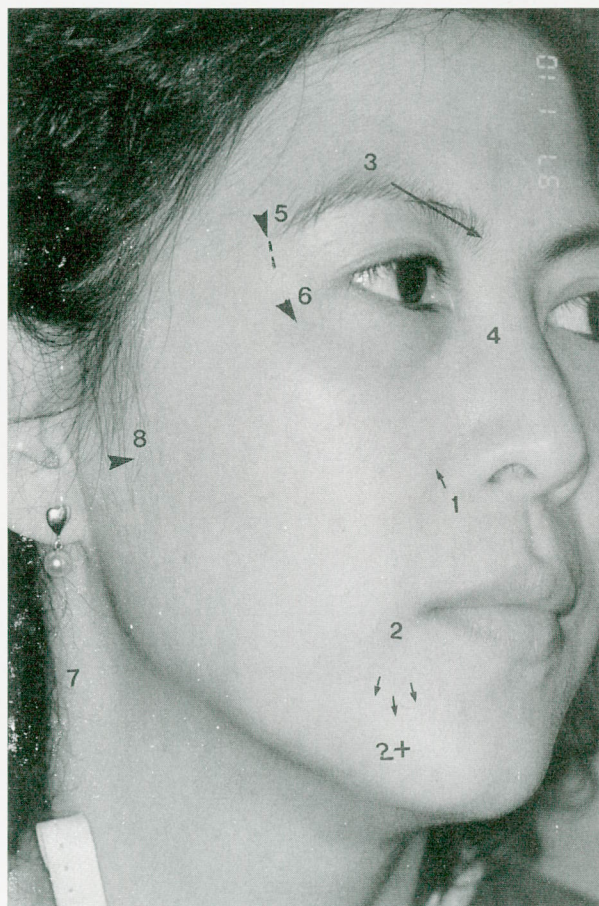


FIG. 1. A side face view of the eight blocks required to anesthetize the face usually done in the order presented. Block I: Both sides are done *facing* the patient; the position then changes for blocks II through VI, for which you are seated over the head of the patient. From the side, blocks VII and VIII are easily performed.

nerve may be blocked in three ways, two transcutaneous and one transoral, only one of these three routes provides a direct face on approach to the foramen itself. Intraoral methods and perpendicular transcutaneous methods do not let the operator know he has entered the foramen. The transcutaneous nasolabial approach does. This approach has a point of injection medial to the upper nasolabial groove a few

millimeters lateral to the alar groove. The injection point for the infraorbital nerve is in the center of the small triangle lateral to the alar rim and medial to the nasolabial fold (Fig. 2, *below*). With your left index finger on the infraorbital rim, ask the patient to look straight ahead. Holding the syringe like a pen, you advance the needle to bone toward the designated point about 4 to 7 mm down from the rim. Often, the needle tip goes directly into the foramen itself. If you wish to inject the foramen, you may have to poke around for a couple of millimeters, but you will always be able to enter into the foramen this way. Then, inject 1 to 2 cc. There is a 100-percent success rate using this external block approach, and the senior author has never seen a neuritis from this or any of the three methods.

*Area of anesthesia.* The area numbered from infraorbital block involves nose, cheek, lip, and eyelid. Almost the entire side wall of the nose, and the entire ala and the base of the columella are affected. Lateral to the commissure, numbness extends 1 to 1.5 cm. Of course, the cheek region below the medial eyelid as well as some of the lid becomes numb. A few minutes after the bilateral injection is given, the upper lip procedures can be accomplished. You can painlessly place your blue dots on the white roll for a lip reconstruction, infiltrate painlessly into the lip itself, or perform laser surgery. Importantly, any added infiltration into the nasal side wall or alar rim can be performed painlessly.

#### Mental Nerve

*Anatomy.* The mental nerve usually exits from a foramen below the apex of the second bicuspid. The variability of this foramen is 6 to 10 mm anterior or 6 to 10 mm posterior to that.<sup>9</sup> Also, the point of exit of the nerve from the foramen may vary in reference to the inferior mandibular border. The mental nerve exits at the foramen as two to three fascicles or as a group that rapidly divides into three or more fascicles. Two of the three branches supply the pink lip and slightly below the vermilion to the labiomental fold and one may supply skin lower down onto the chin. The third branch, which some medical artists draw as exiting separately through the bone and others describe as a descending branch, sometimes provides sensation to the skin and chin below. This branching variability implies that any transcutaneous external block to the mental foramen is unreliable. Because the mental nerve courses directly below



FIG. 2. (Above, left) Infraorbital nerve. The infraorbital foramen opens downward and medially about 5 to 7 mm from the infraorbital rim. It is on line with the medial limbus. (Below) To block the infraorbital nerve, direct the needle upward and laterally to the infraorbital foramen. The needle enters a point in the center of an imaginary inverted V at the level of the alar base. The imaginary V is defined by the nasal labial fold and the alar base inset. (Above, right) Holding the needle like a pen while seated beside the patient, the index finger of the opposite hand is placed on the infraorbital rim. The patient is asked to look straight forward. The needle is passed through the part indicated *below*. The needle is directed upward and laterally to a point 5 to 7 mm below the infraorbital rim and from a line drawn straight down from the medial limbus.

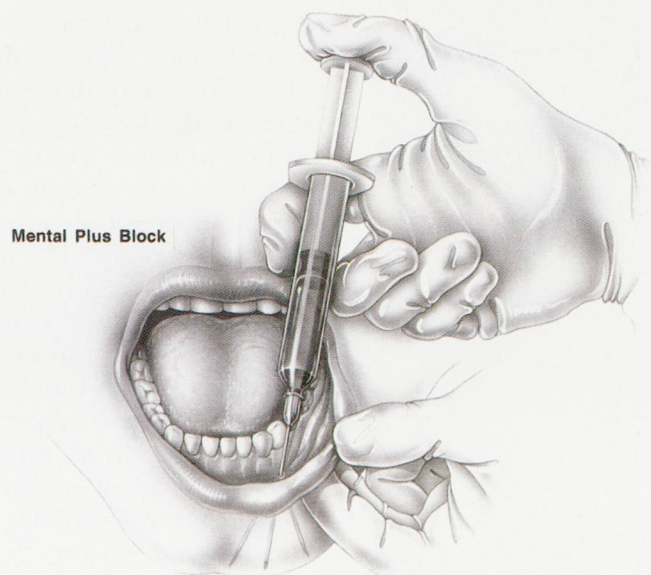


FIG. 3. (*Above*) The mental nerve can be visualized by reflection of the lower lip and by dragging your thumb across the mucosa lateral to the canine. The white nerve is usually visible below the mucosa as in this photograph. (*Below*) After submucosal injection for the lower lip branches noted in Figure 3, *above*. The mental plus block is then done. Pass the needle at least 1 cm in front of the vestibule to the inferior mandibular border to block the rest of the lower lip and chin pad.

the mucosa in the area of the lower canine tooth, surgical traction often makes the upper nerve fascicles visible or palpable in this area (Fig. 3, *above*).

At other times, the nerve to the mylohyoid supplies some sensation to the chin pad and/or lateral to it.<sup>10,11</sup> The nerve to the mylo-

hyoid, which branches from the inferior alveolar nerve just proximal to entering the lingula of the mandibular medial ramus, can be blocked at the medial mandibular ramus. This is a common block for dentists but unnecessary for facial plastic surgery. The terminal branches, the lowest mental nerve branch or



FIG. 4. (Left) The course of injection is provided in figure of a cadaver. The supratrochlear nerve (not shown) can be found under the medial centimeter of the eyebrow. The supraorbital branches pass through muscle to lie on top of the frontalis. Two of many branches are noted. (Right) The block is done subperiosteally from lateral to medial as shown. The needle enters just lateral to the mid eyebrow. The patient should be cautioned about periorbital ecchymosis, which often accompanies this injection. The fingertip rests on the medial orbit periosteum. Note the italics about this in the Anatomy section.

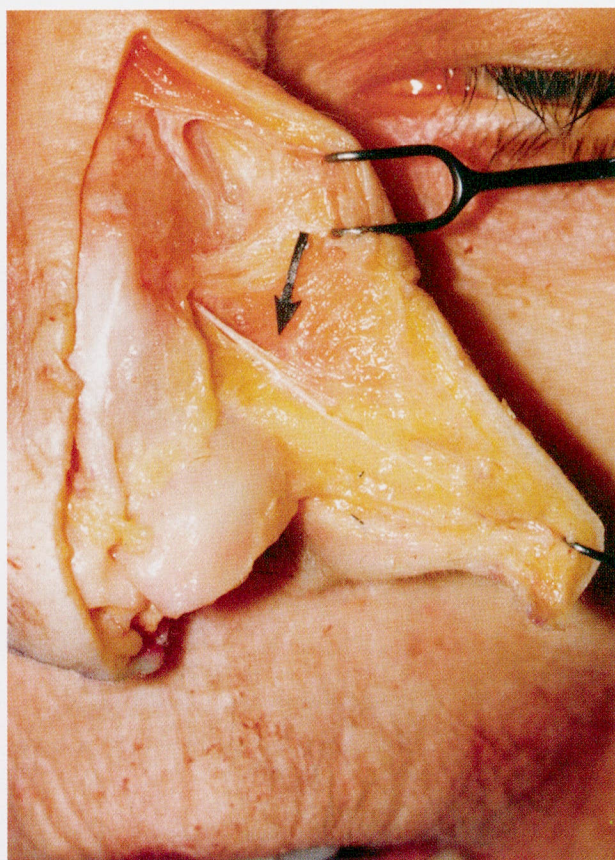


FIG. 5. The dorsal nasal nerve emerges from a small groove in the distal nasal bones and passes under the nasalis transversis to supply some of the skin of the ala, vestibule, and lip. The tip of the arrow rests on the underside of the nasalis transversis. The injection is at the distal edge of the nasal bones and 6 to 10 mm off the midline.

the sensory mylohyoid nerve supplying the chin, can be blocked just before reaching the chin by using the mental plus, block II.

*Technique.* The mental nerve can be blocked at the mental foramen or a few centimeters after it leaves the foramen submucosally. To block it at the foramen, locate the second lower bicuspid. Place the needle tip in the buccal sulcus near the base of the tooth and inject. The nerve itself is not covered by muscle after it leaves the foramen, just a thin layer of mucosa and perineural sheath. Often, the nerve can be palpated at the foramen or in the first few centimeters of its course. If the surgeon desires, he can inject away from the foramen by finding the upper fascicles visually or tactilely. Use the thumb of one hand to pull out the lower lip, lateral to the lower canine tooth (Fig. 3, below). By squeezing the lip and sliding the thumb outward, the nerve is visible submucosally about 85 percent of the time.<sup>12</sup> For the other 15 percent, the nerve is still in the same area, but the mucosal pigmentation may be hiding it. Just inject a small amount under the mucosa.

*Area of anesthesia.* This mental foramen/submucosal injection reliably desensitizes the lower lip down to the labiomental fold. The chin pad and the area lateral to it are not always affected. Therefore, the surgeon has three choices when the entire chin must be numbed: direct local infusion, inferior alveolar nerve block at the lingula, or the mental plus injection. The third choice is, by far, the simplest and will be described.

*Mental plus.* To block the chin, an end branch of the mental nerve and the terminal branches of the mylohyoid need to be blocked. These can be done immediately after the mental block by an anterior premandibular injection *anterior* to the vestibule in front of the anterior teeth (Fig. 3, *below*) You must change your position to behind the patient, turn the syringe more vertically, and inject in the supraperiosteal plane with at least a 1.5-inch needle. You must inject anterior to and beyond the lower border of the mandible (actually out on the lip) but not quite out of the skin. Only the mental plus block obviates the need for the inferior alveolar block (i.e., regardless of whether the mental nerve or mylohyoid nerve supplies the chin).

#### *Supraorbital/Supratrochlear/Infratrochlear*

*Anatomy.* The supraorbital notch, rarely the foramen, is easily palpable at the supraorbital rim just above the medial limbus. The supraorbital nerve exits the foramen, traverses the lower corrugator muscles, and then branches. The nerve splits into two main branches, a medial and lateral. The medial branches proceed cephalad on the surface of the frontalis to supply the skin of the forehead medially and the anterior scalp for many centimeters. (Fig. 4, *left*). The lateral branches, under the frontalis muscle, supply the lateral forehead.<sup>13</sup> *In some cases the lateral branches exit a foramen(ina) above the rim. If these lateral branches are missed with the orbital rim block, the surgeon must deposit local anesthetic 1 cm above the rim.* This subfrontalis injection starts 1 cm above the rim at the zygomaticofrontal suture and proceeds toward the medial eyebrow. The lateral branches are thus injected separately. The supratrochlear nerve, which accompanies the same named vessels, supplies sensation to the midforehead. It can be found under the medial centimeter of eyebrow.

The infratrochlear nerve is a branch of the nasociliary that runs along the medial orbital wall and leaves the orbit below the trochlea to supply the skin in the medial eyelids, the side of the nose above the medial canthus, medial conjunctiva, and lacrimal apparatus.<sup>14</sup>

*Technique.* The block is performed by an easy injection along the supraorbital rim from lateral to medial (Fig. 4, *right*). Stretch the eyebrow laterally and pierce the lateral part of the middle third of the eyebrow. Aim the needle at the supraorbital notch, which is palpable. The other hand is always on the rim. After injecting

1 to 2 cc prior to the notch under the muscle, the needle moves medially a few millimeters along the rim, and another cc is deposited. Finally, another 1 cc is deposited as the needle advances toward and touches the nasal bones.<sup>15</sup> The patient occasionally will get some periorbital ecchymosis from this and thus should be warned.

*Numb area.* The areas anesthetized with this block include: (1) forehead skin from the level of the superior temporal line or temporal fusion line almost to the midline; (2) middle 50 percent of the upper eyelid skin; and (3) frontoparietal scalp between the midline and the superior temporal line, with the anesthetic scalp area extending posteriorly to approximately the level of a vertical plane drawn perpendicularly to the posterior edge of the helical rim of the ear.<sup>15</sup>

#### *Dorsal Nasal Block*

*Anatomy.* The anterior ethmoidal branch of the nasociliary nerve enters the anterior ethmoidal foramen to pass into the cranial cavity. From there it runs forward in a groove in the upper surface of the cribriform plate beneath the dura. Through a slit lateral to the crista galli, the nerve enters the nasal cavity hugging a groove on the internal surface of the nasal bones. First supplying the anterior septal mucosa and lateral nasal wall anteriorly, it emerges as the external or dorsal nasal nerve at the lower border of the nasal bone 6 to 10 mm off the midline<sup>16</sup> (Fig. 5). The nerve exits from a small groove in the distal nasal bones and passes under the nasalis transversis muscle to supply some of the skin of the ala, vestibule, and lip. Painful nasal tip injections can be avoided with this block.

*Technique.* Palpate the nasal midline and feel the end of the nasal bones using the thumb on one side and the index finger on the other. The nerve exits about 6 to 10 mm from the midline of the nasal bones, and 1 to 2 cc of injectate is sufficient for each side.

*Numb area.* Blockade of the dorsal nasal nerve anesthetizes the cartilaginous dorsum and tip. This supplants the painful injection in to the nasal tip and should be used before any infiltration at the tip.

#### *Zygomaticotemporal*

*Anatomy.* The zygomatic nerve is a terminal branch of the maxillary trigeminal nerve, V2. It enters the orbit through the inferior orbital

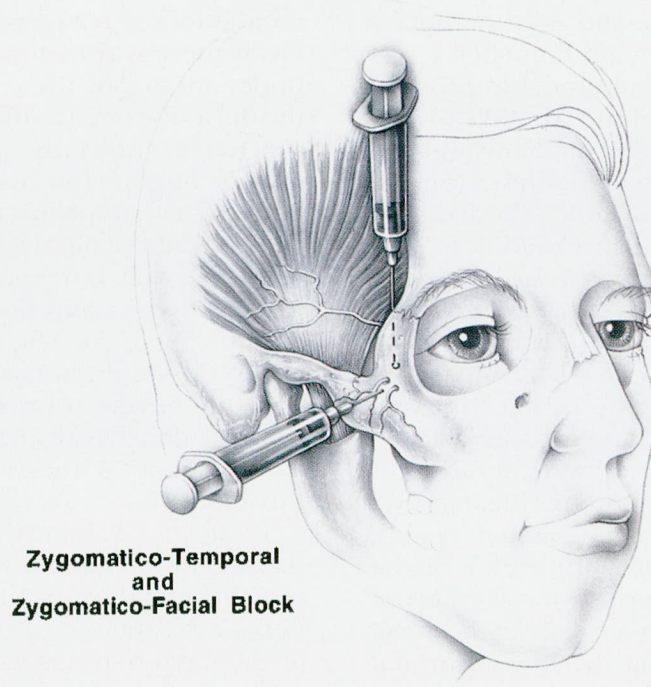
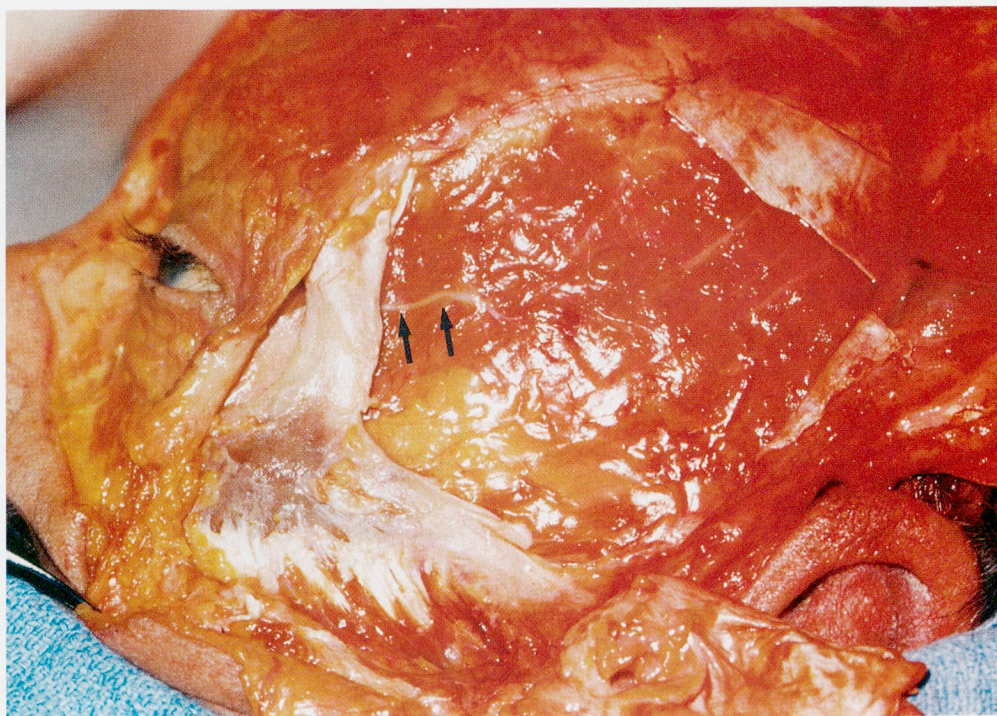


FIG. 6. (*Above*) By removing the deep temporal fascia, one can see the zygomaticotemporal nerve exiting a foramen on the posterior concave surface of the lateral orbital rim slightly above or below the level of the lateral limbus. (*Below*) The zygomaticotemporal nerve block: A 1.5-inch needle is directed  $>1$  cm behind the upper lateral orbital rim to a point 5 mm below the palpable zygomaticofrontal suture. The needle advances along the mid posterior bony wall toward a point 1 cm below the lateral canthus, injecting on the way out. The zygomaticofacial nerve can be injected right after the zygomaticotemporal injection from above on a direct lateral position.

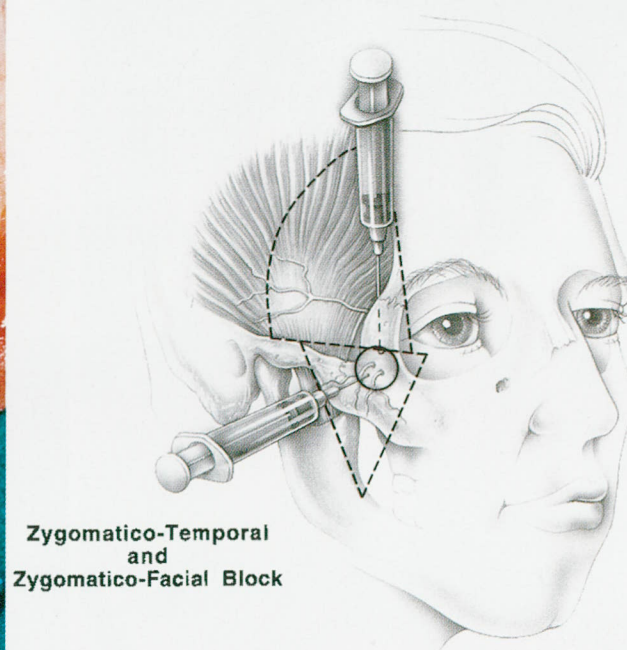
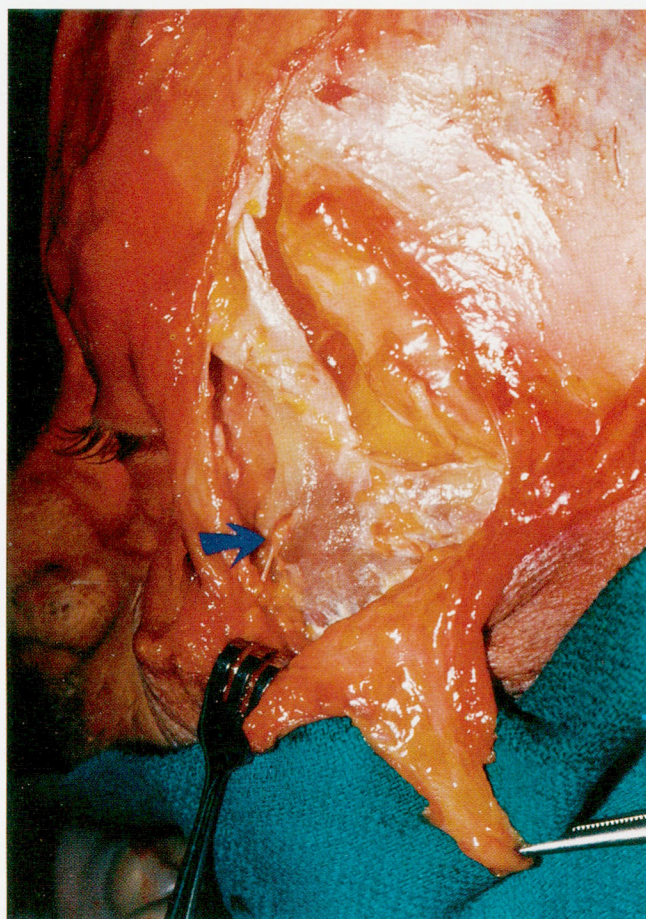


FIG. 7. (Left) The zygomaticofacial nerve exits a foramen along the anterolateral aspect of the zygoma just lateral to the junction of the inferior and lateral orbital rims. (Right) The zygomaticotemporal and zygomaticofacial blocks numb an inverted triangle and a fan-shaped area, respectively. These areas are depicted by the dotted lines.

fissure. The zygomatic nerve branches in to two terminal branches, the zygomaticotemporal and zygomaticofacial. The zygomaticotemporal nerve provides sensory innervation to a fan-shaped area posterior to the lateral orbital rim extending into the hair. The zygomaticotemporal nerve (see below) courses more laterally in the orbit to pass through a foramen into the anterior part of the temporal fossa. The nerve exits a foramen on the posterior concave surface of the lateral orbital rim slightly above or below the lateral canthal level (Fig. 6, above). The variable foramen position is about 1 cm below the level of the canthus.

**Technique.** From above the patient, the surgeon injects *behind* the lateral orbital rim with needle insertion at about 10 to 12 mm behind and just below the zygomaticofrontal suture (palpable). By sliding the 1.5-inch needle along the mid-posterior bony wall toward a point about 1 cm below the canthal level, one can block easily during the pullout (Fig. 6, below).

**Numb area.** This injection blocks a sideward, fan-shaped area about a quarter of a circle (Fig. 7, right). The upper limit (i.e., the temporal line) abuts the area numbed by the forehead block (supraorbital). The lower limit is a line from the lateral canthal area back to the hair and into the temporal scalp. This area abuts the numb zone of the zygomaticofacial block inferiorly and the V3 block posteriorly. It is the auriculotemporal branch of the V3 that supplies this scalp area.

#### *Zygomaticofacial Nerve*

**Anatomy.** This second terminal of the zygomatic nerve emerges through a foramen or foramina on the anterior surface of the zygoma. The branches exit from the anterolateral aspect of the malar bones just lateral to the infraorbital rim.<sup>14</sup> The foramen (ina) are a few millimeters lateral to the inferior orbital rim. This nerve is often cut during elevation of soft tissue here, leaving an insensate area on the cheek promi-



FIG. 8. (Left) The great auricular nerve is about 6.5 cm from the lower external auditory canal. (Right) A good way to measure the 6.5 cm is to measure two points on the hand. For me (B.Z.), 6.5 cm is from the metacarpophalangeal joint of my thumb to the tip.

nence. If you place a finger just in the intersection of the infraorbital and lateral orbital rims, the zygomaticofacial nerve is just lateral to your fingertip (Fig. 7, left).

**Technique.** The zygomaticofacial block is always done right after the zygomaticotemporal block (Fig. 8). With the patient's head slightly turned, the surgeon injects. The needle deposits anesthetic into a dime-sized area just lateral to the junction of the lateral and inferior orbital rim. If hyaluronic acid (Wydase) has been added to the local, the block is virtually fool-proof (Fig. 6, below) as are the other blocks.

**Numb area.** Hollingshead<sup>17</sup> mistakenly states that this nerve only supplies a limited area of skin extending upward toward the lateral corner of the eyelids. The zygomaticofacial nerve provides sensation to an area at the cheek prominence and below. A horizontal line about 3 cm in length starting along lateral one-third of the orbit represents the base of a large inverted isosceles triangle, which ends in mid-cheek (Fig. 7, right). The center of the triangle sits on the cheek prominence. The apex of the triangle is just anterior to the palpable lowest portion of the anterior ramus of the mandible.

#### Great Auricular

**Anatomy.** The great auricular is the largest ascending branch of the cervical plexus C2 and C3. After it rounds the posterior border of the sternocleidomastoid, it passes almost straight upward on the fascial surface of this muscle (Fig. 8, left). The great auricular nerve is 6.5 cm down from the lower external ear canal. The nerve divides into end branches that supply the skin over the parotid and angle of mandible, most of the lower ear, and the skin over the mastoid process.<sup>18</sup>

**Technique.** Have the patient flex the sternocleidomastoid muscle by pushing the head against a hand placed on the ipsilateral forehead. This maneuver will outline the sternocleidomastoid muscle against the neck skin. Mark the skin of the upper anterior and posterior sternocleidomastoid borders with two parallel lines. Then draw a third line between the first two parallel lines directly in midmuscle. Measure down 6.5 cm from the lower border of external acoustic meatus to the mid-sternocleidomastoid. A useful template is a measurement from your own hand. For example, 6.5 cm is the

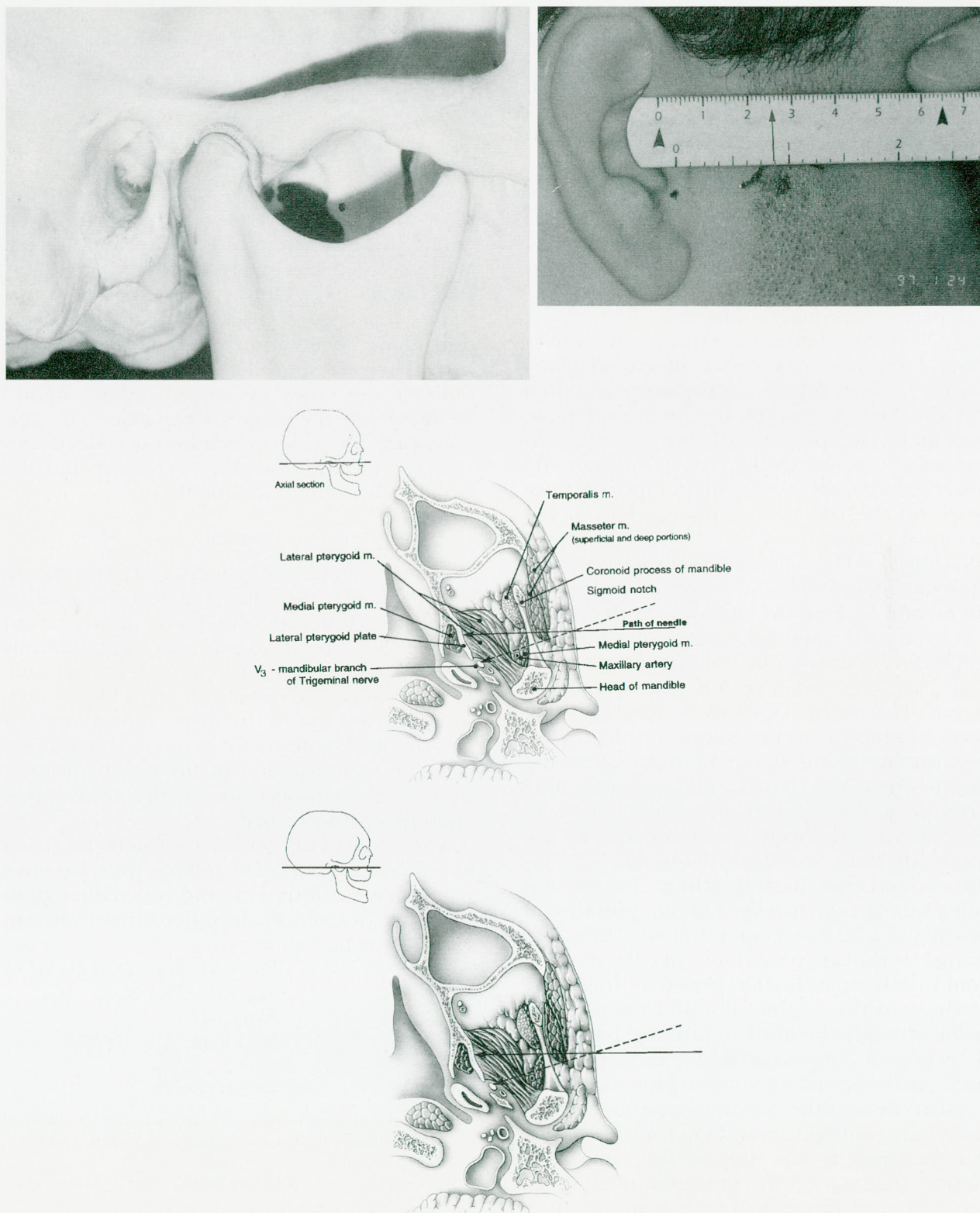


FIG. 9. (Above, left) The needle passes through the skin and masseter muscle just at the center of the sigmoid notch to advance and hit the pterygoid plate as shown by the dot. (Above, right) The injection point is about 2.5 cm (1 inch) anterior to the intratragal incisura. (Center) The structures through which the spinal needle passes and the associated anatomy are depicted. (Below) The spinal needle is marked at 4.5 cm and is inserted until it hits the pterygoid plate. It is withdrawn almost to the skin and is redirected 1 cm posteriorly and advanced the same distance. After aspirating, about 3 to 4 cc are injected.

measurement of my baby finger tip to the web-space or my thumb metacarpophalangeal to tip. Inject a nickel to quarter sized circle of anesthetic onto the muscle fascia at this intersection (Fig. 8, right).

*Numb area.* The lower one-third of the ear and the lower postauricular skin become insensate. Varying amounts of skin over the mandibular angle from the tragus downward and forward for 3 to 4 cm are also insensate.

### V3 Nerve Block

*Anatomy.* The mandibular branch of cranial nerve V<sup>19</sup> travels behind the pterygoid muscles about 1 cm posterior to the pterygoid plate. Figure 9, above, left, shows the sigmoid notch and the lateral view of the pterygoid plate through it. The spinal needle traverses the skin and subcutaneous tissue, passes through the posterior masseter, notch, and temporalis muscle to hit the pterygoid muscle origin at the pterygoid plate.

*Technique.* The sigmoid notch is the valley between the condyle and coronoid process of the mandible. Find the sigmoid notch depression by palpation below the zygomatic arch. The notch can be opened by holding the patient's chin back and rotating the mandible open slightly. This notch (Fig. 9, above, right) is 2.5 cm (1 inch) anterior to the tragus. Confirm your position by asking the patient to open the mouth widely. You should feel the condyle slide forward onto your fingertip. Ask the patient to close the mouth. Your finger remains in the notch. Mark the middle of the notch "U" with blue dye and inject local anesthesia into the skin with a small gauge needle. The surgeon should now place a 22-gauge spinal needle in a 5-cc syringe. It is okay to mark the needle at about 4 cm with the plastic slide provided. Inject the needle into the original dot and advance the needle straight in until it hits the pterygoid plate (Fig. 9, center and below) and note how much of the spinal needle remains outside of the skin. Retract the needle almost to the skin surface and redirect about 1 cm back from your first pterygoid bump. Stop at the same level (depth) that you hit the pterygoid plate. Aspirate, and then inject 3 to 4 cc. It is important to aspirate, as a maxillary vessel sits in back of the pterygoid muscles in this region.

*Numb area.* The rest of the face (the bulk of the cheek and the upper preauricular and auriculotemporal hair regions) will become numb. The buccal branch supplies the rest of

the cheek, which lies over the buccinator muscle down to and below the mandibular border. This area abuts the great auricular zone posteriorly and the orbitolabial numb areas anteriorly.

### DISCUSSION

As surgeons, you have labored intensely to grasp the anatomy. Unless the books showed true cadaver dissections, you were misled. Why? Because most artistic renditions are just that. More importantly, your need for anatomic detail has skyrocketed, and the procedures have become more technically demanding. The classic black and white "Daisy Stillwell" drawings<sup>20</sup> of how procedures should be done are no longer acceptable. The surgeon can, of course, decide how to reduce pain (e.g., by warming or buffering, etc.), but the needle course must still be there.

### SUMMARY

A direct simplified sequence of eight blocks to anesthetize the face is useful for routine plastic surgical procedures and more recent laser techniques. Herein, exact anatomically based block methods are presented. Each side of the face can be done with eight blocks that, when carried out in the order shown, are fast and simple. For aesthetic or reconstructive procedures, memorization of the points of injection will give you security, which increases precipitously with practice.

These blocks will reduce your need for heavy anesthesia support, will reduce your patient's pain during infiltration, and will reduce postoperative discomfort. In other words, you can give it your best shot.

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