

Nerve Blocks of the Head and Face – An Interactive Review of Techniques and Clinical Cases

K. J. Krishna Priyanka¹, S. Balachandar² and S. Parthasarathy³

¹Postgraduate Student, Department of Anesthesiology, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Pillayarkuppam, Puducherry – 607402, India; krishnakarpagaraj@gmail.com

²Assistant Professor, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Karaikkal, Puducherry – 609602, India; amuchandru@ymail.com

³Professor, Department of Anesthesiology, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Pillayarkuppam, Puducherry – 607402, India; painfreepartha@gmail.com

Abstract

Regional anaesthesia is emerging either as a sole anaesthetic technique or as a supplement to general anaesthesia in different surgical conditions. With increasing incidence of systemic illnesses coming for operative procedures, the value of addition of nerve blocks to a routine anaesthetic technique assumes more significance in terms of decreasing morbidity. Usually, the anaesthesiologists are familiar with abdominal, chest and extremity blocks. As ultrasound is not friendly with head and face with bony prominences, the progress in this field is further hampered. In this narrative review, we will try to elaborate on a few useful nerve blocks of the head and face; the importance of ultrasound in viewing those nerves in the bony gaps will be discussed. The use of such techniques as either a perioperative analgesic or as an independent anaesthetic method along with the precautions to be followed in their administration will be highlighted.

Keywords: Anaesthesia, Face, Head, Nerve Blocks, Regional

1. Introduction

Regional anaesthesia of head and face are not commonly practiced due to multiple reasons. Extensive bony hindrances, difficulty in locating the nerves, the possible bony distortion of the ultrasound images, absence of training of such blocks in the routine postgraduate curriculum may be the possible causes of its limited usage than other peripheral nerve blocks. The neural blockade of the trigeminal nerve and their branches along with or without branches of superficial cervical plexus block has far reaching advantages in anesthesia and pain relief¹. The trigeminal nerve block at the Meckel's cave is a separate topic and it is not discussed here. The glossopharyngeal nerve, branches of the trigeminal

nerve, cervical plexus their identification, techniques to block them with their uses and possible use of ultrasound to identify certain nerves will be narrated in this short review. The target nerves for ophthalmic and dental surgeries are not detailed as they are commonly described in many textbooks.

2. Scalp Block

The whole soft tissue area of the scalp is supplied by the designated nerves as described below:

- *From the front:* supra trochlear and the supraorbital branches of the ophthalmic or the first division of the fifth cranial i.e. trigeminal nerve (V1).

*Author for correspondence

- *From the side:* the face is supplied by zygomatico-facial and zygomatico-temporal nerves which are branches of the V2: Auriculo-temporal branch of the mandibular nerve (V3) also supplies a part of it.
- *From the back:* 1. The lesser occipital nerve is a branch of superficial cervical plexus, 2. the greater occipital nerve emerges from the cervical nerves with, and 3. a minimal contribution from the greater auricular nerve, a branch again of the cervical plexus. (Figure 1) The above are the three described nerves.

Uses: Its useful for sewing up lacerations of the scalp, for awake craniotomies² and analgesic regimen for brain surgeries. As there are recurrent branches from trigeminal nerve to the dura mater which is pain sensitive, it's necessary to combine trigeminal nerve block with scalp block for brain interventions.

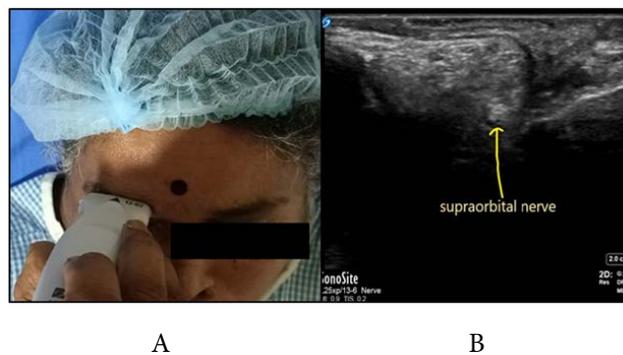


Figure 1. Showing distributions of different nerves.

3. Technique

3.1 Supra Trochlear and the Supraorbital Nerves

The supra trochlear nerve is usually blocked by one ml of local anesthetic drug just lateral to the medial canthus in the subcutaneous plane. The supra orbital nerve can be blocked in the supra orbital fossa (Figure 2). The ultrasound, kept in the plane of the pupil above the orbital rim will reveal a depression or a gap in the bone with pulsations. For USG guided injection, the needle is pricked from the lateral to medial with an in-plane approach to anaesthetize the supraorbital nerve³. The local anesthetic is dropped near the artery to block the nerve.



A: placement of probe, B: supraorbital nerve through the ultrasound

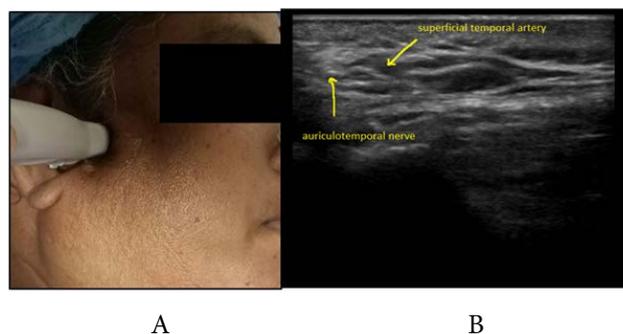
Figure 2. Ultrasound imaging for supraorbital nerve block.

3.2 Zygomatico Temporal and Zygomatico Facial Nerves

These nerves being branches of V2 can be blocked by an infiltration of local anesthetic in the subcutaneous plane lateral to the eyebrow towards the tragus⁴.

3.3 Auriculo Temporal Nerve

This nerve being a branch of V3 swirls around to supply the area above the auricle. After piercing the parotid gland, it carries sensations from the tragus and anterior part of the ear and also the part of the skin just over the temporalis muscle. This nerve can be blocked easily by ultrasound guidance. Keeping the probe in front of the tragus will reveal the superficial temporal vessel, posterior to which the nerve can be visualized⁵ (Figure 3). Deposition of 3- 4 ml of local anesthetic will anesthetize the nerve.



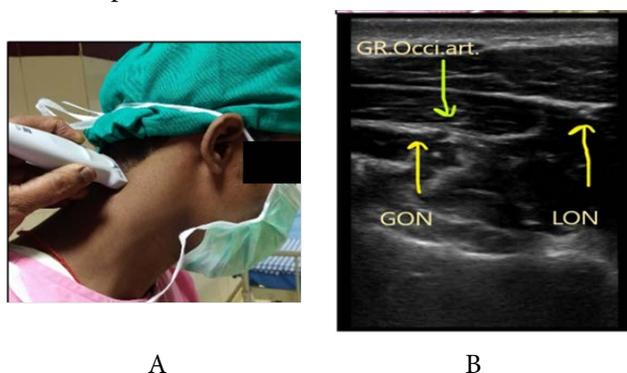
A: placement of probe between tragus and zygoma, B: auriculotemporal nerve close to the artery through the ultrasound

Figure 3. Ultrasound imaging for auriculotemporal nerve block.

3.4 Lesser Occipital, Greater Occipital and Greater Auricular Nerves

Three in one infiltration: A single subcutaneous infiltration of local anesthetics from the level of greater occipital protuberance will block lesser occipital nerve, greater auricular nerve, which are branches of cervical plexus. It will also block the greater occipital nerve which comes directly from cervical spinal nerve. Both lesser and greater occipital nerves can also be visualized in ultrasound and blocked each with 1 ml of the local anesthetic^{6,7} (Figure 4).

Hence blockade of the above said nerves on both sides constitute a scalp block after which all soft tissue surgeries of the scalp can be done.



A: placement of probe B: greater and lesser occipital nerve through ultrasound. Greater occipital nerve near its artery (GON: Greater occipital nerve, LON: Lesser occipital nerve)

Figure 4. Ultrasound image for greater and lesser occipital nerve.

4. Maxillary Nerve

The maxillary nerve is the second branch of the fifth cranial nerve (V2). It courses in the lateral wall of cavernous sinus. It comes out of the skull through foramen rotundum and the comes to occupy the pterygopalatine fossa. The maxillary nerve leaves the pterygopalatine fossa through the infraorbital fissure and terminates as the infraorbital nerve in the orbital cavity. The nerve is purely sensory. It carries sensations from the upper lip, upper teeth, palate, roof of the pharynx, lower eyelid, cheek and the nose. It also innervates the maxillary, ethmoid and sphenoidal sinuses and a part of the meninges.

Technique⁸: Blockade of maxillary nerve can be done with or without the use of ultrasound.

- Needle in the mandibular notch
- Open and close the mouth to find the notch if in doubt
- Anterior to tragus
- Insert medially straight from lateral
- The pterygoid plate will be hit within 2 cm usually.
- Slid anterior and above

Deposit 5 – 10 ml of local anesthetic (Figure 5).

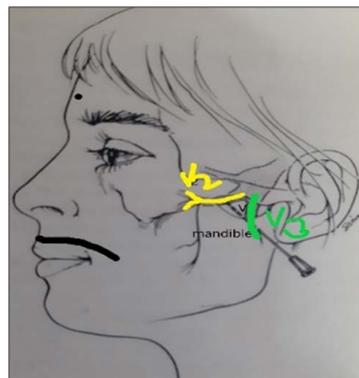


Figure 5. Shows the entry of needle and direction.

The maxillary nerve can be blocked with multiple indications.

- Trigeminal neuralgia limited to the second branch or a post-herpetic cause⁹
- Cluster headache
- Pain in the eye region, the nose, upper jaw, and gums or in simple terms unknown pain in the area of its sensory supply

Postoperative pain which occurs in the distribution of V2

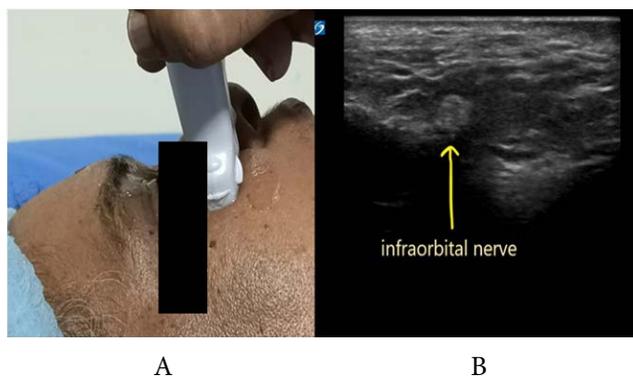
- Pain after a dental procedure
- Occasionally used as a therapy for vasomotor rhinitis

4.1 Infraorbital Nerve

It is the terminal branch of the V2 emerging through the infraorbital foramen which is about 1 cm below the midpoint of the lower orbital margin.

Technique: The line of block is along the pupil. We need to palpate the infraorbital foramen just below the orbit in the face as a dip the needle is introduced just below the point of palpation until a bone contact is made. After that, the needle is withdrawn slightly and injected usually a maximal dose 3 ml is enough¹⁰. An intraoral approach is

also described¹¹. The midpoint of the lower orbital margin is palpated and it is marked with the middle finger. The upper lip is picked with our left thumb and index finger and lifted. The needle is introduced above the second premolar tooth toward the infraorbital foramen (From the skin, the other hand is used as a guide) until a bony contact is made, and with drawn slightly to inject the drug. It is ideal to avoid the canal to prevent direct neural injection while compression after injection is needed for prevention of haematoma. Ultrasound guided injection is also feasible. The High Frequency Linear (HFL) transducer is placed directly over the body of the maxilla parallel to and 1 cm below the infraorbital margin (Figure 6a). Infraorbital foramen is seen as a gap on the maxillary bone through which the infraorbital nerve emerges along with a vessel (Figure 6b)¹². The needle is introduced from the lateral to medial and the injection is made slowly to avoid blood vessels.



A: placement of probe B: infraorbital nerve through the ultrasound

Figure 6. Ultrasound imaging for infraorbital nerve block.

4.2 Sphenopalatine Ganglion Block

The Spheno-Palatine Ganglion (SPG) is a division of V2. It is a triangular parasympathetic autonomic ganglion, located superficially in the pterygopalatine fossa. The site is posterior to the middle nasal turbinate and anterior to the pterygoid canal.

Technique¹³ (Figure 7): Sterile cotton swab (stick like), soaked well in Lignocaine jelly is introduced in the nostril, in an upward and backward direction till a resistance is felt. Inject local anesthetic along the side of stick, so that the drug can reach at the base of the medial turbinate. This is usually less than 5 cm. After five minutes, the stick is redirected in an upward, lateral, and a little backward

to target more surface. Again, inject local anesthetic in a similar fashion.

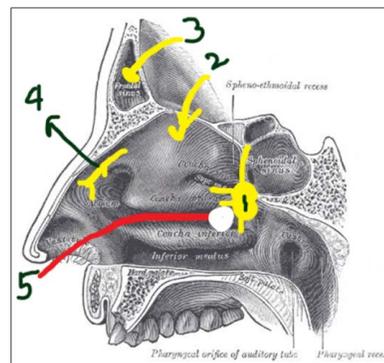


Figure 7. 1. Sphenopalatine ganglion. 2. Inferior orbital branches of V2. 3. Frontal nerve (V1). 4. Anterior ethmoidal branch (V1), and 5. Applicator soaked in local anesthetic).

5. The Mandibular Nerve

There are many indications of this nerve block from which a few are listed below:

- Differential diagnosis of either trigeminal neuralgia (usually pain in the anterior two thirds of the tongue) or glossopharyngeal neuralgia (pain in the posterior third of the tongue) Mandibular nerve block has no effect on glossopharyngeal neuralgia
- Tinnitus (the principle behind is that the otic ganglion has a few connections with the chorda tympani, the nerves of the pterygoid canal, and the medial pterygoid nerve)
- Trigeminal neuralgia in the third branch, a single injection may break the vicious cycle of neuropathic pain
- Trismus after a dental procedure
- Dental and maxillary surgeries – anesthetic dosages need to be with more volume and higher concentration

Technique: The needle is introduced from lateral to medial direction in the mandibular notch to hit the pterygoid plate similar to maxillary nerve block. But after hitting the plate, the needle is dipped slightly posterior. Electrostimulation of the masseter muscle can be added as an extra confirmation point for the needle position during blockade of V3, as this branch is a mixed nerve (Figure 8)¹⁴.

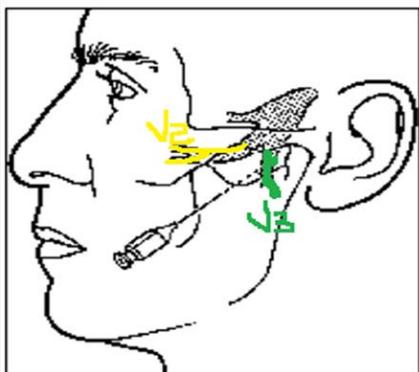


Figure 8. Shows the needle insertion point and direction for mandibular nerve block.

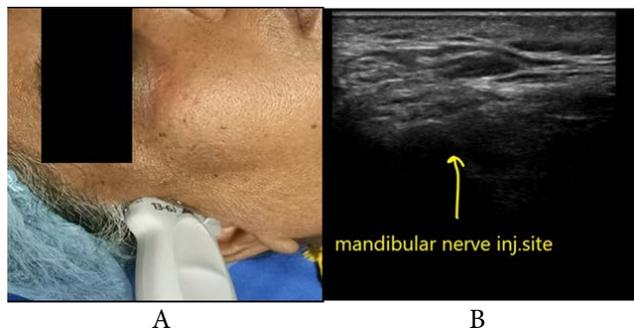
Ultrasound guidance¹⁵ (Figure 9) can be utilized to find the posterior portion of the pterygoid plate and drug deposition of around 5 ml can be made. The sphenopalatine vessel is close to area of the nerve.

A: placement of probe B: mandibular nerve through the ultrasound

5.1 Mental Nerve

It is one of the terminal branches of V3. It supplies the skin of the chin and the skin and mucous membranes of the lower lip. It emerges in the chin through the mental foramen. The block has been described for entrapped mental nerve and lip surgeries.

Technique: With the ultrasound transducer positioned transverse, the mental foramen can be identified¹⁶ and blocked with one ml of 2% lignocaine (Figure 10).



A: placement of probe B: mental nerve through the ultrasound

Figure 9. Ultrasound imaging for mandibular nerve block.

5.2 Lingual Nerve

Lingual nerve concerns with the sensory supply of anterior two thirds of the tongue. It conveys chorda

tympani a branch from the facial nerve which provide taste sensation to the anterior two thirds of the tongue. It also carries the preganglionic fibers from chorda tympani to the submandibular ganglion and, in turn, supplying the submandibular and sublingual glands.

Technique: The point of insertion is distal to and 6–8 mm inferior to the lingual gingival margin of lower second molar¹⁷ (Figure 11). The target is the lingual nerve site which is situated in the third molar area. The depth of penetration of the needle during the block should not exceed 8 mm.

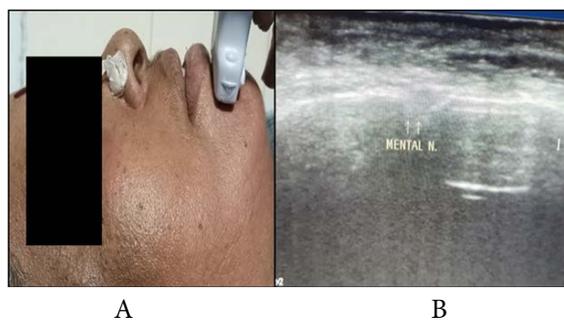


Figure 10. Ultrasound imaging for mental nerve block.

5.3 Buccal Nerve

The buccal nerve can be blocked for procedures involving the mucosa adjacent to the posterior molar teeth, e.g. placement of rubber dam clamp.

Technique¹⁸: The injection site is buccal to the third molar, with the needle just piercing 1-2mm as the nerve lies just directly below the mucosa (Figure 11).

5.4 Glossopharyngeal Nerve (IXth Cranial Nerve)

The ninth cranial nerve innervates the middle ear, part of tongue and posterior part of pharynx. It also supplies the muscles of pharynx. It contains visceromotor, viscerosensory, and gustatory fibers. The block of this nerve is useful in diagnosing and differentiating glossopharyngeal neuralgia from trigeminal neuralgia. The intra oral approach to block is being used for perioperative pain relief in tonsillectomies¹⁹.

Techniques:

Extra oral approach:

1. Entry at Midpoint between mastoid and angle of the mandible
2. Styloid hit at 2.5 cm
3. Slid posterior

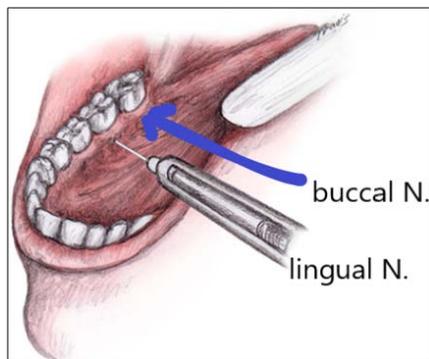


Figure 11. Shows the point of needle insertion for lingual and buccal nerve block.

4. Two ml of local anesthetic drug to be injected

This approach can be facilitated by the use of ultrasound²⁰ (Figure 12).



Figure 12. Ultrasound image for glossopharyngeal nerve.

A: placement of probe B: point of injection of local anesthetic behind the styloid process

The intraoral approach:

It can be done a little easier:

- Identify Posterior palate pharyngeal fold
- Use a Curved needle
- Submucous plane
- Aspiration
- Inject 2 ml (Figure 13).

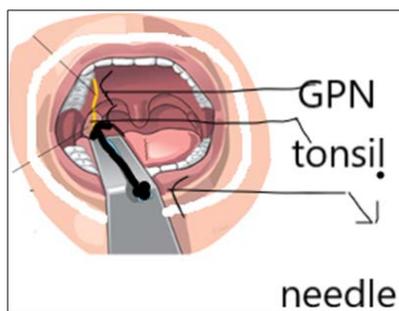


Figure 13. Shows the intra oral approach of glossopharyngeal nerve block.

6. Some Clinical Scenarios and Discussion

1. The parotid gland is supplied by the auriculo temporal nerve and the cervical plexus (greater auricular nerve). A combined block of the cervical plexus and the mandibular nerve may be enough to satisfactorily anaesthetize the parotid gland²¹-----.
2. Regarding the nasal sinuses, the frontal and ethmoidal ones are supplied by V1. The anesthesia for nasal surgeries can be accomplished by blocking the maxillary nerve when combined with nasocilliary nerve⁸.
3. It is very difficult to target the ophthalmic branch V1, but it has been suggested that slight angulation of the needle cephalad during maxillary nerve block may anaesthetize the nerve to conduct plastic surgeries of the face²².
4. The infraorbital nerve block, apart from perioperative analgesic technique can also be used as a sole anesthetic technique.
5. Regarding nerve block for tonsillectomy, the palatine tonsil is innervated by branches from V2, via the lesser palatine nerves, There are twigs from the tonsillar branches of the (Nerve IX) glossopharyngeal nerve. Hence blocking maxillary and intraoral glossopharyngeal nerve with local spray may be helpful for avoiding general anesthesia. The temporomandibular joints need to be blocked to conduct with less discomfort.

7. Conclusion

Regional anesthesia of the head and face is still uncommonly used. Even with the ultrasound, the supplemental usage with General anesthesia seems to be infrequent. We suggest that such blocks and the training for the same to be part of the postgraduate curriculum and trainees should consider face blocks in appropriate cases without hesitancy. The use of ultrasound in a few blocks can be a boon to increase success and decrease the drug volume.

8. Conflict of Interest

NIL

9. Financial Assistance

NIL

All images are taken from the ultrasound machine 'SONOSITE X-PORTE' with a volunteer after informed consent.

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