Recent Updates in Anesthetic Considerations for Awake Craniotomy

Essay

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Abstract

It is clear that awake craniotomy (AC) arose from its use in epilepsy surgery and it has become an increasingly frequent neurosurgical procedure, even for supratentorial tumoral and/or non-tumoral lesions. This method is generally used when a lesion involves or is close to any functional or eloquent area, such as primary motor or language cortices, in order to reduce the possibility of neurological deficits. The overall aim is to minimize the risks of such operations. However, there has been some criticism that AC for preservation of functional areas may decrease the extent of surgical resection. Evolutionary stages with respect to this neurosurgical intervention involve the development of surgical techniques, use of new anesthetic drugs and advanced functional imaging and neuronavigation. Modern anesthetic approaches may be divided as follows: **Monitored anesthesia care (MAC)** and **asleep- awake -asleep (AAA)** and recently a new approach of **awake-awake-awake** technique.

Conclusion: There is increasing evidence that an awake craniotomy would be an appropriate choice for removal of all supratentorial lesions nonselectively. It can maximize lesion resection, which can be linked to improved survival rates, and has low complication rates.

KEYWORDS: AWAKE CRANIOTOMY.

References: ***Ghazanwy M, Chakrabarti R, Tewari A and Sinha A (2014)*** Awake craniotomy: A qualitative review and future challenges. Saudi Journal of Anesthesia;8, 529-539.

Piccioni F and FanzioM(2008) Management of anesthesia in awake craniotomy. Minerva Anestesiologica;74,393-408.

Chui J (2015)Awake Craniotomy. RevColomb Anestesiol ;43:22–28.

INTRODUCTION

It is clear that awake craniotomy (AC) arose from its use in epilepsy surgery and it has become an increasingly frequent neurosurgical procedure, even for supratentorial tumoral and/or non-tumoral lesions. This method is generally used when a lesion involves or is close to any functional or eloquent area, such as primary motor or language cortices, in order to reduce the possibility of neurological deficits. The overall aim is to minimize the risks of such operations. However, there has been some criticism that AC for preservation of functional areas may decrease the extent of surgical resection ***(Taylor and Bersnteinm, 1999).***

Evolutionary stages with respect to this neurosurgical intervention involve the development of surgical techniques, use of new anesthetic drugs and advanced functional imaging and neuronavigation ***(Galip et al., 2015).***

However, it has been emphasized that the success of AC depends on experienced surgical and anesthesia teams in order to keep the patients awake for direct cortical electrical stimulation and neurological examination during surgery. The anesthetic management for this surgery must include sedation, analgesia, respiratory, and hemodynamic control, and a responsive, co-operative patient for neurologic testing intra-operatively ***(Attari and Salimi, 2013).***

Aim of the Work

The aim of this work is to:

Discuss the recent modalities for setting the proper management plans and monitoring their efficiency for awake craniotomy.

Chapter 1

NERVE SUPPLY AND ARTERIAL SUPPLY OF SCALP

Nerve Supply of Scalp

Sensory innervation of the scalp and forehead is supplied by both the trigeminal and spinal nerves.

A) *Sensory Innervation of The Anterior Scalp and Forehead:*

The trigeminal nerve (5th cranial nerve) is the largest cranial nerve and is the main supply of sensory innervation of the head and face. The trigeminal nerve divides into three smaller divisions: ophthalmic, maxillary, and mandibular division, all of which contribute branches that innervate the forehead and scalp (fig.1) ***(Baltimore, 1991).***

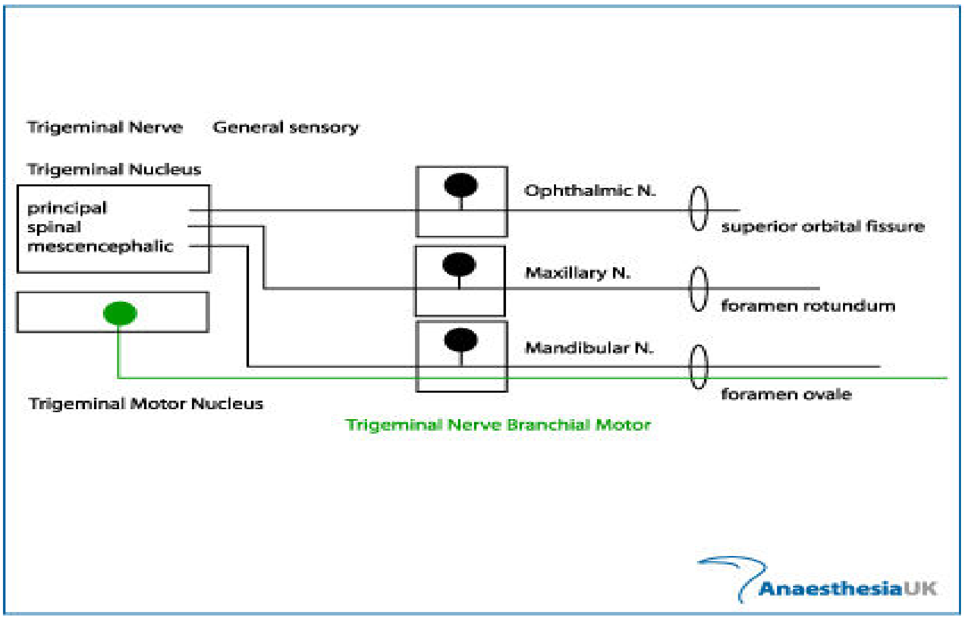

Fig. (1): Branches of trigeminal nerve ***(Osborn and Sebeo, 2010).***

The smallest and first branch of the trigeminal nerve is the ***ophthalmic division*** (V1). It is definitely a pure sensory nerve, carrying sensory innervation from the same side from upper eyelids, ciliary body, iris, the cornea, skin of the forehead, the skin of the nose, and eyebrows. The largest branch of the ophthalmic division is the *frontal nerve*, which reaches the orbit by passing through the superior orbital fissure, before dividing into 2 branches, the supraorbital and supratrochlear nerves. These 2 branches carry sensations from the forehead and anterior scalp (fig. 2&3) ***(Osborn and Sebeo, 2010).***

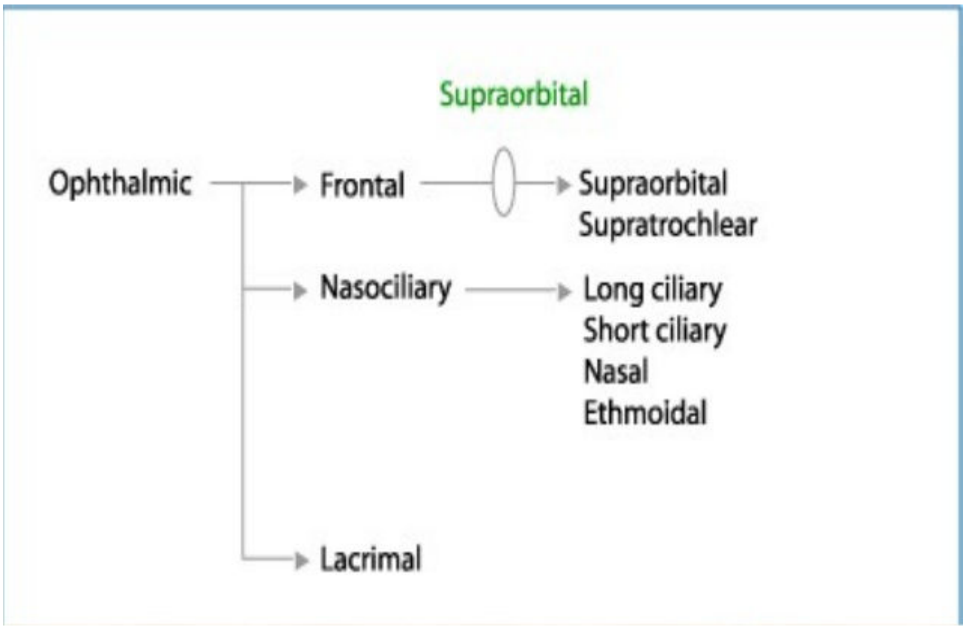

Fig. (2): Branches of ophthalmic nerve ***(Osborn and Sebeo, 2010).***

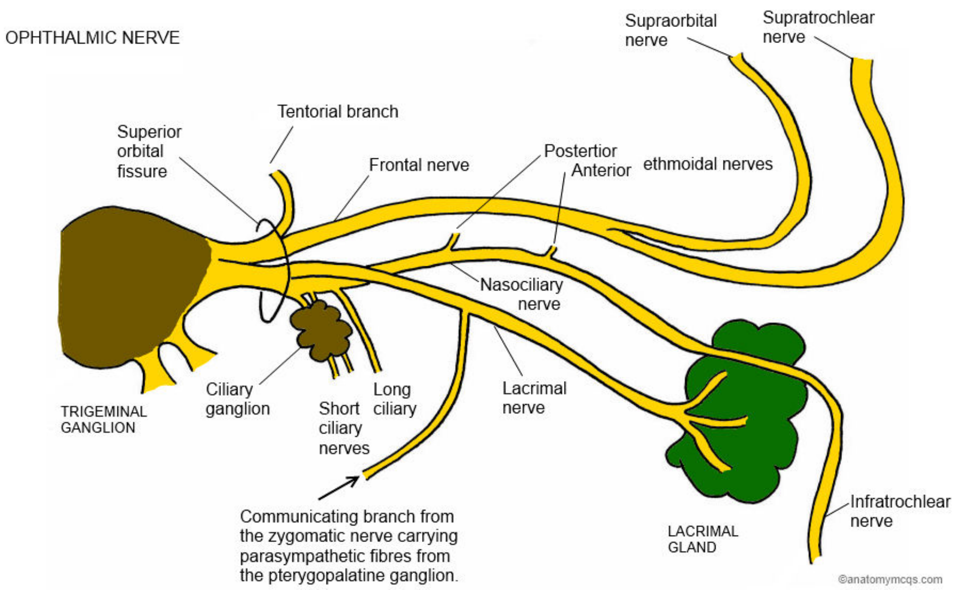

Fig. (3): Distribution of ophthalmic nerve ***(Osborn and Sebeo, 2010).***

The second major division of the trigeminal nerve (V2) is the ***maxillary division***, which is a purely sensory nerve and it is of great importance for scalp block, as it carries sensory innervations from face up to the zygomatic prominence by its branches (infraorbital, zygomaticofacial, and zygomaticotemporal nerves) (fig.4&5) ***(Agur et al., 1991).***

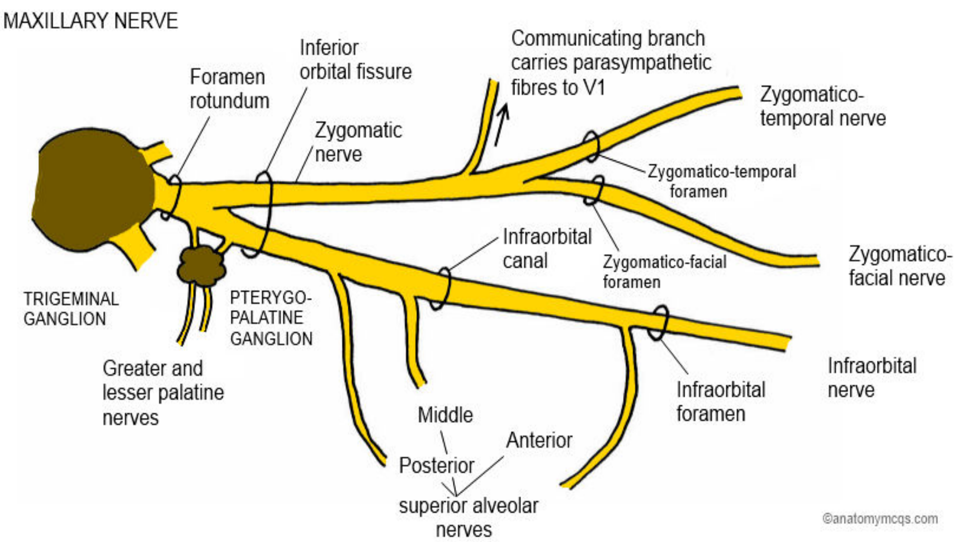

Fig. (4): Distribution of maxillary nerve ***(Osborn and Sebeo, 2010).***

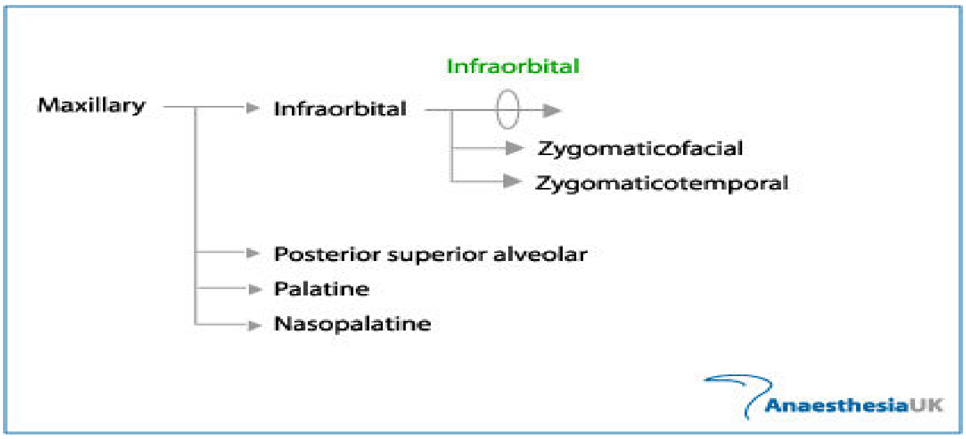

Fig. (5): Branches of maxillary nerve ***(Osborn and Sebeo, 2010).***

The third and the last major branch of the trigeminal nerve is the ***mandibular division*** (V3), which supplies sensory innervations to the lower lip and the lower part of the face (through mental and buccal branches), and the auricle and the scalp surrounding the auricle through its auriculotemporal cutaneous branches (fig.6&7) ***(Osborn and Sebeo, 2010).***

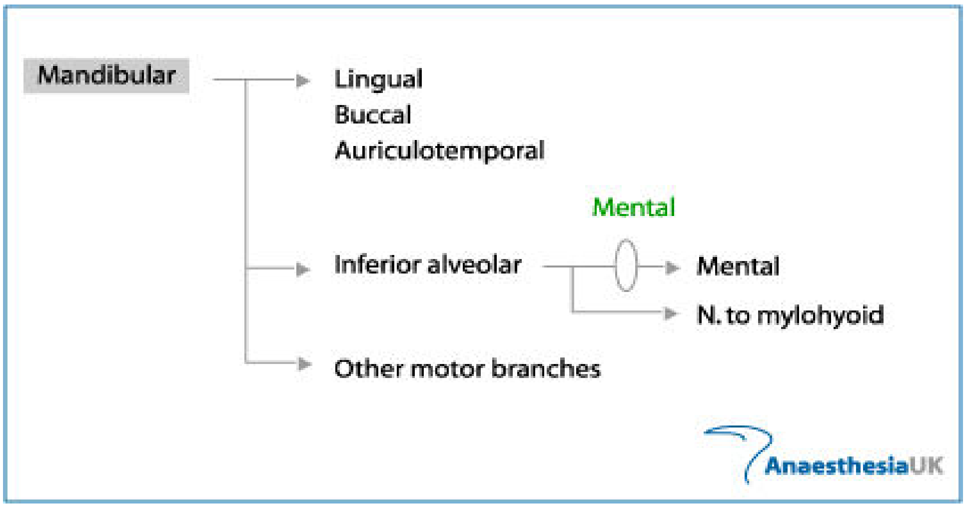

Fig. (6): Branches of mandibular nerve ***(Osborn and Sebeo, 2010).***

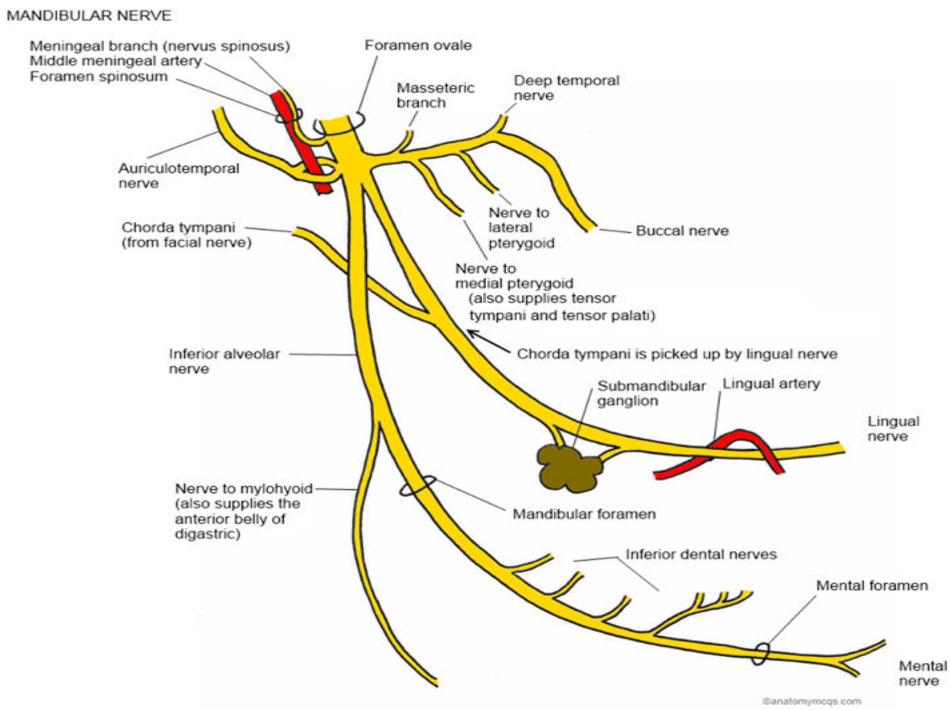

Fig. (7): Distribution of mandibular nerve ***(Osborn and Sebeo, 2010).***

B) Sensory Innervation of The Posterior Scalp

The greater occipital nerve which arises from the posterior ramus of the second cervical nerve (C2) root carries the sensory innervations from the major portion of the posterior scalp. It has an important anatomical relation to the occipital artery after passing above an aponeurotic sling (immediately medial to the occipital artery) (fig.8) ***(Nikas et al., 2001).***

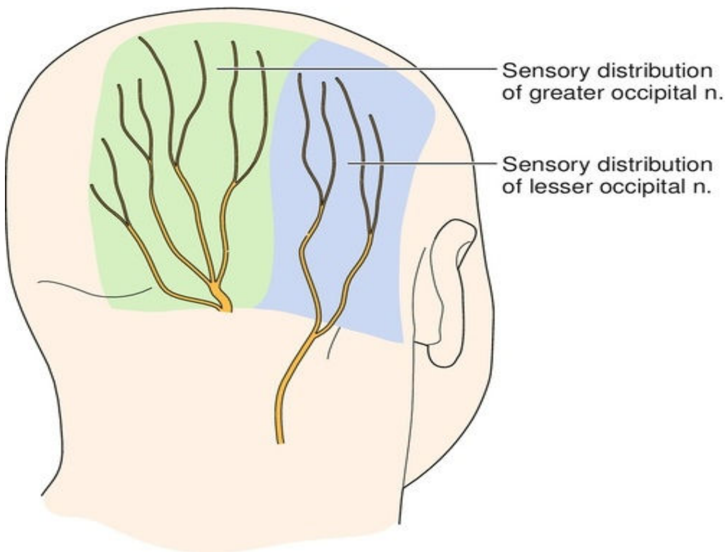

Fig. (8): Sensory distribution of greater occipital and lesser occipital nerves ***(Nikas et al., 2001).***

The lesser occipital nerve arises from the ventral rami of the C2 and C3 spinal nerves to carry sensation from the skin of the scalp just behind the auricle (fig.8) ***(Cousins and Bridenbaugh, 1998).***

In summary, sensory innervation to the forehead and anterior scalp is supplied by the supraorbital and supratrochlear nerves, with temple sensory innervations provided by the auriculotemporal and zygomaticotemporal nerves. The posterior scalp principally gets its sensory nerve supply from the greater occipital nerve while the lesser occipital nerve carries sensations from the scalp skin behind the ear (fig. 9&10) ***(Baltimore, 1991).***

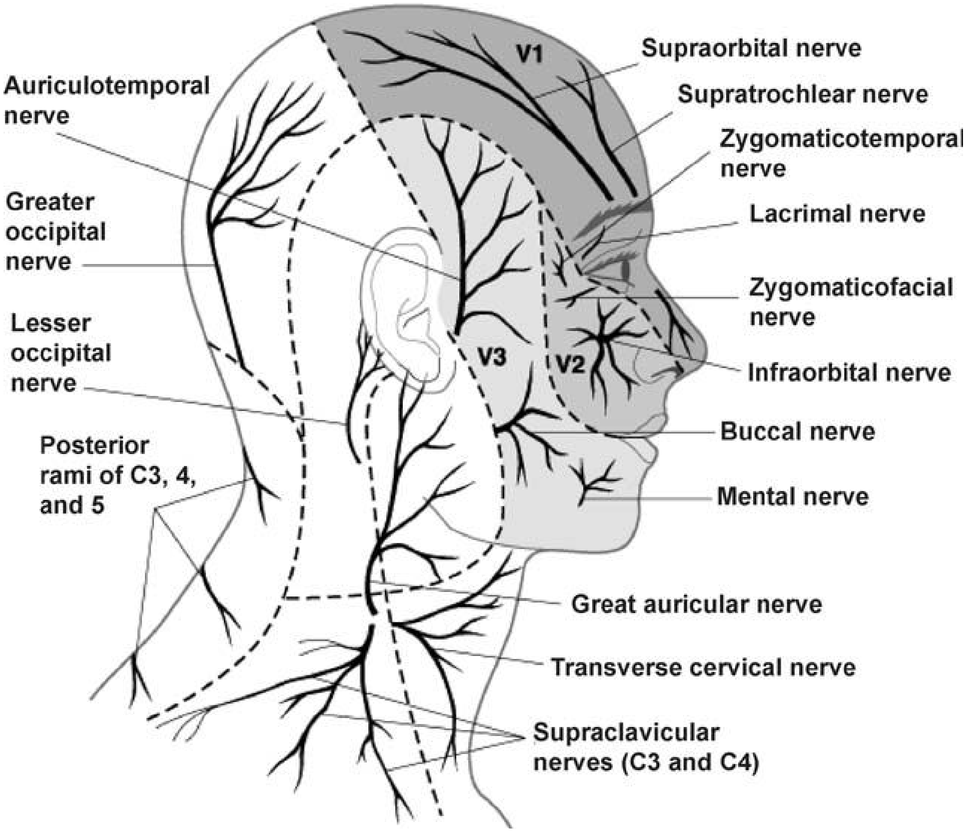

Fig. (9): Dermatomes of head and neck ***(Lalwani, 2003).***

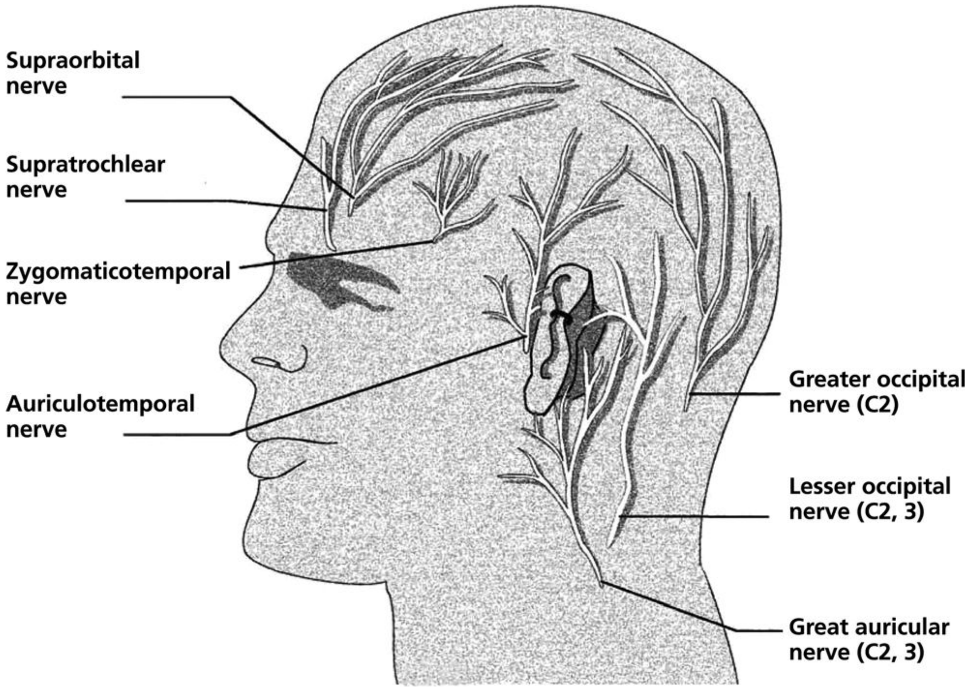

Fig. (10): Innervation of scalp ***(Lalwani, 2003).***

Motor Supply

The occipito-frontalis muscle with its two bellies is supplied by the facial nerve through its temporal and posterior auricular branches (fig.11) ***(Agur et al., 1991).***

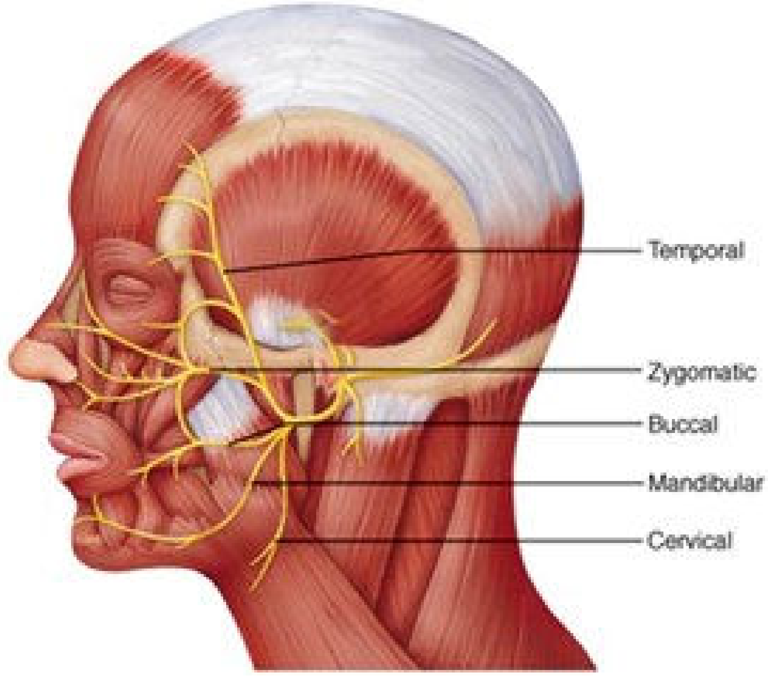

Fig. (11): Distribution of facial nerve ***(Marieb and Hoehn, 2016).***

Arterial Supply

The scalp has a rich vascular supply receiving vascular contribution from the internal and external carotid arteries.

From the midline anteriorly, the arteries present as follows (fig.12):

- **Supratrochlear artery & Supraorbital artery:** branches of the ophthalmic artery (a branch of the internal carotid artery). These arteries accompany the corresponding nerves.
- **Superficial temporal artery:** terminal branch of the external carotid artery travels with the auriculotemporal nerve.

- **Posterior auricular artery:** branch of the external carotid artery.

- **Occipital artery:** a branch of the external carotid artery; it is accompanied by the greater occipital nerve.

(Snell, 1995)

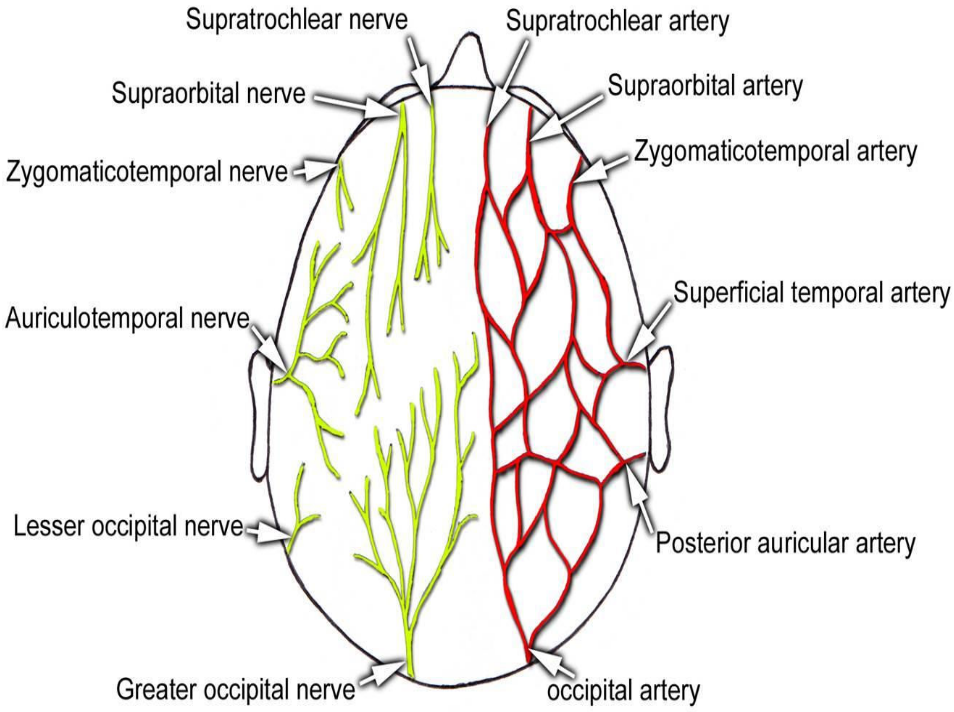

Fig. (12): Sensory innervation and arterial supply of the scalp ***(Snell, 1995).***