Variations in Emergence and Course of the Inferior Palpebral Nerve

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Abstract

Comprehensive understanding of the anatomy of the inferior palpebral (IP) nerve is crucial to preservation of sensation in the inferior eyelid and conjunctiva. Iatrogenic injuries may occur during blepharoplasty, repair of orbitozygomatic fracture and other maxillofacial surgeries involving this region. Although several studies depict the anatomical variations of the main infraorbital nerve (ION), little information exclusive to the IP nerve exists. This study provides information on the additional variations of the ION with reference to the IP nerve. The study was performed on 84 IP nerves by dissection of 42 formalin-fixed cadavers from the laboratory of topographic anatomy, Department of Human Anatomy, University of Nairobi, Kenya. Each of the nerves were exposed at the emergence and followed to their termination. Variations encountered involved emergence, course, and even absence. Variant emergence was through an accessory infraorbital foramen, an infraorbital notch, and as a common trunk with the external nasal nerve. This nerve shows high anatomical variability that may account for the difficulties and complications encountered in clinical interventions. It is believed that this information will improve clinical management of conditions affecting the region of distribution of the IP nerve.

Keywords

- inferior palpebral nerve
- infraorbital foramen
- distribution
- accessory foramen

The inferior palpebral (IP) nerve is the smallest branch of the infraorbital nerve (ION) and supplies cutaneous innervation to the inferior eyelid and the conjunctiva.¹ It normally branches within the infraorbital canal before emerging through the infraorbital foramen (IOF).^{2,3} It then courses superolaterally in relation to the IOF to its region of distribution.⁴

Reported variations of the IP nerve include partial innervation of the inferior eyelid, emergence through accessory IOF, and bifid anatomy.⁵ The frequencies of occurrence of some of these variations are unknown.

As part of the entire ION complex, IP nerve is often involved in pain syndromes of the face.⁶ Traumatic injuries to this nerve may be occasioned by orbitozygomatic complex fracture⁷ or deep lacerations whereas iatrogenic injuries may occur during maxillofacial surgery.⁸ The aim of this study was to describe the precise pattern and distribution of the nerve

to highlight the aberrations that may influence the outcome of clinical interventions.

Materials and Methods

This study was performed on 84 IP nerves by dissection of the faces of 42 formalin-fixed cadavers from the laboratory of topographic anatomy, Department of Human Anatomy, University of Nairobi, Kenya. These included cadavers without facial malformations, injury, or evidence of surgical operation in the midface.

The point of emergence of the ION was determined by dissection and its branches were exposed. The course of the IP nerve was defined through meticulous dissection. The position of emergence of the IP nerve was recorded as either infraorbital and accessory infraorbital or other foramina. If

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Figure 1 Patterns of emergence expressed as percentage of the total sample. Note that the aberrant patterns occurred in nearly a half of all the nerves studied.

the nerve emerged other than from the IOF, its relationship with the IOF was determined followed by the course toward its termination. When the nerve emerged from an accessory foramen the bone was drilled to confirm that it branched from the ION within the infraorbital canal. All instances of aberrant emergence were investigated further through wide dissection to confirm the branching point and exclude the possibility of the nerve being absent. Other features of the IP nerve investigated were its relationship with the other branches of the ION including common trunks and postemergence fusion.

Results

The normal course superolaterally relative to the IOF was noted in 34 nerves (40.48%). The classical emergence from the IOF occurred in 44 nerves (52.4%), while the rest emerged from an accessory IOF, and a few from an infraorbital notch (►Fig. 1). Variations encountered were categorized into those involving its emergence, course, or a complete absence of the nerve.

Variation in Emergence

Emergence from an accessory IOF was noted in 30 (35.71%) nerves. All nerves from an accessory foramen were superomedial to the IOF and as such entered into the inferior eyelid medially. Their distance from the IOF was highly variable (►Fig. 2A, B).

Emergence from an infraorbital notch was noted in 10 (11.9%) nerves (►Fig. 2C, D). These had a brief short extraosseous course before entering the inferior eyelid. Some of these nerves were noted to course in the orbital floor before emerging through a notch in the elevation of the infraorbital rim (margin). The ends of the notch were connected by fibrous tissue which ran over the nerve. In keeping with the emergence from accessory infraorbital foramina, the nerves traversing the notch all lay superomedial to the IOF.

A further variation in emergence was a common trunk with the external nasal nerve which occurred in 4.76% (►Fig. 3). This trunk ran medially for approximately 8 to 9 mm from the IOF before bifurcating into the IP nerve

Figure 2 Variant positions of emergence of the inferior palpebral (IP) nerve. (A, B) Show the emergence from an accessory foramen (red arrows). The red arrows are used to highlight the difference in their proximity to the infraorbital foramen. (C) The IP nerve emerging from an IOF (arrow) had a very brief course before terminating in the inferior eyelid. (D) The IP nerve has been removed to reveal the notch on the infraorbital margin.

Figure 3 Emergence as a common trunk with the external nasal nerve. The trunk had a short and variable course before bifurcating into the two nerves. The IP nerve did not emerge from the IOF independently as should have been. Instead, one big branch of ION emerged and then divided into the IP and EN nerves. Since the IP and EN are normally independent branches of the ION, the big branch from which they both arise is termed here as a trunk. This is the term used by anatomist to refer to a structure which constitutes two structurally and functionally independent structure. EN, external nasal nerve; IP, inferior palpebral nerve.

running superiorly to the inferior eyelid and the external nasal nerve which had a short oblique course before entering the ala of the nose. There were no cases of multiple IP nerves.

Variations in the Course

A variant superomedial course of the IP nerve relative to the IOF (►Fig. 4A, B) was noted in the majority of nerves (59.52%). Twenty (23.8%) nerves emerged from the IOF while the rest emerged from the accessory foramen or the infraorbital notch.

Intraosseous Canal

In two cases, the nerve had a short superomedial course before entering an osseous canal from which it emerged via a foramen just medial to the medial canthus to penetrate into the IP (►Fig. 4B).

Discussion

Reports on studies on dry skulls show that accessory IOF are a common occurrence.⁹ Results from this study has shown that the IP nerve may commonly traverse one of these accessory foramina. It is noteworthy that despite the presence of multiple accessory IOF, there were no cases of multiple or even bifid IP nerves unlike previously reported.⁵ This study has also revealed the existence of an infraorbital notch, a hitherto unreported finding. These aberrant patterns of emergence may significantly reduce the success of ION block in the area of distribution of the nerve. These findings may suggest that the consideration of a separate IP nerve block be made in procedures exclusive to the inferior eyelid such as blepharoplasty. If this were to

Figure 4 Illustration of aberrant course patterns. (A) Shows the nerve emerging from the infraorbital foramen (IOF) but running superomedially toward the lower eyelid. (B) The nerve ran superomedially from the IOF then entered an osseous canal (arrow). The extent of the canal is visible in the red background formed by the inferior palpebral (IP) vessels which accompanied the IP nerve within the canal. It emerged from an accessory foramen medial to the medial canthus (asterisk) to enter into the lower eyelid. LC, lateral canthus; MC, medial canthus.

be done, extreme caution is recommended in view of the variable distance from the IOF and the close proximity to the orbit. An important observation is that all the variant positions of emergence occurred medial to the IOF and this was in keeping with previous reports indicating tendency of the nerve to be located more medially.⁵ This and in addition to the present findings may imply that the area lateral to the IOF may be a safer point for surgical incision than the medial side.

While fusion of the nasal nerves has been described,⁵ a common emergence between the inferior eyelid and external nasal nerves has not. Majority of the nerves in this study exhibited a variant superomedial course. This occurred when the nerve had a classical emergence from the IOF and in all cases of aberrant emergence from an accessory foramen or infraorbital notch. A superomedially coursing IP nerve has been reported⁵ but with a much lower frequency. While the higher frequency observed in this study may be a result of the sample size, there exists a possibility that this variation is the predominant pattern in the general population. Maxillofacial surgeons need to be aware of this variant course as the nerve is at increased risk of injury during surgery as medial incisions including the Weber Ferguson are done more frequently to avoid injuring the IP and zygomaticofacial nerves on the lateral aspect.¹⁰

Conclusion

This study has demonstrated that the IP nerve has a high anatomical variability that may account for the difficulties and complications encountered in clinical interventions. It is

believed that this information will improve clinical management of conditions affecting the region of distribution nerve of the IP nerve as well as in surgical interventions.

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