Topography and branching pattern of the infraorbital nerve

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Topography and branching pattern of the infraorbital nerve

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ABSTRACT

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The infraorbital nerve (ION) is the terminal branch of the maxillary nerve and supplies the skin and mucous membrane of the middle portion of the face. This nerve is vulnerable to such surgical procedures as removal of tumor on the upper jaw, maxillary resection and deep injuries as the orbitozygomatic complex fractures. Severe pain and loss of sense are noted on patients whose ION were entirely or partially lost after such procedures. But, there are few researches concerning the topography of this nerve. For this reason, we performed this study through dissection of 43 hemifaces of Korean cadavers.

In most cases, the infraorbital artery (IOA) was located at the middle (73.8%) and superficial layer (73.8%) when exiting the infraorbital canal. The inferior palpebral branch was the smallest branch of ION, was generally bifurcated (58.1%), and showed cases that only gave off either the medial (27.9%) or the lateral (14.0%) branch. The internal nasal branch, while it almost always appeared in all specimens, ran superior to the depressor septi muscle, along the ala of the nose, and supplied the skin of the philtrum and gave off terminal branch to supply the nasal septum and the vestibule of the nose. The external nasal branch was distributed in diverse patterns ranging between the root and the ala of the nose. Most commonly, the nerve supplied the inferior 4/5 portion of the nose (39.0%). The superior labial branch was the largest and numerous of ION. These branches were sorted into the medial and lateral branches according to the area it is distributed. As the branching patterns of the external, internal nasal branch and the anterior, posterior branch of superior labial branch, we classified four types. Type I, where all four branches are separated was most frequent (42.1%).

These studies will help to preserve ION while performing such maxillofacial surgeries as removal of tumor on the upper jaw, fracture of the upper jaw and rhinoplasty.

Key words: infraorbital nerve, infraorbital space, internal nasal branch, distribution area

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I. INTRODUCTION

The infraorbital nerve (ION), one that is entirely sensory, is the terminal branch of the maxillary nerve, the second division of the trigeminal nerve. This nerve supplies the skin and mucous membrane of the middle portion of the face that is derived from the maxillary prominence of embryonic period (Moore 2003), When it emerges onto the face through the infraorbital foramen, it divides into the inferior palpebral, lateral nasal, and superior labial branches. The inferior palpebral branches supply the skin and the conjunctiva of the lower eyelid, lateral nasal branches, skin over the lateral aspect of the external nose, and superior labial branches, skin over the cheek and upper lip, and the related oral mucosa (Woodburne 1994, Moore 1999, Standring *et al.* 2005).

ION is vulnerable to such surgical procedures as the removal of tumor on the upper jaw, maxillary resection, laser in situ keratomileusis (LASIK) and zygomaticomaxillary cheek pedicled flap (Gianni *et al.* 1995, Wolford *et al.* 1995, McCulley *et al.* 2002, Ohki and Takeuchi 2002). Severe pain and loss of sense are noted on patients whose infraorbital nerves were entirely or partially lost after such procedures. On the case of craniomaxillofacial bone injury, most frequently it occurs in the form of orbitozygomatic complex fracture. In such cases, mostly patients experience ION damage and experience anesthesia, hypoesthesia, or paresthesia on the infraorbital area (Zingg *et al.* 1992). The reason for the nerve impair is due to its vicinity of orbitozygomatic complex as it passes through the infraorbital sulcus in the floor of the orbit to exit through the infraorbital foramen and the protrusion of the infraorbital nerve into fracture line (Kristensen and Tveteras 1986, Jungell and Lindqvist 1987, Vriens and Moos 1995, Vriens *et al.* 1998). Recently, efforts have been given to save ION in operations of middle portion of the face (Peltomaa and Rihkanen 2000).

It has been suggested that bilateral infraorbital nerve block is the local anesthetic technique of choice for early repair of cleft lip, repair of facial lacerations, rhinoplasty, and endoscopic endonsal maxillary sinus surgery (Maravolo *et al.* 1991, Nicodemus *et al.* 1991, Lynch *et al.* 1994, Bösenberg and Kimble 1995, Mayer *et al.* 1997, Prabhu *et al.* 1999, Higashizawa and Kosa 2001). In anesthesia of these surgeries, the distribution area of the infraorbital nerve is very important to predict anesthetic area and area of the pain relief.

Although the knowledge of precise topography and distribution area of the infraorbital nerve need the preservation of cutaneous senses and precise anesthesia, there are only few publications concerning the topographic anatomy of the nerve. For this reason, we performed this study to elucidate the course it travels on the face, the extent to which it is distributed, and its anatomic relations to surrounding structures.

II. MATERIALS AND METHODS

The observations were made on ION from 43 hemifaces (male:26, female:17) of embalmed Korean cadavers, mean age 64.6 (32 to 101 age). To study the precise course it runs and the extent to which it innervates, cadavers that didn't have any history of trauma or surgical procedures on the middle portion of the face were used.

After the dissection of the whole dermal layer was carried out, the orbicularis oculi and levator labii superioris muscles were exposed. The lower portion of the orbicularis oculi muscle was then elevated, and the origin of the levator labii superioris muscle was snipped off to unveil the infraorbital foramen, and ION and the infraorbital artery (IOA) that travel through it. The observed items were as follows.

a. The relations between the ION and the IOA : At the site, where ION and IOA exit into the face through infraorbital foramen, the relative position of the nerve and the artery was observed, horizontally and vertically.

b. The traveling and distribution patterns of the inferior palpebral branch (fig. 1) : Based on the orbicularis oculi muscle, the area of the inferior eyelid was divided horizontally into three regions to observe precise extent that the inferior palpebral branch distributes and to observe its branching pattern.

c. The running and distribution patterns of the internal nasal branch : As the internal nasal branches exit through the infraorbital foramen and travel into the nasal septum, their path and the patterns of its distribution were studied.

d. The distribution patterns of the external nasal branch (fig. 2) : The area between the root and the ala of the nose was divided into five regions to study the distributing patterns of the external nasal branch.

e. The distribution patterns of the superior labial branch (fig. 3) : Based on center region of the upper lip, the ala of the nose, and the mouth coprner, superior labial area was divided into three regions to study the innervation of the superior labial branch.

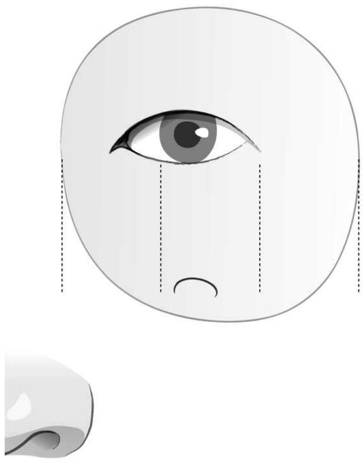

Figure 1. Based on the orbicularis oculi muscle, the area of the inferior eyelid was divided horizontally into three regions.

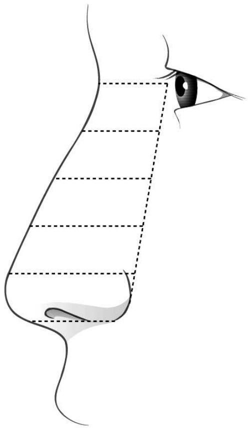

Figure 2. The area between the root and the ala of the nose was divided into five regions.

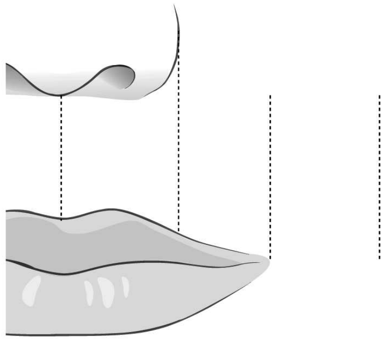

Figure 3. Based on center region of the upper lip, the ala of the nose, and the mouth corner, superior labial area was divided into three regions.

f. the relations between the external nasal, internal nasal, and medial and lateral branch of the superior labial branches (Fig. 4) : At the site of emergence of the infraorbital nerve through the infraorbital foramen, the infraorbital nerve was observed of its branching patterns of the external, internal nasal branches, and the medial, lateral branches of its superior labial branch. The patterns were classified into four types.

type Ⅰ: all four branches were separated from each other at the inferior orbital foramen.

type Ⅱ: the external and internal nasal branches were separated while the medial, lateral branches of the superior labial branch were fused.

type Ⅲ: the external and internal nasal branches were fused while the medial and lateral branches of the superior labial branch were separated.

type Ⅳ: the external and internal nasal branches were fused, and the medial and lateral branches of the superior labial branch were also fused.

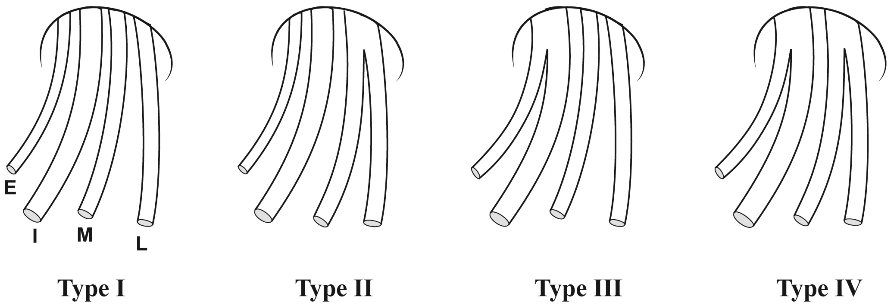

Figure 4. The branching patterns of ION. E, external nasal branch; I, internal nasal branch; M, medial branch of the superior labial branch; L, lateral branch of the superior labial branch.

g. the infraorbital component that passes through accessory infraorbital foramen : Observations were made on the existence of the accessory infraorbital foramen and its components.

III. RESULTS

When ION exits the infraorbital foramen, it divided into many different nerves that could be classified into five branches.; The inferior palpebral branch innervated the skin of the inferior eyelid and the conjunctiva. The external nasal branch innervated the skin of the lateral surface of the nose. The internal nasal branch innervated the nasal septum and its vestibule. The medial branch of the superior labial branch innervated the skin on the center portion of the upper lip and its mucosa. The lateral branch of the superior labial branch innervated the skin of the lateral side of the upper lip and its mucosa (Fig. 5). The many branches of ION are complexly entangled in the infraorbital space, or the canine space. The upper corner of the canine space is bounded on the origin of the lavator labii superioris muscle, the lower corner on the orbicularis oris muscle, the lateral corner on the levator anguli oris muscle, and the medial corner on the levator labii superioris alaeque nasi muscle (Fig. 6). Also, because the branches of ION are observed to descend vertically while those of the facial nerve (FN) transverse horizontally in the canine space, The nerves in this space were named as the infraorbital nerve plexus (Fig. 7).

In most cases, IOA was located at the middle of the infraorbital nerve and foramen when exiting the infraorbital canal (31/42, 73.8%). There were cases where it was lateral and medial location of ION in 19.1% (8/42) and 7.1% (3/42), respectively (Fig. 8). Also, IOA was mostly superficial layer (31/42, 73.8%) to ION, and there were cases where it was middle layer (7/42, 16.7%) and deep layer (4/42, 9.5%) to the nerve (Fig. 9).

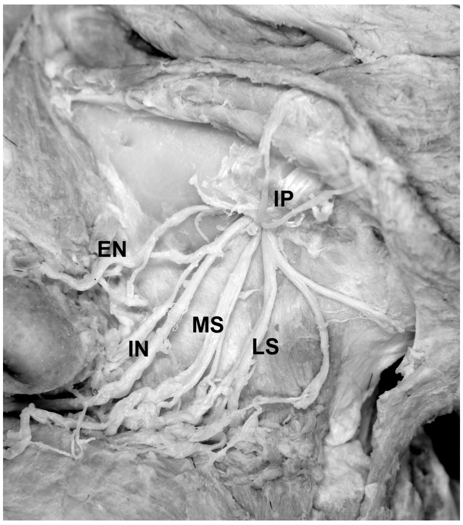

Figure 5. The general patterns of the infraorbital nerve. IP, inferior palphebral branch; EN, external nasal branch; IN, internal nasal branch; MS, medial branch of the superior labial branch; LS, lateral branch of the superior labial branch.

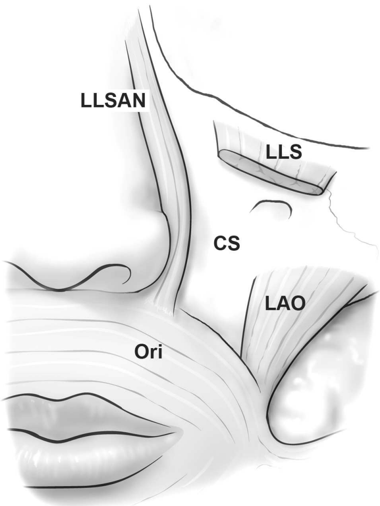

Figure 6. The canine space (CS). LLSAN, levator labii superioris alaque nasi muscle; LLS, levator labii superioris muscle; LAO, levator anguli oris muscle; Ori, orbicularis oris muscle.

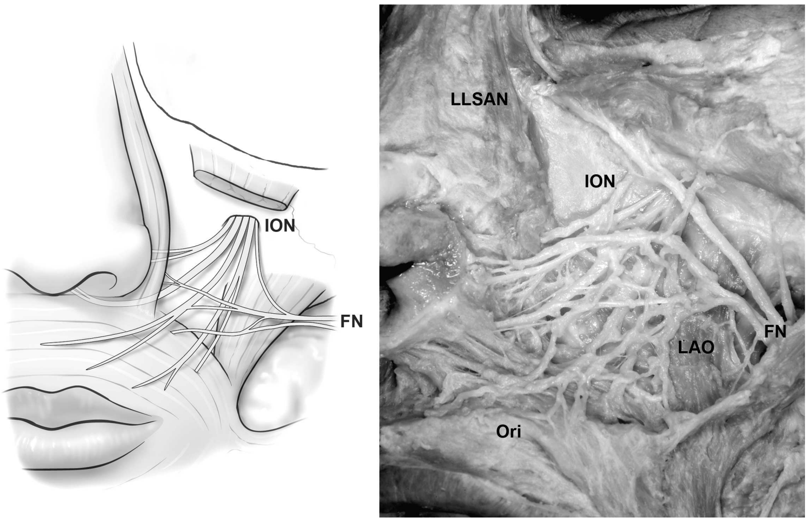

Figure 7. The infraorbital nerve plexus. ION, infraorbital nerve; FN, facial nerve.

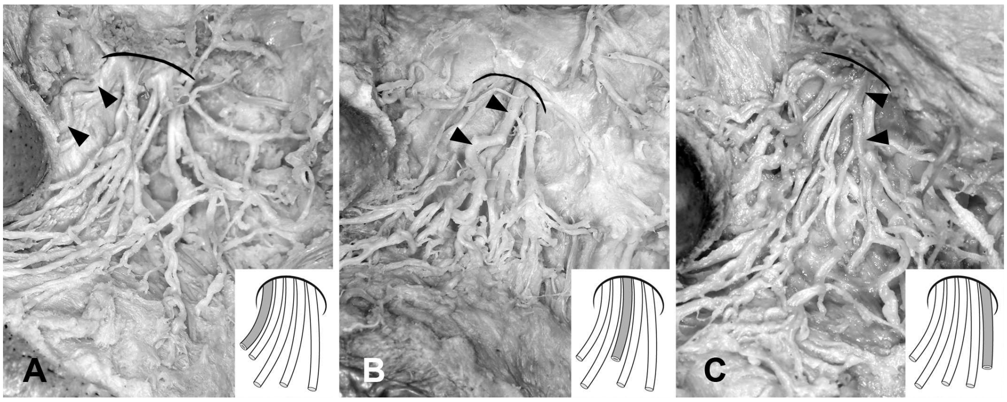

Figure 8. The horizontal relation with the infraorbital artery and the infraorbital nerve. The infraorbital artery was located at the medial (A), middle (B), lateral (C) of the infraorbital nerve and foramen when exiting the infraorbital canal. Arrowheads indicate the infraorbital artery. The black lines indicate superior margin of the infraorbital foramen.

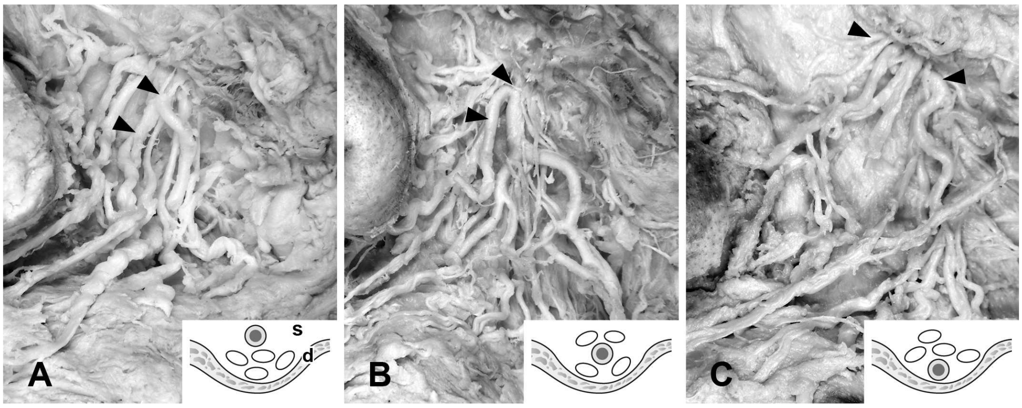

Figure 9. The vertical relation with the infraorbital artery and the infraorbital nerve. The infraorbital artery was located at the superficial layer (A), middle layer (B) and deep layer (C). Arrowheads indicate the infraorbital artery. s, superficial layer; d, deep layer.

The inferior palpebral branch was the smallest branch of ION. This nerve was generally bifurcated (58.1%), one medial and another lateral to the orbit, and showed cases that only gave off either the medial (27.9%) or the lateral (14.0%) branch (Fig. 10). In many cases, the inferior palpebral branch supplied the entire area of inferior eyelid (55.8%), but in 16.3%, it supplied only the medial 1/3 portion, in another 16.3%, the medial 2/3, and in 11.6%, the lateral 2/3 portion of the inferior eyelid (Fig. 11).

The internal nasal branch appeared in all cadaver specimens, which was surprising because it was rarely described in text books. The nerve exited the medial portion of the infraorbital foramen and descended down the face along the nose and around the ala of the nose and passed superficial to the depressor septi muscle. Finally, the nerve supplied the nasal septum and the vestibule of the nose (Fig. 12-A). But before the nerve supplied the nasal septum, in some cases it gave off branches to the skin of the philtrum (Fig. 12-B) and in others it gave off branches to the nasal septum and to the skin of the philtrum as it exit the infraorbital foramen (Fig. 12-C).

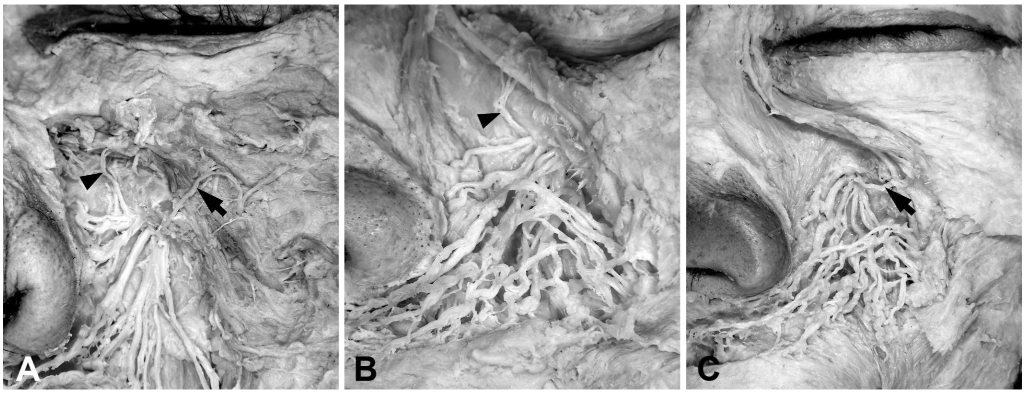

Figure 10. The patterns of the inferior palpebral nerve. (A) bidirectional branch, (B) medial branch, (C) lateral branch. Arrowheads indicate medial branch and arrows indicate lateral branch.

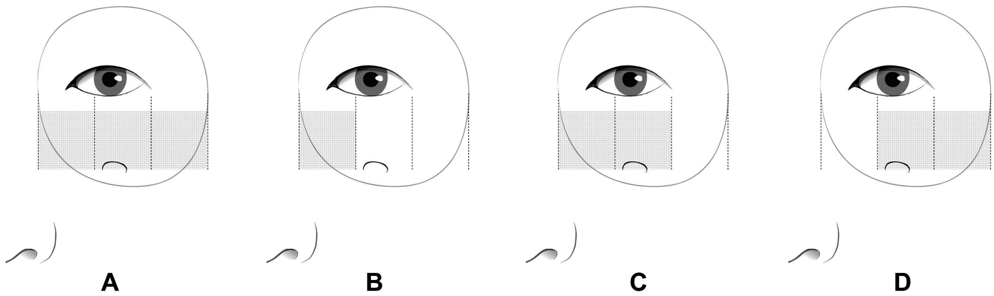

Figure 11. The distribution areas of the inferior palpebral nerve. (A) entire area of the inferior eyelid, (B) medial 1/3, (C) medial 2/3, and (D) lateral 2/3.

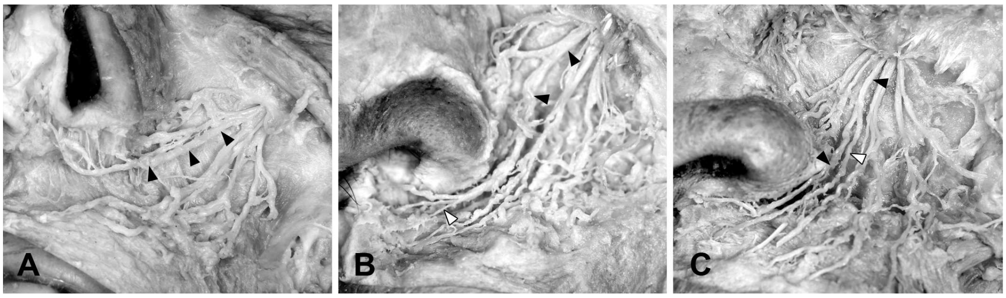

Figure 12. The course patterns of the internal nasal branch. The black arrowheads indicate the branch which distributes nasal septum and nasal vestibule. The white arrowheads indicate the branch which distributes skin of the philtrum.

The external nasal branch supplied the lateral skin of the nose, and was distributed diversely ranging from the root and to the ala of the nose. In 26.8% (11/41) the branch was found to supply from the ala and below (the inferior 2/5 portion of the nose) (Fig. 13-D), and in 22.0% (9/41) it supplied even wider, the inferior 3/5 portion of the nose (Fig. 13-C). Most commonly, the nerve supplied the inferior 4/5 portion of the nose (39.0%, 16/41) (Fig. 13-B), and in 12.2% (5/41) it was found to innervate the entire area from the ala to the root of the nose (Fig. 13-A).

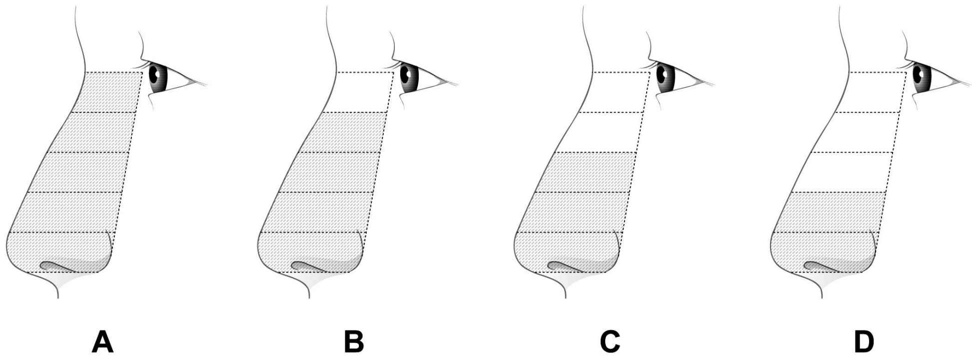

Figure 13. The distribution areas of the external nasal branch.

The superior labial branches were the largest and numerous of the terminal branch of the ION, and were distributed the most abundantly. The nerve supplied the skin and mucous membrane of the upper lip. In 25.6%, the nerve was distributed from the center of the lip to the mouth corner (Fig. 14-A) and in 74.4%, it went even further lateral to the mouth corner (Fig. 14-B). The branches of the superior labial branch were classified into the medial branches which were distributed center area and lateral branches which were distributed lateral area of the upper lip (Fig. 15). Also, in all cases, most lateral tiny branch to the lateral branches of the superior labial branches communicated with the zygomatic branch of the FN (Fig. 15).

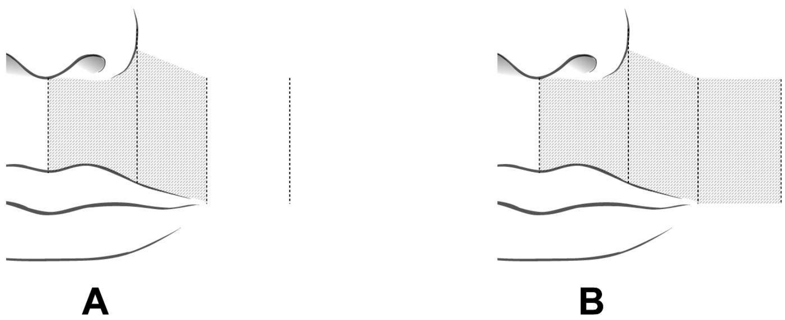

Figure 14. The distribution areas of the superior labial branch.

As the branching patterns of the external nasal, internal nasal branches, and the medial and lateral branches of superior labial branches, we classified into four types. Type Ⅰ, where all four branches are separated was found in 42.1%. Type Ⅱ, where two nasal branches are separated and two superior labial branches are merged was 21.1%. type Ⅲ, where only two branches of superior labial branch are separated was founded in 21.1%. The least case was type Ⅳ (15.7%), where two nasal branches and two superior labial branches were merged, respectively (Fig. 16).

The accessory infraorbital foramen was found in 6 cases (14%). The nerve component that exited through the accessory infraorbital foramen was observed to be either the inferior palpebral branch (3/43, 7.0%), or the external nasal branch (3/43, 7.0%)(Fig. 17).

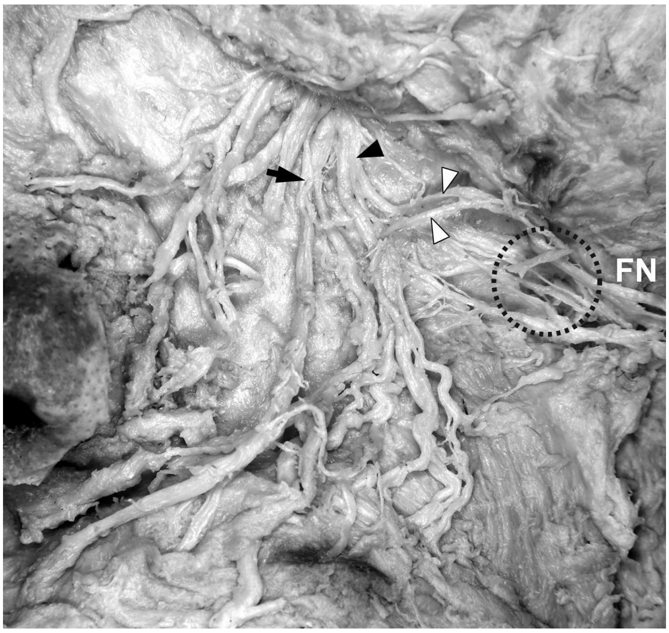

Figure 15. The communication with the infraorbital nerve and the facial nerve (FN). Arrow indicates medial branch of the superior labial branch. The black arrowhead indicates lateral branch of the superior labial branch. The white arrowheads indicate most lateral tiny branch most lateral to the lateral branches of the superior labial branches communicated with the zygomatic branch of the facial nerve. The dotted circle indicates the communication of the infraorbital nerve and the facial nerve.

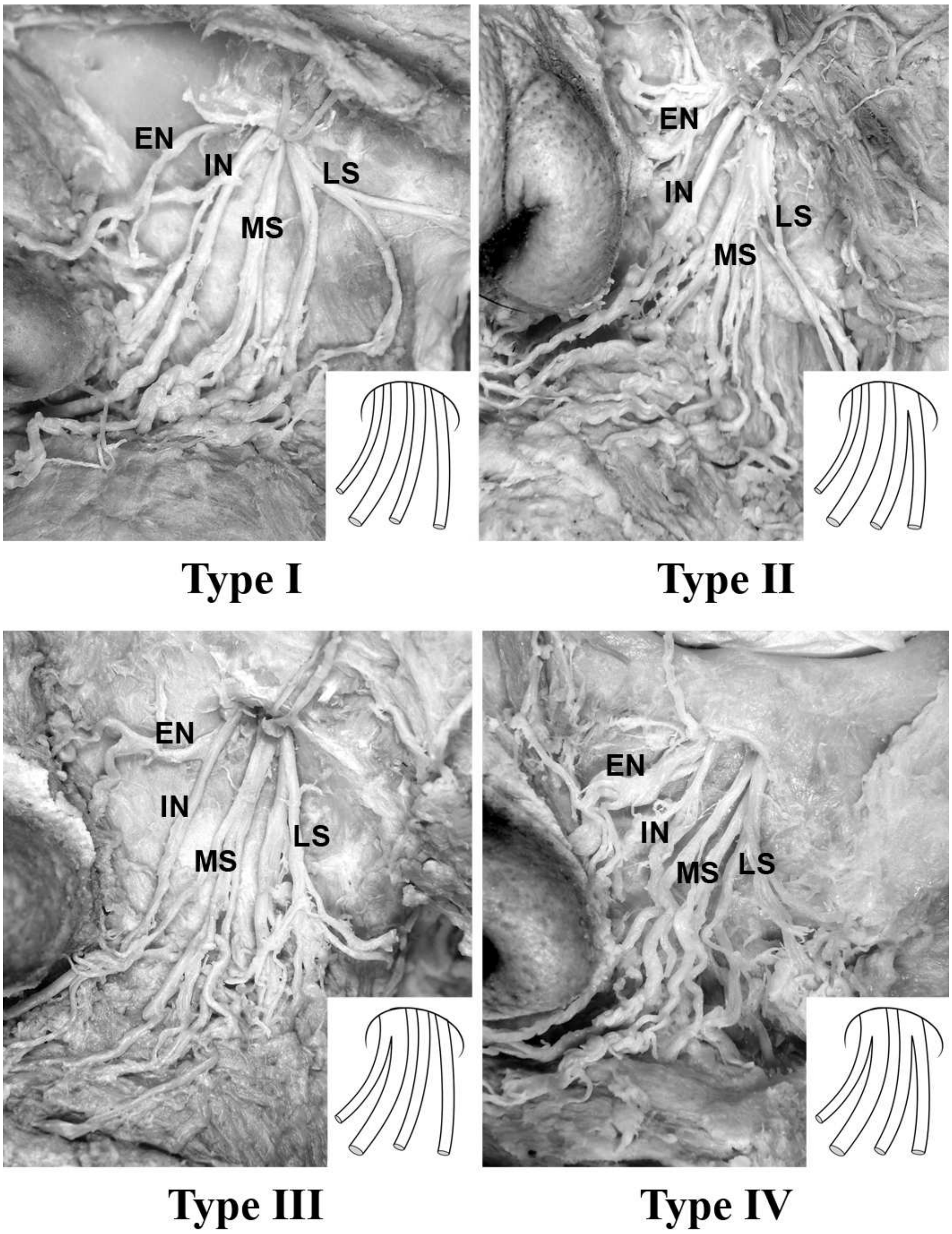

Figure 16. The branching pattern of the infraorbital nerve. IP, inferior palphebral branch; EN, external nasal branch; IN, internal nasal branch; MS, medial branch of the superior labial branch; LS, lateral branch of the superior labial branch.

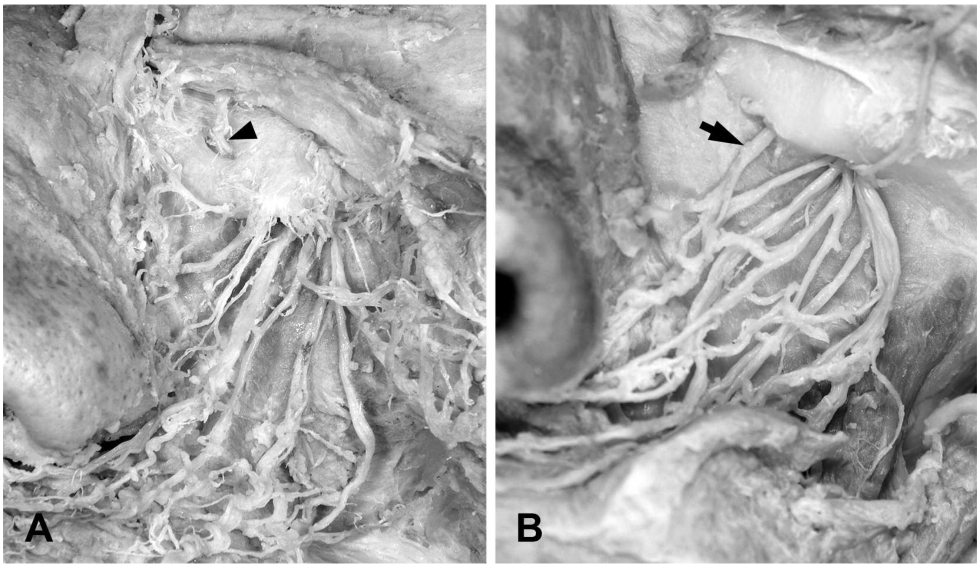

Figure 17. The accessory infraorbital foramen and the component of the nerve which exits through accessory infraorbital foramen. Arrowhead indicates inferior palpebral branch and arrow indicate external nasal branch.

In all cases, the parotid duct pierced through the maxillary portion of the buccinator to enter the oral cavity at the parotid papilla. Also, the external layer (tunica adventitia) of the parotid duct was continuous with the buccinator fascia (a part of the buccopharyngeal fascia).

Through the meticulous dissections, distinct small muscle fibers originating from the buccinator were extended into the external layer of the terminal portion of the parotid duct (Fig. 2). These muscle fibers were observed constantly in all cases and the length of the muscle fibers extending into the terminal portion of the parotid duct varied from 3 mm to 10 mm.

IV. DISCUSSION

Many anatomy text books simply sort the branches of ION into the inferior palpebral, external nasal, and superior labial branches, and describes them as entirely sensory nerves that innervate the middle portion of the face, and no more (Woodburne 1994, Moore 1999, Standring *et al.* 2005). Unlike the way many textbooks describe the branching pattern of ION as simple, its branches are hazardously entangled in the infraorbital area, and shows many variation in their distribution patterns. In addition, the Terminologia Anatomica classified the branches of ION into four branches (inferior palpebral, external nasal, internal nasal and superior labial branch) (FCAT 1998). In this study, the internal nasal branch was found in all samples. The internal nasal branch exited the medial portion of the infraorbital foramen and descended down the face along the nose and around the ala of the nose and passed superficial to the depressor septi muscle. Finally, the nerve supplied the nasal septum and the vestibule of the nose (Fig. 12). In some cases it gave off branches to innervate the skin of the philtrum before entering the nose to supply the nasal septum. Such internal nasal branch should be watched out when performing surgeries in the nasal area, especially when performing on the ala of the nose and the depressor septi muscle as does the rhinoplasty.

When ION exits the infraorbital foramen, all three branches excluding the inferior palpebral branch, runs downward. The infraorbital space (canine space) exists inferior to the infraorbital foramen, and ION that travels downward and the facial nerve that travels transversely formed infraorbital nerve plexus in here. The two nerves that from the infraorbital nerve plexus either met or just crossed over the other and were entangled hazardously. The infraorbital space is vulnerable to orbitozygomatic complex fracture, such surgical procedures as the resection of maxillary tumor and maxillary dissection because it is located at the center of the face. On performing surgery of the middle face, the infraorbital nerve plexus should expecially be taken care of. In addition, in case of severe odontogenic infection, the spreading of the infection commonly occurs in this space (Al-Belasy and Hairam 2003). The infraorbital space is bounded medially on the levator labii superioris alaque nasi muscle, laterally the levator auguli oris muscle, and its superior margin on the origin of the levator labii superioris muscle, and its inferior margin on the orbicularis oris muscle. The space was covered by the levator labii superioris muscle. Thus in case of surgeries, each boundary should be marked when reaching this space to preserve the infraorbital nerve plexus.

In case of maxillary surgery or anesthesia ION, it is important to know the precise area ION distributes to predict area of anesthesia and to find the damaged area. Branches of ION distributed a wide range. Hwang *et al.* (2004) described and marked the distribution of ION in numeric values, but because each people have heads of different sizes, it would be more helpful to surgical procedures if marked in ratio. The inferior palpebral branch was most commonly found to supply the entire area of the inferior eyelid (55.8%), and most rarely was found to supply only the lateral portion (11.6%). Such pattern is closely related to the branching pattern of the inferior palpebral branch. In 58.1%, most commonly the inferior palpebral branch divided into two smaller branches that run bilaterally, and least commonly had only a lateral branch (14.0%). When it only had the lateral branch, the external nasal branch compensated for the absence of the medial branch, and when it only had the medial branch, the zygomaticofacial branch of the maxillary nerve compensated for the absence of the lateral branch and innervated the area instead.

In 39.0%, most commonly the external nasal branch supplied the inferior 4/5 portion of the nose, and in 5 cases it supplied the entire nasal area. This was so when the medial branch of the inferior palpebral branch was absent. Also, when the external nasal branch supplied only the inferior 2/5 or 3/5 of the nose, the medial branch of the inferior palpebral branch extended to the skin of the root of the nose. The superior labial branch distributed most widely of the four branches of ION, and according to the area it supplies, its branches could be classified into two distinct branches; medial branch and lateral branch (Fig. 5, 15). Most frequently (74.4%) it supplied from the middle of the upper lip to the lateral portion of the mouth corner. The medial branch ran toward the center of the upper lip and when it reached the center it perforated into the skin and mucosa of the lip. There were no cases where the left and right medial branches met or innervated other side. In the case of facial arteries that supply the upper lip, if one of the one branch was dominant to the other, the dominant artery suppilied other side unlike nerve (Koh *et al.* 2003). This is due to their difference in development. The maxilla is formed by the fusion of the two maxillary prominences of the first pharyngeal arch, but because the distribution of the maxillary nerve is already done before the fusion, nerve of one side of the face would not innervate the other side even after the fusion has occurred. In all cadavers there was most lateral small branch to the lateral branch of the superior labial branch. This branch always communicated with the zygomatic branch of the maxillary nerve. Hwang *et al.* (2004) described the infraorbital plexus as the site where FN and ION communicated. A hazardous zone of infraorbital plexus is found in a circle 36 ㎜ in diameter. Its center is located 22 ㎜ below the infraorbital foramen. Although the facial and maxillary nerves met in the infraorbital plexus, this had occurred between the external nasal branch and FN or between the superior labial branch and FN. The communication site found in this study was not only the infraorbital plexus but also the lateral side of the face. In all cases the lateral branch of the superior labial branch gave off a small independent unit to run lateral and communicate with FN. Like the way ION and the zygomatic branch communicated, there are many reported cases where the sensory nerve of the trigeminal nerve and the motor nerve of FN communicated; the auriculotemporal nerve and the facial nerve trunk, the zygomaticotemporal nerve and the temporal branch, tge zygomaticofacial nerve and the zygomatic branch, the infratrochlear nerve and the zygomatic branch, the buccal nerve and the buccal branch, the mental nerve and the marginal mandibular branch. However, the function of these communications between the sensory and motor nerves is not yet to be known. I guess that function of the sensory nerve is proprioception of the muscle.

Studying the location of the artery in relations to the nerve when exiting the infraorbital foramen, Kazkayasi *et al.* (2003) described the artery to be always medial-superior to the nerve, a result that contrast to ours. In this study, IOA was mainly superficial-middle to ION, and showed other various patterns.; deep, medial, lateral to the nerve, or even mixed. This difference is thought to have occurred due to the use of small number (20 cases) of specimens.

The incidence of the accessory infraorbital foramen was 14.0%. This incidences reported are various from 2.2% to 18.2% depending on the researcher (Berry 1975, Canan *et al.* 1975, Hindy and Abdel-Raouf 1993, Leo *et al.* 1995, Aziz *et al.* 2000, Kazkayasi *et al.* 2001). This accessory foramen was always medial-superior to the main foramen in this study. However, Kadanoff *et al.* (1970) classified the location of the accessory foramen into six various types, and Leo *et al.* (1995) included the medial-superior location and had seven classifications. Our accessory foramens could not classified into the six types of Kadanoff *et al.* (1970), but were of the medial-superior position of Leo *et al.* (1995). The nerve components that exit through the accessory foramen were examined to be the inferior palpebral branch (7.0%) and the external nasal branch (7.0%). When the inferior palpebral branch exited through the accessory foramen, the medial branch of the inferior palpebral branch was missed. But, when it was the external nasal branch, it exited through all of accessory and main foramen.

The most frequently occurred branching pattern of ION was type I where all branches exit the foramen as separate branches (42.1%), and depending on its merging pattern it showed variances. However, such fusions always occurred between nasal branches, and between superior labial branches, and never between the nasal and labial branches. In addition, when the nerve exited the infraorbital foramen, the branches were always located from medial to lateral, external nasal, internal nasal branches, medial and lateral branches of the superior labial branch. Thus when this topographic relations of the nerves are well understood, I think that selective anesthesia of ION could be performed.

I think that these results will help to preserve ION while rhinoplasty, Caldwell-Luc operations, tumor surgery, reduction of the orbital floor and malar fracture and LeFort Ⅰ type osteotomy.

V. CONCLUSION

Unlike the way many textbooks describe the branching pattern of the infraorbital nerve as three branches, ION was classified into four branches (inferior palpebral, external nasal, internal nasal and superior labial branch). The internal nasal branch exited the medial portion of the infraorbital foramen and descended down the face along the nose and around the ala of the nose and passed superficial to the depressor septi muscle. Finally, the nerve supplied the nasal septum and the vestibule of the nose.

The branch of ION always communicated with the zygomatic branch of the maxillary nerve at not only infraorbital plexus but also lateral site of the face. In all cases the lateral branch of the superior labial branch gave off a small independent unit to run lateral and communicate with FN.

As the branching patterns of the external nasal, internal nasal branches, and the medial and lateral branches of the superior labial branches, ION was classified into four types. The most frequently occurred branching pattern of ION was type I where all branches exit the foramen as separate branches (42.1%), and depending on its merging pattern it showed variances.

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국문요약

눈확아래신경의 나뉨양상과 국소해부

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눈확아래신경은 삼차신경의 두 번째 가지인 위턱신경의 마지막 가지로 눈확아래구멍을 나와 아래눈꺼풀가지, 바깥코가지, 윗입술가지로 나뉜다. 눈확아래신경이 분포하는 부위는 얼굴의 중간부위 피부와 점막에 분포하며, 얼굴의 피부에 분포하는 신경 중 가장 넓게 분포한다. 눈확아래신경은 위턱의 종양제거, 위턱뼈 절개술, 눈확광대 복합골절 등의 수술을 할 때 제거되거나 일부 손실되어 얼굴의 심한 통증이나 감각상실 등을 일으킬 수 있다. 그러나, 눈확아래신경의 국소해부학적 관계는 잘 알려져 있지 않은 실정이다. 따라서, 본 연구는 눈확아래신경의 주행양상과 분포범위, 주위 구조와의 해부학적관계를 밝히기 위해 한국인 얼굴 43쪽 (남자: 26쪽, 64.6세. 여자: 17쪽, 71.4세)을 해부하여 다음과 같은 결과를 얻었다.

눈확아래구멍에서 눈확아래동맥은 구멍의 가운데에 (73.8%), 눈확아래신경의 얕은층에 위치한 경우 (73.8%)가 가장 많았다. 아래눈꺼풀가지는 눈확아래신경의 가지 중 가장 가늘었으며, 안쪽과 가쪽 양쪽으로 나뉜 경우 (58.1%), 안쪽가지만 있는 경우 (27.9%), 가쪽가지만 있는 경우 (14.0%) 순으로 나타났다. 속코가지는 대부분의 교과서에서 거의 언급되어 있지 않은 신

경이나, 언제나 나타나는 신경이다. 속코가지는 코중격내림근 위에서 콧방울을 감싸며 주행하여, 인중 부위의 피부에 분포하고, 마지막가지는 코중격과 코안뜰에 분포하는 양상을 보였다. 바깥코가지는 코뿌리에서 콧등까지 다양하게 분포하고 있었으며, 코중간에서 콧등까지 분포하는 경우 (39.0%)와 콧등에만 분포하는 경우 (26.8%)가 많았다. 윗입술가지는 눈확아래신경 중에서 가장 크고, 가장 많은 가지를 내었으며, 분포부위에 따라 안쪽가지와 가쪽가지로 나뉘었다. 앞가지는 윗입술의 정중부위에서 콧방울선까지의 피부와 입안점막에 분포하고 있었으며, 뒷가지는 입꼬리 가쪽의 피부와 입안점막까지 분포하고 있었다. 눈확아래신경을 바깥코가지, 속코가지, 윗입술가지의 안쪽가지와 가쪽가지의 나뉨양상에 따라 네 개의 유형으로 분류하였다. 네 개의 신경이 완전히 나뉜 Ⅰ유형이 42.1%로 가장 많이 나타났다.

이상의 결과는 위턱부위의 종양제거, 골절과 같은 수술이나 코성형수술을 할 경우, 눈확아래신경을 보존하는 데 도움을 줄 것으로 생각된다.

핵심되는 말: 눈확아래신경, 눈확아래공간, 속코가지, 분포영역