

pharyngeal examination of the patient and there was no missing tooth fragment, so it was considered that the foreign body sensation occurred secondary to a neurological block. In addition, the patient had significant hyperlacrimation, conjunctival hyperemia, mild ptosis, and enophthalmos only in the left eye, the pupils were isochoric, and the pupillary light reflex was bilaterally positive. The symptoms regressed in correlation with the regression of the block during two hours and completely disappeared at the 3rd hour (Figure 1). During this period, vital parameters remained stable.

Discussion

Various local or systemic complications could be seen after IANB. Complications include allergic reaction, local anesthetic systemic toxicity, intravascular injection, hematoma, neuropathy, block of the facial nerve and its branches, and needle breakage. Intravascular injection and hematoma development can occur secondary to vascular damage in the pterygoid plexus. In addition, in very

rare cases, Horner’s syndrome, ptosis, 4th, and 6th cranial nerve palsy, skin necrosis, visual field loss, blurred vision, and diplopia have been reported [2,3].

In Horner’s syndrome, flushing, ptosis, miosis, enophthalmos, and conjunctival hyperemia are observed [5]. The presence of several of the symptoms of Horner’s syndrome is defined as partial Horner’s syndrome [5]. Rare cases of Horner’s syndrome after IANB have been reported [2,3,6,7]. In a case report, it was considered that Horner’s syndrome developed due to stellate ganglion blockade with local anesthetic spread into the lateral pharyngeal spaces, and it was observed that hoarseness and dyspnea were also accompanied [7]. In other case reports, Horner’s syndrome was thought to develop due to ganglion ciliare block or internal carotid plexus block [3,6]. Since the symptoms in our case did not include all the symptoms of Horner’s syndrome, it was considered as partial Horner’s syndrome and it was thought that the carotid plexus was affected due to increased lacrimation. Due to obesity and the presence of a short-thick neck structure in the patient, it was thought that the fifth-grade dental student may have injected the local anesthetic solution back forward from the targeted injection site. In addition, it was considered that the local anesthetic agent may have reached the carotid plexus and associated neurological structures with undesired posterior and inferior spread secondary to a possible anatomical variation.

The carotid plexus originates from the superior cervical ganglion. One of its branches originating from the superior pole of the superior cervical ganglion is the external carotid plexus. The external carotid plexus surrounds the external carotid artery and its branches and contains postganglionic sympathetic fibers. While traveling along the maxillary artery, some filaments make a course with the inferior alveolar artery [5,8] (Figure 2).

Many different anatomical variations have been described in the course of the carotid plexus. As an anatomical variation, it has been reported that the branch leading to the superior laryngeal nerve (SLN) travels around the lingual artery and goes to the superior thyroidal artery as a separate branch [8]. In addition, different studies showed that the cutaneous branch of the external carotid plexus connects with the glossopharyngeal nerve along with the vagus nerve branches [9,10]. In another study conducted on animals, it was shown that the external carotid plexus originates from two nerve branches, and one of these branches travels in front of the external pharynx and eventually joins the external carotid plexus [11]. In the recent case, it was evaluated that the local anesthetic effect may have progressed into the carotid sheath and reached the carotid plexus through similar anatomical variations.

The external and internal carotid plexus provide sympathetic innervation to the pterygopalatine fossa. Neuronal conduction disorder in the cervical sympathetic trunk due to any reason causes Horner’s syndrome. The external

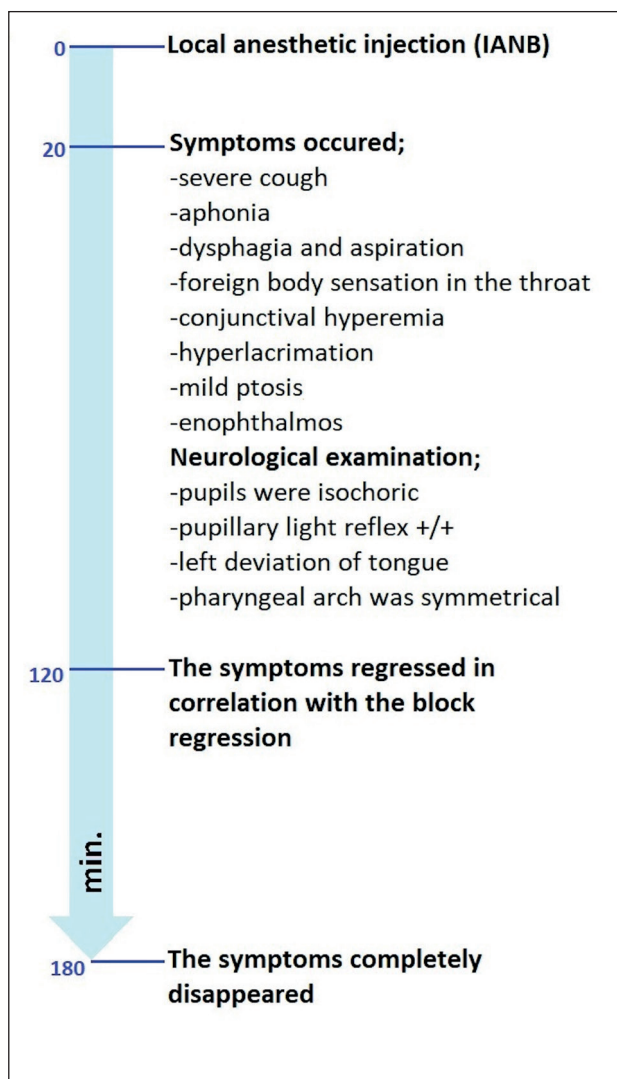


Figure 1. Timeline.

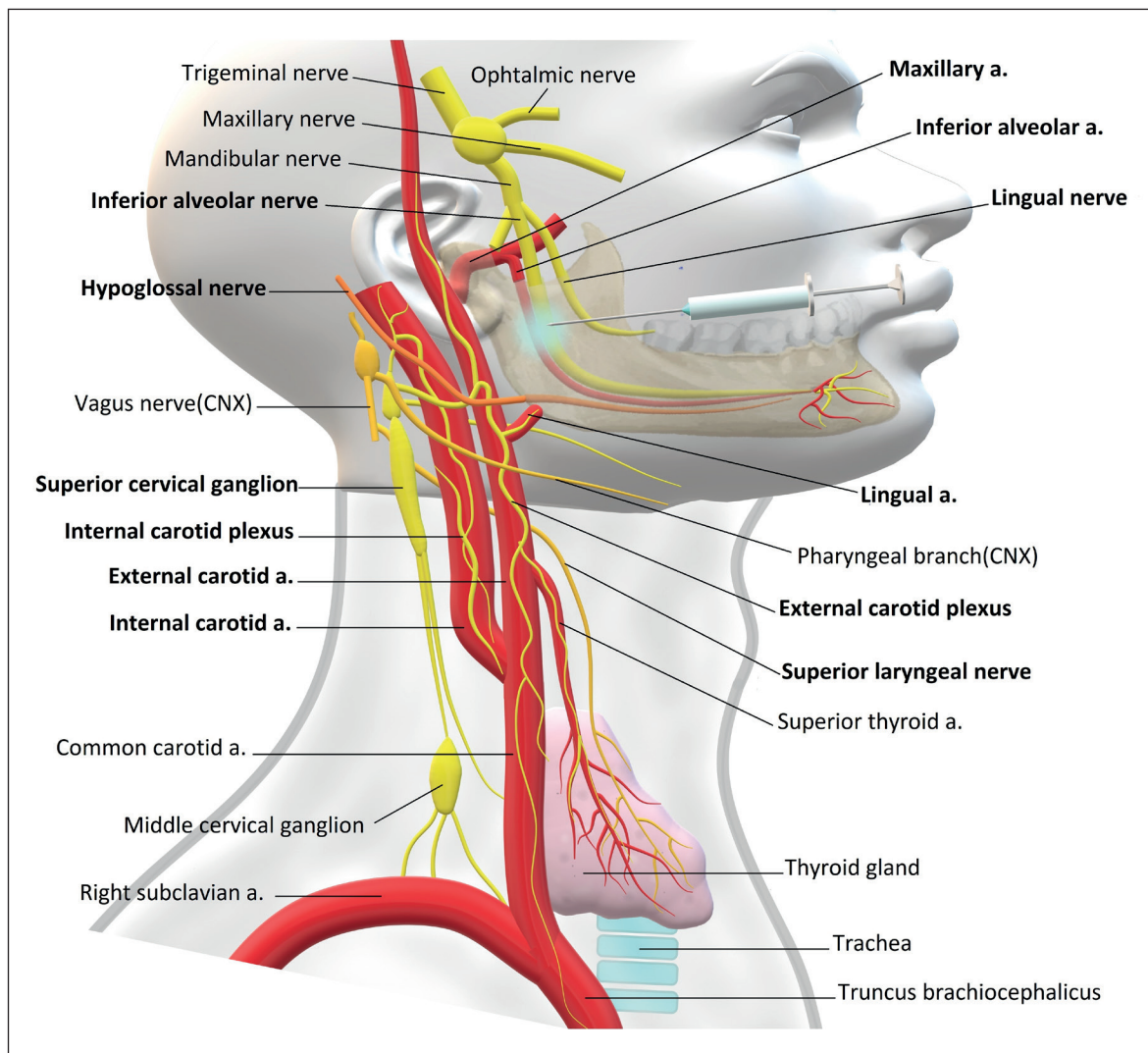


Figure 2. IANB injection site-associated nerves and carotid plexus.

carotid plexus is in close relationship with the sympathetic trunk, and it has been reported that partial Horner's syndrome could occur in case of mechanical tension or conduction disorder involving the external carotid plexus [5]. Similarly, schwannoma tumors typically originate from the internal carotid plexus and are extremely rare. It has been reported in the literature that partial Horner's syndrome developed after the removal of the tumor [12]. Another pathology that has been shown to develop due to carotid plexus dysfunction is cluster headache. In cluster headache, increased ocular lacrimation and conjunctival hyperemia develop due to autonomic dysfunction in the internal carotid plexus [13]. It was considered that partial ptosis, enophthalmos, and conjunctival hyperemia developed secondary to carotid plexus dysfunction in our patient, and these were defined as partial Horner's syndrome. Hyperlacrimation is thought to develop due to internal carotid plexus dysfunction, similar to the pathogenesis of cluster headache.

After unilateral paralysis of the internal branch of the SLN, dysphagia and foreign body sensation in the throat

may develop, resulting in the aspiration of oral contents [14]. It was evaluated that the reason for the foreign body sensation in the throat, dysphagia, and coughing with the aspiration of fluid and secretions during swallowing in our patient was SLN paralysis. A branch of the superior cervical ganglion anastomose with the SLN forms the superior thyroideal plexus [5]. One of the anatomical variations is the branch going to the SLN around the lingual artery [8]. Due to the presence of such a variation in our patient, it was thought that the branch leading to the SLN might have been affected as a result of the infiltration at the injection site. It was considered that carotid plexus dysfunction may have potentiated the SLN block. Dysphagia is also seen with glossopharyngeal nerve paralysis. However, because of the preserved bilateral pharyngeal arch symmetry in the recent case, glossopharyngeal nerve paralysis was excluded.

In a case report, left deviation of the tongue and hoarseness were reported with hypoglossal nerve and inferior laryngeal nerve paralysis after IANB [15]. Similarly, in our case, deviation of the tongue to the left and

development of aphonia indicate hypoglossal nerve and inferior laryngeal nerve paralysis. It was thought that the local anesthetic agent spread in the posterior region of the pharyngeal arch and blocks the hypoglossal nerve.

Partial Horner's syndrome, dysphagia, aphonia, and hyperlacrimation have not been reported after IANB in the literature, however, it should be considered that these complications may develop as a result of the carotid region being affected after the block. In the recent case, all complications disappeared in correlation with the regression of the block effect.

The limitation of our report was that neurological symptoms and signs could not be photographed due to the patient's agitation. After the symptoms disappeared completely, the patient calmed down and informed consent was obtained.

Conclusion

It was thought that there may be a relationship between the development of complications and obesity, a short thick neck structure, but comprehensive clinical studies are needed to reveal a concrete relationship. In patients with obesity and thick-short necks, the precise injection site for IANB should be determined more carefully. If the practitioner is a student or inexperienced, the procedure should be followed more closely, and the practitioner should be informed before the procedure against the risk of complications.

What is new?

In recent publications, cases of Horner's syndrome, hoarseness, and dysphagia as extremely rare complications of an IANB have been reported. However, partial Horner's syndrome, dysphagia, aphonia, and hyperlacrimation have not been reported after IANB in the literature.

List of Abbreviations

IANB	inferior alveolar nerve block
BMI	body mass index
SLN	superior laryngeal nerve

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this Case Report.

Funding

None.

Consent for publication

Written informed consent was obtained from the patient.

Ethical approval

Ethical approval is not required at our institution to publish an anonymous case report.

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Summary of the case

1	Patient (gender, age)	Male, 79-year-old
2	Final diagnosis	When the clinical symptoms were evaluated together after IANB, it was considered that neuronal blockade developed in the carotid plexus, nervus laryngeus superior and inferior.
3	Symptoms	Partial Horner's syndrome, hyperlacrimation, aphonia, dysphagia, severe cough, and foreign body sensation in the throat.
4	Medications (Generic)	The patient was monitored, and vital parameters were within normal limits. Therefore, the patient was monitored without any medication until the symptoms disappeared.
5	Clinical procedure	Application of inferior alveolar nerve block prior to the extraction of number #37
6	Specialty	Maxillofacial surgery, anesthesiology