Improvement of local anesthesia of the buccal region with taking into account the individual anatomical variability of its innervation

O Ya Mokryk
Danylo Halytsky Lviv National Medical University, Oblast, Ukraine

Abstract
The purpose of the study was improvement of local anesthesia of the buccal region, taking into account the individual anatomical features of its innervation, to evaluate its effectiveness in clinical conditions. In clinical observations, 18 planned stationary surgical stomatological patients were implicated, with planned surgical interventions on the cheek area. For the successful local anesthesia of the buccal area, it is necessary to take into account the anatomical variability of the branch on the face of the buccal and zygomaticofacial nerves in patients with different types of skull structure and face shape. Application in clinical conditions of the technique of conductive anesthesia of the zygomaticofacial nerve, developed by us, in combination with the classical method of local anesthesia of the buccal nerve provides painless surgical interventions on the lateral area of the face.

Keywords: The buccal nerve, the zygomaticofacial nerve, the buccal area, the anatomical variability on the face, the local anesthesia

Introduction
Actuality of theme. As you know, sensory innervations of the maxillofacial area (MFA) are quite complicated. In the soft tissues of the face branching the sensory branches of the trigeminal nerve, as well as the cervical superficial nerve plexus (Fig. 1.) [1, 2].

Fig 1: Illustration of the cutaneous, sensory nerves of the face (according to the data of a literary source of Thomas von Arx, et al., 2017).
The purpose of the study: improvement of local anesthesia of the buccal region, taking into account the individual anatomical features of its innervation, to evaluate its effectiveness in clinical conditions.

Methods: In clinical observations, 18 planned stationary surgical stomatological patients were implicated, with planned surgical interventions on the cheek area. For the detection of individual anatomical features of the facial section of the head in patients, the facial index was determined by the Garson’s formula. The cheek area was divided into four quadrants: the upper - front, upper - back, lower - front, lower – back by imaginary, mutually perpendicular lines, carried through its center. Tactile sensitivity was investigated using nylon monofilaments. Pain sensitivity was determined by injection of needle into the epidermis. The assessment of tactile and pain sensitivity was performed on a four-point scale in each quadrant: 0 points - no sensitivity, 1 point - sensitivity is sharply reduced, 2 points - sensitivity is moderately reduced, 3 points - tactile and pain sensitivity completely preserved. In case the localization of pathological processes (benign tumors, keloid scars, fistulas of migrating granulomas) in the buccal region surgical interventions were conducted under local conduction anesthesia of buccal, zygomaticofacial, mental nerves and facial branches of transverse cervical nerve (if necessary). The conductive anesthesia of the buccal nerve was carried out through the skin according to the method of P.M. Yegorov [11] - anesthetic was injected at the anterior edge of the base of the

Fig 2: Dissection of the lateral aspect of the cheek and lips in a sample of hemi-head human adult cadavers (according to the data of a literary source of K. Takezawa, et al., 2018).

The branches of the buccal nerve (BN - highlighted by blue strips) anastomose with the infraorbital nerve (highlighted by the upper white strip) and with branches of the mental nerve (highlighted by the lower white strip).

The individual variability of innervations of soft tissues of the maxillofacial area should be taken into account in their local anesthesia. In order to anesthetize the of the cheek area, besides the conductive anesthesia of the buccal nerve, we performed a blockade of the zygomaticofacial nerve in accordance with a well-known technique, when the anesthetic was injected at the lower outer edge of the eye orbit [8, 9], where the zygomaticofacial foramen are located, through which from the zygomatic bone go outside the branches of the same name nerve [10]. However, the cheek area were completely anesthetized in 74% of cases. The absence of the necessary anesthetic effect in the remaining cases was, in our opinion, associated with the individual anatomical variability of the branching of the buccal and zygomaticofacial nerves on the face.

As a result of craniometric studies, we detected anatomical variability of the structure of the skull. There is a certain feature of the localization of the zygomaticofacial foramen on the lateral (facial) surface of the zygomatic bone, depending on the type of structure of the skull. In people thea have

1 - supraorbital nerve, 2 - supratrochlear nerve, 3 - infratrochlear nerve, 4 - palpebral branches of lacrimal nerve, 5 - external nasal branch of anterior ethmoidal nerve, 6 - infraorbital nerve, 7 - zygomaticofacial nerve, 8 - zygomaticotemporal nerve, 9 - auriculotemporal nerve, 10 - long buccal nerve, 11 - mental nerve, 12 - mental branch of mylohyoid nerve, 13 - great auricular nerve, 14 - transverse cervical nerve.

In adjacent anatomical sites, these nerves are anastomosed with each other. The trigeminal nerve with branching of the buccal and zygomaticofacial nerves on the face.

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Fig 3: The brachycephalic skull. Most of the zygomaticofacial foramen are centered near the lower - outer edge of the eye orbit. One of the zygomaticofacial foramen was shifted from the eye orbit to the zygomaticotemporal suture (results of own research).
coronary process of the mandible, where the buccal nerve passes (Fig. 3).

Fig 4: Blockade of the buccal nerve according to the method of P. Yegorov

The facial surface of the zygomatic bone resembles an scalene quadrangle, which differs in the form of each person, depending on its type of structure of the skull. Therefore, anatomical landmark point for injection of the needle and anesthetic injection is determined individually in each patient. It is at the intersection of two imaginary lines, which connect the opposite corners of the quadrangle: a vertical, drawn from the zygomaticofrontal suture to the lower corner of the zygomatic bone and the horizontal, made from the zygomaticotemporal suture to the zygomaticomaxillary suture. Zygomaticofacial foramen are within the imaginary ellipse, the center of which is the place of the needle injection (Fig. 5). In people with mesaticephalic and dolichocephalic skulls, a local anesthetic (1.0 ml) is injected after the needle is inserted into a definite anatomical landmark. In brachycephalic skulls (broad-leaved), to block the branches of the zygomaticofacial nerve in the place where they reach the surface of the zygomatic bone, the needle should be directed horizontally 1.0-1.5 cm towards the zygomaticotemporal suture. Anesthesia of facial branches of transverse cervical nerve was conducted along the inferior border of mandible [12].

Fig 5: Blockade of the zygomaticofacial nerve according to the method of O. Mokryk

Results of the research
It is established that pathological processes did not influence the sensory function (tactile and pain sensitivity) of the buccal regions in patients before the planned surgical interventions on the lateral facial region. After the blockade of the buccal nerve in 18 patients, it was found that in 10 patients (55.6% of cases), complete buccal anesthesia occurred. In these cases, there was a scattered type of buccal nerve ramifying was found on the face in patients prevailing in leptoprosoips. In the 44.4% of cases, of the cheek area were anesthetized only partially (tactile and pain sensitivity - 2.0 ± 0.5 points). After an additional blockade of the branches of the zygomaticofacial nerve, according to the technique developed by us, a complete anesthesia of the above-mentioned topographic anatomical site occurred (tactile sensitivity 0 - 1 points, pain sensitivity - 0 points). In three patients transverse cervical nerve took part in the buccal region innervation. In all cases they were individuals with euriprosopic face shape.

The loss of tactile and pain sensitivity on the skin cover of the buccal region absolutely confirmed the effectiveness of the developed methods of local conduction anesthesia. During surgical treatment the effectiveness of the local anesthetic methods was evaluated as good - it was observed a stable anesthesia, without psychosomatic peculiarities as well as local and general complications, in patients; sometimes weakly expressed affective reactions took place, but they didn’t influence the course of the operation.

Conclusion
For the successful local anesthesia of the buccal area, it is necessary to take into account the anatomical variability of the branch on the face of the buccal and zygomaticofacial nerves in patients with different types of skull structure and face shape. Application in clinical conditions of the technique of conductive anesthesia of the zygomaticofacial nerve, developed by us, in combination with the classical method of local anesthesia of the buccal nerve provides painless surgical interventions on the lateral area of the face.

References

