

Regional Blockades in the Perioperative Period during the Reposition of the Inferior Orbital Rim Wall

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Abstract

The analgesic effect of the pterygopalatine blockade is successfully used as anesthesia in otolaryngology, with volumetric surgical interventions in the maxillofacial region and as an interventional method for the treatment of migraine, cluster and chronic facial pain, in the treatment of post-functional pain syndrome, postherpetic neuralgia.

The purpose of this study is to evaluate the analgesic effect of the infra zygomatic access of performing a pterygopalatine block as a component of combined anesthesia during reconstructive surgery for fractures of the lower orbital edge.

Research and Design: The study was carried out at Irkutsk Branch of S. Fyodorov "Eye microsurgery" Federal State Institution of Ministry of Health of the Russian Federation. 9 male patients with the fractures of the lower orbital edge were included.

Material and Methods: Pterygopalatine blockade as a component of combined anesthesia was performed through a infrazygomatic access by the impregnation technique for pain management in reconstruction of the inferior orbital rim wall. A 25 mm needle with a 23G diameter was used to anesthetize the pterygopalatine ganglion and the maxillary nerve with solutions of local anesthetics (lidocaine 2% - 2 ml and ropivacaine 0.75% - 2 ml). The following parameters were evaluated: the adequacy of anesthesia, the duration of the analgesic effect of the pterygopalatine blockade by Verbal Rating Scale, the appointment of additional anesthesia, patient comfort, complications after the blockade.

Results: Pterygopalatine blockade as component of a combined anesthesia was effective intraoperatively and didn't cause hemodynamic changes during surgery. During a postoperative period, patients felt comfortable without pain. No additional anesthesia required. The length of the block varied from 4 to 6 hours. Such complications as hemorrhages, intravascular injection of anesthetic, trauma of neural structures were not noticed.

Conclusion: Pterygopalatine block is a good alternative to both intra and post operative anesthesia in reposition of the inferior orbital rim wall.

Keywords: Pterygopalatine Blockade; Sphenopalatine Block; Ultrasound Navigation; Pain; Peripheral Nerve Blockade; Ophthalmic Surgery

Abbreviations

PPB: Pterygopalatine Blockade; PPG: Pterygopalatine Ganglion; ASA: Physical Status Classification System American Society of Anesthesiologists; ICU: Intensive care Unit; VRS: Verbal Rating Scale

Introduction

Damage of the inferior orbital rim wall is often accompanied by a violation of binocular vision, tear film instability, drainage function of the paranasal sinuses, infraorbital paresthesia, and have high requirements for aesthetic and functional treatment results [1]. Reconstruction of isolated fractures of the inferior orbital rim wall, especially its defects and deformations, remains one of the most effective methods of surgical treatment [2]. Traditionally, intravenous opioids are commonly used to provide analgesia along with general anesthesia during these operations.

Pain management during surgical correction of inferior orbital rim wall fractures is not limited by intraoperative period and is one of the most important components of the patient’s rehabilitation after surgery [3]. The concept of combined anesthesia meets these requirements considering methods of regional anesthesia not as an alternative to general anesthesia, but as an addition to it, allowing to reduce the frequency of intra- and postoperative complications, improving analgesia [4].

Regional anesthesia is widely and often used in various fields of medicine, allowing both reducing intraoperative opioid loading and improving the rehabilitation period by creating an anti-inflammatory effect [5,6]. The inability to perform an infraorbital blockade to anesthetize during surgery of the inferior orbital rim wall is associated with the displacements of bone fragments in the infra-orbital foramen after the fracture [7]. In this regard, the analgesic effect of the pterygopalatine blockade (PPB) is of interest, which is successfully used in otolaryngology, maxillofacial surgery and as an interventional technique for acutemigraine headache, cluster and chronic facial pain, as well as in the treatment of postdural puncture pain syndrome, post-herpetic neuralgia [8,9].

The purpose of this study is to evaluate the analgesic efficacy of the PPB as a component of combined anesthesia performed through aninfrazygomatic access in isolated fracture of the inferior orbital rim wall.

Materials and Methods

A prospective, non-blind, observational study was conducted in accordance with the Helsinki Declaration and approved by the Ethics Committee of the Irkutsk branch of S. Fyodorov “Eye Microsurgery” Federal State Institution of the Ministry of Health of the Russian Federation (Protocol № 12-A). 9 adults, ASA I-III, aged 21-57 years, who underwent planned surgery from 01.01.2019 to 01.01.20 for a fracture of inferior orbital rim wall. Patients’ consent to the study was the inclusion criterion. The exclusion criteria were contraindications to the implementation of regional blockades such as allergy to local anesthetic, coagulopathy, etc. The characteristics of patients are presented in the table 1.

	Group N = 9
Sex, n (%)	
Males	6 (66.6%)
Females	3 (33.4%)
Mean age (years)	43.37±12
ASA (I/II/III)	(5/3/1)
Comorbidity	
Arterial hypertension	4
Chronical gastritis	1
Post-traumatic encephalopathy	1
None	3
Type of surgery	
Subperiostealplastic surgery of the inferior orbital rim wall with implantation of the plate “ECOPHLON”to close a bone defect	7
Subperiosteal plastic surgery of the inferior orbital rim wall with implantation of carbon felt“Carbotexin”	2
Mean time interval between the first surgery after trauma and treatment (months)	2,5

Table 1: Patients’ characteristics.

All patients underwent plastic surgery of the inferior orbital rim wall. 30 minutes before surgery, all patients underwent ultrasound-guided pterygopalatine blockade through an infrazygomatic access by the impregnation technique we presented before [6]. The patient was placed in a supine position, the head was turned to the contralateral side and after sterilization of the block side of the face, the mouth was slightly opened to ease the ultrasound navigation with a high-frequency linear probe (Sonosite Edgell; Fujifilm Sono Site, Bothwell, Washington, USA) to visualize the pterygopalatine fissure. The fissure was partially visualized in the area of the mandibular notch. The zygomatic arch was identified, and the mandibular notch is palpated where a 25 mm needle, 23-gauge, was inserted with in-plane approach at the angle of 45° in the direction of the posterior margin of the globe until the notch (Figure 1). The needle is located on the border of the junction of the infratemporal fossa to the pterygopalatine fossa. After the aspiration test, a mixture of 2 mL lidocaine 2% and 1 mL ropivacaine 0.5% was administered. The spread of local anesthetic solution in the pterygopalatine fossa was assessed during ultrasonography.

0.25 mg/kg, induction by the VIMA method, sevoflurane inhalation with a gas flow rate of 6 l/min, with the installation of a laryngeal mask of the appropriate size. Anesthesia was maintained by sevoflurane inhalation 2.2-2.5 vol% (MAX 1.0-1.2) with preserved spontaneous breathing. Functional parameters of the cardiovascular system were recorded noninvasively: blood pressure (systolic, diastolic, mean), heart rate. The indicators were recorded intraoperatively at the end of the operation, in the intensive care unit (ICU) 2 hours and 8 hours after the operation. Pain after the operation was assessed by a 4-point Verbal Rating Scale (VRS), where 1 - no pain; 2 - mild; 3 - moderate; 4 - severe. Pain assessment was performed in the ICU (2 hours after surgery, when the patient woke up and could answer questions), 8 and 24 hours after surgery. The time of the appointment of additional anesthesia was recorded. Patients' assessment of the comfort of the postoperative period was carried out the day after surgery: the presence of positional comfort, sufficient activity, the presence of appetite were assessed as "Satisfactory", the absence of one or more signs as "Unsatisfactory".

Statistical analysis was carried out using the Statistica 6.0 software package. The data were presented in the form of mean (M), standard deviation (SD) and in the form of median (Me), first (Q1) and third quartile (Q3).

Results

The analysis of heart rate, blood pressure, showed that the functional state of the cardiovascular system at various stages of surgery remained stable and had no deviation within acceptable values (Figure 2 a, b).

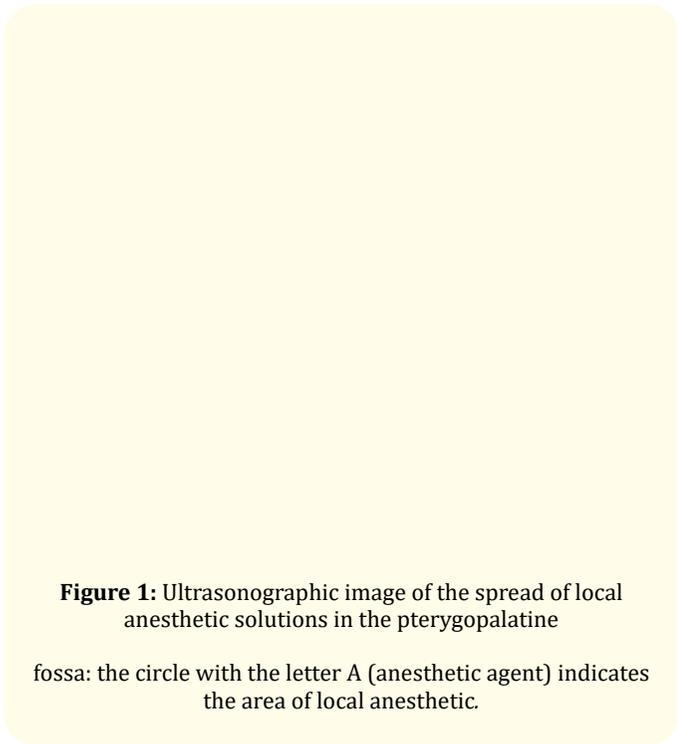


Figure 1: Ultrasonographic image of the spread of local anesthetic solutions in the pterygopalatine

fossa: the circle with the letter A (anesthetic agent) indicates the area of local anesthetic.

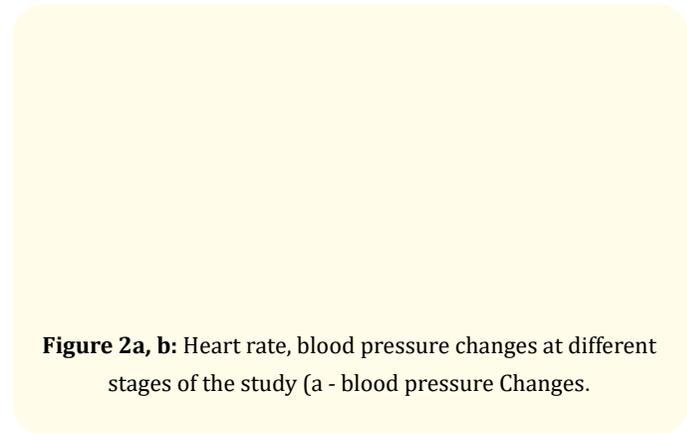


Figure 2a, b: Heart rate, blood pressure changes at different stages of the study (a - blood pressure Changes.

The surgery was performed under general anesthesia according to a single method, including premedication with midazolam 0.1-

The duration of surgery averaged 86.66 ± 25.12 minutes. The time of awakening after the surgery was 37 ± 17 minutes. No patient complained of pain immediately after waking up. Evaluation of pain in the postoperative period showed that 2 hours after the operation, only 1 patient (11.1%) complained of pain estimated at 1 point on the VRS. After 8 hours, 2 patients (22.2%) rated the pain at 1 point. The information on pain assessment is presented in table 2.

Evaluation criteria		Group (N = 9)
VRS (0 points/ 1 point/ 2 points)	2 hours	8/1/0
	8 hours	7/2/0
	24 hours	9/0/0
Mean time of repeated anesthesia appointment (minutes)		310 ± 142.04

Table 2: Assessment of pain in the postoperative period.
VRS: Verbal Rating Scale

We considered it important to register the duration of the pain-free period, since 3 patients required Ketoprofen anesthesia (1.6 mg/kg) (1 patient - 2 hours after surgery and 2 patients - 8 hours after surgery). Mean time of repeated anesthesia appointment after surgery was 310 ± 142.04 minutes.

All patients rated the postoperative period as satisfactory. There were no complications after performing the pterygopalatine blockade.

Discussion

The use of regional blockades in surgery can significantly reduce the use of opioid analgesics both in the intraoperative and postoperative periods [10]. The relevance of regional blockades in ophthalmic surgery has increased not only due to a stable analgesic effect, but also the possibility of performing operations in outpatient care. The use of visualization of blockade performance has played a positive role [11,12].

Currently, ultrasound imaging allows to localize peripheral neuronal structures and surrounding tissues, monitor the progress of the needle and the spread of local anesthetic solutions in real time to control the implementation of the PPB [13].

Interest to the PPB in ophthalmology is justified by the possibility of interrupting not only nociceptive, but also vegetative impulses of the eye, due to the complex structure of the PPG. The parasympathetic part of the PPG is represented by a petrosus major nerve. The PPG obtains sympathetic fibers from the synapse of the superior cervical ganglion. Sympathetic postganglionic fibers along the internal carotid artery enter the skull in the proximal part of the pterygoid canal in the form of a petrosus major nerve and form, due to fusion with the petrosus major nerve, the Vidian nerve, which passes through the pterygoid canal and reaches the PPG. Sensory fibers from the maxillary nerve (the second pair of the trigeminal nerve V2) are attached to the ganglion and form the sensory component of the PPG [14]. All this determines the expediency of using PPB as a component of regional anesthesia, combined anesthesia during surgery of an isolated fracture of the inferior orbital rim wall, in order to improve the quality of anesthesia and postoperative analgesia.

Our study showed that the use of the PPB as a component of combined anesthesia allowed to achieve the level of adequate analgesia, which was demonstrated by stable parameters of hemodynamics intraoperatively. At the same time, an analgesic effect in the postoperative period was achieved by a single injection. The role of adequate postoperative anesthesia in ophthalmic surgery is important not only for pain relief syndrome, but also for the prevention of oculovisceral pathological reflexes. The mechanism of occurrence of these pathological reflexes is based on the presence of numerous peripheral collaterals and anastomoses of nerves, adjacent localization of the nuclei of the trigeminal, glossopharyngeal and vagus nerves in the medulla oblongata and reticular formation. Regional anesthesia reduces the risk of pathological reflexes due to the blockade of afferent impulses from the area of surgical intervention.

Do our results correlate with the conclusions of Deleuze A (2009), which noted the advantages of regional anesthesia compared to parenteral anesthesia, including smoother recovery, fewer adverse events, residual analgesia in the postoperative period [14].

Conclusion

Pterygopalatine blockade, as a component of combined anesthesia, avoids the use of parenteral anesthesia in intra and postoperative anesthesia with an isolated fracture of the inferior orbital rim wall.

Limitations

This study has limitations. Due to the limited number of cases of this type of surgery, there is no comparison group where parenteral anesthesia would be used for intra and postoperative analgesia. The study should be continued with an increase in the sample and further study of the intraoperative hemostasis system. The results of this study would be interesting for understanding the effect of regional blockade on hemostasis during surgery.

Conflict of Interest

The Authors declare that there is no conflict of interest.

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