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Safe anesthesia, analgesic and sedation in the surgery of head and neck tumors

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Abstract
Highly traumatic surgical interventions for head and neck tumors were performed in 62 adult patients under conditions of multimodal opioid-free general anesthesia, which included dexmedetomidine, lidocaine, nefopam, and sevoflurane. In 18 cases, due to trismus II – IV degree, fibro optic nasotracheal intubation was used, in 10 patients with laryngeal stenosis, the operation was started with tracheotomy under local anesthesia. In all 28 cases, local anesthesia was supplemented by sedation with intravenous (IV) administration of dexmedetomidine and lidocaine, which was enhanced by the addition of sub-drug doses (10–20 mg) of ketamine. Consciousness and spontaneous breathing were preserved in all observations. Before intubation, propofol and rocuronium were added, and at the stage of the main operation, against the background of intravenous infusion of dexmedetomidine and lidocaine, inhalation of sevoflurane vapors (1–1.5 MAC). In 62 cases, the course of the operation and anesthesia was smooth, awakening and restoration of spontaneous breathing occurred after the end of the operation. Postoperative pain relief for the first two days was in the form of a continuous iv infusion of a 3-component mixture of 1% lidocaine and two non-opioid analgesics (nefopam and tenoxicam) using a disposable elastomeric pump. In the next 3-4 days, they switched to intramuscular administration of nefopam and tenoxicam. The quality of pain relief was high, without clinically significant complications. Only in three cases, at the beginning of mastering the technique, it was necessary to resort to an additional single injection of promedol or tramadol.

Keywords: Safe anesthesia, analgesic and surgery of head and neck tumors

Introduction
A significant part of oncosurgical interventions in the head and neck area is characterized by high traumatism, which is due to the rich innervation and vascularization of the maxillofacial region and the proximity of the reflexogenic zones of the neck, as well as the requirements of ablastic surgery, implying the removal of tumors within healthy tissues. Modern reconstructive surgery makes it possible to operate on patients with locally advanced malignant neoplasms of the head and neck region, which are often accompanied by a critical tumor obstruction of the upper respiratory tract, which requires tracheostomy or fibroscopic intubation to provide mechanical ventilation during the operation. Postoperative edema of nearby tissues can significantly aggravate impaired respiratory function in the postoperative period. The use of analgesics and sedatives that depress respiration, primarily opioids and benzodiazepines, is dangerous [8]. Modern pharmacology of anesthesia, analgesia and sedation, built on the principle of multimodality, including taking into account the specifics of patients with head and neck tumors. The methods of pain relief that have become widespread in other areas of surgery, including prolonged regional blockade, are not very suitable for operations on the head and neck due to the high risk of purulent-septic complications.
Analysis of the possibility of an alternative solution to the problem of perioperative analgesia in patients with tumor lesions of the head and neck region led us to study a multimodal scheme of anesthesia, analgesia, and sedation based on the highly selective central α2-adrenoreceptor agonist dexmedetomidine, which has sedative, anxiolytic, analgesic, and sympatholytic effects. An especially valuable property of dexmedetomidine is the absence of respiratory depression while maintaining contact with the patient even with deep sedation [1, 4, 6]. The second component of the scheme, potentiating analgesia, promoting neurovegetative stability and having an anti-inflammatory effect, is lidocaine administered

intravenously, which has been confirmed by numerous publications in recent years [3, 5]. At the same time, the trauma of oncological operations on the head and neck requires increased pain relief, since the analgesic potential of lidocaine and dexmedetomidine is insufficient. Therefore, we included in the multimodal scheme of the operating period 2 strong non-opioid analgesics: non-selective long-acting NSAIDs tenoxicam and central analgesic nefopam. The action of the latter is based on inhibition of the reuptake of dopamine, norepinephrine, and serotonin in the neural supraspinal and spinal synapses [2, 7]. Of course, the components of the scheme used were supplemented with the necessary elements depending on the stage of anesthesia, surgery and in the postoperative period.

The aim of the study was to evaluate the efficacy and safety of a new regimen of anesthesia, analgesia and sedation based on dexmedetomidine, lidocaine, nefopam and tenoxicam in cancer patients operated on in the head and neck area.

Material and methods. The study was conducted in 2014–2015. Blochian in 62 patients aged 29–81, class I – III ASA. Most of them underwent extended and combined operations on the upper and lower jaw, tongue and floor of the oral cavity with various types of plastics.

The average duration of surgical interventions was 6.38 ± 1.56 h, blood loss was 765 ± 193 ml. In 28 (45%) cases, tracheal intubation was performed under intravenous sedation with preserved spontaneous breathing, including 18 (29%) patients underwent endoscopic intubation due to grade II – IV trismus, and 10 (16%) patients had a tracheostoma for grade II – III laryngeal stenosis with a tumor. 34 (55%) patients were intubated in the usual way. The depth of sedation was assessed using the 6-point Ramsay scale.

The technique of tracheal intubation with preserved spontaneous breathing. Infusion of dexmedetomidine at a rate of 3 μg / kg / h and 1% lidocaine solution at a rate of 4.5 mg / kg / h through Percussor Space pumps (B. Braun) was started 20–30 minutes before intubation. The "loading" dose of dexmedetomidine before intubation was 1 mg / kg, 1% lidocaine solution - 1.5 mg / kg. To enhance the analgesic and sedative effects of dexmedetomidine and lidocaine, sub-drug doses (10–20 mg) of ketamine were administered. Fiberoptic intubation was started after nasopharyngeal anesthesia with 10% lidocaine spray (4 doses - 19.2 mg) and local tracheal anesthesia with 2% lidocaine solution 6 ml (120 mg). When placing a tracheostomy, we used local infiltration anesthesia with 1% lidocaine solution (10–20 ml). After the endoscope was inserted into the trachea or the trachea was opened, propofol 80–140 mg and rocuronium 40–60 mg were injected, then the trachea was intubated with a 7 mm reinforced tube with a cuff.

The technique of opioid-free induction anesthesia (in the absence of difficult airways): 20-30 minutes before intubation, dexmedetomidine was infused at a rate of 3 μg / kg / h and 1% lidocaine (4.5 mg / kg / h) until the dose of dexmedetomidine was reached.

plebian was maintained with rocuronium in a total dose of 120–180 mg. Dexmedetomidine administration was stopped 40–60 min before the end of the operation.

Method of opioid-free multimodal postoperative pain relief. 284 ml of 1% lidocaine, 120 mg (12 ml) of nephopam (acupan from Biocodex) and 40 mg (4 ml) of tenoxicam (texamen from Asfarma) were pumped into a 300 ml Tuoren disposable elastomeric infusion pump with a speed regulator). Intravenous infusion of this mixture at a rate of 6–8 ml / h was started 30 minutes before the end of the operation and continued during the first 2 days, including the day of the operation. Pain intensity was assessed using a 10-point visual analogue scale (VAS). Assessment stages: after extubation in the operating room, in the awakening room, then in the surgical department 2 times a day on the 1st and 2nd postoperative days. At the end of the intravenous administration of the analgesic mixture, over the next two days, the patients received intramuscular injections of nefopam, 20 mg 3 times a day and 20 mg tenoxicam once a day.

Research results and their discussion. Sedation with dexmedetomidine in combination with small doses of ketamine and intravenous administration of 1% lidocaine solution made it possible to create optimal conditions for fibrooptic tracheal intubation or tracheostomy while maintaining spontaneous breathing of the patient. The average dose of dexmedetomidine at the time of intubation was 84.8 ± 21.3 μg (1.08 μg / kg), 1%

lidocaine 123.5 ± 23.6 mg (1.58 mg / kg) and ketamine 14.5 ± 2.7 mg. The average duration of administration of dexmedetomidine and lidocaine was 21.7 ± 2.8 minutes. The sedation level on the Ramsay scale before intubation was 3.8 ± 0.7 points.

Intubation went smoothly with no mental or motor reactions. Mean BP at the time of intubation was 100.4 ± 8.6 mmHg Art., heart rate - 77.4 ± 11.8 in 1 min. The patients slept, but at the same time they quickly woke up in response to the call of the anesthesiologist, adequately followed the commands. No patient had respiratory depression during the procedure.

Induction anesthesia with propofol against the background of dexmedetomidine and lidocaine did not require fentanyl, which is routinely used in these cases, to prevent hemodynamic reactions to direct laryngoscopy and intubation. Dexmedetomidine infusion at the time of intubation was 82.2 ± 19.8 μg (1.05 μg / kg), 1% lidocaine solution - 120.8 ± 26.2 mg (1.54 mg / kg), duration of administration - 20.8 ± 2.1 minutes. The mean blood pressure at the time of intubation was 88.4 ± 9.3 mm Hg. Art., heart rate - 64.8 ± 12.2 in 1 min. None of these parameters differed from the parameters recorded during fibrooptic intubation and tracheotomy. Then propofol (36 ± 22 mg) and rocuronium (48 ± 6.7 mg (0.6 mg / kg)) were administered. After intubation and the start of mechanical ventilation, they switched to a maintenance dose of dexmedetomidine (0.91 ± 0.13 μg) and 1% lidocaine solution at a dose of 1.1 ± 0.2 mg against the background of inhalation of sevoflurane (1.14 ± 0.19 MAC). The total dose of dexmedetomidine during the operation was 497 ± 186 μg, 1% lidocaine - 588 ± 190 mg. In all cases, there was a stable course of anesthesia, without sudden changes in blood pressure and pulse, which is largely attributed to the sympatholytic effect of dexmedetomidine.

Correction of moderate arterial hypotension with sympathomimetics was required in 26 (42%) patients, in 24 patients - with mesatone (660 ± 399 μg), in 2 - with norepinephrine (3-5 μg / min). To correct bradycardia (maximum decrease in pulse rate up to 46 per minute), 16 (26%) patients were injected with atropine 0.7 ± 0.3 mg.

The administration of dexmedetomidine was stopped 49.6 ±

12 minutes before the end of the operation. Awakening after switching off the sevoflurane evaporator occurred in 7.2 ± 2.1 minutes, and after another 5.4 ± 1.8 minutes, the patients were extubated. In the majority of patients (38 people, or 61%), after awakening, the absence of any pronounced residual sedation was noted, which is associated with the exclusion of narcotic analgesics and benzodiazepines from the anesthesia regimen and the early termination of the dexmedetomidine infusion. All 62 patients were extubated in the operating room. There were no signs of respiratory depression in the early postoperative period in any patient. Postoperative IV analgesia with a mixture of lidocaine, nefopam and tenoxicam during the first two days was very effective.

After extubation, the intensity of pain did not exceed 0.4 ± 0.2 points, in the awakening ward - 1.02 ± 0.75 points. The peak of pain was noted at the end of the 1st day and averaged 2.4 ± 0.95 points. On the 2nd day, the intensity of pain at the beginning and end of the day did not exceed 2 ± 0.96 and 1.4 ± 0.83 points, respectively. Additional anesthesia with paracetamol was required in 12 (19.3%) patients in the recovery room, 8 (12.8%) patients in the surgical department received ketoprofen, 3 (4.8%) patients received tramadol, and 2 (3.2%) patients with chronic pain syndrome required promedol before surgery. On the 2nd postoperative day, additional anesthesia was required for 8 (12.8%) patients, Ketoprofen was administered to 6 (9.6%) patients, Promedol 1 (1.6%) patient and tramadol 1 (1.6%) patient.

It should be noted that all cases of administration of promedol and tramadol occurred at the initial stage of the introduction of the technique, when the medical staff on duty felt insecure after many years of practice of routine administration of opioids on the first day after surgery. Adverse reactions were detected in 6 (9.6%) patients; the central side effects of nefopam prevailed: sweating and tachycardia. Signs of the toxic effect of lidocaine and severe hypotension were not observed in any patient.

Thus, multicomponent opioid-free anesthesia with dexmedetomidine in combination with 1% lidocaine and sevoflurane provided sufficient analgesia and reliable antinociceptive protection in highly traumatic oncological operations in the head and neck area, and allowed to avoid narcotic depression of consciousness and create conditions after extubation and to continue opioid-free pain relief in the postoperative period.

In almost half of the patients, the anatomy of the maxillofacial region or the larynx was changed, which created obstacles for conventional tracheal intubation. They required either fibroscopic intubation or tracheotomy. It is well known how painful, and sometimes difficult, both of these procedures, if they are performed only under local anesthesia. Traditional means of additional systemic anesthesia and sedation are very unsafe in this category of patients due to the risk of respiratory depression and high variability of individual sensitivity to opioids and benzodiazepines. A solution was found with the advent of dexmedetomidine in our arsenal, especially in combination with i / v and local administration of lidocaine, which suppresses laryngeal and pharyngeal reflexes. Simply put, fibroscopic intubation and tracheotomy have become easier to remove.

A further step was the use of dexmedetomidine and lidocaine, already introduced at the stage of intubation, as an antinociceptive basis for induction and main anesthesia. He completed the multimodal induction regimen with ketamine in a sub-narcotic dose and propofol, and sevoflurane for the main anesthesia. The results presented above, in our opinion, demonstrate the reliability and controllability of anesthesia at all stages without the traditional use of opioids. A logical continuation of the opioid-free technology of anesthetic management of highly traumatic operations in the head and neck area was the connection at the end of the operation of the intravenous infusion of two strong non-opioid analgesics with different mechanisms of action - nefopam and tenoxicam, which were prescribed against the background of the ongoing infusion of lidocaine for postoperative pain relief. We believe that a certain role in smooth, "stress-free" awakening is played by the residual effect of dexmedetomidine, which was switched off approximately 40 minutes before the end of the operation. Our experience shows the high quality of postoperative pain relief by 3-component intravenous infusion of lidocaine, nefopam and tenoxicam for 2 days, after which, as a rule, it is expedient to preserve anesthesia with nefopam and tenoxicam in the form of intramuscular injections.

Probably, the absence of a comparison group can be regarded as a methodological flaw in our work, so we consider it necessary to provide explanations. After receiving the first positive results of using the described technique, we discussed with the surgeons the possibility of creating a control group with the traditional use of promelo and tramadol for postoperative anesthesia and local anesthesia for anesthesia with fibrooptic intubation and tracheotomy. This proposal was unanimously rejected as unethical given the striking difference in the quality of anesthetic protection.

After switching off the infusion pump, for the next 3-4 days, patients were anesthetized with a combination of nefopam (20 mg 3 times a day) with ketoprofen (100 mg 2 times a day) intramuscularly.

Clinical example

Induction: Dexdor 1.1 μg / kg (68 μg) + 1% lidocaine 1.7 mg / kg (106 μg) through the perfuser 30 minutes before intubation + propofol 130 mg + rocuronium 50 mg. Intubation of the trachea through the nose with a 7 mm reinforced tube. Maintenance of anesthesia: Dexdor 1 μg / kg / h (392 μg) + 1% lidocaine 1 mg / kg / h (380 mg) + sevoflurane 1.5 MAC. The duration of the operation was 6 hours 40 minutes, blood loss was 1000 ml. Awakening 6 minutes after turning off the sevoflurane vaporizer, extubation 5 minutes after awakening. Postoperative anesthesia with a 3-component mixture of lidocaine 1%, nefopam and tenoxicam at a rate of 6 ml / h (lidocaine 1440 mg / day). The efficacy of pain relief according to the VAS: 1st day - 3 points, 2nd day - 1 point. Additional anesthesia: paracetamol 1000 mg intravenously 2 times a day. The duration of anesthesia is 50 hours. Then nefopam 20 mg 3 times + ketonal 100 mg 2 times intramuscularly for 5 days. No narcotic analgesics were used for the entire perioperative period! Discharged on the 21st day.

Conclusions

1. Dexmedetomidine in combination with intravenous and local use of lidocaine provides effective sedimentation and pain relief without respiratory depression and loss of doctor-patient contact, creating optimal conditions

for fibrooptic tracheal intubation and tracheotomy.
2. Multimodal opioid-free anesthesia based on dexmedetomidine in combination with lidocaine and sevoflurane is a reliable, controlled and safe method of anesthetic protection in traumatic interventions in the head and neck area.
3. Multimodal scheme of pain relief in the form of long-term continuous intravenous infusion of nefopam, lidocaine and tenoxicam provides high-quality postoperative pain relief and early activation of patients who have undergone traumatic head and neck surgery, excluding the use of narcotic analgesics.
4. The described multimodal scheme of opioid-free pain relief can be recommended for patients for whom the use of opioids is contraindicated [9].

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