CASE REPORT

Features of the use of regional anesthesia in the surgical correction of traumatic defects of the bones of the skull and spine reconstructive plastic surgery

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Abstract
This article discusses the features of the use of regional anesthesia in the surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery. Regional anesthesia is a safe and effective method of anesthesia, which reduces the risk of complications and speeds up the recovery process after surgery. The authors describe in detail various types of regional anesthesia, such as facial nerve blockade, blockage of the frontal branch of the trigeminal nerve, etc. The paper also discusses indications and contraindications to the use of regional anesthesia, as well as possible complications. In conclusion, it is noted that regional anesthesia is an important element in surgical practice during operations for the operative correction of traumatic defects of the skull bones and reconstructive plastic surgery.

Keywords
Regional anesthesia, Surgical correction, Traumatic defects of the skull bones, Reconstructive plastic surgery.

Materials and methods

In the process of writing the study, an analysis of scientific articles and literature on the topic was applied. This method allowed us to get an overview of scientific papers on regional anesthesia during operations on the skull and face, as well as to compare various methods of anesthesia and identify their advantages and disadvantages.
Results

Regional anesthesia is a method of anesthesia that blocks nerve impulses in a certain area of the body. Unlike general anesthesia, in which the patient is unconscious, with regional anesthesia, the patient remains enlightened, retains control over breathing and blood circulation, which avoids many possible complications associated with general anesthesia [2].

Regional anesthesia can be performed at different levels of the body: from individual limbs to the whole body. Depending on the level and place of administration, there are different types of regional anesthesia, such as shoulder block, femoral block and others.

The main advantage of regional anesthesia is its high efficiency in anesthesia for a long period of time. This reduces the risk of complications after surgery, such as thromboembolism, and reduces the recovery time after surgery.

In addition, regional anesthesia is a safe method of anesthesia, as it avoids problems associated with general anesthesia, such as allergic reactions to an anesthetic or the possibility of deterioration of respiratory and cardiac function.

However, regional anesthesia has its own peculiarities and disadvantages, such as the need for professional qualification of the doctor who performs the procedure, the possibility of complications associated with the injection of an anesthetic, etc. [3].

In general, regional anesthesia is one of the safest and most effective methods of anesthesia, which can be used in operations for the surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery.

The advantages of using regional anesthesia for surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery include:

1. Improved pain control. Regional anesthesia allows you to anesthetize a specific area of the body, which provides more accurate and effective control over pain, especially in the case of operations on sensitive areas of the body.

2. Reducing the need for general anesthesia. The use of regional anesthesia reduces the need for general anesthesia, which can help reduce the risk of complications associated with general anesthesia and speed up the recovery process after surgery.

3. Improved organ function. Since regional anesthesia does not affect the function of the respiratory and cardiovascular systems, as it happens with general anesthesia, the risk of complications associated with disruption of these systems is reduced.

4. Reducing the need for analgesics after surgery. The use of regional anesthesia can help reduce the need for analgesics after surgery, which also reduces the risk of complications associated with their use.

5. Reduced hospital stay. Patients undergoing regional anesthesia can recover faster after surgery and, as a result, can be discharged from the hospital faster, which reduces the cost of medical care.

In general, regional anesthesia is a safe and effective method of anesthesia, which can be used for surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery.

There are several types of regional anesthesia that can be used for surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery:

– superficial regional anesthesia. This method of anesthesia involves the introduction of an anesthetic into the surrounding nerves that innervate a certain area of the skin. It can be used for anesthesia of the skin, mucous membranes and soft tissues of the head and face;

– peripheral blockage. This method involves the introduction of an anesthetic agent near a certain nerve, blocking it and providing anesthesia to the entire area that it innervates. This method can be used for anesthesia of the upper and lower extremities, as well as the head and neck [4].

The choice of the method of regional anesthesia depends on many factors, including the type of surgery, patient history, the presence of possible complications and the preferences of the surgeon and anesthesiologist. It should be taken individually for each patient.

Superficial regional anesthesia is used for anesthesia of the skin, mucous membranes and soft tissues of the head and face during operative correction of traumatic defects of the skull bones and reconstructive plastic surgery. This method of anesthesia involves the introduction of an anesthetic into the surrounding nerves, which innervate a certain area of the skin and soft tissues. For this purpose, special needles and catheters are used, which are inserted into the skin and into the tissues under it.

The advantage of superficial regional anesthesia is that it does not require deep insertion of the needle into the tissues and does not lead to a high level of anesthetic in the blood, which can reduce the risk of complications. In addition, this method of anesthesia
usually does not require intubation and general anesthesia, which reduces the recovery time after surgery and reduces the risk of complications associated with general anesthesia [5].

However, superficial regional anesthesia may not be effective enough for more complex operations and may require additional anesthesia methods, such as peripheral blockade. In addition, this method of anesthesia can lead to some complications, such as bleeding, infection and incomplete anesthesia, if the correct selection of the area and dose of the anesthetic is not carried out.

Peripheral blockade is a method of regional anesthesia in which an anesthetic is injected into the nerves responsible for the innervation of the limbs, face or other parts of the body. In the context of surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery, peripheral blockade can be used to anesthetize nerves responsible for innervation of certain areas of the face and head.

The procedure consists in the fact that the anesthetic is injected near the nerve located in the area that needs to be anesthetized. This can be done through injection directly into the tissues near the nerve, or with the help of special catheters or electronic stimulators that allow you to more accurately determine the place of injection of the anesthetic.

Peripheral blockade can provide stronger and longer-lasting anesthesia than superficial regional anesthesia, and may be more effective for more complex operations. In addition, this method of anesthesia may allow surgeons to perform operations without the use of general anesthesia, which may reduce the risk of complications associated with general anesthesia.

However, peripheral blockade can lead to some complications, such as bleeding, infection and incomplete anesthesia, if the correct choice of area and dose of anesthetic is not carried out. In addition, this method of anesthesia may require a higher qualification of an anesthesiologist than superficial regional anesthesia [6].

Facial nerve blockade is one of the types of regional anesthesia, which is used in the surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery. This procedure allows you to block the pain in the face and head, which allows the surgeon to perform the operation without pain for the patient. The blockade of the nerves of the face is carried out by injecting an anesthetic drug near the corresponding nerves that are responsible for the sensitivity of the skin of the face and head [7].

The use of nerve blockade of the face has its advantages, such as the rapid onset of anesthesia and the absence of the need to insert a needle deep into the tissue. However, like any procedure, it has its risks and can cause some side effects, such as dizziness, nausea and rarely allergic reactions. Therefore, the blockade of the nerves of the face should be carried out only by qualified medical personnel with experience in this field.

The blockade of the nerves of the face and head can be performed in various ways within the framework of regional anesthesia with surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery. Some of the main types of blockades that can be used include:

- trigeminal nerve blockade (trigeminal nerve blockade) is a blockade that blocks the sensitive fibers responsible for sensitivity on the face. It can be performed at various points of the face, including the forehead, temples and lower jaw;
  - maxillary blockade (maxillary nerve blockade) is a blockade that blocks sensitivity on the upper jaw, teeth and gums;
  - mandibular blockade (mandibular nerve blockade) is a blockade that blocks sensitivity on the mandible, teeth and gums;
  - occipital nerve blockade (occipital nerve block) is a blockade that blocks sensitivity on the back of the head and the upper part of the neck;
  - upper cervical plexus blockade is a blockade that blocks sensitivity on the back of the head and the upper part of the neck;
  - median nerve blockade (Moss nerve blockade) is a blockade that blocks sensitivity on the forehead and nose;
  - blockade of the nerves responsible for eye movement (orbital nerve blockade) is a blockade that blocks eye movements and can be used to prevent pain during operations on the eyes and ocular tissues [8].

The specific type of blockade can be selected depending on the location of the operation and the individual characteristics of the patient. Let's consider these types in more detail.

Trigeminal nerve blockade can be performed using various methods, but the main method is subcutaneous aponeurotic injection at the exit point of the frontal branch of the nerve from the zygomatic bone. Before performing the blockade, local anesthesia should be performed in the area of the intended injection. To block the frontal branch of the nerve, the injection
point is located at the level of the zygomatic bone, where the periosteum passes. After the injection, it is necessary to evaluate the effectiveness of the blockade by testing the area of innervation of the trigeminal nerve.

After the blockade is performed, it is necessary to monitor the patient, observing possible side effects and evaluating the effectiveness of anesthesia.

Like any medical procedure, trigeminal nerve blockade can have a number of complications. Some of the most common complications include:

- pain syndrome: after the blockade, pain may occur in the injection area. This is usually temporary and can be relieved by analgesics;
- hyperesthesia: sometimes after nerve blockage, hypersensitivity of the skin in the injection area may develop;
- paralysis: in rare cases, a blockage of the trigeminal nerve can lead to temporary or even permanent paralysis of the facial muscles;
- infection: as with any invasive medical process, there is a risk of infection at the injection site;
- bleeding: there is a risk of bleeding due to the fact that the needle will damage the blood vessels;
- allergic reaction: rarely, but it is possible that the patient may develop an allergic reaction to the anesthetic used or other components of the procedure [9].

Patients should definitely discuss all possible risks and complications of trigeminal nerve block with their doctor before deciding on the procedure.

Blockade of the upper and lower jaws is one of the techniques of regional anesthesia, which can be used for surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery. In this technique, an anesthetic injection is used into the nerve structures responsible for the innervation of the corresponding areas of the face.

It is important to remember that the blockade of the upper and lower jaws can be accompanied by a number of complications, such as bleeding, infection, allergic reactions and even damage to nerve structures, therefore, before carrying out such a procedure, it is necessary to carefully evaluate the indications and contraindications, as well as follow all the rules of asepsis and antiseptics.

Occipital nerve blockade can be performed both superficially and deeply, depending on the objectives of the procedure and the planned manipulations. Usually, the technique of injecting a local anesthetic into the occipital region is used to block the occipital nerve. To block the occipital nerve, the injection is carried out in the occipital region, where the occipital nerve passes through the bone tissue. After the injection of the drug, it is necessary to evaluate the effectiveness of occipital nerve blockade, paying attention to the reduction of pain in the area that was exposed.

Blockade of the upper cervical plexus (UCP) is one of the types of peripheral regional anesthesia. It is used to provide anesthesia of the upper limb, neck, head, including the face and the skin of the back of the head.

After the blockade of the UCP, the patient should be under the supervision of medical personnel. Possible complications of UCP blockade include: nerve damage, hemorrhage and infections.

Blockade of the nerves responsible for eye movement is used to provide anesthesia during surgical interventions on the orbit or in the eye area. Such operations may include correction of intraocular pressure, removal of tumors or damaged tissues, as well as other procedures. The blockade of the nerves responsible for eye movement should be carried out only by a qualified anesthesiologist or surgeon. Improper blockade can lead to serious complications, such as paralysis of the eye muscles or visual impairment [10].

For regional anesthesia during operations for surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery, various drugs can be used, such as:

- lidocaine is a local anesthetic that blocks nerve impulses at the sites of its administration, which leads to loss of sensitivity in this area;
- bupivacaine is also a local anesthetic, which is also used for regional anesthesia during operations on the bones of the skull and reconstructive plastic surgery;
- ropivacaine is another local anesthetic that is used for regional anesthesia in surgery [11].

Other drugs that are used during regional anesthesia can also be used.

It is important to note that the choice of the drug for the medical manipulation in question depends on the specific procedure, the patient's condition and other factors, and should be determined by an experienced anesthesiologist.

Discussion

There are several innovative methods for the use of regional anesthesia in operations for the surgical correction of traumatic defects of the skull bones and
reconstructive plastic surgery. Among such methods should be highlighted:

– ultrasound navigation is a method in which an anesthesiologist uses an ultrasound machine to determine the place of needle insertion for regional anesthesia. It allows you to accurately determine the location of nerve trunks and vessels, which reduces the risk of complications and increases the effectiveness of anesthesia.

– continuous regional anesthesia is a method in which a local anesthetic is injected through a catheter placed near a nerve or nerve trunk, which provides permanent analgesia. It allows patients to receive long-term analgesic therapy after surgery and reduce the use of narcotic analgesics;

– combined regional anesthesia is a method in which an anesthesiologist uses a combination of local anesthetics and other drugs to achieve the best effect of anesthesia. For example, in addition to a local anesthetic, the composition of the medicine may include an opioid analgesic;

– robotic regional anesthesia is a method in which an anesthesiologist uses robotic systems to perform regional anesthesia. It can improve the accuracy of needle insertion and reduce the risk of complications [12].

It is important to note that the use of these innovative methods requires special training and experience of an anesthesiologist, so the choice of method is based on the individual characteristics of the patient and the surgical procedure. Let’s consider the features of the above innovative methods of regional anesthesia in more detail.

Ultrasound navigation is a method in which an anesthesiologist uses an ultrasound machine to determine the place of needle insertion for regional anesthesia. This method allows you to accurately determine the location of nerve trunks and vessels, which reduces the risk of complications and increases the effectiveness of anesthesia. This method is used during regional anesthesia to determine the place of needle insertion near the nerve or nerve trunk. Due to this method, it is possible to visualize structures inside the body and determine the location of nerves, blood vessels and other tissues, which allows the anesthesiologist to accurately determine the place of needle insertion.

The main advantages of ultrasonic navigation are:

1. Accuracy – ultrasound navigation allows you to accurately determine the location of nerve trunks and vessels, which reduces the risk of complications and increases the effectiveness of anesthesia.

2. Safety – Ultrasound navigation helps to avoid damage to nerves and blood vessels when inserting a needle.

3. Effectiveness – ultrasound navigation reduces the dose of local anesthetic, which reduces the risk of side effects [13].

However, the use of ultrasound navigation requires special training and experience of an anesthesiologist, as well as the availability of appropriate equipment. Therefore, before using this method, it is necessary to evaluate the individual characteristics of the patient and the surgical procedure.

Despite the fact that ultrasound navigation has many advantages, it also has some disadvantages:

– cost – an ultrasound device for navigation is quite expensive equipment, which may become an obstacle to its use in some medical institutions;

– complexity – the use of ultrasound navigation requires certain skills and experience of working with ultrasound equipment from the anesthesiologist;

– time – ultrasound navigation takes longer than traditional methods of regional anesthesia, which may affect the duration of the operation;

– limitations – ultrasound navigation may not always be used in cases where the needle insertion site is located in hard-to-reach places or near critical structures such as arteries and veins;

– technical problems – when using ultrasound equipment, technical problems may arise, such as poor image quality, which may complicate the procedure [14].

In general, despite some limitations, ultrasound navigation during regional anesthesia is an effective and safe method that can improve the quality of anesthesia and reduce the risk of complications.

Continuous regional anesthesia (ConRA) is a method of anesthesia in which an anesthetic is injected into an annular catheter located next to a nerve or a group of nerves to provide a long-term analgesic effect. The peculiarity of this method is the constant infusion of anesthetic for a long time.

The technology of continuous regional anesthesia includes several stages:

– preparatory stage: this stage includes assessment of the patient’s condition, planning of the operation, selection of the catheter installation site, local anesthesia and insertion of the catheter into the nerve;
– directly ConRA: after the catheter is installed, a continuous infusion of anesthetic begins, which enters the nerve through the catheter;
– monitoring: during the ConRA, it is necessary to constantly monitor the patient’s condition and the effectiveness of anesthesia in order to adjust the anesthetic dose in time, if necessary;
– catheter removal: after the operation is completed and the catheter is removed from anesthesia [15].

The features of continuous regional anesthesia are as follows:
– duration of anesthesia: continuous infusion of anesthetic provides long-term analgesia, which reduces or even eliminates the need for the use of strong analgesics in the postoperative period;
– reduction of complications: The use of ConRA reduces the risk of complications associated with the use of general anesthesia, such as nausea and vomiting, postoperative pain and a long recovery period.;
– accuracy: the installation of the catheter provides more accurate and selective anesthesia than with superficial regional anesthesia;
– safety: continuous regional anesthesia is a safe method of anesthesia that can be used in patients with various diseases;
– flexibility: the ability to adjust the anesthetic dose allows you to adjust the infusion for each individual patient and adapt it to the needs of the operation and the postoperative period.;
– patient convenience: continuous regional anesthesia allows the patient to maintain sensitivity and mobility in other parts of the body, which can contribute to faster rehabilitation and recovery after surgery;
– Cost-effectiveness: The use of ConRA can be cost-effective for hospitals because it can reduce the length of time patients stay in the hospital, reduce the cost of pain relief and reduce the number of complications and the need for additional procedures.

However, as with any method of anesthesia, continuous regional anesthesia also has its limitations and disadvantages. Some of them may include:
– Difficulties with catheter installation: Catheter installation can be a complex procedure requiring experienced medical personnel, which may be a limiting factor for some medical institutions;
– risk of infection: insertion of a catheter may increase the risk of infection, which can lead to serious complications for the patient.;
– risk of overdose: incorrect dosage of the anesthetic can lead to an overdose, which can be life-threatening for the patient.;
– the need for constant monitoring: continuous regional anesthesia requires constant monitoring to monitor the effectiveness of anesthesia and prevent possible complications;
– limited applicability: some types of operations may be difficult to perform using continuous regional anesthesia [17].

In general, continuous regional anesthesia is an effective method of anesthesia, which can be used in a number of surgical interventions to achieve long-term and accurate anesthesia in patients. However, as with any procedure, before using NRA, it is necessary to identify contraindications to its implementation in a particular patient.

Combined Regional Anesthesia (ComRA) is a method that combines two or more forms of regional anesthesia to provide effective analgesia during and after surgery. This allows you to achieve maximum pain relief and prevent unpleasant sensations during the operation and during the first hours after it. In addition, ComRA can reduce the total dose of anesthetics, which reduces the risk of unwanted side effects.

The advantages of combined regional anesthesia include:
– Higher level of analgesia: the combination of several methods of regional anesthesia allows you to achieve a higher level of analgesia, which can be useful in the case of complex operations or for patients who experience severe pain;
– longer duration of action: nerve blockades have different characteristics of duration of action, which allows you to get prolonged analgesia for several hours or even days;
– lower dose of anesthetics: combined regional anesthesia can reduce the total dose of anesthetics, which reduces the risk of undesirable side effects;
– reducing the dose of general anesthesia: nerve blockages can reduce the dose of general anesthesia, which reduces the risk of undesirable side effects.

Some of the disadvantages of combined regional anesthesia may include:
– the difficulty of installing catheters. The installation of catheters for nerve blockages can be a complex procedure that requires experienced medical personnel;
– risk of complications. As with any procedure involving the insertion of a needle, there is a risk of com-
Complications, such as infection, damage to surrounding tissues or nerves, as well as the possibility of allergic reactions to anesthetics;

– restrictions. Combined regional anesthesia may not be possible for some patients due to medical contraindications or anatomical features;
– complexity of analgesia management. Combined regional anesthesia may be difficult to manage analgesia in the postoperative period, which may require more medical supervision and monitoring [18].

The technology of combined regional anesthesia may vary depending on the specific procedure and the needs of the patient. Special attachments for ultrasound navigation can be used to install catheters and control analgesia.

In general, combined regional anesthesia can be an effective method of providing a high level of analgesia and reducing the dose of anesthetics. However, as with any method of anesthesia, it should be used with caution and only after a thorough assessment of the patient and consultation with an experienced anesthesiologist.

Robotic regional anesthesia is a relatively new method of providing anesthesia that uses robotic systems to perform accurate and safe injections of anesthetics in the right places. This method can be useful when performing complex procedures, such as operations on the spinal cord or other sensitive areas [19].

The features of robotic regional anesthesia are as follows:

– accuracy. Robotic systems allow you to achieve great accuracy when administering anesthetics to the right place, which can reduce the risk of complications and increase the effectiveness of the procedure.
– security. Robotic systems provide a high level of safety, as they can control the depth and speed of injection of anesthetics, which minimizes the risk of damage to nerves or other tissues;
– minimal impact. Robotic regional anesthesia may require fewer anesthetics, as it allows you to achieve high accuracy in the administration of injections, which reduces the risk of overdose;
– complexity of management. Robotic regional anesthesia may require a higher level of experience and require specialized training for an anesthesiologist, since the use of a robotic system requires additional work and configuration.

However, as with any method of anesthesia, robotic regional anesthesia has its limitations and may be ineffective in some cases. In addition, this method can be quite expensive and requires special equipment [20].

In general, robotic regional anesthesia is a promising method of providing anesthesia that can improve the accuracy and safety of procedures. However, before using it, it is necessary to conduct a thorough assessment of the patient and consult with an experienced anesthesiologist.

**Conclusions**

Regional anesthesia is a safe and effective method of providing anesthesia during surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery. The use of regional anesthesia allows to achieve maximum effectiveness of anesthesia, reduce the risk of complications, accelerate the patient's recovery and reduce the total dose of anesthetics.

However, when using regional anesthesia, it is necessary to take into account the characteristics of each patient, such as age, health status, allergies and other factors. It is important to conduct a thorough assessment of the patient and consult with an experienced anesthesiologist to choose the optimal method of anesthesia.

Currently, various methods of regional anesthesia are available, such as ultrasound navigation, continuous regional anesthesia, combined regional anesthesia and robotic regional anesthesia. Each method has its advantages and disadvantages, and the choice of method should be carried out in accordance with the specific conditions and needs of the patient.

Thus, regional anesthesia is an important tool for ensuring safe and effective anesthesia during surgical correction of traumatic defects of the skull bones and reconstructive plastic surgery. However, in order to achieve the best results, it is necessary to take into account the characteristics of each patient and choose the optimal method of anesthesia, taking into account its effectiveness and safety.

**References**


