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MODERN REPRESENTATIVES OF ANESTHETICS USED IN DENTISTRY

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ANNOTATION: This article analyzes anesthetics that provide painless treatment in modern dentistry, their chemical properties, clinical applications and efficiency indicators. The mechanism of action, advantages and risks of anesthetics such as articaine, lidocaine, mepivacaine, bupivacaine and prilocaine are discussed, as well as recommendations for use in special groups of patients. The results of the study indicate the importance of an individual anesthesia approach in dental practice.

Keywords: Dentistry, anesthesia, local anesthetics, articaine, lidocaine, mepivacaine, bupivacaine, prilocaine, painless treatment, topical anesthesia.

STOMATOLOGIYADA QO'LLANILUVCHI ANESTETIKLARNING ZAMONAVIY VAKILLARI

ANNOTATSIYA: Mazkur maqolada zamonaviy stomatologiyada og‘riqsiz davolash jarayonini ta’minlovchi anestetiklar, ularning kimyoviy xususiyatlari, klinik qo‘llash sohalari va samaradorlik ko‘rsatkichlari tahlil qilingan. Artiqain, lidokain, mepivakain, bupivakain va prilokain kabi anestetiklarning ta’sir mexanizmi, afzallik va xavf jihatlari, shuningdek, maxsus guruh bemorlarda qo‘llash bo‘yicha tavsiyalar yoritilgan. Tadqiqot natijalari stomatologik amaliyotda individual anesteziya yondashuvining ahamiyatini ko‘rsatadi.

Kalit so’zlar: Stomatologiya, anesteziya, mahalliy anestetiklar, artiqaïn, lidokain, mepivakain, bupivakain, prilokain, og‘riqsiz davolash, topikal anesteziya.

СОВРЕМЕННЫЕ ПРЕДСТАВИТЕЛИ АНЕСТЕТИКОВ, ПРИМЕНЯЕМЫХ В СТОМАТОЛОГИИ

АННОТАЦИЯ: В данной статье анализируются анестетики, обеспечивающие безболезненное лечение в современной стоматологии, их химические свойства, клиническое применение и показатели эффективности. Обсуждаются механизм действия, преимущества и риски применения таких анестетиков, как артикаин, лидокаин, мепивакаин, бупивакаин и прилокаин, а также рекомендации по применению у особых групп пациентов. Результаты исследования свидетельствуют о важности индивидуального подхода к анестезии в стоматологической практике.

Ключевые слова: Стоматология, анестезия, местные анестетики, артикаин, лидокаин, мепивакаин, бупивакаин, прилокаин, безболезненное лечение, топическая анестезия.

INTRODUCTION

21st century dentistry strives to provide maximum comfort and painless treatment for the patient. The effectiveness of painkillers significantly increases the quality of the treatment

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process and has a positive effect on the psychological state of the patient. As anesthetics are constantly improving, anesthetics used in modern clinics are distinguished by safety, rapid onset of action, duration and minimization of risks associated with allergic reactions. Therefore, it is important to study modern representatives of anesthetics used in dental practice on a scientific basis.

Today, it is almost impossible to perform any procedure in dentistry without anesthesia. Anesthesia is of great importance in all surgical procedures performed in the oral cavity, such as tooth grinding, tooth extraction, or during dental treatment and prosthetics. Therefore, anesthesia is widely used during dental procedures, and currently a large number of drugs are used for it. The effectiveness of such drugs is assessed by the degree of protein binding of the pharmacological structure, its solubility in fats and the distribution properties in tissues. The stronger the protein binding of the anesthetic agent and the lower its solubility in fats, the higher the analgesic effect and the minimal side effects. Based on these criteria, the most effective anesthetics used in modern dentistry include novocaine, trimecaine, lidocaine and articaine.[1]

The mechanism of action of anesthetics is manifested by directly affecting the endings of afferent nerve fibers and nerve fibers, preventing the formation, transmission and propagation of an excitation impulse. They change the surface tension in the phospholipid layer of the nerve membrane and block the channels necessary for the passage of sodium and potassium ions. The main requirements for local anesthetics are: they must have high selectivity, sufficient duration of action, no side effects, low toxicity, hydrophilic properties, be easy to manufacture industrially, be inexpensive, and maintain sterility.

DISCUSSION AND RESULTS

In modern dentistry, the primary task is to ensure a painless treatment process, and the role of local anesthetics in this regard is invaluable. Anesthetics developed in recent years have higher efficiency, shorter onset of action, longer duration, and lower risk of allergic reactions than their predecessors. Currently, anesthetics used in dental practice belong to the amide group, which are metabolically safe, have low neurotoxicity, and good tissue compatibility. Articaine is the most widely used of modern anesthetics, as it has high diffusion properties, therefore it provides sufficient analgesia both in infiltration anesthesia and in complex surgical procedures. It is used in combination with adrenaline in a ratio of 1:100,000 or 1:200,000, reducing bleeding and prolonging the duration of anesthesia.

Modern dentistry is also expanding the use of topical anesthetics. Benzocaine and lidocaine preparations in the form of sprays, gels or creams are important for reducing injection pain, treating gums and facilitating psychological adaptation to injections in children. The addition of additional components to modern anesthetics - for example, vasoconstrictors, antioxidants and stabilizers - increases their safety, enhances their effectiveness and minimizes the negative impact on the patient's general condition. The choice of anesthetic is based on the patient's age, allergic history, cardiovascular diseases and the complexity of the dental procedure to be performed. [2] Novocaine is used in medicine in the form of hydrochloride, has sufficient analgesic effect, very low toxicity, and the effect lasts 30–60 minutes. Due to its poor penetration through mucous membranes, it is used more for superficial anesthesia. Novocaine does not constrict blood vessels, therefore, it is recommended to use it together with adrenomimetics - adrenaline or mezaton to keep it at the injection site longer, increase the

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duration of action and reduce toxicity. If the dose is exceeded, signs of poisoning such as dizziness, weakness, nausea, vomiting, loss of consciousness, pale skin, decreased blood pressure, increased pulse, and in severe cases, seizures are observed. The anesthetic power of trimecain is 2–3 times higher than that of novocaine, and the effect lasts 2–4 hours. It is absorbed very quickly by tissues, but its toxicity is approximately 1.5 times higher than that of novocaine.

Lidocaine is the most widely used universal anesthetic, used in all types of local anesthesia. It is 2.5 times more potent than novocaine, and its toxicity is slightly higher. The duration of action is twice as long as that of novocaine. While novocaine is effective with adrenomimetics for 1.5–2 hours, lidocaine provides analgesia for 2–4 hours with the addition of adrenaline. Its good absorption into the blood allows it to have a positive therapeutic effect even in heart rhythm disorders. If the dose exceeds the norm, nausea, difficulty breathing, convulsions, decreased visual acuity, drowsiness, tremor of the limbs, and in severe cases, cardiovascular system dysfunction are observed.[3]

Table 1. Modern dental anesthetics

№	Name of Anesthetic	Type of Application	Duration of Action	Note (Main Advantage)
1	Articaine	Infiltration / conduction	1–3 hours	Strong and fast effect
2	Lidocaine	Mainly infiltration	1–1.5 hours	Standard, safe
3	Mepivacaine	Infiltration / conduction	1.5–3 hours	Can be used without vasoconstrictor
4	Bupivacaine	Conduction	4–8 hours	Very long-lasting effect
5	Prilocaine	Infiltration	1.5–3 hours	Low toxicity
6	Benzocaine	Topical	5–15 minutes	Rapid analgesia
7	EMLA cream	Topical	30–60 minutes	Suitable for children

Articaine is a modern anesthetic with vasodilating and muscle spasmolytic properties. It is characterized by high protein binding and low lipid solubility. It is especially convenient for use in elderly patients and pregnant women. The onset of action is 3–4 minutes and lasts about 25–30 minutes, making it a suitable agent for short-term dental procedures.

Excessive use of local anesthetics, incorrect dosage, or if the patient is allergic can lead to the following complications: general intoxication, toxic reactions to novocaine or adrenaline,

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fainting, acute vascular insufficiency, anaphylactic shock, seizures, and in severe cases, death.[4]

The anesthesia process in dentistry is divided into several types and stages. Local anesthesia is widely used and is divided into the following types: application, infiltration, conduction, intrapulpal, intraligamentary, osteocentral and topical anesthesia.

It is used as the initial stage of local anesthesia. The mucous membrane around the tooth is covered with a special gel using a sterile cotton swab. Within about 30 seconds, a slight numbness appears in the gum area and the injection site becomes completely numb. Due to this, the patient hardly feels the needle insertion process. A capsule syringe is used in all types of local anesthesia. It has a thin needle, and the anesthetic substance is injected very slowly. Therefore, the patient feels only a slight feeling of pressure, there is no significant pain. It is mainly used in dental procedures in the upper jaw: treatment of caries and pulpitis, tooth extraction, root resection, frenuloplasty, gingival transplantation, implant placement and sinus lift procedures. It is used less frequently in the lower jaw, mainly for professional cleanings or minor procedures on the front teeth. The effect begins in 3–5 minutes and lasts up to 1.5 hours.

It is used only in the lower jaw. The anesthetic is not injected directly into the treatment area, but around the nerve that innervates this area. As a result, half of the jaw, half of the tongue, the lower lip, and the affected side of the cheek are numbed. Its main advantage is that it allows for the treatment of several teeth at the same time. The effect begins in 10–15 minutes and lasts up to 4 hours. Eating after the procedure is not recommended, as the sensitivity of the cheeks and lips is reduced.[5]

This anesthesia is used when infiltration or conduction anesthesia is not enough for root canal treatment. Using a very thin (0.3 mm) flexible needle, the anesthetic is injected directly into the pulp, that is, into the part where the tooth nerve is located. The anesthetic is injected into the periodontal ligament. If necessary, it is used in combination with infiltration or conduction anesthesia. The effect is short - lasts 30-40 minutes. Often it does not provide complete anesthesia on its own and is chosen as an additional method. Using a special electronic device, the anesthetic is injected directly into the bone tissue. Up to six teeth can be anesthetized at the same time with one injection. Since there is no adhesion in the oral cavity, there is no risk of biting the lip. The pen-like tip of the device makes the procedure more comfortable for the patient. The most commonly used anesthetic in dentistry today is Articaine, which is more effective than novocaine and lidocaine.[6]

Table 2. Modern Articaine-based Preparations

№	Name of Anesthetic	Composition	Application	Special Note
1	Ultracaine DS forte	Articaine + epinephrine	Conduction anesthesia	Strong and long-lasting effect
2	Ultracaine DS	Articaine	Infiltration anesthesia	Can be used for children, pregnant and breastfeeding women
3	Ubistesin / Ubistesin forte	Articaine + epinephrine	Conduction and infiltration	Provides rapid onset of action

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№	Name of Anesthetic	Composition	Application	Special Note
			anesthesia	
4	Septanest	Articaine + adrenaline	Fast and long-acting anesthesia	Contraindicated in patients with anemia, tachycardia, and children due to adrenaline content
5	Scandonest	Mepivacaine	Conduction and infiltration anesthesia	Strong effect up to 4 hours, often suitable for patients with cardiovascular diseases

Most anesthetics contain adrenaline or epinephrine, which constricts blood vessels and significantly prolongs the effect of anesthesia. In modern dentistry, various methods of anesthesia are selected depending on the complexity of the procedure, the patient's sensitivity to pain, and the general state of health. Articaine-based drugs are characterized by high efficiency, rapid action, and a high level of safety. Properly selected anesthesia ensures that the patient feels comfortable during the procedure, increasing the quality of the dental treatment process.[7]

CONCLUSION

The improvement of painless treatment technologies in dentistry is closely related to the development of modern anesthetics. The effectiveness, safety and biocompatibility of a new generation of anesthetics belonging to the amide group have brought dentistry to a new level. Articaine, lidocaine, mepivacaine, bupivacaine and prilocaine have proven themselves in clinical practice, and correctly selected doses and an individual approach ensure maximum patient safety. In the future, further improvement of anesthetics will ensure that dental procedures are painless and psychologically comfortable for the patient.

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