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The Progress of Oral Local Anesthetics in the Treatment of Maxillofacial Pain

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Abstract

Maxillofacial pain represents a substantial health burden, exerting detrimental effects on patients' physical health, psychological state, and overall quality of life. Within the therapeutic strategies for this complex condition, oral local anesthetics hold a pivotal position. Contemporary research endeavors are progressively enhancing our comprehension of their precise roles and efficacy. This article provides a comprehensive review of the current therapeutic approaches for maxillofacial pain, with a specific focus on elucidating the critical importance and underlying mechanisms of action of oral local anesthetics. Furthermore, it critically evaluates recent innovations and advancements in the clinical application of these anesthetic agents for maxillofacial pain management. The insights presented aim to inform and guide the future evolution of diagnostic methodologies and therapeutic interventions in this field.

Keywords

Maxillofacial pain; Oral cavity; Local anesthetic; Therapeutic Progress

Maxillofacial pain is a relatively common somatic symptom in diagnosis and treatment. Its onset characteristics and etiological classification are rather complex. It mainly includes acute maxillofacial pain and chronic maxillofacial pain, inflammatory maxillofacial pain and non-inflammatory maxillofacial pain, etc. [1]. The common causes of maxillofacial pain include odontogenic, neurogenic, myofascial, etc. Among them, patients with odontogenic maxillofacial pain mostly present with persistent pain, and the degree of pain is closely related to the changes in the condition. Pulpitis and dental caries are more common [2]. Neurogenic maxillofacial pain is commonly seen in diseases such as trigeminal neuralgia. The pain of patients is mostly paroxysmal, with a relatively intense pain response, resembling lightning or knife cuts. The attack duration is relatively short, and the intervals between attacks vary [3]. Myofascial maxillofacial pain is related to factors such as overuse of muscles and poor posture, and the pain is characterized by chronic and diffuse features. The occurrence of maxillofacial pain can have a relatively significant impact on the quality of life of patients. At present, the intervention for maxillofacial pain in the medical field mainly includes drug therapy, physical therapy, surgical treatment, etc. [4]. Anesthesia and analgesia are important components in the intervention of maxillofacial pain. Oral local anesthetics are the most commonly used. Through block anesthesia, infiltration anesthesia, etc., local anesthetic drug intervention can effectively relieve the pain symptoms of patients. Based on the relevant research data in recent years and the current situation of maxillofacial pain treatment, this paper reviews and analyzes the importance and mechanism of action of oral local anesthetics in the treatment of maxillofacial pain.

1. The current situation of treatment for maxillofacial pain

1.1 Drug therapy

In the treatment of maxillofacial pain, drug therapy is the most commonly used. For mild inflammatory maxillofacial pain, non-steroidal anti-inflammatory drugs can be used to relieve symptoms. Patients with moderate to severe pain may need to be given opioid drugs and other interventions to relieve pain symptoms. The safety of drug treatment

has always been one of the main problems faced in drug intervention for maxillofacial pain. For example, non-steroidal anti-inflammatory drugs may cause gastrointestinal discomfort, liver and kidney function damage, etc., while opioid drugs have risks such as addiction and respiratory depression. Meanwhile, for patients with chronic maxillofacial pain, if they use drug intervention for a long time, there is a certain risk of tolerance and dependence, which affects the control of maxillofacial pain.

1.2 Surgical treatment

It is applicable to cases of maxillofacial pain with clear causes and ineffective conservative intervention. For instance, for patients with neurogenic maxillofacial pain, nerve decompression surgery can be performed as an intervention. For those with odontogenic maxillofacial pain, root canal treatment can be carried out, etc. By removing the cause through surgical treatment, the pain in the maxillofacial region can be effectively relieved. However, surgical treatment has the risks of complications such as infection, bleeding, and nerve injury [5]. Meanwhile, patients with poor physiological conditions and contraindications for surgery are not eligible for surgical treatment.

1.3 Physical therapy

Currently, commonly used physical therapy methods include hot compress, massage, acupuncture, physiotherapy, etc. These mainly relieve muscle tension, promote local blood circulation, and alleviate pain symptoms in the maxillofacial region. Physical therapy is relatively safe, but it takes effect relatively slowly and requires long-term treatment. When applied to patients with chronic maxillofacial pain, physical therapy can play a certain auxiliary role, but it cannot completely cure the disease.

2. The importance of oral local anesthetics in the treatment of maxillofacial pain

2.1 Targeted nature of oral local anesthetics

In the treatment of maxillofacial pain, oral local anesthetics can directly act on the painful area, precisely blocking nerve conduction and achieving a relatively satisfactory analgesic effect. Oral local anesthetics are widely used in superficial surgeries, such as tooth extraction and periodontal treatment [6]. By locally injecting anesthetics, the surgical area can quickly lose sensation without affecting the function of adjacent areas. Oral local anesthetics can also be used in complex surgical treatments, such as the resection of oral and maxillofacial tumors. Through the intervention of oral local anesthetics, nerve block can be effectively achieved to ensure the smooth progress of the surgery [7].

2.2 Reversibility of oral local anesthetics

The effect of oral local anesthetics is reversible. After the administration of oral local anesthetics, the local nerve conduction function can return to normal through the body's metabolism. Therefore, the intervention of oral local anesthetics does not affect the sensory and motor functions of patients and has high safety.

2.3 Diagnostic value of oral local Anesthetics

In the treatment of maxillofacial pain, oral local anesthetics can also be used for the identification and diagnosis of etiology. For instance, when applied to patients with trigeminal neuralgia [8], by injecting local anesthetics around the patient's nerve trunk, the pain relief of the patient can be evaluated, and then the source of pain can be identified, providing a certain basis for subsequent treatment.

2.4 Safety of oral local Anesthetics

Oral local anesthetics are used locally. Compared with general anesthesia, they have less impact on the patient's whole body and a lower risk of adverse reactions. During the implementation of general anesthesia, operations such as tracheal intubation and mechanical ventilation are required, and there are certain risks of complications such as respiratory tract infection, nausea, and vomiting [9]. Oral local anesthetics are administered locally and exert their effects on the target tissues. They have a relatively small impact on the overall physiological functions of the patient and are highly safe. They are especially suitable for patients with poor physiological conditions who cannot tolerate general anesthesia.

2.5 Scope of application of oral local Anesthetics

In the treatment of maxillofacial pain, oral local anesthetics have a relatively wide range of applications and show good application effects in the treatment of odontogenic, neurogenic, musculofascial, and other maxillofacial pain. In actual diagnosis and treatment, the selection of local oral anesthetics can be based on the characteristics of the patient's pain and treatment needs. For instance, lidocaine takes effect quickly and is suitable for short-term pain relief, while bupivacaine has a long-lasting effect and is suitable for situations requiring prolonged pain relief.

3. The mechanism of oral local anesthetics in the treatment of maxillofacial pain

It was generally believed in previous diagnosis and treatment that oral local anesthetics mainly function by blocking sodium ion channels. After oral local anesthetics are administered, they enter nerve cells and bind to specific receptors on sodium ion channels, effectively preventing the influx of sodium ions, thereby inhibiting the generation and conduction of nerve impulses and achieving a better anesthetic and analgesic effect. In recent years, with the gradual in-depth research on oral local anesthetics [10, 11], it has been found that such drugs have better anti-inflammatory and pain-regulating effects, etc. In an inflammatory environment, oral local anesthetics can effectively inhibit the release of inflammatory mediators such as prostaglandins and leukotrienes after administration, alleviate the inflammatory response, and thereby relieve the pain response caused by the stimulation of inflammatory factors. Meanwhile, oral local anesthetics also have a good effect in regulating the expression and activity of pain-causing factors. For example, oral local anesthetics can effectively reduce the levels of substance P, calcitonin gene-related peptides, etc., reduce the transmission of pain signals, and exert a better analgesic effect [12].

Oral local anesthetics may have an impact on intracellular signal transduction pathways and exert multi-target regulatory effects. For example, oral local anesthetics can exert better anti-inflammatory and analgesic effects by inhibiting the mitogen-activated protein kinase signaling pathway and reducing the expression of inflammation-related genes. Meanwhile, oral local anesthetics also have a certain function of regulating ion channels. For example, by regulating potassium ion channels, they can affect the excitability of nerve cells. Oral local anesthetics can also have a certain intervention effect on central sensitization. The occurrence of chronic pain is closely related to central sensitization. After oral local anesthetics are administered, they effectively reduce the excitability of neurons by inhibiting the sensitization process of the central nervous system, thereby alleviating the chronic pain symptoms of patients.

With the development of anesthesiology, oral local anesthetics have also been developing towards precision in the treatment of different types of maxillofacial pain. For example, in the treatment of odontogenic maxillofacial pain such as pulpitis, commonly used oral local anesthetics such as lidocaine and articaine can exert better analgesic effects by injection around the dental pulp, root apex, and other sites [13]. In the treatment of neurogenic maxillofacial pain, such as trigeminal neuralgia, bupivacaine and lidocaine are commonly used. The injection sites are generally selected around the nerve trunk, such as the branches of the trigeminal nerve, etc., which can effectively improve the pain symptoms and relieve the physical burden of patients [14]. Myofascial pain is commonly treated with local anesthetic drugs such as procaine and lidocaine. Local injection is carried out at the sites where the painful muscles and fascia are attached, effectively alleviating the pain symptoms.

Among the commonly used oral local anesthetics in the current medical field, lidocaine has a strong local anesthetic effect, takes effect rapidly, and is suitable for various types of pain. It is widely used in the short-term treatment of odontogenic pain and neurogenic pain. Drugs like bupivacaine have a long duration of action and are thus commonly used in situations where long-term analgesia is required, such as block therapy for neurogenic pain. Atecaine has relatively ideal permeability and is often used in the treatment of odontogenic pain. Procaine has less toxicity and side effects and higher safety, and thus is often used in local infiltration anesthesia for myofascial pain. Oral local anesthetics also have high value in patients after maxillofacial pain surgery. Postoperative analgesia is directly related to the postoperative rehabilitation quality of maxillofacial pain. Effective postoperative analgesia can reduce the risk of stress response in patients and the incidence of complications at the same time. Studies have found [15] that poor postoperative pain control can cause varying degrees of impact on the respiratory system, circulatory system, etc. of patients, increasing the risk of complications such as pulmonary infection and deep vein thrombosis. If some doctors combine oral local anesthetics with oral analgesics in postoperative patients [16], it effectively alleviates the early postoperative pain response, lays a good foundation for early postoperative oral functional exercise, effectively shortens the recovery time, and simultaneously reduces the incidence of complications.

4. Innovation in dosage forms and optimization of delivery of oral local anesthetics

At present, the research and development of oral local anesthetics is constantly advancing, and related technologies are also constantly innovating, bringing new options for the treatment of maxillofacial pain. For example, as a new type of amide local anesthetic, atecaine has the characteristics of rapid onset and long-lasting effect, and its action time can reach 2 to 3 hours. Compound preparations containing epinephrine are also new types of local anesthetics. The application of epinephrine can prolong the anesthesia time. The new technology of microcomputer-controlled injection systems has been gradually applied in clinical diagnosis and treatment. The application of this technology can effectively improve the accuracy and safety of local anesthetic injection. In practical applications, by precisely controlling the injection speed and dosage, complications caused by too fast injection or excessive dosage can be avoided.

5. Conclusion

In the treatment of maxillofacial pain, oral local anesthetics play an extremely important role. They can achieve anesthesia and analgesia by blocking sodium ion channels and inhibiting nerve impulse conduction. At the same time, they also have multi-target regulatory effects such as anti-inflammation, regulation of pain-causing factors, and intervention in central sensitization, providing many options for the treatment of maxillofacial pain. In the future, it is expected that through the exploration of targeted delivery technologies such as nanocarriers, the accuracy of local anesthetic applications can be further enhanced and the impact on surrounding normal tissues can be reduced.

References

[1] Hay MI, Bender S, Alonso A, et al. How does dental sleep medicine fit into the specialty of orofacial pain?: A narrative review. J Am Dent Assoc. 2025; [Epub ahead of print].

[2] Liu F, Li Q, Wu Z, et al. Research progress of long non-coding RNA regulating gene expression and its application in chronic oral and maxillofacial pain. Chin Med Rev. 2025;22(11):65-70.

[3] Yang S, Zhao Y, Zhang Y, et al. Balloon compression under local anesthesia for the treatment of trigeminal neuralgia complicated with type II respiratory failure: one case. Contemp Chin Med. 2025;32(4):144-7.

[4] Li X, Sun M, Guo W, et al. Expert consensus on the evaluation and rehabilitation management of speech disorders after oral and maxillofacial tumor surgery. J Pract Stomatol. 2025;41(1):5-15.

[5] Miao Y, He L, Dong D, et al. Protocol selection for percutaneous balloon compression under local anesthesia in the treatment of primary trigeminal neuralgia. J China Med Univ. 2025;54(2):161-6.

[6] Su R. Comparison of the roles of lidocaine and atecaine in anesthesia for irreversible pulpitis of mandibular molars. Contemp Chin Med. 2018;25(17):134-6.

[7] Gao Y, Hao L, Ma H, et al. Different analgesic model the influence of postoperative analgesia in patients with oral cancer surgery. J Harbin Med Univ. 2024;58(1):59-63.

[8] Yan W, Liao C, Yang T. Analysis of the application effect of ultrasound-guided coronal process nerve block combined with bupivacaine local anesthesia in patients with trigeminal neuralgia. Chin Foreign Med Res. 2024;3(32):40-2.

[9] Cao N, Tang L. The influence of local anesthesia mucosal injection sites and individual factors on the pain degree of patients during dental implant surgery. Syst Med. 2024;9(12):178-81.

[10] Guo X. Two kinds of the STA anesthesia method for the treatment of children's oral comfortable degree of influence [dissertation]. Shandong University; 2023.

[11] Wang Y, Xie H, Gong Y. Clinical study on the effect of compound atecaine combined with lidocaine on inferior alveolar nerve block in elderly patients with acute pulpitis of mandibular molars. Chin J Clin Pharmacol. 2023;33(17):2459-63.

[12] Xiao H. Research on the effects of four anesthesia methods in root canal treatment of irreversible pulpitis in the posterior mandibular teeth [dissertation]. Jilin University; 2023.

[13] Li Y. Comparison of blood drug concentration changes of atecaine in the periodontal ligament, submucosa and intravenous injection [dissertation]. Beijing Union Medical College; 2023.

[14] Zhang N. Comparison of the efficacy of percutaneous balloon compression and radiofrequency thermocoagulation under regional anesthesia for primary trigeminal neuralgia [dissertation]. Hebei Medical University; 2022.

[15] Zhang Y, Chu Q. The influence of nerve block combined with radiofrequency surgery on pain and quality of life in patients with oral and maxillofacial trigeminal neuralgia. Guizhou Med. 2022;46(2):265-6.

[16] Tian X. Clinical study on the anesthetic effects of four different local anesthesia methods in the pulp preservation treatment of the first young permanent molar of the mandible [dissertation]. China Medical University; 2022.