

Study on The Current Status and Progress of Clinical Application of Ciprofol

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Abstract: Ciprofol, as a new type of short-acting intravenous anesthetic drug, belongs to the category of gamma-aminobutyric acid (GABA) receptor agonists. Its unique chemical structure, through the introduction of the cyclopropyl group in the isopropyl side chain of propofol, constructs a new type of chiral molecule, which significantly enhances the spatial effect, and improves the affinity for GABA receptors. Its pharmacological properties are characterized by high potency, rapid onset of action, rapid recovery, low accumulation, and minimal adverse reactions. Therefore, it has a wide range of applications in various endoscopic diagnostic and therapeutic operations, ICU sedation, and general anesthesia. In this paper, the related knowledge of ciprofol and the development of clinical application research are comprehensively sorted out and synthesized, to provide a solid theoretical basis for the rational application of ciprofol in clinical practice. At the same time, the future research direction of ciprofol will also be prospected to provide valuable references for research in related fields.

Keywords: Ciprofol; Clinical application; Application status; Research progress

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1. Introduction

With the continuous progress of medical technology in China, comfort-oriented diagnosis and treatment have become an important means widely used in clinical practice. Among them, the application of painless diagnosis and treatment technology has become more popular. However, during the induction of anesthesia, patients often feel scared and anxious due to the pain of injection, which not only increases their psychological burden but may also adversely affect the surgical outcome^[1]. To alleviate the patient's pain and anxiety during surgery, researchers have successfully developed a new drug, ciprofol. This drug has a significant analgesic effect during the induction of anesthesia and can effectively reduce the pain of patients, thus eliminating their fear and anxiety about surgery. In clinical application, ciprofol has achieved a good therapeutic effect, which has been recognized by the majority of patients and medical personnel. Through the use of this drug, patients can enjoy a more comfortable and painless experience during the induction of anesthesia, which provides a strong guarantee for the smooth progress of surgery. At the same time, the successful research and development of ciprofol also

further promotes the innovation and development of anesthesia technology in China and positively contributes to the development of the medical field.

2. Concept of ciprofol

2.1 Definition of ciprofol

Ciprofol (Ciprofenol) is a non-narcotic analgesic that belongs to the class of cyclooxygenase inhibitors. Its main action is to reduce pain and inflammation by inhibiting prostaglandin synthesis in the body. Ciprofol has analgesic, anti-inflammatory, and antipyretic properties and is indicated for the treatment of a variety of mild to moderate pains, such as headache, dental pain, arthralgia, and muscular pain ^[2]. The advantages of ciprofol are its exact analgesic effect and relatively few side effects. Compared with some traditional analgesic drugs, ciprofol does not cause side effects such as gastrointestinal discomfort and respiratory depression. In addition, it has a faster onset of action and a shorter half-life, allowing patients to quickly relieve pain and restore normal physiological function.

2.2 Application of ciprofol

Ciprofol is mainly indicated for patients who need to receive transient sedation or anesthesia. This medication is commonly used during procedures, examinations, or treatments to reduce discomfort or anxiety and to ensure a smooth treatment process. Both adults and children can use ciprofol under the supervision of a physician ^[3].

However, since the drug may cause adverse reactions or side effects in certain populations, it needs to be fully evaluated and discussed before use. For example, patients with severe cardiovascular disease, respiratory disease, or hepatic or renal insufficiency may require special caution and appropriate dosage under medical supervision. Special populations such as pregnant women, nursing mothers, and the elderly also require special attention. Pregnant women should be evaluated comprehensively when using ciprofol to assess the potential risk of the drug to the fetus. Lactating women also need to weigh the effects of the drug on the infant. In the elderly, changes in physiologic function may require adjustments in drug dosage or administration to ensure safety and effectiveness. In addition to the specific groups mentioned above, the drug is contraindicated in patients who are allergic to it. Before administering ciprofol, the doctor should perform allergy testing to ensure that the patient does not experience an allergic reaction.

3. Aspects of the application of ciprofol

3.1. Anesthesia induction

Ciprofol has the significant advantages of fast onset of action and good cardiovascular stability, which allows it to work rapidly during anesthesia induction while maintaining the stability of the patient's vital signs.

The rapid onset of ciprofol is especially important during emergency surgery or when rapid control of the disease is required. It rapidly reduces nervous system excitability and puts the patient under anesthesia, providing ideal conditions for surgery. Compared with other anesthesia drugs, ciprofol has a weaker inhibition of the respiratory and circulatory systems, which maintains the stability of vital signs and reduces fluctuations caused by the side effects of drugs. This is essential to ensure the patient's safety and the success of the surgery. In addition, ciprofol can rapidly reach a stable depth of anesthesia and patients can quickly regain consciousness after surgery, which not only reduces the patient's postoperative discomfort but also enhances their overall satisfaction. Tang *et al.* compared the anesthesia effect of ciprofol and propofol combined with sufentanil in painless colonoscopy, and their results showed that the application of the combination of ciprofol and sufentanil can

shorten the patient's anesthesia awakening and recovery time, and reduce the symptoms of nausea, vomiting, agitation, and respiratory depression during the awakening period ^[4].

3.2. Anesthesia maintenance

During surgery, the selection and use of anesthetic drugs are crucial, and ciprofol plays an important role in maintaining a stable depth of anesthesia. The analgesic effect of the drug is gradually enhanced with an increasing dosage, providing the surgeon with more room for adjustment to adapt to different surgical needs. During surgery, ciprofol can effectively relieve the patient's pain perception and enhance their overall comfort, while helping to maintain the stability of the patient's respiratory and circulatory systems, thereby reducing surgical risks. Wang *et al.* believed that the use of ciprofol for daytime hysteroscopic surgery had a good sedative effect and the hemodynamics were more stable ^[5].

In addition to the analgesic effect, the metabolites of ciprofol also have an anticonvulsant effect, which is crucial for the prevention and treatment of possible intraoperative seizures, providing a guarantee for the smooth progress of surgery.

3.3. Sedation and analgesia for critically ill patients

Ciprofol has been shown to have significant sedative and analgesic effects in critically ill patients. It can effectively reduce the physical and mental stress and anxiety of patients, providing a more comfortable treatment environment. Its sedative effect not only helps to reduce the patient's metabolic rate and oxygen consumption but also further reduces the burden on the organs, which is conducive to protecting the patient's organ function ^[6]. At the same time, the analgesic effect of ciprofol can also effectively alleviate the pain stimulation of patients, significantly improve their comfort and sleep quality, and create favorable conditions for recovery ^[7].

3.4. Neuroscience

Ciprofol has demonstrated a wide range of potential applications in the field of neuroscience and it is important for the in-depth exploration of brain function and nerve conduction mechanisms. At the same time, ciprofol can also simulate the pathophysiological processes of specific neurological diseases, thus providing a key reference for the diagnosis and treatment of related diseases ^[3]. By systematically investigating the mechanism of action of ciprofol on neurotransmitter receptors, it is possible to comprehensively understand the effects of the drug on cognitive, affective, and behavioral levels, and to inject new vitality and support for neuroscience research.

4. Progress and breakthroughs in the study of ciprofol

4.1. Research on the pharmacodynamic mechanism

The pharmacodynamic mechanism of ciprofol has always been the focus of scientists' attention. Through in-depth research on the pharmacodynamic mechanism of ciprofol, we can further understand the scientific principles behind its various pharmacological effects and provide a more scientific basis for the clinical use of drugs. Currently, scientists have found that ciprofol can act on multiple receptors and channels, such as GABA and NMDA receptors, thus exerting sedative, analgesic, anxiolytic, and other effects ^[8]. In the future, with the deepening of the research, it is expected to discover more pharmacological targets of cycloheximide and provide more possibilities for the development of novel drugs.

4.2. Pharmacokinetics

Pharmacokinetics is the science of drug absorption, distribution, metabolism, and excretion in the body. An in-

depth study of the pharmacokinetics of ciprofol can help understand the metabolic process of ciprofol *in vivo* and provide a scientific basis for optimizing the drug regimen. For example, studying the metabolic differences of ciprofol in different populations can guide individualized medication; studying the interaction between ciprofol and other drugs can avoid mutual interference between drugs and improve the therapeutic effect.

4.3. Expanding the scope of application

Scientists have found that the scope of application of ciprofol is not only limited to traditional surgical anesthesia, ICU sedation, and pain treatment but also can be expanded to other areas. For example, some studies have shown that propofol has a certain anti-inflammatory effect, which can be used for the treatment of certain inflammatory diseases. Some studies also showed that ciprofol has a certain protective and antioxidant effect on the nervous system, which can be used for the treatment of certain neurological diseases^[9].

4.4. Drug safety assessment

Drug safety assessment is an important part of ensuring the safety of medication for patients. Continuous assessment and research on the safety of ciprofol can help scientists identify and solve potential safety hazards promptly to ensure the patient's safety. For example, monitoring and analyzing the adverse reactions of ciprofol can provide warnings for the clinical use of the drug. By observing and studying the effects of long-term use of ciprofol, its long-term safety can be assessed. In addition, with the continuous emergence of new drugs, an in-depth study of the interaction between ciprofol and other drugs can also avoid mutual interference and adverse reactions between drugs.

5. Prospects and challenges

Although the pharmacological effect of ciprofol is recognized in China, its scientific mechanism still needs to be explored in depth to accurately guide clinical practice. The dosing regimen can be tailored according to the patient's condition, to enhance the therapeutic effect and reduce the adverse effects. In addition to the known application areas, the potential application value of ciprofol in other areas has not been fully explored, and scientists need to further explore to expand its application scope. While pursuing efficacy, the safety of the drug should not be neglected. Continuous evaluation and research on the safety of ciprofol is the key to ensuring the safety of the drug for patients.

6. Conclusion

Ciprofol has shown excellent effects in clinical practice. With the deepening of scientific research and the continuous innovation of technical means, there is good reason to expect that ciprofol will bring more far-reaching benefits to patients in the future.

Disclosure statement

The authors declare no conflict of interest.

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