Drug Application and Technology Application in Clinical Anesthesia

Shengliang Li
Zhengzhou University, Zhengzhou, Henan, China

Abstract: Anesthesiology has now developed into an independent discipline in clinical medicine, among which clinical anesthesia is the main part of modern anesthesiology, which plays an important role in ensuring patient safety and creating good conditions for surgery. With the development of science and technology, more and more technical means are used in clinical anesthesia; at the same time, the use of corresponding anesthetic drugs to assist surgical treatment is now an essential measure in clinical medicine. However, the auxiliary technical means and anesthetic drug selection for clinical anesthesia are diversified, and the anesthetic effects produced by different technical measures and anesthetic drugs are quite different. Therefore, this article briefly introduces the development status of clinical anesthesia by reviewing relevant domestic and foreign research literature, and reviews the drug applications and technical applications in clinical anesthesia.

Keywords: Clinical Anesthesia; Drug; Technology Application; Anesthesiology

1. Introduction

Today, we are in the “ultrasound era” [1] of clinical medicine, clinical anesthesiology, and perioperative medicine. A large number of clinical trials have shown that anesthesia can effectively control patients' pain status and relieve their stress response [2]. Clinical anesthesia mainly includes general anesthesia and local anesthesia, involving all perioperative treatments before and after anesthesia. General anesthesia refers to a process in which anesthetic drugs are introduced into the body through inhalation, intravenous, intramuscular injection or rectal infusion to suppress the central nervous system, causing the patient to lose consciousness without feeling pain throughout the body. At present, the most commonly used method of general anesthesia is general anesthesia with tracheal intubation. Local anesthesia is when the anesthesiologist injects local anesthetic drugs into the corresponding parts, causing the spinal nerves, nerve plexuses or nerve trunks to be blocked, thereby temporarily losing consciousness in the corresponding parts of the body. Currently, commonly used local anesthesia drugs include procaine, lidocaine, etc. Commonly used local anesthesia methods include nerve block, regional block, local infiltration anesthesia, and topical anesthesia. In addition to ensuring that patients can successfully undergo surgical treatment under painless and safe conditions, clinical anesthesia also includes preparation and treatment before and after anesthesia, monitoring and treatment of critically ill patients, emergency resuscitation, and pain treatment, etc. In order to do a good job in clinical anesthesia, one must master the basic theory of anesthesia, be proficient in applying various anesthesia techniques, and be familiar with the characteristics of surgeries for various conditions.

For more than half a century, improvements in drugs with progressively shorter durations of action and in different medical monitoring technologies have stimulated interest in anesthesia, especially clinical anesthesia [3]. At present, clinical anesthesia is mainly used in preoperative preparation, intraoperative operations, postoperative treatment, first aid resuscitation, and pain treatment for clinical medical operations. However, the aging of the population, the increase in young children with congenital diseases, and the existence of various complications in many surgical patients have brought great difficulties to modern clinical anesthesia, and also brought challenges to clinical anesthesiologists. In fact, any anesthesia surgery has certain risks. The level of risk is affected by many factors such as the patient's physical condition, type of

surgery, doctor's technical experience, surgical conditions, anesthesia method and medication dosage. There came great pressure and challenges. Therefore, how to solve clinical anesthesia-related problems with the help of various new drugs, new technologies, and new instruments used in the scope of anesthesia has attracted more and more attention from researchers.

2. Drug Applications

A large number of clinical trials have shown that the use of correct anesthetic drugs and anesthetic techniques can effectively control the patient's pain state and relieve the patient's stress response [4]. The rationality of the anesthesia plan is closely related to the selection of anesthetic drugs. Once a problem occurs with one of them, it will directly affect the clinical anesthesia effect or patient safety [1]. At present, clinical anesthetic drugs mainly include two categories: local anesthetics and general anesthetics. Clinical studies have shown that the dosage of anesthetic drugs may directly affect the blocking effect of movement and sensation, and then affect the anesthetic effect [5].

2.1 Sufentanil

Xinli Li [6] combined clinical experience and conducted different anesthesia plans for the two groups of patients. The final test results showed that sufentanil has outstanding effects in postoperative analgesia and clinical anesthesia after intravenous surgery and can better suppress adverse reactions. Therefore, sufentanil deserves to be promoted and applied in clinical anesthesia.

2.2 Ropivacaine

Ropivacaine is a common clinical local anesthetic drug. It is a long-acting local anesthetic drug of the amide class and has gradually been widely used in clinical practice. In terms of the choice of intravenous local anesthetic drugs, ropivacaine has a better anesthetic effect and a long-lasting anesthetic effect, which can effectively reduce the toxicity of the heart and central nervous system. Clinical studies have found that different concentrations of ropivacaine anesthetic drugs have different anesthesia and analgesic effects on patients. Among them, patients who use 0.125% concentration of ropivacaine anesthetic drugs have better clinical application effects [7], and patients who use 0.2% concentration of hydrochloric acid have better clinical application effects [8]. Ropicar has high clinical value and will not affect patients' signs of anesthesia. It can highlight better pain treatment effects and improve the safety of clinical anesthesia.

2.3 Non-Opioid

Yali Wang [9] found in clinical research that for patients undergoing laparoscopic cholecystectomy, it is safe and feasible to use opioid-free anesthesia, and it can effectively reduce the incidence of intestinal dysfunction caused by opioids, thus providing a new basis for laparoscopic cholecystectomy. Provide a reference for drug selection in clinical anesthesia during resection surgery.

2.4 Dexmedetomidine

During clinical surgical treatment, it is necessary to provide reasonable anesthesia to the patient to reduce the patient's stress response during the operation and promote the smooth progress of the operation. There are many drugs used for anesthesia clinically, among which the more common anesthetic drug is dexmedetomidine. This drug is a drug with dose-dependent, sedative and hypnotic effects, and it also has analgesic and inhibitory sympathetic activity. It is widely used in clinical practice [10].

3. Technology Application

With the continuous advancement of medical technology, the use of corresponding anesthetic drugs to assist medical operations has become an inevitable measure to ensure the operation. And with the development of society and the advancement of medical technology, research on technical means to improve the effectiveness of clinical anesthesia and reduce its safety risks has become increasingly widespread. Currently, the commonly used technical means in clinical anesthesia mainly include visualization technology and artificial intelligence technology [11].

3.1 Ultrasound Visualization Technology

Ultrasound can generate different image information by using the principle of ultrasonic waves, emitting ultrasonic waves

through the probe and receiving and processing signals. With the development of ultrasound application software and imaging technology, ultrasound technology is no longer limited to physicians and surgeons as a means to assist in diagnosing diseases, but is increasingly used in the fields of anesthesia, pain and critical illness. It has now become a commonly used method in modern clinical anesthesia. A means of medical examination and treatment. The visualization technologies currently used in clinical anesthesia mainly include ultrasound technology and visual airway management technology, among which ultrasound technology has a wider range of applications [11].

3.1.1 Advantages of ultrasound technology

First of all, ultrasound technology relies on ultrasound, which is non-radioactive and will not cause trauma to the patient; secondly, ultrasound has the characteristics of gray-scale cross-sectional images, and the images presented are more conducive to getting closer to the true structure of the patient's body tissue; finally, Ultrasound has no limitations in examining the patient's parts and can provide substantial judgments on the patient.

In addition, anesthesiologists can use ultrasound technology for preoperative examination, intraoperative monitoring, invasive puncture and postoperative analgesia to formulate optimal anesthesia plans, thereby reducing damage to patients and reducing the occurrence of various complications to achieve the best results. Effective and optimized anesthesia concepts [12].

3.1.2 Specific application of ultrasound visualization technology in clinical anesthesia

(1) Ultrasound-assisted arterial puncture

In clinical anesthesia, we often encounter patients who are overweight, have spinal deformities, etc., and who are difficult to perform spinal canal puncture. Through ultrasound technology, it is possible to locate the intervertebral space, predict the distance from the skin to the epidural space, and determine the appropriate puncture point and direction, making the puncture visible, simple, and safe. Similarly, the application of ultrasound technology in deep venous puncture cannulation can also greatly improve the success rate of deep venous puncture and reduce the number of punctures and complications.

Ultrasound visualization technology can guide anesthesiologists in the placement of superficial veins in obese children. Through ultrasound technology, the superficial veins on the back of children's hands can be clearly observed, which greatly improves the success rate of superficial vein catheterization in obese children. It can effectively avoid repeated fitting of obese children and reduce the psychological and physiological impact on children.

(2) Ultrasound-guided regional block anesthesia

In the past, when anesthesiologists performed peripheral nerve block anesthesia, nerve positioning usually relied on anatomical landmarks on the body surface to determine the position. The position accuracy was insufficient and the drug diffusion effect was not ideal, which could easily lead to anesthesia failure. For patients whose body surface anatomy is difficult to locate, multiple punctures will not only delay the operation time, but also increase the patient's discomfort and even cause tissue damage.

(3) Lung ultrasound applications

Postoperative pulmonary complications can occur for a variety of reasons during general anesthesia. The occurrence of back complications depends not only on the patient's physical condition, but also on the anesthesia technique, mechanical equipment and type of surgery used by the anesthesiologist [11]. If hypoxemia occurs during the perioperative period, lung ultrasound examination can quickly identify pleural effusion, atelectasis or emphysema, etc., thereby helping doctors to quickly diagnose and treat early, thereby reducing patient safety risks. Haotian Zhao et al [13] and others found that lung ultrasound has good diagnostic value for emphysema when conducting ultrasound examinations on patients with emphysema. Other studies have also found that ultrasound-guided lung recruitment not only reduces the risk of postoperative respiratory tract infection, but also shortens the patient's length of hospital stay [14].

3.2 Machine Learning

Machine learning, a form of artificial intelligence, can be used for predictive analytics required for clinical decision-making.

The continued development of machine learning in healthcare, including clinical anesthesia, is driven by strong research interest and compatibility with societal goals of reducing healthcare costs [15]. The current application of machine learning in clinical anesthesia has been initially verified. For example, machine learning can be used for risk assessment and prediction in the perioperative period, and in-depth monitoring of anesthesia conditions [16].

3.2.1 Prediction of perioperative complications

Perioperative complications refer to various adverse symptoms that may occur during or after anesthesia and surgery, including hypotension, hypoxemia, postoperative delirium, etc. These complications may be related to anesthetic drugs, surgical procedures, patients, etc. Physical condition and other factors are related. Research by Z Zhang and Tuo et al. found that machine learning can effectively predict perioperative complications and reduce patient risks [17].

3.2.2 Clinical anesthesia status monitoring and pre-evaluation

In clinical practice, anesthesiologists can subjectively judge anesthesia status by referring to the patient's physical signs and stress reactions during anesthesia. However, due to factors such as individual patient differences, doctor experience or subjective bias, it is easy to cause errors in anesthesia status assessment, which further leads to safety hazards. Li Ma [18] established a clinical victory signal collection platform with the help of machine learning methods. Research shows that the use of machine learning models can objectively evaluate the depth of anesthesia, and has certain effectiveness and scientific rationality in monitoring anesthesia status.

4. Conclusions

In summary, ultrasound visualization technology and deep learning methods play an important role in clinical anesthesia preoperative evaluation, complication diagnosis, and anesthesia status assessment. Developing effective and clinical anesthesia plans and rational use of anesthetic drugs can maximize the safety of anesthetized patients, promote their rapid recovery, reduce postoperative complications, and improve patient satisfaction. Therefore, it is of great clinical research significance to explore the application progress and development prospects of different technologies and anesthetic drugs in clinical anesthesia. Due to the insufficient base of this article to summarize the technical means and drugs used in clinical anesthesia, it does not fully reflect the research progress of contemporary clinical anesthesia. In the follow-up research, we will increase the base of literature research and make full use of domestic and foreign clinical research results to further promote the representativeness and authoritativeness of relevant research.

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