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Observation on the Effect of Ultrasound Guided Arterial Puncture and Catheterization in Clinical Anesthesia

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Abstract: Arterial catheterization has become one of the important techniques for perioperative monitoring, which provides continuous, accurate blood pressure monitoring. With the popularity of visualization technology in medical work, ultrasound-guided radial artery catheterization has been widely used clinically. Arterial catheterization is an indispensable procedure in clinical anesthesia, but conventional arterial catheterization has a high risk and a high failure rate. With the progress and development of society, human visualization and visualization surgery are becoming more and more popular. In order to verify the advantages of ultrasound-guided arterial catheterization, this paper obtained a comparative analysis of two groups of puncture patients: With the popularity of ultrasound equipment and the improvement of technology, it plays an important role in clinical anesthesia. In arterial catheterization, the ultrasound guidance method can't only reduce the number of punctures, reduce the puncture failure rate, but also improve the safety of the puncture catheter. Only a properly selected ultrasound device can operate more effectively.

1. Introduction

With the increase of the number of major clinical operations and the demand for intensive care, arterial catheterization [1] has become one of the main invasive monitoring techniques. From the first arterial puncture operation to the operation room, ICU and interventional operation room today. Arterial puncture has existed for more than 300 years. The main function of ductal catheterization is to monitor arterial blood pressure continuously in real time. At the same time, it has many advantages. On the other hand, the assessment of the patient's volume state is based on the arterial waveform and guides liquid therapy. For patients who are unable to measure blood pressure by non-invasive cuff, ductal pressure measurement can provide a monitoring method and reduce the complications of arterial blood collection many times during blood gas analysis. At the same time, the artery is easy to locate and the possibility of complications is low, so it is usually used as the preferred location for invading the artery. Arterial catheterization can provide continuous and accurate blood pressure monitoring, which has become one of the important techniques of perioperative monitoring.

Despite the above advantages, many factors can lead to arterial puncture failure, and even complications. Compared with noninvasive pressure measurement, arterial puncture is invasive, time-consuming and expensive, and the requirements for monitoring equipment are demanding. The study also summarized a series of complications related to arterial catheterization [2]. According to the highest incidence of arterial spasm occlusion, bleeding, infection, bleeding at puncture site, bacteremia and permanent ischemic injury, pseudo aneurysm and so on, the most serious complications were ischemic injury of puncture hand. Repeated puncture can lead to arterial wall injury, increase the incidence of complications, cause anxiety and anxiety, and even cause cardiovascular complications. Therefore, it is not only necessary to improve the success rate of arterial first needle catheterization, but also to prevent and treat complications.

During the preparation of the procedure, attention should be paid to the principle of the sterility of the iodophor and the sterile drape, in particular for patients with diabetes and immune deficiency, to reduce the likelihood of infection at the site of the puncture. Continuous and pressurized infusion of sterile heparin water is also useful in the prevention of arterial thrombosis, and it is found that the clot should be removed in a timely manner. A-adrenergic receptor is distributed in the arterial wall and repeated mechanical stimulation results in vasospasm after the receptor challenge. Scholars have found that local injection of nitroglycerin and verapamil can reduce the incidence of vasospasm by 3.8. The success rate of the arterial catheter insertion is improved, the clinical blood pressure monitoring can be performed rapidly, and the prognosis of the patient can be improved. However, the success of the first needle catheter in the arterial puncture catheter is generally affected by a number of factors, primarily through the puncture; the practitioner factors, the patient's own factors, the operational implementation techniques, and the device factors. The clinical anesthesiologist is the main implementer. With the economy, the network: social development, hospital equipment and the same level of diagnosis and treatment technology are similar. However, the patient's condition is varied and specific, and it is a difficult factor for the clinician to control.

The initial success rate of arterial puncture anesthesia is usually low, which requires a long learning curve and a certain number of puncture cases to reach a certain level of operation. It was found that the traditional puncture catheter method completely depended on the hand touch position and clinical experience of anesthesiologist [3], which required the operation technique and clinical experience of anesthesiologist very high. Due to the lack of beginner operation experience, the failure rate is very high, which may lead to complications. The equipment of arterial catheterization mainly includes one-off puncture trocar and ultrasonic instrument. At present, the clinical needle is mainly made of casing steel needle. Arterial indwelling needles designed and manufactured by BD of the United States, ARROW Wrigley arterial cannula made by American companies and arterial puncture kits sold by TERUMO of Japan. The length and type of needle will also affect the success rate of puncture tube. At present, two-dimensional ultrasound guided puncture is used in clinic, linear array probe is selected, and the frequency is adjusted to 5-13MHz. Color Doppler flow imaging also plays an important role in ductal catheterization. There are many methods for catheterization into the artery. Because the blind wear method is relatively simple, the requirements for puncture equipment and technology are low, and the study is relatively easy, so it is more used in clinical and teaching work. Some scholars have improved the current clinical surgical methods, and innovatively put forward negative pressure method, l-ml syringe auxiliary method and cuff to block the distal end of styloid process. Ultrasound-guided catheterization has also been widely used in recent years. According to its cross section, it is converted to short axis: out-of-plane and long-axis plane.

The identification of possible difficult puncture is often ignored in clinical work, and the diversity and complexity of combined diseases make arterial puncture particularly difficult in some patients. The change of anatomical structure, the difference of gender development and the degeneration related to aging can change the physiological and anatomical characteristics of artery, which makes it more difficult to carry out arterial puncture. Common complications such as hypertension, diabetes, hyperlipidemia and peripheral vascular diseases can also cause pathological changes in the arterial wall, which can reduce the diameter and compliance of blood vessels. Obesity, edema, hypotension and other factors may also challenge arterial catheterization, the study found. Traditional catheterization surgery usually uses local anesthesia, spinal anesthesia or general anesthesia. These anesthesia methods not only lead to anesthetic complications, such as imperfect analgesia, nausea, vomiting, urinary retention, itching and so on. Moreover, the recovery period of anesthesia after operation is longer, which is not conducive to the postoperative recovery of patients. This is contrary to the concept of rapid surgical (FTS) put forward in recent years, which is not conducive to improving the prognosis of patients. First of all, local infiltration of wound often appears block incomplete, analgesic effect is poor, muscle relaxation is incomplete, obvious traction reaction, and patient comfort is low. Secondly, spinal anesthesia may be limited by many conditions, such as skin infection at the puncture site, spinal tuberculosis or severe malformation, cardiovascular insufficiency, central nervous system diseases, elderly patients with hyper osteogeny of the spine, calcification of ligaments, narrowing of epidural cavity, filling of venous bundles or vascular sclerosis, difficulty of intraspinal anesthesia puncture or low back pain after operation, in other patients, due to anticoagulant therapy, Spinal anesthesia is not suitable. Thirdly, general anesthesia endotracheal intubation has some disadvantages, such as large dosage of anesthetics and slow metabolism, increased muscle tension, bronchus or laryngospasm, intraoperative hypotension, postoperative restlessness, long recovery time and prone to nausea and vomiting, which limits its application in inguinal hernia surgery in elderly patients. Because of the aging degeneration of tissue and organ function in most elderly patients, the reserve function of important organs decreases, and there are cardiopulmonary diseases and endocrine diseases in varying degrees, which will bring certain risks to anesthesia and operation, and the tolerance and adaptability of anesthesia surgery will also be reduced. Cardiovascular accidents, pulmonary infections and other related complications are also common during perioperative periods. Therefore, for elderly patients, drugs or methods that have less interference with their physiological functions and can quickly restore their physiological functions after anesthesia should be selected. Therefore, it is very important to choose anesthesia, which is simple, safe and efficient, and has little influence on the whole body of elderly patients. It is very important to reduce nociceptive stimulation and stress response to ensure the safety of elderly patients during the operation and even the whole perioperative period. It is of great clinical and social value to explore simpler, more effective, safe and feasible anesthetic methods.

In this paper, 70 patients requiring arterial catheterization were randomly divided into control combined ultrasound guided groups. The control group underwent catheterization of the left hand around the artery using traditional magic. Ultrasound-guided inferior arterial catheterization was performed in the ultrasound-guided group. Comparing the total puncture failure rate and complication rate in two groups compared the success rate of puncture catheter. Ultrasound-guided inferior arterial catheterization can effectively improve the success rate and reduce complications.

2. Method

2.1. Basic Application of Ultrasonic Guidance

Ultrasonic examination [4-5] is increasingly becoming a daily condition monitoring anesthesia tool, which provides great help for spinal canal anesthesia and improves the success rate in the process of anesthesia. Abdominal surgery requires ultrasound guidance to ensure that it is punctured to the correct anatomical position. If ultrasound technology can be developed into the mainstream and become a routine test, we can also use it to accurately judge gastric volume. Ultrasound is a safe, portable, relatively cheap and easy to obtain imaging mode, and has become an effective diagnostic and monitoring tool in medicine. Anesthesiologists encounter all kinds of emergencies in their daily work. Ultrasound technology, as a rapid and accurate diagnostic tool, will benefit them a lot from their daily work. In recent decades, ultrasound technology has played a great role in the nursing of obstetrical patients. With the development of ultrasonic technology, ultrasonic instruments become more and more compact, portable and safe. Ultrasonic examination is helpful to accurately evaluate the anatomical structure of the body and to provide effective guidance and help for nerve block, vascular pathway and complex airway surgery. It is a low-cost, non-invasive assessment and diagnostic tool for echocardiography, lung assessment and gastric volume assessment. With the development of science, these applications continue to expand and gradually become a necessary skill for anesthesiologists.

Ultrasound-guided peripheral nerve occlusion and vascular channels are the most popular ultrasound applications in anesthesiology. In many pain treatments, ultrasound has recently begun to replace CT scanning and imaging as an important means of examination. Although the clinical application of airway ultrasound is still limited, the prospect is very broad. Pulmonary ultrasound has become an important auxiliary examination method in the field of emergency medicine because of its advantages of rapidity and accuracy. The measurement of optic nerve sheath diameter (ONSD) and transcranial color-coded duplex (TCCD) are relatively new neuroimaging modalities, which are widely used in the evaluation of intracranial pressure and cerebral blood flow. Gastric ultrasound can be used for the evaluation of gastric content and the diagnosis of stomach. Transthoracic (TTE) and esophageal (TEE) echocardiography are helpful to facilitate the assessment of left and right ventricular function, cardiac valve abnormalities and volume status, and to guide cardiac resuscitation. Therefore, ultrasound can play a potential role in many fields, including guiding invasive intervention, diagnosing key diseases and evaluating changes in anesthesia caused by anatomical changes, so ultrasound training may become a part of anesthesia training courses in the future.

Anesthesiologists need rapid and accurate diagnostic tools to deal with emergencies effectively. Ultrasonic (US) is a kind of medical equipment, which is safe, easy to operate, more and more used and relatively easy to obtain in modern anesthesiology practice. With the ultrasonic examination of doctors becoming more practical and experienced, the application of anesthesiologist to this kind of cross-department examination method has gradually increased. The current and future applications of ultrasound in anesthesiology are shown in figure 1:

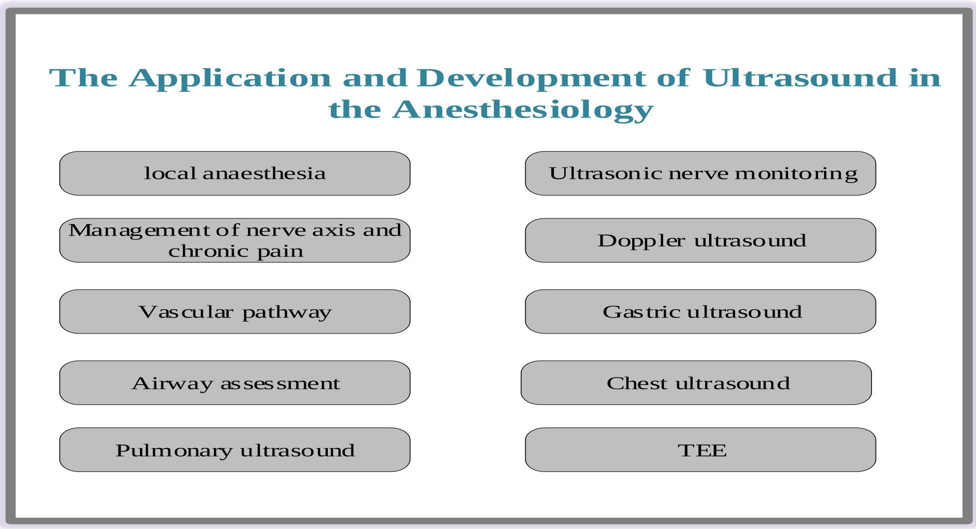

Figure 1. Current and future applications of ultrasound in anesthesiology

2.2. Principle of Ultrasonic Guidance

Ultrasound refers to sound waves (usually from 2 to 15 MHz, but increased to 22MHz in modern detection) higher than the frequency of sound waves that can be heard in the human ear (in the range of 20 to 20, 000 Hz). At present, there are several basic and advanced ultrasonic imaging modes, but type b, m and color Doppler are still the three most widely used methods in anesthesiology. Ultrasonic optical scanning [7] is the most basic mode of any ultrasound machine. In b mode, each grayscale tomographic image is determined by pixels and brightness, which depends on the intensity of the echo received from the corresponding position of the body. This model is used to evaluate and scan organs in real time. Ultrasonic frequency shift diagnostic method [8] records the movement of human structure along a single line selected by the operator. M mode is used to evaluate cardiac wall or valve motion, hemodynamic status, and pulmonary sliding or diaphragm movement. Doppler mode detects the frequency shift produced by acoustic reflection of moving targets. It uses the tone of sound waves to provide information about blood flow. Three Doppler techniques are usually used. As shown in figure 2:

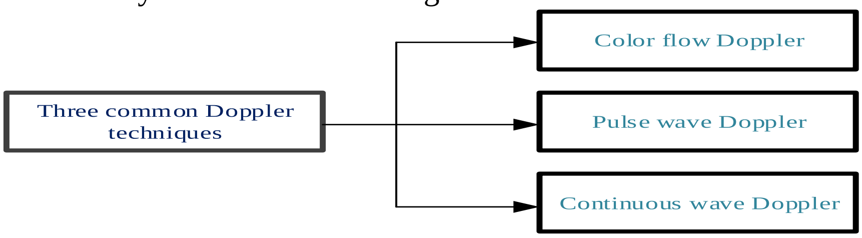

Figure 2. Three common Doppler techniques

(1) Color flow Doppler: this is an image of a blood vessel that represents the velocity and direction of blood flow in the vessel. Color (usually red and blue) indicates the flow direction and the direction away from the sensor, regardless of the nature of the container (artery or vein). Doppler Sonar imaging technology is a special color Doppler.

(2) Pulse Doppler (PWD): transmits short pulse ultrasound and Doppler signals. It allows you to measure blood velocity from a small area and provide information about the velocity and direction of blood flow through blood vessels by converting Doppler sounds into a chart.

(3) Continuous wave Doppler (CWD): transmits and receives continuous ultrasound. The region of the obtained Doppler signal is determined by the overlapping part of the transmitted and received ultrasound. This method is helpful to measure the high velocity of flow, but because the signal can be generated from any point of ultrasonic beam, the accurate positioning ability of flow signal is poor.

2.3. Arterial Puncture and Catheterization

In this experiment, the patient's first needle catheter was inserted directly into the needle and the first needle was placed in the catheter; ultrasound guided puncture was used to select the defeated patient. When the patient is ready, the lying puncture hand is extended on the support rack, palm up, fingers facing the operator, and bandages wrapped around the patient's wrist. Raise your wrists 5 to 8 centimeters and overexpose your wrists with tape from the far end. The puncture uses the fingertip of the middle finger of the left hand to touch the ventral side of the finger to find the strongest point of the arterial pulse and to determine the direction of the blood vessel. 0.5 cm near the styloid process was selected as the puncture point. At present, there are four main methods of catheterization, as shown in figure 3.

Direct puncture: after sterilizing towels, 0.5ml local anesthetics were injected into the puncture point, puncture site and direction puncture. The angle between the control needle and the skin is 30 to 40 degrees, the reverse direction of the needle is opposite to the reverse of the blood flow, and the needle is inserted slowly. When the blood is found smooth, the needle further advances 1: 2 mm, the needle is fixed, gently push the jacket tube. After removing the needle core, the tail of the casing pulsates outward, and the puncture is successful.

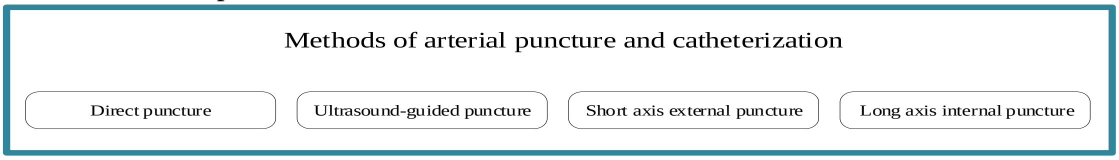

Figure 3. Four methods of arterial puncture and catheterization

Ultrasonic guided puncture method: the ultrasonic linear array probe is used and the frequency is adjusted between the 5-I3MHz to ensure that the left and right directions of the probe are consistent with the direction of the ultrasonic image. Ultrasound is used to scan blood vessels on the short axis of the wrist, usually between the styloid process of the tibia and the flexor tendon of the temporal side. After mild pressure, the veins disappeared and the arteries were not affected. Once the artery is clearly located, the assistant can optimize ultrasonic contrast to make the development clearer. After determining the depth of the artery, the vessels were scanned on the wrist axis by ultrasound, and the curvature and calcification of the vessels were scanned. The puncture point is located in the maximum diameter of the artery, walking regularly and without calcification.

Short axis out-of-plane puncture [9]: first, place the long axis of the probe perpendicular to the long axis of the arm, adjust the image of the artery to the center of the screen, then insert the needle along the center line of the probe, and insert the angle into the tilt or rotation of the probe until you see the tip. The puncture needle slowly enters the vascular wall to prevent puncture of the posterior wall of the vessel.

Long axis in plane puncture method: the long axis of the probe is placed parallel to the long axis of the arm, and the image of the artery is adjusted to the center of the screen, and the needle is inserted along the centerline of the probe. The angle is controlled between 15 and 30 degrees, keeping the long axis of the needle parallel to the blood vessels. If the needle is not visible, it can be located inside or outside the blood vessel. Slowly insert the needle into the blood vessels and see the blood in the trocar.

2.4. Puncture Complications

The complications after puncture are also a difficult clinical problem, which is often caused by inappropriate puncture techniques. The traditional puncture technique cannot intuitively see the anatomical structure under the skin of patients. More rely on the experience of the operator to carry out puncture, so it is inevitable that there will be errors, increase the incidence of complications and bring great mental pressure to patients. Under the guidance of ultrasound, we can clearly see the structure under the skin of patients with different physique, quickly and accurately find the puncture site, and better grasp the depth of the needle. Even if the puncture position is incorrect, the depth and angle of the needle can be adjusted in time to achieve the best puncture effect. Complications after puncture are important factors affecting the effect of comprehensive puncture. Postoperative complications are often caused by improper operation during anesthesia or repeated puncture caused by unsuccessful puncture. Although ultrasound technology has been rapidly developed and ultrasound images are becoming more and more clear, the anatomy of human skin is too complicated, especially the number of small veins and small arteries. Although we will make a detailed analysis according to the changes of blood vessels and blood flow of ultrasound imaging before operation, so as to determine the best puncture route. However, it is inevitable that small blood vessels will be encountered in practice, which will lead to catheterization and bleeding.

However, ultrasound guidance has been pre-optimized through the puncture path compared to conventional puncture, which can greatly reduce the occurrence of this phenomenon. Under normal circumstances, the complications of arterial catheterization are mainly divided into the following four types:

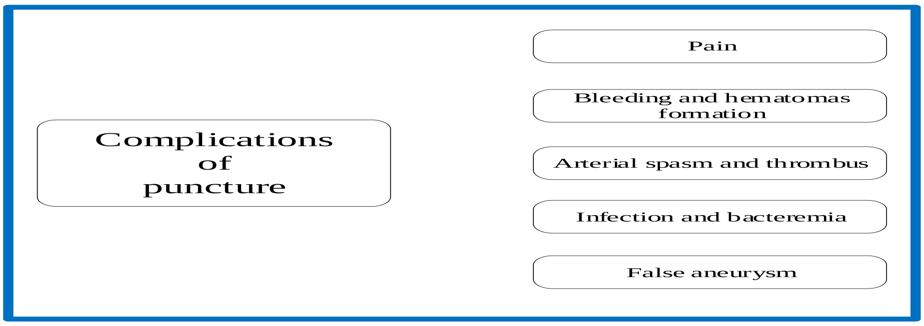

Figure 4. Classifications of puncture complications

Pain: pain at the puncture point will cause psychological and physical discomfort. Psychological comfort before puncture, local injection of local anesthetics and a small amount of sedation can improve the pain and the puncture operation experience of the patients.

Puncture site bleeding and hematomas formation: a small amount of bleeding in the vascular wall is mainly caused by the exudation of the puncture site, when there is more bleeding, local subcutaneous hematomas can be formed. If puncture fails and hematomas are formed, press the gauze roller to fix the puncture site and do not cause excessive pressure to cause distal limb ischemia. In this experiment, patients who needed compression and hemostasis were monitored by pulse oxygen saturation on the compression side in order to detect complications in time.

Arterial spasm occlusion, thrombosis, and hand ischemic injury: puncture mechanical stimulation can usually lead to occlusion of arterial stenosis, or even thrombosis. The movement of puncture is mild, and vasodilator can be used to relieve arterial spasm and occlusion. Continuous heparin water washing can reduce thrombus in pipes and blood vessels and remove thrombus fragments from the device. Once there are symptoms such as distal finger, palm color change, limb numbness and so on, the puncture tube should be pulled out as soon as possible and the artery should be examined by ultrasound to confirm the diagnosis.

Infection, bacteremia: ordinary patients remove the puncture device after surgery, but patients returning to ICU need to keep the pressure sleeve for 3 to 4 days. Postoperative nursing should be taken to strengthen the puncture site. For severe infections, antibiotics can be given to prevent the aggravation of bacteremia.

Pseudoaneurysm: when the puncture needle injures the arterial wall, it is easy to form a false cavity, which is gradually wrapped into an aneurysm through fibrous connective tissue. These complications usually have a long history, easy to diagnose, and rapid surgical resection, usually with a good prognosis.

2.5. Local Anesthesia

Ultrasound-guided peripheral nerve block [10] may be the most commonly used ultrasonic application by anesthesiologists. This may be the golden standard for local anesthesia, which enables anesthesiologists to perform regional anesthesia more accurately and improves the ability to block nerves in smaller and more difficult anatomical locations. Ultrasound-guided peripheral nerve block has the following advantages: direct observation of nerves and surrounding structures (such as blood vessels), thereby reducing complications (for example, accidental intravascular or intravascular injection), and direct observation of the spread of local anesthesia. More accurate injection can lead to faster onset and longer action time, improve the quality of block, and reduce the number of local anesthetics. Studies have shown that when ultrasound can fully image the peripheral nerve, the traditional puncture technique cannot provide more advantages at the same time. Ultrasound guidance has similar advantages to adults in children and has recently become more popular. However, clinical studies still lack the advantages of ultrasound guidance over traditional techniques (nerve stimulation), especially the study of safety. Inguinal hernia block may be an exception, but further research is necessary.

3. Experiment

Anesthesia: monitoring of HR, MAP, SpO2 and ECG. in all patients After routine intravenous injection of midazolam 0. 04 mg/ kg, sufentanil 0.2 ~ 0.5 μ g / kg, etomidate 0.2 ⩽ 0.3 mg/ kg, rocuronium 0. 8 ⩽ 1.0 mg / kg anesthesia induced intubation mechanical ventilation. The respiratory parameters were adjusted according to the patient's age, weight and sex. The fresh gas velocity (FiO2) was 2L / min. The tidal volume (VT) was 8 ⩽ 10 ml/ kg, / (I: E) was 1: (1.5 ⩽ 2), and the respiratory rate was 10 ⩽ 14 times / min, so that PetCO2 was maintained at 35 × 45 mm • L ~ (- 1) • L ~ (- 1). All patients chose their left hand for puncture, put their arms flat on the pallet, lift their palms to the wrist with their palms, and stretch their palms with gauze rolls under their wrists. After routine disinfection of iodophor: in group C, the traditional touch localization method was used for puncture, and the operator's left hand began to contact the center of the sacral styloid process in order to find the strongest part of the artery pulsation. The puncture needle for right hand surgery enters the needle at an angle of 30^0. Exit the needle core and see the arterial blood return to the needle sleeve. Group B uses ultrasound-located intraocular puncture. The operator holds the ultrasonic probe coated with aseptic coupling agent and covers the left hand with aseptic application. Explore the location of the artery, walk to find the best tip, right hand needle inserted at 30 °into the needle. Under ultrasound examination, watch the puncture needle enter the artery and see the blood return, then flatten the puncture needle, continue the needle 1 ⩽ 2 mm, to exit the needle core, and see the arterial blood return to the needle sleeve. The two groups were successfully sterile after puncture and connected with pressure sensors to monitor arterial blood pressure. The same 2-year anesthesiologist operated all patients.

Outcome measures: the success rate of one puncture, the total failure rate, the rate of penetration catheterization and the complications of hematomas were recorded.

Statistical methods: for patient selection, we used a completely random method for single-blind patients. In this experiment, SPSS22.0 statistical software was used for statistical analysis. The comparison of test count data, and the factor of $P < 0.2$ was included in logical regression analysis. There was significant difference between $P < 0.05$ and $P < 0.05$.

Experimental materials and equipment

(1) BD 20G closed needle is used for arterial puncture; (2) PT-1 disposable pressure sensor for Shenzhen production is used to transmit invasive blood pressure signal; (3) Mery BeneViewT5 multifunctional patient monitor produced in Shenzhen is used to monitor blood pressure.

4. Discussion

4.1. Comparison of Data between Two Groups of Puncture Patients

A total of 80 cases were included in this study, including 10 cases of sample loss, 12.5 cases of wastage rate and 70 cases of effective sample size. The statistical data of gender, age, and acute physiological and chronic health status scoring system in the two groups were analyzed. The analysis proves that the above data are comparable. For a total of 70 reasonable comparative experiments given in this paper, the statistical data on the ratio of men to women and age are shown in Table 1:

Table 1. Comparison of general data of patients

Group	Number of examples	sexual distinction		Age	APACHE grade
		Male	Female		
B group	35	32	3	54.86±14.26	19.6±7.52
C group	35	30	5	55.33±14.26	19.9±7
X^2	0.163	/	/	0.156	0.154
P	0.25	/	/	0.877	0.85

4.2. Comparison of Puncture Success Rate, Failure Rate, Penetration Catheterization Rate and Hematomas Incidence between the Two Groups

The success rate of one puncture, the total failure rate and the catheterization rate of penetration method in group B were significantly higher than those in group C ($P < 0.001$). The total failure rate, penetration rate and hematomas incidence in group B were significantly lower than those in group C ($P < 0.001$ or $P < 0.01$), and the success rate of puncture in group B was significantly higher than that in group C ($P < 0.05$ or $P < 0.01$). As show in table 2.

Table 2. Comparison of one penetration success rate and failure rate between the two groups

Group	Number of examples	Success rate of one puncture	Total failure rate	Penetration method tube placement rate
B group	35	28(80%)	5(14.2%)	8(22.8%)
C group	35	17(48.57%)	10(28.57%)	18(51.4%)
X^2	/	6.58	4.58	3.85
P	/	<0.01	<0.05	<0.05

The comparison between the two groups of patients was given in the above comparison. Effectively reduce puncture failure rate and penetration method. In order to express the advantages of ultrasound-guided arterial puncture more clearly, Figure 5 shows the comparative results of the two groups of patients.

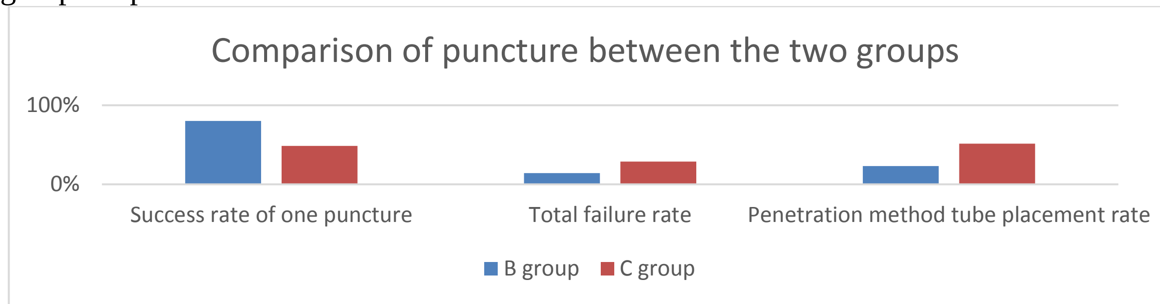

Figure 5. Comparison of data between the two groups of patients

As showed in Figure 5, compared with fingertip touch localization method, ultrasonic visualization technology can locate the shape of artery more accurately in order to determine the best puncture point and needle insertion direction. The decrease of penetration depends on the visible ultrasound, the needle is inserted into the plane, and the operator can clearly see the position relationship between the needle and the artery during the operation. The direction and angle of the needle can be adjusted in time according to the actual situation: after the tip of the needle enters the artery, the operator flattens the needle, continues to move forward, keeps the needle in the blood vessel, then withdraws the needle core and places the needle smoothly. Compared with the traditional touch method, relying on the operator's clinical experience and feeling to adjust the direction, angle and tube position of the needle is more reliable and has absolute advantages.

4.3. Incidence of Complications in Both Groups

In order to show more clearly the advantages of ultrasound-guided arterial catheterization, the attention of postoperative and intraoperative complications is indispensable. In fact, the increase of the success rate of one puncture and the reduction of puncture can effectively reduce the formation of hematomas and the high total failure rate. The following Table 3 shows the contrast between the two groups of patients with hematomas.

Table 3. Comparison of hematomas formation between the two groups

Group	Incidence of hematomas
B group	5(14.2%)
C group	12(34.2%)
X^2	12.3
P	<0.01

As showed in Figure 6, in order to describe the incidence of hematomas clearer, we can see than the B group has lower Incidence of hematomas than C group. So we draw a conclusion than ultrasound guided arterial catheterization can effectively reduce the occurrence of complications of hematomas.

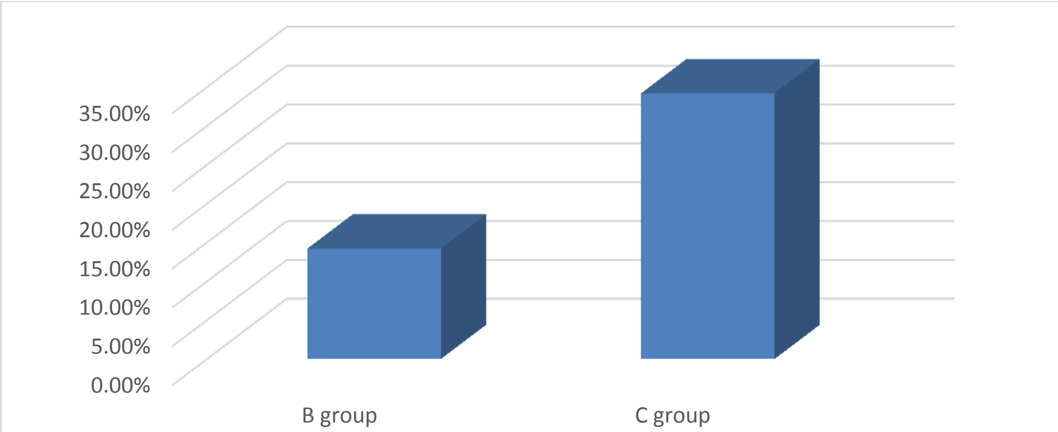

Figure 6. Formation rate of hematomas in two groups

As showed in Figure 7, with the aging of the population and the increasing number of severe patients and major surgeries, the use of arterial catheter is becoming more and more routine. However, difficulties and failures in arterial catheterization not only delay treatment, but also increase pain and medical costs. This requires clinical anesthesiologists to understand the factors affecting arterial catheter in order to take appropriate measures. For operator factors, anesthesiologists need to constantly sum up clinical experience, standardize clinical operation, and constantly improve their own level. For patient factors, it is beneficial to detect suspicious arterial puncture and catheterization in time before operation in order to take preventive measures. Active use of ultrasound reduces the number of punctures, improve the first success rate, and avoid complications. For the operation equipment and method, the operator should take the familiar own method as the leading factor, actively adopt the ultrasonic guidance technology, personally select the specification of the puncture needle, and greatly improve the puncture success rate.

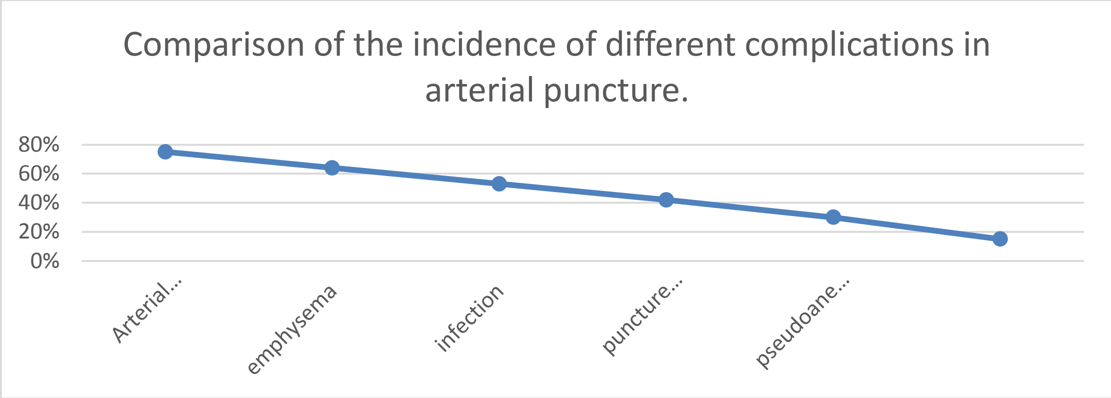

Figure 7. Comparison of the incidence of different complications in arterial puncture

4.4. Comparison of Examination Cost between the Two Groups

In order to adapt to the actual situation, we compare the cost of ultrasound-guided artery puncture with that of blind artery puncture. In fact, for the actual situation of most people, it is necessary for us to compare the actual cost of the two methods, which is beneficial to our actual analysis of the advantages and disadvantages of ultrasound-guided artery puncture. Through the hospital data, we made an average statistic of the medical expenses under the two methods. 70 of the above 70 people can be counted. At the same time, we also followed up the above 70 people and made a survey of their physical condition and use after arterial puncture. Here we draw the above cost and survey results in the figure below to show the advantages of ultrasound puncture.

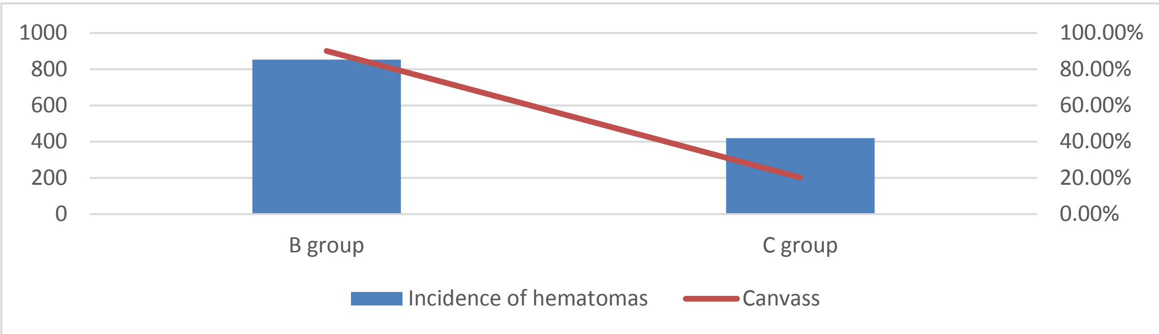

Figure 8. Actual usage costs and opinion polls

As can be seen from the above Figure 8, the cost of the ultrasonic guidance is almost twice the conventional blind penetration, but in practice most people are willing to use the ultrasound puncture, since the effect of the ultrasound puncture is much better than that of the conventional blind puncture, and the complications are small, The recovery is fast.

5. Conclusion

In the anesthesia, real-time arterial monitoring is accomplished by the need for arterial puncture, so the arterial puncture is becoming more and more important, and the ultrasonic guidance plays a more and more important role in achieving higher tube placement success rate and reducing the complications. At present, the main method is still blind, including direct puncture and indirect puncture. Blind puncture can easily lead to the increase of preoperative and intraoperative complications. At the same time, it will reduce the success rate of catheterization and cause irreversible injury to patients. In this paper, two groups of patients were treated with different methods of arterial puncture. The success rate, total failure rate, penetration catheter insertion rate, and the incidence of thrombus complications were then compared between the two groups. It is concluded that ultrasound guidance, as a means of observing the human body in the current society, has been constantly applied to display life. Ultrasound-guided catheterization reduces the failure rate, improves the success rate and reduces the catheterization rate. Finally, the complications of the patients are reduced. So, ultrasound-guided arterial puncture is more beneficial during anesthesia.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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