

Research Progress of Catheter Tip Positioning Guided by Intracavitary Electrocardiogram Combined with Ultrasound in PICC Catheterization

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Abstract: With the rapid development of medical career in our country, in order to better solve the pain of patients, reduce the incidence of adverse events, medical means innovation, PICC catheter PICC catheter tip positioning as the impact tube catheterization and use one of the key factors is no exception, and after clinical trials found that the cavity joint ultrasonic electrocardiogram can help guide the PICC catheter tube tip more economy is simple and accurate positioning, the extensive concern to the medical field, the scholars have this question has carried on the detailed research and published many articles. In this paper, we read the literature of scholars in detail and reviewed the necessity, definition, principle and other theories of the application of ECG combined with ultrasound guided PICC catheter tip positioning, as well as the research and development, as well as the clinical application methods and effects. It is expected to be helpful to promote the application and development of ECG combined with ultrasound guided PICC catheter tip positioning.

Keywords: Intracavitary electrocardiogram combined ultrasound; PICC catheter; Catheter positioning; The research progress

1. Introduction

As what we know about the main function of PICC catheter for patients better safer entry drugs as well as the nutrient solution, has been widely used in clinical medical treatment, and PICC catheter superior vena cava catheter tip must be smoothly achieve to ensure smooth patient infusion, avoid to produce infusion, blood clots, and complications such as infection, so the PICC catheter catheter tip positioning is very important, and clinical display ecg joint cavity PICC catheter guided by ultrasound catheter tip positioning has a very high economic value and accuracy, so this article has a very high research value.

2. Importance of Catheter Tip Positioning Guided by Intracavitary Electrocardiogram Combined with Ultrasound for PICC Catheterization

According to the American society for vein transfusion nursing of PICC catheter tip positioning standards, the optimal location of PICC catheter catheter tips should be at the center of patients with venous, namely in the need for patients with PICC catheter of superior vena cava (lower 1/3, superior vena cava and right atrium above 3

cm to 4 cm between, thus it can be seen that PICC catheter tip positioning need to be very accurate, if accurate solution and nutrient solution can ensure patients safety in and out, on the contrary if positioning errors may lead to thrombosis patients, infusion, phlebitis, Bblocked venous catheters and varying degrees of infection can lead to cardiac arrhythmias and even perforation of the heart, which can lead to death. [1]

Through in-depth investigation and data analysis, the author found that the current medical field guide catheter PICC catheter tip positioning is the main method of X-ray chest X-ray examination, although this method can also play the role of positioning, but compared with lumen of the electrocardiogram (ecg) combined ultrasonic method has a great deal of defects, on the one hand, some patients due to their own or illness and so on reasons cause the X-ray chest radiograph of the shooting is not clear, affects the accurate degree of PICC catheter tube tip positioning; [4] on the other hand, X-ray chest radiograph positioning need to be done after completion of the catheter in patients with X-ray chest X-ray photography, it is easy to cause the catheter in patients with ectopic circumstance is not timely adjusted, if want to solve the problem, may need to be done in the radiation chamber tube, if the catheter in the radiation chamber while in a timely manner to adjust catheter heterotopia, but due to

the radiation room equipment condition and the overall environment is limited, catheter security is difficult to guarantee. The use of intravital electrocardiogram combined with ultrasound to guide PICC catheterization tip positioning can well solve the above problems, on the one hand, it is more economical and convenient, on the other hand, it can improve the accuracy. [2]

3. Overview of Catheter Tip Positioning Theory of PICC Catheterization Guided by Intracavitary Electrocardiogram Combined with Ultrasound

3.1. Concept and application object of catheter tip positioning guided by intravital ECG combined with ultrasound for PICC catheterization

Electrocardiogram (ecg) joint cavity PICC catheter guided by ultrasound catheter tip positioning refers to the use of the concept of electrocardiogram (ecg) and ultrasonic for patients with PICC catheter locates the position of the catheter, electrocardiogram (ecg) joint cavity ultrasound refers to the electrode catheter and the different parts of the ultrasound in patients with heart, to the heart of the different parts of the show lumen electrocardiogram (ecg) and ultrasonic data are recorded, and then through the record of electrocardiogram (ecg) and the change of ultrasonic data judgment PICC catheter tube tip position. [3] cavity electrocardiogram (ecg) joint application of PICC catheter guided by ultrasound catheter tip positioning objects is mainly to PICC catheter tumor patients, for patients with severe neurological patients, elderly patients and the need for parenteral nutrition patients also have application, but for the patients with prior to application should first of all, whether explicitly exclude these patients with cor pulmonale, left bundle branch block, ventricular premature beat, atrial fibrillation, ventricular tachycardia, installation of cardiac pacemaker and may affect the situation of P wave changes to occur after cardiac surgery.

3.2. Principle of catheter tip positioning guided by intracavitary electrocardiogram combined with ultrasound for PICC catheterization

As discussed above, the determination of the location of the tip of the PICC catheter is mainly determined by the recorded ECG and ultrasound, namely the change data of P wave, which is technically known as atrial depolarization wave, in which the distance and relative position between the electrode and the atrial integrated vector axis are the key factors that determine its shape and amplitude. Is simply when detecting electrodes on the pacemaker of right atrium, upright of electrocardiogram (ecg) will appear high amplitude and P wave, namely the highest point, when the electrode from atrial pacemaker, P wave disappeared, [8] PICC can be summed up in the location

of the catheter tip can clearly by P wave height and changes to reflect the potential, thus determine PICC catheter tube tip position.

3.3. Method of catheter tip positioning guided by intracavitary electrocardiogram combined with ultrasound for PICC catheterization

After the author's deep research and reading a large number of literature summarizes cavity electrocardiogram (ecg) joint of PICC catheter guided by ultrasound catheter tip positioning method can be mainly divided into two kinds, one kind is the traditional blind in PICC catheter, the other is a ultrasound guided with plug dingle technology of PICC catheter, the two ways can generally by PICC catheter operation standard, concrete steps can be summarized as: Firstly, the patient was successfully puncture ensured. Secondly, the guide wire was connected with the ECG converter, the end of the internal guide wire of the PICC catheter and the electrode of the ECG monitor during the catheterization of the patient, so that the electrocardiogram would appear. Then, the position of the tip of the PICC catheterization catheter could be determined by observing the changes of P wave. In this process, we should pay attention to the following points. First, before PICC catheterization, we should select the most patients with three leads or five leads to do a basic electrocardiogram. However, it is necessary to ensure that the lead connecting the PICC catheter guide wire is RA, and the monitor is adjusted to II lead. Only in this way can the patient's ECG be clearly positive P wave.

3.4. Development status of catheter tip positioning guided by intracavitary electrocardiogram combined with ultrasound for PICC catheterization

By analyzing the history of catheter tip positioning guided by intravital ECG combined with ultrasound in PICC catheterization, Hellerstein et al. found for the first time in 1949 that the position of CVC tip could be determined by observing the changes of ECG P wave in atrium with probe electrode, and this was verified by X-ray test. In 2006, Jeon et al. used esophageal ultrasound test to confirm the changing relationship between the position of CVC catheter tip and P wave, and further confirmed the findings of Hellerstein et al.. Smith et al. found in the experiment in 2010 that the ECG localization method could be used to guide PICC catheterization, and in many tests, it was found that when the catheter tip was located at the junction between the superior vena cava and the right atrium, the P-wave amplitude reached the peak. [12] From a domestic perspective, He Xueyu conducted clinical trials in 2008, that is, injecting concentrated sodium into the lumen of 30 patients with PICC catheterization to guide the intracavitary electrocardiogram, and further concluded that the P-wave amplitude was the most obvi-

ous when the tip of the PICC catheter reached the atrial entrance.

From the point of application, lumen electrocardiogram (ecg) joint application of PICC catheter guided by ultrasound catheter tip positioning earlier in foreign countries, in our country, the first is von BiLong scholars in 2010 through to 132 patients tested detection electrode (thread) for usm drawn cavity electrocardiogram (ecg), and found that the cavity ecg P wave amplitude is associated with PICC head end position, the biggest P wave amplitude reach maximum at the entrance is located in the heart, the positioning guide the can be used as a standard. Secondly, in the digital subtraction angiography monitoring experiment in 2013, Zhuo Yajuan et al. found that when the PICC catheter tip was located at 7 mark points in the body, the amplitude of intracavinal ECG P wave was different. When the amplitude of P wave was the largest, the PICC catheter was located at the entrance to the right atrium.

4. Advantages and Limitations of Catheter Tip Positioning Guided by Intracavitary ECG Combined with Ultrasound for PICC Catheterization

4.1. Advantages of catheter tip positioning guided by intracavitary ECG combined with ultrasound for PICC catheterization

Electrocardiogram (ecg) joint cavity of PICC catheter guided by ultrasound catheter tip positioning advantages mainly can be summed up in three aspects, one is the lumen of the electrocardiogram (ecg) combined ultrasonic positioning method compared with the traditional chest radiograph, PICC can more timely and accurate positioning to the location of the catheter tip, improve the success rate of PICC catheter and better more accurate judgment whether the catheter in the atrium entrance position. At the same time, the position of the tip of the catheter can be determined, and the catheter can be adjusted in time when it is ectopic, without repeated puncture. [4] second, the cavity of the electrocardiogram (ecg) combined ultrasonic positioning method can be implemented, beside ward beds not only have good equipment support, and safe environment, at the same time also save manpower, time and energy, reduce the risk of patients from radiologists and mobile, avoids the adjustment in the X line catheter heterotopia and DSA imaging agents damage, good solve the disable X-ray to pregnant women and young children for patients with PICC catheter. Thirdly, compared with traditional chest radiography, intracavitary electrocardiogram combined with ultrasonic localization method is more simple, cost saving, and simple to operate. As long as there is a common monitor, it can meet the clinical requirements.

4.2. Limitations of catheter tip positioning guided by intracavitary ECG combined with ultrasound in PICC catheterization

Lumen electrocardiogram (ecg) joint limitations of PICC catheter guided by ultrasound catheter tip positioning can be summarized as three aspects, one is the lumen of the electrocardiogram (ecg) combined ultrasonic positioning method is by observing the principle of the P wave changes to judge the catheter tip position, therefore does not apply to cor pulmonale, left bundle branch block, ventricular premature beat, atrial fibrillation, ventricular tachycardia, installation of cardiac pacemaker and may affect the P wave change conditions to occur after cardiac surgery patients. Second is the lumen of the electrocardiogram (ecg) combined ultrasonic positioning method is mainly using guide wire and the electrical conductivity of the blood, saline water to obtain the cavity electrocardiogram (ecg), therefore the catheter was clear, thread tightness of electrode connection, external interference and so on all affect lumen ecg acquisition, currently in use within the PICC catheter with thread, but part of PICC type guide wire is too thin, three-way valve open channel catheter need physiological saline, thread with different electrode connection mode, to get a clear and stable cavity electrocardiogram (ecg) has a certain influence. Reuse of intracavitary electrocardiography after the removal of the guide wire was limited. Third, as a new business and technology, intracavitary electrocardiogram combined with ultrasonic positioning requires high professional knowledge of medical staff. Nurse catheterization is required to have certain knowledge of electrocardiogram, to judge patients' electrocardiogram before and after catheterization and during catheterization, and to have certain qualification requirements for nursing staff catheterization. [5]

5. Conclusion

To sum up, the cavity of the electrocardiogram (ecg) combined ultrasonic positioning method can not only help guide catheter PICC catheter tip more accurate positioning, with high success rate, more simple, cost savings, and the advantages of the operation is simple, with very high value of clinical application, expected to promote lumen electrocardiogram (ecg) of this essay joint application of PICC catheter guided by ultrasound catheter tip positioning help, help patients recover at an early date.

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