Peer Review File

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Reviewer A

1. This study was conducted on cancer patients, and I wonder if the patient was able to move and was in a condition to perform fluoroscopy. If the patient is mobile and in a condition that can perform fluoroscopy, the reason why PICC was not performed under fluoroscopy should be explained.

Reply 1: Thanks for your comments. There are many approaches to determine the PICC tip position, including X-ray fluoroscopy, B-ultrasound positioning and intracavitary electrocardiogram positioning. PICC insertion was done by a team of experienced nurses in our venous access center. The catheterization operation is not performed in the interventional department, so real-time fluoroscopy guided catheterization is not available. During the entire catheterization process, in addition to IC-EKG real-time guidance, we also use ultrasound to locate and puncture the blood vessel before catheterization. During the catheterization process, ultrasound observes the direction of the guide wire and catheter to ensure that the catheter runs in the superior vena cava. After catheterization, a posterior anterior chest radiograph is performed to understand the position of the catheter tip. More than 500 PICC catheters are inserted in our venous access center every year, and it is found that the catheter position determined by the IC-EKG guidance method is very consistent with the catheter position shown on the chest radiograph after the catheterization. In summary, we did not allow patients to complete PICC catheterization under fluoroscopy guidance

Changes in the text: see Page 7, line 128-135 in the manuscript with a clean copy

2. 105-108

A detailed explanation of how to use the Braun transducer and switch and how to attach the catheter to the transducer connector is required. It is difficult to understand how the procedure is performed with only this description. Please add a picture so that the reader can understand the procedure in detail.

Reply 2: we have modified our text as advised. We've added 2 pictures to better illustrate the procedure of IC-EKG guided PICC catheterization.

Changes in the text: see Figure 1-2

Reviewer B

1.When the details of your paper are broken down it appears that you are simply comparing the complication rate of PICC that were placed in the lower 1/3 of the SVC compared to those placed at the CAJ.

Reply 1: Thanks for your suggestions. The comparison of complications was aimed at the observation group (the autonomous peak of the P wave) and the control group (the P wave is 50%-80% of the QRS main wave). The overall complications not only include

the patients whose catheter tip fell in the lower third of the superior vena cava and CAJ you mentioned, but also the patients in the two groups whose catheter tip position is inappropriate (The catheter tip was located in the middle or upper third of SVC or into the right atrium). We referred to the distance between the tip of the catheter and the carina as shown on the chest radiograph after the catheterization to determine the PICC tip position.

Changes in the text: See Table 2-3.

2.In your introduction you state that the P wave amplitudes can predict where the PICC tip will be positioned. Maybe you could have a stronger argument in saying that the 2 P wave morphologies represent the lower 1/3 of the SVC and the CAJ with accuracy.

Reply 2: Whether the tip of the catheter is located in the lower 1/3 of the superior vena cava or CAJ is mainly judged by observing the amplitude change of the positive P wave of the intracavitary electrocardiogram. This has been repeatedly explained in the article, and it is visually expressed in Figure 2. In accordance with your comments, we have added some arguments to more fully explain that the positive P wave represents two catheter tip positions at two different amplitudes (the tip is located in the lower 1/3 of SVC or CAJ)

Changes in the text: Page 7, line 142-147 in the manuscript with a clean copy

3. From what is reported it is simply comparing PICC complications from one position to the other.

Reply 3: Thanks for your suggestions. Your suggestion 3 is similar to suggestion 1. Our study is not just to compare the complications when the catheter tip was located in the lower third of the SVC and the CAJ. We compared the overall incidence of complications in the observation group and the control group (including patients with inappropriate catheter tip position in these two groups). The setting of our study is mainly to known the PICC tip position and understand the accuracy of the catheter tip position and the incidence of complications corresponding to the two P wave levels when the IC-EKG guides the PICC insertion.

Changes in the text: See Table 2-3.