

Abstract:

BACKGROUND: The intracavitary electrocardiogram (IC-ECG) method has been used for the tip location of central venous access devices for the advantage of being safe, accurate and highly cost effective. However, long-term follow-up is rare. This randomized clinical trial aimed to evaluate the long-term complications of peripherally inserted central catheters (PICCs) positioned by the IC-ECG method.

METHODS: We randomized 2250 patients who needed PICC placement to either a landmark length estimation supplemented by IC-ECG positioned group (ECG group) or the traditional landmark length estimation alone group (control group) in a 2:1 allocation. Post-procedural chest X-rays were applied to confirm tip position. Follow-up was performed monthly to six months. Standard statistics analyses were performed with the SAS 9.13 software, and $p < 0.05$ was considered significant.

RESULTS: As evaluated by post-procedural chest X-ray, tip location in the ECG group had a first-attempt success (catheter tip located at optimal position) of 91.7% (95% confidence interval (CI): 90.3%-93.1%), significantly higher than 78.9% (95% CI: 76.0%-81.9%) observed in the control group ($p < 0.001$). At six-month follow-up, in the control group, frequency of total complications was 9.5%, including the exit site infection (4.0%), phlebitis (1.3%), deep venous thrombosis (1.5%), liquid extravasation (2.9%) and mechanical failure (1.9%). The IC-ECG group had significantly lower rates of complications (6.4%, $p < 0.001$), including the exit site infection (2.7%, $p > 0.05$), phlebitis (1.1%, $p > 0.05$), deep venous thrombosis (1.2%, $p > 0.05$), liquid extravasation (2.4%, $p > 0.05$) and mechanical failure (1.2%, $p > 0.05$). In the univariable logistic regression analysis, ECG method, other diseases and upper arms were the independent protective factors, and the number of adjustment procedures ($n \geq 2$) were the independent risk factors of the complications.

CONCLUSIONS: The intra-procedural tip location by IC-ECG is more safe and accurate than the traditional method of verifying tip location only post-procedurally, by chest X-ray.

Reference:

Yin, Y.X., Gao, W., Li, X.Y., Lu, W., Deng, Q.H., Zhao, C.Y., Liu, X.R., Cao, M.K., Wang, L.N. and Zhang, H.J. (2020) Randomized multicenter study on long-term complications of peripherally inserted central catheters positioned by electrocardiographic technique. *Phlebology*. May 6th. doi: 10.1177/0268355520921357. (Epub ahead of print).