

# Appropriate posture of cancer patients treated with PICC to prevent internal jugular vein ectopic

Zhaoyan Liu

Oncology Department, Rizhao People's Hospital, Rizhao 276826, China

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**Abstract Objective:** We aimed to study the appropriate posture of peripherally inserted central catheter (PICC) patients, to reduce the incidence of internal jugular vein heterotopia. **Methods:** From 2009 to 2013, a total of 290 cases with PICC were enrolled in our study. They were divided into two groups. The patients in control group took regular position, which mean prostration, upper limb of tube side was abduction 90°, head moved to puncture side in order to block the internal jugular vein. On the basis of conventional body position putting, posture of patients in observation group was improved, the head remain neutral, and had 180° angle with trunk longitudinal axis, not favor any side. After ensuring the upper limb abduction, had 90° angle with the trunk, then catheter was inserted slowly. The jugular venous catheter heterotopia rate was judged by X-ray results. **Results:** The jugular venous catheter heterotopia rate of control group and observation was 12.8% and 0.68%, respectively. The difference between two groups was statistically significant ( $P < 0.01$ ). **Conclusion:** The body posture improvement can prevent discomfort of patients and reduce the jugular venous catheter heterotopia rate of PICC.

**Key words** peripherally inserted central catheter (PICC); internal jugular vein heterotopia; body posture

Peripherally inserted central catheter (PICC) for oncology patients infusion chemotherapy drugs greatly reduces the stimulus such as complications [1], also provides a safe and effective for rescuing patients with open infusion channel [2], and improves the success rate of rescue. But in clinical, PICC encountered a lot of internal jugular ectopic, and these brought difficulty to catheter. In order to resolve the problem, we improved the body posture to brake the neck and reduce the incidence of the internal jugular vein ectopic, and achieved good results.

## Materials and methods

### General information

From 2009 to 2013, a total of 290 patients with PICC catheter were enrolled in our study, 176 males and 114 females, age ranged from 23 to 84 years with a median age of 53.5. Among them, 95 cases were lung cancer, 50 cases were leukemia, 130 cases were tumor of intestine, 15 cases were gastric cancer. All patients were operated by the same nurse, who has the certificate of PICC catheter and with over 3-year PICC catheter experiences.

### Catheter materials and methods

PICC catheter package was produced by BD company (USA) and the specification was 4–5 F. Operation process was according to the PICC operation specification of American Association of Intravenous Infusion. PICC catheter was operated with ultrasound guidance and seldinger technique [3], the process as follow: the puncture point was selected 2 cm upper elbow joint, patients with upper arm and body in the same plane with 90° angle, measured from the puncture point to right sternoclavicular joints and down to the third floor; select basilic vein, disinfect the skin; venipuncture; catheter, fixed. Fluoroscopy was used to confirm the position of the catheter and to manoeuvre it to the desired location.

### Grouping

Patients were randomly divided into two groups (control group and observation group). There were no significantly statistical difference between the two groups in terms of gender and age ( $P > 0.05$ ).

In control group, the tube after patients recumbent, the piercing upper arm abduction, and 90° angle to the body in the same plane. In the process of placing catheter, when catheter tips were near to the shoulder, the patients were told to puncture side, jaw close to the shoulder. So that a acute angle was formed between the subclavian vein and the internal jugular vein, and prevented the catheter in

the internal jugular vein, so that the catheter is smoothly into the superior vena cava<sup>[4]</sup>. If a patient didn't reach the designated position, the assistant would oppression ipsilateral supraclavicular fossa<sup>[5]</sup>, blocking pipe again, after internal jugular vein to the required length, then localization by X-ray.

In observation group, the tube in patients with recumbent, piercing upper arm abduction as the control group. The process of placing catheter was improved: when the catheter reached to the shoulder, patients did not need to turn to the side of the tube, keeping the neutral head position and forming 180° angle with the longitudinal axis of body. After ensuring 90° angle between the upper arm and the body, the tube was slowly pushed until the required length, then localization by X-ray.

### Statistical analysis

SPSS 17.0 software was used for statistical analysis. Fisher's exact probability method was used to test between groups,  $P < 0.05$  was considered as significant difference.

### Results

There were no other complications during catheter application. In control group, there were 16 cases (12.8%) with catheter internal jugular vein ectopia. In observation group, there was 1 case (0.68%) with catheter internal jugular vein ectopia. There existed significantly statistical difference between two groups ( $P = 0.0037 < 0.01$ ).

### Discussion

The internal jugular vein begins in the posterior compartment of the jugular foramen, at the base of the skull. It runs down the side of the neck in a vertical direction, being at one end lateral to the internal carotid artery, and then lateral to the common carotid, and a little above its termination is a second dilatation, the inferior bulb<sup>[6]</sup>. Subclavian vein is the continuation of axillary vein, a slight upward arch, to the rear of the sternoclavicular joints, and the internal jugular vein join to become head of the arm vein. Subclavian calm and open to the outside above internal jugular venous confluence angle is called venous angle, on both sides of the head arm vein into the superior vena cava. On the basis of the venous angle, the subclavian vein is bow the anatomical basis of determines the subclavian vein and the meeting place of internal jugular vein downward bending, catheter tip arrived at venous Angle, the catheter tip and subclavian vein in the venous Angle at the same location, bent down, as long as tube feeding speed is not fast at this moment, catheter tips touch less than the opposite arm vein blood vessel wall, venous catheter with slow blood flow into the first arm.

Angle between internal carotid and subclavian vein (venous angle) are: on the left side of the average of 70.23°, an average of 74.7° on the right side; the angle between subclavian-head arm vein: on the left side of an average of 152.6°; On the right side of an average of 130.5°<sup>[7]</sup>. The angle of subclavian and brachiocephalic veins is significantly obtuse than that of internal jugular and subclavian vein. It is easier for catheter to go through. Catheter in patients with position is 90° arm outreach, then your basilic vein, axillary vein, subclavian vein are a straight line, the blood vessels are straight, PICC catheter is straight<sup>[8]</sup>, catheter will along the direction of blood vessels and natural end of the arm vein.

The internal jugular vein exit diameter is: on the left side of the average is about 0.98 cm; On the right side of an average of about 1.14 cm; brachiocephalic vein entrance diameter is: on the left side of the average is about 1.63 cm; On the right side of an average of about 1.43 cm<sup>[7]</sup>. The internal jugular vein end while expands, the brachiocephalic vein entrance diameter still greater than the internal jugular vein caliber, export after catheter to the subclavian vein, as long as the pipe slowly, into the big caliber than into the small caliber easier. Along the subclavian vein to PICC catheter, the catheter to the subclavian vein sternoclavicular joints after end, tube feeding speed slightly faster, catheter met the contralateral arm vein wall, easy to be rebound to internal jugular venous vessel wall block catheter heterotopia, internal jugular vein end enlargement, the catheter into the internal jugular vein easier.

In the process of intubation, the control group patients need to turn, jaw tight shoulder, due to the lack or excessive turn, patients felt uncomfortable and does not reach the designated position. This would lead to a obtuse angle of the ipsilateral internal jugular venous, or make a smaller angle between brachiocephalic vein and subclavian vein, so that the catheter was easily into the internal jugular vein. If the assistant oppression ipsilateral supraclavicular fossa, block the internal jugular vein, good reduced the internal jugular vein ectopic, patients will feel very pain, is not willing to accept and even cause patient dissatisfaction. Position after the set, in the process of the catheter, patients may because of upper arm adduction of involuntary nervous, upper arm and torso cannot achieve angle of 90°, expensive to vein, axillary vein, subclavian vein is not in a straight line, and above the diagonal, catheter will be inclined to the above, opening of the catheter tip right internal jugular vein, and easy to enter the internal jugular vein<sup>[9]</sup>. So when the pipe to the shoulder joint to again confirm whether upper arm outreach 90°, observation group of patients with the case of internal jugular vein ectopic it is for this reason. Patients with congenital hang right shoulder, right shoulder low left shoulder high, the catheter in the right arm, as-

assessment before operation does not reach the designated position, still according to the observation group method to send tube, failed to assess to the upper arm outreach 90° when such patients shoulders droop, still above the subclavian vein is the direction of the diagonal, thus catheter heterotopia to the internal jugular vein, after filming, in accordance with the improved method of position by Li RQ<sup>[10]</sup>, carried out the catheter adjustment, change the running direction of catheter, an adjustment in place.

### Conclusion

PICC catheter for patients need long-term transfusion provides a way<sup>[11]</sup>, painless treatment is very important to successful puncture indwelling catheter. Catheter heterotopia is the most common complication of clinical catheter upper middle and higher rate of ectopic of internal jugular vein, foreign reports with bilateral internal jugular vein ectopic rate 36%<sup>[12]</sup>, domestic coverage of internal jugular vein ectopic 64.1%<sup>[13]</sup>. In our study, we found that the rate of ectopic in observation group was 0.68%, the way we think improve body put more conventional catheter body put method is not easy to internal jugular vein ectopic, more easily into the superior vena cava. PICC lines so tumor patients, the tube to improve the success rate of puncture, in addition to pay attention to the choice of blood vessels, puncture technique and catheter skills, more important is to pay attention to the patients with catheter position put, when this method is safe, convenient, no patient discomfort, easy to accept, the effect is good, suitable for promotion.

### Conflicts of interest

The author indicated no potential conflicts of interest.

### References

1. McLemore EC, Tessier DJ, Rady MY, *et al.* Intraoperative peripherally inserted central venous catheter central venous pressure monitoring in abdominal aortic aneurysm reconstruction. *Ann Vasc Surg*, 2006, 20: 577–581.
2. Xing L, Adhikari VP, Kong LQ, *et al.* Diagnosis and treatment of peripherally inserted central catheters (PICC)-related sepsis in breast cancer patients carrying PICC catheter for chemotherapy. *Chinese-German J Clin Oncol*, 2012, 11: 99–103.
3. Rao NY, Wu JN, Li SR, *et al.* Central venous port placement in advanced breast cancer patients: comparison of the anatomic-landmark and ultrasound-guided techniques. *Chinese-German J Clin Oncol*, 2011, 10: 695–698.
4. Guo LJ, Wang L, Ren SL, *et al.* The prevention of the complications of PICC catheter nursing methods. *J Pract Nurs (Chinese)*, 2003, 19: 5–6.
5. Jin Y, Wu YQ, Su Q. Low semi-fowler combined pressure refers to the internal jugular vein blocking method in neurosurgery, the application of PICC catheter. *J Nurs Train (Chinese)*, 2013, 28: 2267–2268.
6. Zhang WL, Zhong SZ. *The clinical anatomy of the arches of head and neck*. Beijing: People's Medical Publishing House, 1988. 385.
7. Li FD. Observation near angle and vein cavity structure and clinical significance. *J Changzhi Med Coll (Chinese)*, 1998, 12: 246–247.
8. Li QX, Wang XP. Subclavian venipuncture into the discussion of internal jugular vein to avoid method. *China Pract Med (Chinese)*, 2009, 4: 119–120.
9. Jin JF, Chen CF, Zhao RY, *et al.* The peripheral puncture into the research progress of central venous catheter heterotopia processing method. *Chin J Nurs (Chinese)*, 2013, 13: 184–185.
10. Li RQ, Jiang DQ, Guo ZJ, *et al.* Position improved to prevent head and neck cancer patients with PICC internal jugular vein ectopic. *J Nurs Sci (Chinese)*, 2012, 27: 70–71.
11. Sun JH. When central venous puncture catheter to determine whether intravenous piercing method research. *J Pract Nurs (Chinese)*, 2002, 18: 46.
12. Trerotola SO, Thompson S, Chittams J, *et al.* Analysis of tip malposition and correction in peripherally inserted central catheters placed at bedside by a dedicated nursing team. *J Vasc Intervent Radiol*, 2007, 17: 513–518.
13. Jiang Q, Liao L, Yang J, *et al.* Analysis and countermeasures of 39 cases of ultrasound guided internal jugular venous catheter heterotopia. *J Nurs Pract Res (Chinese)*, 2012, 9: 104–106.

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