A Randomized Controlled Trial to Compare Peripherally Inserted Central Catheter Tunnel Lengths in Adult Patients With Cancer

Jia Li, MS, Zeyin Hu, MS, Xiling Lin, BS, Weihua Huang, BS, Chunli Huang, BS, Jielin Luo, BS, Lihua Li, BS, Xinghong Zhang, BS, and Huiying Qin, MS

BACKGROUND: Evidence is insufficient on the effect of tunnel lengths on tunneled peripherally inserted central catheter (PICC) placement in adult patients with cancer.

OBJECTIVES: The primary objective was to explore whether there is an optimal PICC tunnel length to reduce the risk of PICC-related complications. The secondary objective was to compare patients' pain and comfort levels during catheter placement with different tunnel lengths.

METHODS: Two hundred patients were randomly assigned to groups based on PICC tunnel length. Data collected included baseline characteristics, catheter-related characteristics, PICC-related complications, and patients' pain and comfort levels.

FINDINGS: Patients with 4 cm, 5 cm, and 6 cm PICC tunnel lengths had a longer catheter dwell time and fewer PICC-related complications. No significant differences were found among all groups regarding patients' pain and comfort levels. The results suggest that a tunneled PICC is safe and effective. A tunnel length longer than 4 cm is recommended for tunneled PICC placement.

KEYWORDS
peripherally inserted central catheter; tunnel length; catheter dwell time; cancer

DIGITAL OBJECT IDENTIFIER
10.1188/23.CJON.295-304

A PERIPHERALLY INSERTED CENTRAL CATHETER (PICC) is a catheter inserted through a peripheral vein (e.g., basilic vein, median cubital vein, cephalic vein, brachial vein) that terminates in the superior vena cava. PICCs can be used to deliver chemotherapy regimens, parenteral nutrition, long-term fluid infusions, or blood transfusions in patients with cancer (Mielke et al., 2020). However, PICC complications such as wound oozing, catheter dislodgement, catheter-related infections, and thrombosis can occur, with a total complications incidence rate ranging from 3% to 61.67% (Kang et al., 2017; Mingkun et al., 2019). These complications can be associated with patient discomfort, increased medical expenses, and, in some cases, decreased treatment efficacy (Huang, Jiang, & Le, 2021).

Subcutaneous tunneling technology has been applied in PICC catheterization to reduce PICC-related complications. Guidelines recommend positioning PICCs at the middle third of the arm to achieve a catheter-to-vein ratio (i.e., the proportion of the catheter to the vein from insertion point) of less than 45%. This placement has been associated with a lower incidence of catheter-related thrombosis and catheter dislodgement (Camp-Sorrell & Matey, 2017; Chopra, 2023; Chopra et al., 2015; Franco-Sadud et al., 2019; Gorski et al., 2021; O'Grady et al., 2011; Ostroff et al., 2023). However, in some patients, because of congenital or acquired causes, small blood vessels at the middle third of the arm prevent this placement. Therefore, creating a subcutaneous tunnel can separate the puncture site from the exit site to achieve a larger catheter-to-vein ratio on the upper third of the arm and a more safely positioned exit site on the middle third of the arm (Ostroff et al., 2023).

Studies have reported that tunneled PICCs could significantly reduce the incidence of wound oozing, catheter dislodgement, central line–associated bloodstream infection (CLABSI), and thrombosis, and extend PICC dwell time (Kim et al., 2019; Saijo et al., 2018; Xiao et al., 2021). However, there is no evidence-based consensus on the optimal length of the subcutaneous tunnel, which can range from 2 cm to 10 cm (Elli et al., 2017; Kim et al., 2019; Maria et al., 2019; Ostroff & Moureau, 2017; Xiao et al., 2021). Historically, clinicians have determined PICC tunnel length based on their previous clinical experience, which suggests that a shorter tunnel is more likely to shift and cause infection, whereas a longer tunnel increases the difficulty of placement, patient suffering, and the chance of catheter failure (Ostroff

Downloaded on 05-11-2024. Single-user license only. Copyright 2024 by the Oncology Nursing Society. For permission to post online, reprint, adapt, or reuse, please email pubpermissions@ons.org. ONS reserves all rights.