The Official Journal of the Italian Society for the Study of Hemostasis and Thrombosis
SISET
Società Italiana per lo Studio dell'Emostasi e della Trombosi
Corso Nazionale SISET
Bergamo | 23-25 ottobre 2025

29TH NATIONAL CONFERENCE OF THE ITALIAN SOCIETY FOR THE STUDY OF HEMOSTASIS AND THROMBOSIS, 2025

ABSTRACT N. PO15

VENOUS THROMBOEMBOLISM RISK ASSOCIATED WITH MIDLINE CATHETERS AND PERIPHERALLY INSERTED CENTRAL CATHETERS: A SYSTEMATIC REVIEW AND META-ANALYSIS.

D. Santagata[1], F. Subri[1], F. Dentali[1|2], M.P. Donadini[1], I. Giarretta[2].

[1]Department of Medicine and Surgery, Research Center on Thromboembolic Disorders and Antithrombotic Therapies, University of Insubria, Varese and Como; [2]Department of Internal Medicine, Ospedale di Circolo and Fondazione Macchi, Varese;.

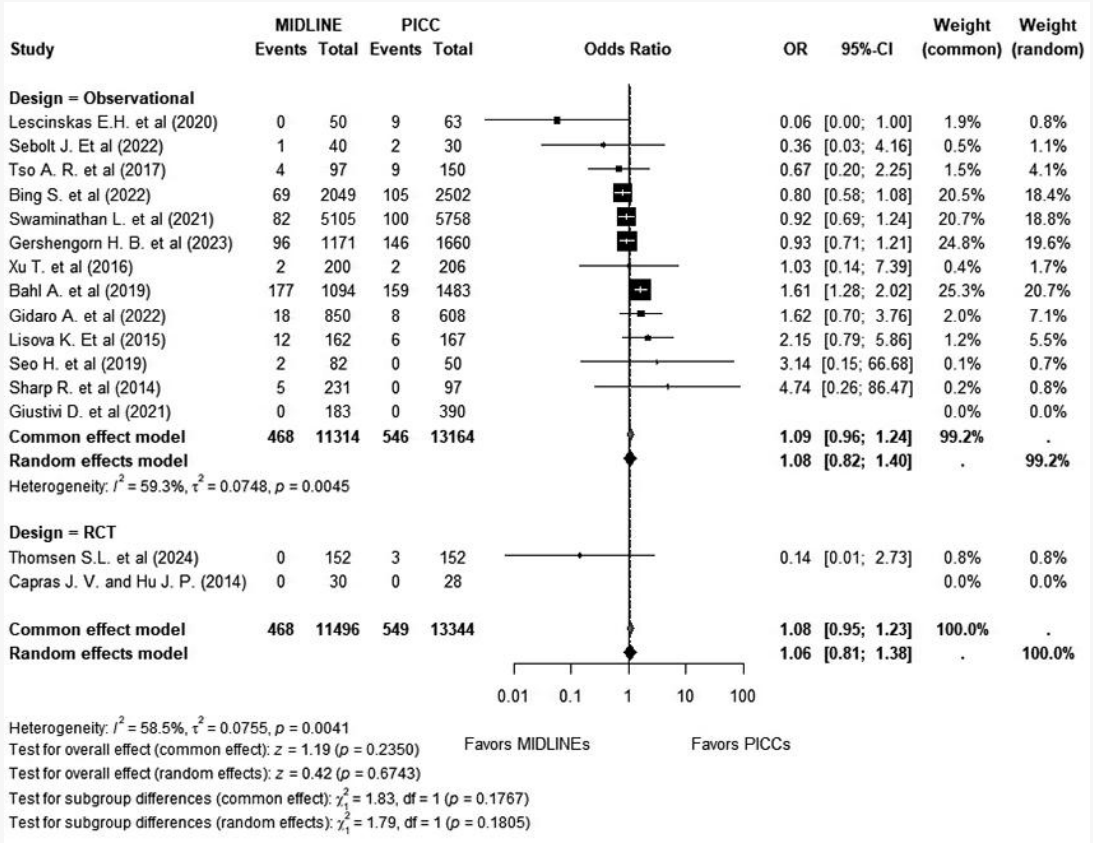
Background and aims: Peripherally inserted central catheters (PICCs) and midline catheters (MCs) are essential for administering intravenous therapies. PICCs, which extend from peripheral veins to the central venous system, are effective for high-volume infusions but are associated with significant complications, including venous thromboembolism (VTE) and catheter-related bloodstream infections. In contrast, MCs (terminating in peripheral veins) could present a different thrombotic risk, although current evidence remains conflicting. This systematic review and meta-analysis was conducted to compare VTE rates between these two devices and clarify their safety profiles.

Methods: A systematic literature search was performed across PubMed, Embase, Scopus, Web of Science, and The Cochrane Library following the PRISMA 2020 guidelines. Studies were eligible if they reported VTE outcomes (deep vein thrombosis, superficial venous thrombosis, pulmonary embolism) for both MCs and PICCs in adult patients, with a minimum of 15 catheters per type. Risk of bias was assessed using the Cochrane RoB2 tool for randomized controlled trials and the ROBINS-E tool for non-randomized studies. Subgroup and sensitivity analyses were also performed to explore potential sources of variability.

Results: After screening 2878 records, 15 studies were included, encompassing 11,496 MCs and 13,344 PICCs. Among these, 2 were randomized controlled trials and 13 were cohort studies (12 retrospective and 1 prospective). Thrombotic events were observed in 468 MC cases (4.1%) and in 549 PICC cases (4.1%). The random-effects model revealed no significant difference in the risk of venous thromboembolism between MCs and PICCs (OR 1.06; 95% CI 0.81–1.38) (Figure 1). These findings remained consistent after excluding high risk-of-bias studies and in the leave-one-out sensitivity analysis. Subgroup analyses based on ICU setting, placement year, and hospitalization status yielded similar results to the overall analysis. However, when examining placement methods, there was an increased VTE risk for MCs compared to PICCs ECG-guided techniques and echo-guided techniques were used for placement (OR 1.57; 95% CI 1.25–1.97). Moreover, when the analysis has been restricted to catheter related thrombosis (CRT) events only (available in seven studies) we reported a non significant increased risk for MCs compared to PICCs (OR 1.30; 95% 0.88 – 1.82). Overall, the quality of the included studies was moderate to low regarding our outcome of interest.

Conclusions: In summary, the overall rates of VTE were similar between MCs and PICCs across most analyzed sub populations. However, when advanced placement techniques were utilized, MCs were associated with an increased risk of VTE. Further high-quality studies are warranted to strengthen these findings.

Email: *santagatadavide@gmail.com*


Study
MIDLINE Events Total
PICC Events Total
Odds Ratio
OR 95%-CI
Weight (common)
Weight (random)
Design = Observational
Lescinskas E.H. et al (2020) 0 50 9 63 0.06 [0.00; 1.00] 1.9% 0.8%
Sebolt J. Et al (2022) 1 40 2 30 0.36 [0.03; 4.16] 0.5% 1.1%
Tso A. R. et al (2017) 4 97 9 150 0.67 [0.20; 2.25] 1.5% 4.1%
Bing S. et al (2022) 69 2049 105 2502 0.80 [0.58; 1.08] 20.5% 18.4%
Swaminathan L. et al (2021) 82 5105 100 5758 0.92 [0.69; 1.24] 20.7% 18.8%
Gershengorn H. B. et al (2023) 96 1171 146 1660 0.93 [0.71; 1.21] 24.8% 19.6%
Xu T. et al (2016) 2 200 2 206 1.03 [0.14; 7.39] 0.4% 1.7%
Bahl A. et al (2019) 177 1094 159 1483 1.61 [1.28; 2.02] 25.3% 20.7%
Gidaro A. et al (2022) 18 850 8 608 1.62 [0.70; 3.76] 2.0% 7.1%
Lisova K. Et al (2015) 12 162 6 167 2.15 [0.79; 5.86] 1.2% 5.5%
Seo H. et al (2019) 2 82 0 50 3.14 [0.15; 66.68] 0.1% 0.7%
Sharp R. et al (2014) 5 231 0 97 4.74 [0.26; 86.47] 0.2% 0.8%
Giustivi D. et al (2021) 0 183 0 390 0.0% 0.0%
Common effect model 468 11314 546 13164 1.09 [0.96; 1.24] 99.2% .
Random effects model 1.08 [0.82; 1.40] . 99.2%
Heterogeneity: I^2 = 59.3%, τ^2 = 0.0748, p = 0.0045
Design = RCT
Thomsen S.L. et al (2024) 0 152 3 152 0.14 [0.01; 2.73] 0.8% 0.8%
Capras J. V. and Hu J. P. (2014) 0 30 0 28 0.0% 0.0%
Common effect model 468 11496 549 13344 1.08 [0.95; 1.23] 100.0% .
Random effects model 1.06 [0.81; 1.38] . 100.0%
0.01
0.1
1
10
100
Favors MIDLINEs
Favors PICCs
Heterogeneity: I^2 = 58.5%, τ^2 = 0.0755, p = 0.0041
Test for overall effect (common effect): z = 1.19 (p = 0.2350)
Test for overall effect (random effects): z = 0.42 (p = 0.6743)
Test for subgroup differences (common effect): χ^2_1 = 1.83, df = 1 (p = 0.1767)
Test for subgroup differences (random effects): χ^2_1 = 1.79, df = 1 (p = 0.1805)