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Is clinically indicated replacement of peripheral catheters as safe as routine replacement in preventing phlebitis and other complications?

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Background

Peripheral intravenous catheterisation is the most common invasive procedure in hospitalized patients. In a significant percentage of patients it can be associated with minor complications such as phlebitis and infiltration. Serious complications such as catheter-related bloodstream infections (CRBSI) are fortunately rare, occuring in about 0.1 % of intravenous catheters [1]. A regular removal and replacement of peripheral intravenous catheters (IVC) has been recommended by the US Centers for Disease Control and Prevention (CDC) to reduce the risks of such complications [2].

However, such approach may lead to discomfort for patients requiring additional needdlesticks and increased workload for clinical staff. Furthermore, it can be a significant contributor to health-care costs. For these reasons, IVC are already frequently left in place beyond the currently recommended 72–96 h for appropriate reasons such as a treatment soon to be completed, poor veins, or no available staff to cannulate [3].

Small randomized clinical trials showed that IVC replacement based on clinical indication is safe in terms of development of phlebitis and other complications as compared to IVC routine replacement every 72–96 h [4, 5]. Despite this evidence, the 2011 CDC guidelines designate clinically indicated replacement of IVC as an unresolved issue, indicating that more research is needed [2].

Summary

In a multicentre, non blinded, randomized controlled equivalence trial Rickard and colleagues [6] investigate the safety, effectiveness and possible benefits of clinically indicated replacement of IVC as compared to routine replacement. Patients were considered eligible if they were at least 18 years old and they were scheduled or expected to have a peripheral IVC in situ for 4 days or more. The exclusion criteria were current bacteraemia, planned removal of IVC within 24 h, IVC already in situ for more than 72 h, IVC inserted in an emergency. 3,283 patients were enrolled in three university-affiliated hospitals in Australia and randomized either to IVC replacement every third calendar day or to a replacement only after the development of phlebitis, infusion failure or completion of therapy (clinically indicated IVC replacement). 1,593 patients were assigned to the clinically indicated replacement group, 1,690 patients were randomized to the routine replacement group.

The primary endpoint was phlebitis during catheterisation or within 48 h after removal; there were several secondary outcomes, including bloodstream infection, infusion failure and mortality. The routine replacement and clinically indicated replacement of IVC were considered equivalent if the limits of the two-sided 95 % confidence interval (CI) for the absolute risk difference were included inside the predefined equivalence margin of 3 %.

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Considering the 3,283 patients belonging to the intention to treat population, phlebitis occurred in 7 % of patients in both groups, with an absolute risk difference (ARD) of 0.41 % (95 % CI −1.33 to 2.15), which was within the predefined equivalence margin of 3 %. Even in the 2,540 patients belonging to the per-protocol population the ARD was 0.70 % (95 % CI −0.88 to 2.28) showing that clinically indicated replacement was equivalent to routine IVC replacement. Mean IVC dwell time was 99 h in the clinically indicated group as compared to 70 h in patients assigned to the routine treatment, with no significant difference in overall duration of iv treatment. Considering the secondary outcomes, CRBSI and all-cause bloodstream infections were very rare with equivalent incidence between the two study groups, while there was no significant difference in infusion failure. Importantly, patients allocated in the clinically indicated group required significantly fewer IVC per patient (1.7 versus 1.9; difference 0.21; 95 % CI 0.13 to 0.29), with significantly reduced hospital costs ($61.66 versus $69.24 per patient).

In the authors' opinion this trial shows that routine replacement has no proven benefit.

Strengths of the study

- Unlike previous studies, this RCT investigated a large population of patients.
- Study design was well-conducted: clear inclusion criteria, clinical assessment of patients with close monitoring to detect the development of complications.
- The choice of equivalence test as a powerful statistical tool showing that clinically indicated replacement is safe, besides reducing workload for clinical staff and health-care costs.
- 100 % follow-up for primary outcome.

Weakness of the study

- Non blinded assessors. The authors themselves admit that the non-masking of research nurses was a limitation that could have biased the recording of phlebitis.

Question marks

- The mean age of enrolled patients was 55 years old and 80 % of them were admitted to surgical units. It would be interesting to compare routine and clinical indicated IVC replacement in populations with older individuals and many comorbidities such as patients admitted to medical wards. Furthermore, we do not know if study findings are reproducible in clinical settings without such a close monitoring of complications.
- It is not clear if the frequency of factors potentially leading to phlebitis differs between the two groups (continuous versus intermittent infusion, chemotherapy, parenteral infusion, different types of catheters and insertion-maintenance procedures).
- The attrition in routine IVC replacement group is higher when compared to other RCTs. In fact, 504 out of 1,690 patients had no routine IVC replacement on day 3. It is not specified how many of these patients had their catheters not in situ on day 3 and how many of them had their catheters left in situ as in clinically indicated replacement group.
- Hospital costs are described in detail. However, can costs of devices (iv catheters, gauze and so on) and staff time be considered generalizable in different settings and in other countries?

Clinical bottom line

A clinically indicated peripheral intravenous catheter replacement is safe and equivalent to a routine replacement in terms of development of phlebitis.

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Conflict of interest None.

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