Does my patient need a peripheral intravenous catheter?

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Introduction

Peripheral intravenous catheterisation is the most common medical procedure in the world, but provider knowledge of and reporting of serious adverse events is underappreciated. This case describes the harms of undifferentiated routine insertion and outlines potential solutions for improvement.

Discussion

This case reminds clinicians of the serious complications, particularly bloodstream infections, related to peripheral intravenous catheters. An estimated 330 million peripheral intravenous catheters are inserted in the United States of America each year, with up to 80% of patients receiving one during their hospital stay – easily making it the most common medical procedure (Zingg and Pittet, 2009; Alexandrou et al, 2015). As many as 50% of these catheters remain idle and unused within 72 hours of insertion, contributing to complications, expenses and patient discomfort (Limm et al, 2013; Alexandrou et al, 2015).

It must be recognised that just because a patient is hospitalised this does not mean that he/she needs a peripheral intravenous catheter. While undifferentiated patients may require initial peripheral intravenous catheters, routine insertion for all patients is often based on entrenched practices that value convenience over standardised protocols and assessment of need (Lederle et al, 1992; Becerra et al, 2016). This perpetuates the 'just-in-case' rationale behind many idle catheters, propagated by the lack of awareness of serious adverse and preventable events among health-care professionals. Unselective insertion practices are further complicated by a frequent lack of standardised evaluation, lack of timely removal and unnecessary replacements (Patel et al, 2017).

Case Report

A 49-year-old man with a history of alcohol dependence presented with bilateral leg weakness and hand numbness. Symptoms began after a mechanical fall. Physical exam demonstrated decreased lower extremity strength – right (3/5) worse than left (4/5), decreased right upper extremity handgrip and decreased distal upper extremity sensation to light touch. Non-contrast cervical spine computed tomography revealed severe C3–C7 spinal stenosis with severe posterior disc bulges, neuroforaminal narrowing and associated myelomalacia. Neurosurgery was consulted and non-emergent laminectomy planned. The patient was admitted to the medical ward for preoperative observation, operative preparation and rehabilitation evaluation.

Upon arrival at the emergency room, an 18-gauge left antecubital peripheral intravenous catheter was inserted. Seventeen hours after placement, the patient reported pain and swelling in his left arm. The insertion site was swollen, tender and erythematous. The peripheral intravenous catheter, which had not been used, was removed. Despite conservative management, the inflammation worsened and another peripheral intravenous catheter was inserted for initiation of intravenous vancomycin. The cellulitis worsened and a single blood culture was positive for meticillin-sensitive *Staphylococcus aureus*. An upper extremity computed tomography scan revealed a complex abscess at the initial peripheral intravenous catheter insertion site needing surgical debridement. Wound cultures also grew meticillin-sensitive *S. aureus*, necessitating modification of antibiotic coverage to cefazolin. Subsequent workup for bloodstream infection complications was unremarkable.

The patient was treated with 2 weeks of intravenous cefazolin from the date of debridement. Thereafter, successful C3–C7 laminectomies were performed, and he was discharged to an acute rehabilitation facility on hospital day 25.

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Initiatives aiming to reduce the burden of complications associated with insertion of peripheral intravenous catheters can be divided into three areas:

1. Systematic assessment of medical necessity
2. Appropriate aseptic insertion techniques
3. Implementation of surveillance programmes for discontinuation or replacement of these devices (Carr et al, 2019; Ray-Barruel et al, 2019).

The association between peripheral intravenous catheters and their complications has been well described. The estimated rate of bloodstream infection with peripheral intravenous catheters is 0.2–0.7 episodes per 1000 catheter-days (Maki et al, 2006; Mermel, 2017). The burden of central-line associated bloodstream infections approaches nearly $33 000 per incident, and peripheral intravenous catheter-associated bloodstream infections likely have similar costs (Maki et al, 2006; Dawson and Moureau, 2013; Chopra et al, 2015). However, underreporting of events, lack of surveillance systems and scarcity of quantified data mean that these complications are underappreciated.

The question of medical necessity is often not explicitly addressed before a peripheral intravenous catheter is inserted. A decision-making aid has been proposed for patients presenting to the emergency department. It suggests selective insertion of peripheral intravenous catheters in those with anticipated hospital admission who are expected to undergo imaging procedures with intravenous contrast, require intravenous fluids or medications, or when a clinician predicts the likelihood of the patient needing a peripheral intravenous catheter to be over 80% (Carr et al, 2019).

After insertion, increasing awareness of idle catheters requires appraisal of continued clinical need and device condition. Clinicians should provide periodic justification for continued catheterisation as a patient's clinical course evolves. While use of a peripheral intravenous catheter for more than 72–96 hours may be associated with higher rates of catheter colonisation, routine replacement does not prevent phlebitis or bloodstream infections (Patel et al, 2017; Webster et al, 2019). Instead, daily survey for recognition of local complications is prudent, with prompt removal when noted or if the catheter is considered to be idle without further clinical need. Otherwise, catheters should only be routinely replaced if clinically indicated.

Conclusions

This case illustrates that the practice of inserting a routine (just-in-case) peripheral intravenous catheter should be revisited. Clinicians should be aware of idle catheters and their associated complications. Although seemingly benign, peripheral intravenous catheters should be treated similarly to any other procedure, with careful needs assessment and post-procedural maintenance care. Appropriate and robust strategies are needed to increase identification of idle catheters and reduce unnecessary insertions.

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Learning points

- Not every hospitalised patient needs a peripheral intravenous catheter.
- The clinical need for insertion of a peripheral intravenous catheter should be assessed on an individual basis.
- Routine strategies for care of peripheral intravenous catheters, including removal of idle lines, are necessary.
- Clinicians should be cognisant of the potentially serious risks of peripheral intravenous catheters.

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