Exploring solutions to prevent venous needle dislodgements and vascular infiltrations during haemodialysis

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Introduction

Vascular access cannulation is arguably the most vulnerable and painful aspect of most haemodialysis (HD) delivery. Arteriovenous fistulas (AVF) have historically been the recommended modality of haemodialysis; successful cannulation of an AVF plays an important part in patient safety, patient confidence and AVF health.

Many HD patients may experience cannulation complications such as a vein infiltration, venous needle dislodgement (VND) or pain [1,2,3], which may lead to haematomas, vessel injuries, operational disruption, postponed treatments and poor patient experiences. Plastic cannulas (Diacan Flex, B. Braun) are therefore being developed as a potential alternative to the traditional sharp steel needles for all different types of AVF. As plastic cannulas have been used in Australia and Japan since 2012 for selected HD patients, our unit explored whether these devices could be a sustainable safe option for individual patient care.

The aim of this product evaluation was to observe use of the Diacan Flex cannula device for a 6 month period on a selected group of patients.

The selection criteria included patients struggling to stay still throughout haemodialysis sessions, patients finding metal needle cannulation too painful, and patients with previous history of VND. In addition, it was also essential to establish patient experiences and observe staff cannulation techniques.

Methods

From September 2022 to February 2023 haemodialysis competent healthcare clinical staff cannulated with a 16G Diacan Flex cannula for a selected group of 25 consenting patients with the following established clinical risks: AVF pain on dialysis, history of metal needle dislodgement or allergy, previous problematic venous infiltrations. A training programme was designed by Practice Development Nurses to train renal staff using a simulation dummy arm, an online training pack and literature and information videos. Implemented clinical care was evaluated and documented by competent healthcare clinical staff in care plans. Feedback from 20 patients was captured with a questionnaire.

Figure 1. Diacan Flex

Figure 2. Insertion of Diacan Flex

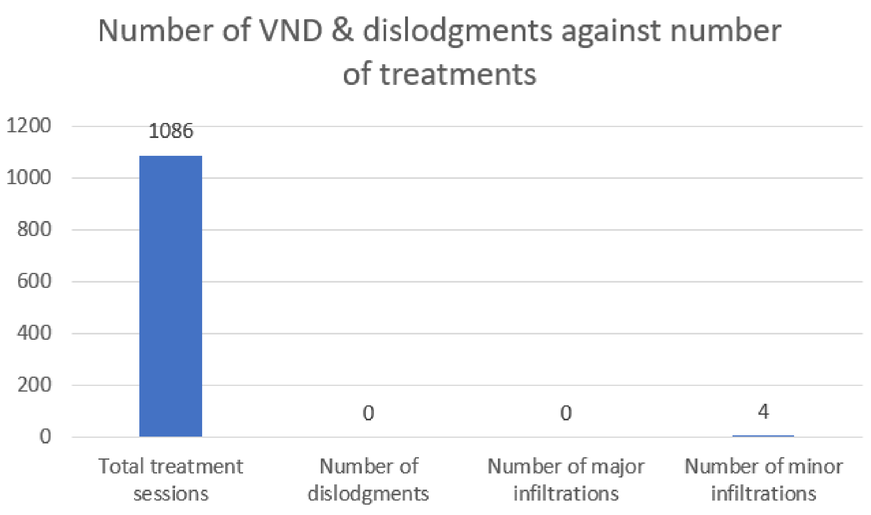

Figure 3. Number of treatment sessions against number of VND and infiltrations

Patient responses:

"I love the new needles/catheters; it allows me to move my arm without making the machine alarm."

"I don't feel the sharp in my arm which I normally feel with the other needles."

"My arm doesn't have bruises now."

"I wish to stay on these needles forever; even after the trial."

Results

Total number of patients: 25

- 5 patients discontinued the product evaluation in week 1, 3 due to training teething problems, 1 renal transplant and 1 cancelled consent.
- Total treatment sessions: 1086
- Number of VND: 0
- Numbers of infiltrations: 4 (minor/non disruptive)
- All patients reported that Diacan Flex was more comfortable (20%) or much more comfortable (80%) than a steel needle
- Patients reported that they rarely (40%) or never (60%) experienced bruising, needle blow or pain with Diacan Flex
- 100% of patients said that they would recommend the future use of Diacan Flex

Arteriovenous fistula site selection

60% brachiocephalic fistula,
30% radio-cephalic fistula
10% brachiobasilic fistula.
25% right-sided
75% left-sided.

Conclusion

- Diacan Flex is a safe product for a selective group of dialysis patients as a replacement for traditional metal needles
- Patients did not find the device uncomfortable
- No vascular injuries were observed
- Training and support for cannulation is essential
- Further research is required to establish if the 16G Diacan Flex compromises HD adequacy parameters or affect AVF mid-long term vessel health

References:

[1] Lee, T., Barker, J., & Allon, M. (2006). Needle infiltration of arteriovenous fistulae in hemodialysis: risk factors and consequences. *American journal of kidney diseases*, *47*(6), 1020-1026.
[2] Marticorena, R. M., Dacouris, N., & Donnelly, S. M. (2018). Randomized pilot study to compare metal needles versus plastic cannulae in the development of complications in hemodialysis access. *The Journal of Vascular Access*, *19*(3), 272-282.
[3] Wu, H. W., Lin, H., Chen, K., Lin, Y., & Hu, H. (2020). The analysis of risk factors for the patients experienced venous needle dislodgement or bleeding during dialysis. *Nephrology, Dialysis, Transplantation*, *35*(Supplement 3).