

Is Dialysis Nursing Practice Associated with Successful Cannulation of Native AV-Fistula and Graft?

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Introduction

Patients on extracorporeal dialysis treatment depend on well-functioning vascular accesses for their survival. The arteriovenous fistula (AVF) presents as the optimal vascular access (VA), having a lower rate of complications, lower morbidity and less maintenance costs compared to central venous catheters (1). In 2006 KDOQI introduced a list of features that define a well-functioning VA among which was the statement "it can be easily cannulated", thus shifting focus from the surgical aspects of VA preparation to the way in which the VA is handled in normal clinical practice (1). Although the usual insertion of two needles into the vessels is a basic nursing action, if we consider that it has to be repeated roughly 156 times a year we can understand its importance in the medium/long term maintenance of the VA. Cannulation is an essential skill for dialysis nurses: failure to correctly repeat this operation day after day may result in serious complications.

Objectives

To investigate if the different aspects of AVF and AVG cannulation have an effect on the development of acute access complications which may, in the medium to long-term, affect the survival of the vascular access.

Methods

In April 2009 a cross-sectional survey was conducted in 171 dialysis units located in Europe, the Middle East and Africa to collect details on VA cannulation practices on a clinic by clinic level. The survey results have already been published (2). The association between acute access complications observed during the survey and cannulation practice was investigated in all 10,807 patients enrolled in the survey.

Information on cannulation retrieved from the survey comprised access type and location, cannulation technique, needle size, use of disinfectants and of local anaesthetics, application of arm compression at the time of cannulation, arterial needle and bevel direction, needle rotation, 1st needle inserted (arterial/venous), and needle fixation. Five categories of acute complications were investigated: Multiple-cannulation, Infiltration, Haematoma, Haemorrhage and Unknown.

Results were considered statistically significant for $p < 0.05$. SPSS (SPSS Statistics for Windows, Version 21.0, IBM Corp., Armonk, NY, USA) was used for all statistical analyses.

Results

Cannulations in hemodialysis patients with either arteriovenous fistula or arteriovenous graft were documented:

- **91.2%** of cannulations were performed on AVFs (of these, 54.1% distal, 45.9% proximal), and **8.8%** on AVGs.
- Out of all observed cannulation procedures, **367** were associated with complications, with multiple cannulations being the most frequent (**33.8%**).
- **Figure 1** shows the proportion of cannulation complications by vascular access type and anatomical location: with the exclusion of the rare forearm grafts, no major differences were detected.
- **Table 1** shows the results of the logistic regression model evaluating the association between cannulation practice and occurrence of an acute complication.
- **Figure 2** reports the proportion of patients with different cannulation complications by cannulation technique, with rope-ladder more likely to be associated with multiple cannulations or other complications.

Conclusions

In conclusion, this study identified certain steps in the process of cannulation that can potentially prolong the life of the vascular access. This has consequences not only for patient survival on chronic haemodialysis but also patient quality of life by preventing further suffering due to the creation of additional temporary or permanent vascular accesses.

However, vascular access care requires continuous education of nurses, patients and also physicians. Therefore, more studies should be conducted on this important topic.

References

1. Vascular Access Work, G., Clinical practice guidelines for vascular access. *Am J Kidney Dis*, 2006. 48 Suppl 1: p. S176-247.
2. Gauly, A., et al., Vascular access cannulation in hemodialysis patients - a survey of current practice and its relation to dialysis dose. *J Vasc Access*, 2011. 12(4): p. 358-64.

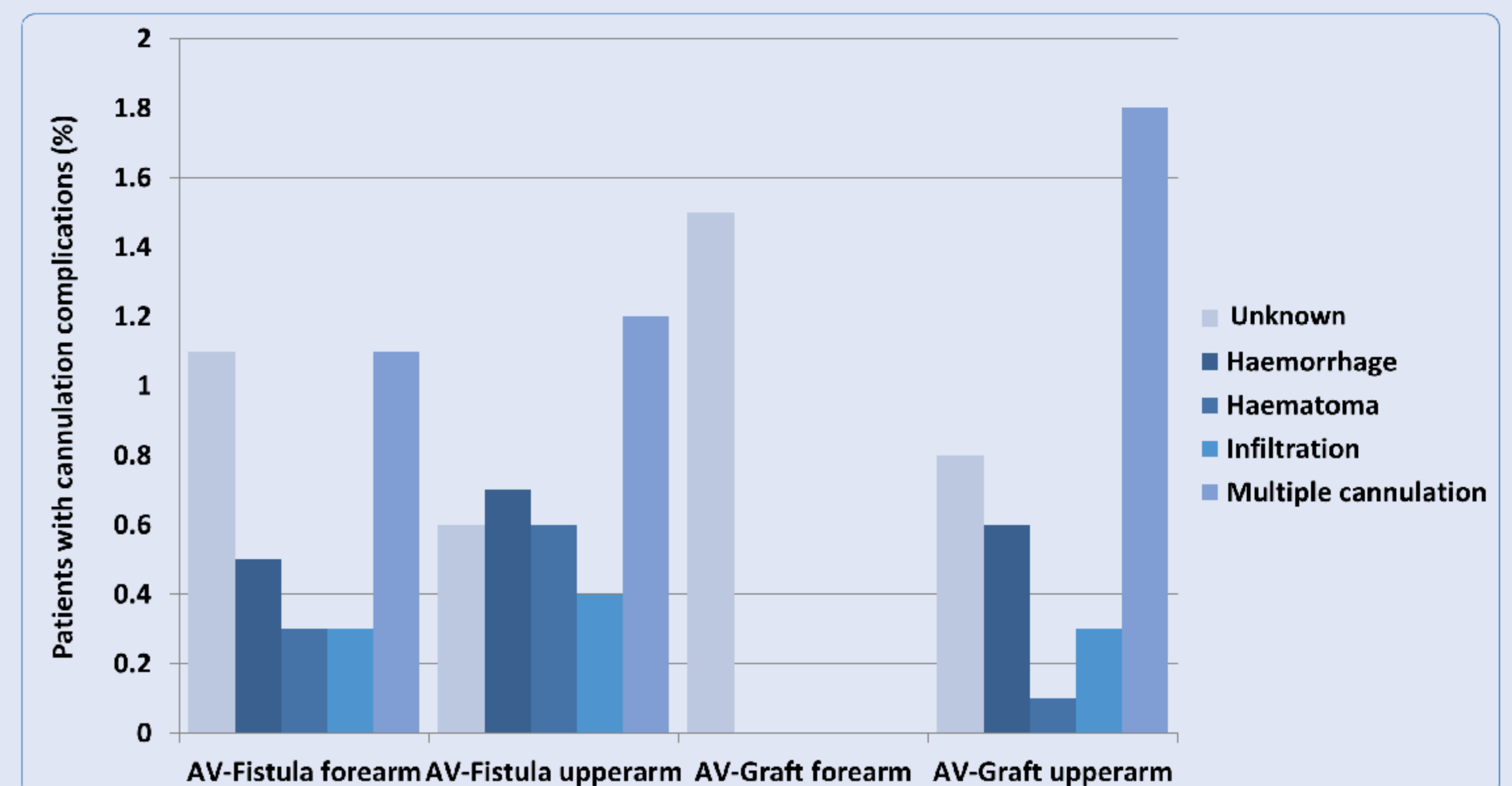


Figure 1: Proportion of patients with cannulation complications by vascular access type and anatomical location.

Nursing practice aspect			OR	95% confidence Interval		p-value
Variable	Reference	Category		Lower limit	Higher limit	
Needle gauge	15	14	0.545	0.199	1.491	NS
		16	1.305	1.016	1.676	0.037
		17	4.245	2.548	7.072	<0.001
Back-eye needle	No	Yes	1.879	1.409	2.508	<0.001
Cannulation technique	Rope-Ladder	Buttonhole	0.559	0.332	0.942	0.029
		Area	0.613	0.482	0.780	<0.001
1 st needle inserted	Arterial	Venous	1.677	1.306	2.155	<0.001
Needle axis rotation	No	Yes	1.522	1.206	1.921	<0.001
Needle fixation	Butterfly	Chevron	0.836	0.474	1.475	NS
		U-Shape	0.754	0.461	1.232	NS
		Others	0.561	0.347	0.905	0.018

Table 1: Results of the logistic regression model evaluating nursing practice aspects in respect to the event "cannulation complication"

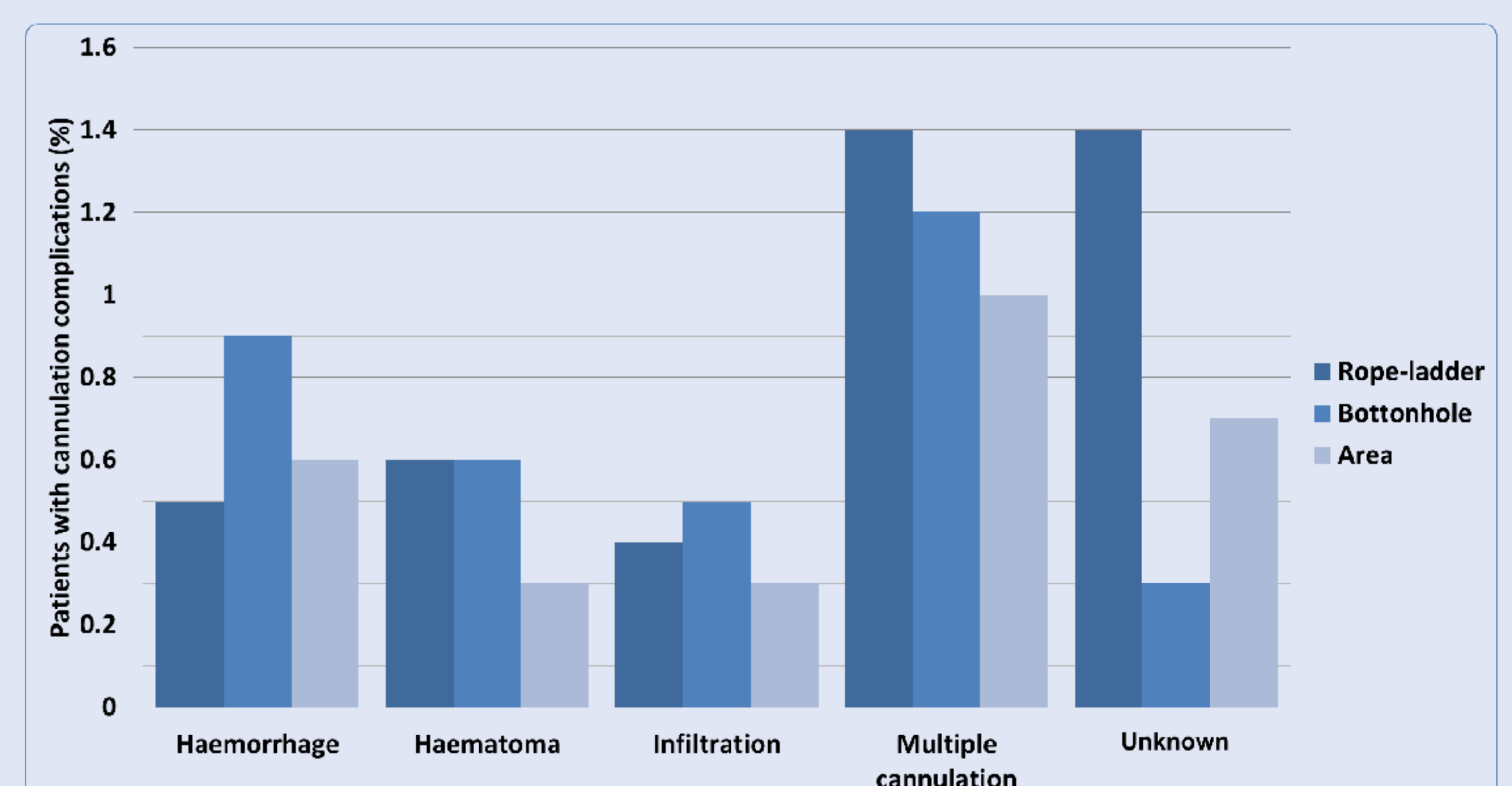


Figure 2: Proportion of patients with cannulation complications by cannulation technique.