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Original Article

Timing of cannulation of arteriovenous grafts: are we too cautious?

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Abstract

Background. Timing of first cannulation of an arteriovenous graft has been the subject of great debate for clinicians worldwide. In this paper, we reviewed the current literature on the timing of first cannulation of arteriovenous grafts.

Methods. Searches of PubMed, Medline and the Cochrane Library were performed using specific search terms to identify articles, dealing primarily with the timing of dialysis graft cannulation.

Results. Following strict inclusion/exclusion criteria by two reviewers, eleven studies were included and divided into subgroups for ePTFE and new generation grafts.

Conclusions. The current literature does not seem to support the current guidelines as there is no evidence to suggest that a delay in cannulation of grafts will improve graft survival and patency.

Keywords: arteriovenous; cannulation; graft; timing

Introduction

Haemodialysis (HD) is a lifeline therapy for patients with renal failure. It is estimated that over 1.5 million patients receive regular HD treatment worldwide. A critical factor in the survival of renal dialysis patients is the surgical creation of vascular access. Arteriovenous fistulae require prior planning and might require a number of weeks prior to successful maturation. On the other hand, arteriovenous grafts (AVGs) can be used soon after insertion but seem to have a higher rate of complications. The timing of the first cannulation of vascular access is critical for appropriate management of HD patients. Current guidelines are based on professional opinions rather than scientific evidence. Table 1 lists the current recommendation regarding timing of cannulation after creation of a new AVG.

In this paper, we aim to search the literature for evidence for optimal timing of cannulation of AVGs.

Materials and methods

Searches of Pubmed, Medline and the Cochrane Library were performed using the following specific search terms as well as a combination of the procedure (PTFE, Flixene, Vectra, Rapidax, Acuseal) with either arteriovenous cannulation to identify articles in English or French, dealing primarily with the timing of dialysis graft cannulation. In addition, the references cited in selected articles were reviewed for any further relevant available studies. Case reports and studies without an abstract were excluded. The systematic review was performed in accordance with PRISMA. Therefore, all included studies were assessed for inclusion on the basis of their topic, type of study, method, number of patients included and statistical analysis.

Due to the small number of papers available and the HD population being so heterogenous, statistical analysis was not deemed suitable, and therefore, a narrative review of the evidence is presented.

Results

One hundred and eighty relevant articles and abstracts were identified. After screening the contents of the abstract, 18 full text articles underwent assessment for eligibility and quality inspection of methodology. Following this, there were 11 articles eligible for the review (Figure 1). These were subdivided between PTFE arteriovenous graft and the new generation of grafts.

PTFE arteriovenous graft

The current literature on the topic can be described as sparse at best. Saran *et al.* [1] looked at practice patterns at 309 international HD centres. It showed that European and American practices were similar as only a small minority of patients had their AVG cannulated in the first 2 weeks (16% in USA, 17% in Europe). However, the Japanese HD centres did not seem to have much issue with cannulating as early as 42% of grafts were needled within 2 weeks of placement. Interestingly, the authors went on to study the relative risk of access failure by time of first cannulation for AVGs. They took the 2–3-week timeframe

Table 1. Current guidelines on cannulation of grafts

Scientific group	Guidelines
Kidney Disease Outcomes Quality Initiative (USA)	Grafts generally should not be cannulated for at least 2 weeks after placement and not until swelling has subsided so that palpation of the course of the graft can be performed.
Canadian Society of Nephrology (Canada)	A new PTFE dialysis AV graft should not be cannulated until the swelling has gone down enough to allow palpation of the course of the graft—ideally 3–6 weeks after placement. Ideally, no attempt should be made to cannulate the graft for at least 14 days after placement.
European Best Practice Guidelines on Vascular Access (Europe)	Prosthetic graft AVFs do not need a maturation period and can be cannulated 2–3 weeks after implantation.
Renal Association (UK)	For prosthetic grafts, a maturation period of longer than 2–3 weeks after implantation is not required.

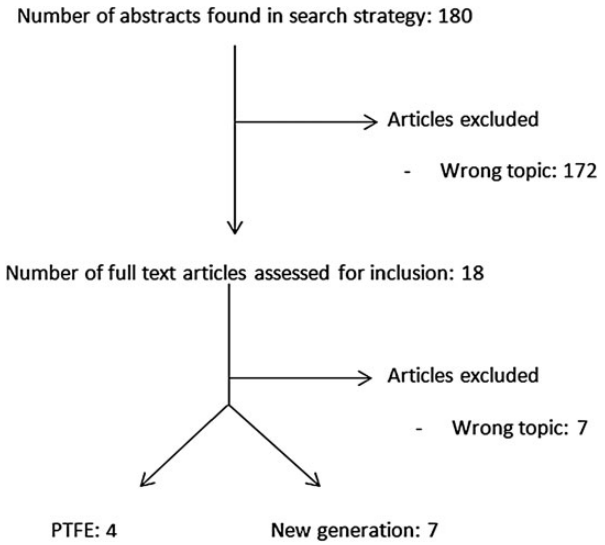

Fig. 1. Flowchart describing search strategy.

to be the reference point as it is the usual recommendation as described in Table 1. The relative risk for cannulating an arteriovenous graft within 2 weeks was shown to be 0.84 and might therefore suggest a benefit in early use of AVG. Unfortunately, the results were not found to be significant, and therefore, we cannot make strong conclusions from their findings.

Sottiurai *et al.* [2] carried out a study to determine whether grafts could be cannulated for HD within 48 h of placement. Thirty-six patients were subdivided into two groups: early cannulation (24–48 h) and late cannulation (10–14 days). They found that there was no significant difference in outcome and adverse events in the two groups.

Feldman *et al.* [3] carried out a retrospective study on their cohort of patients ($n = 59$) and studied whether there was an association between AVG patency and timing of first cannulation. They did not find any survival benefit from any delay in the cannulation of grafts. However, due to their small cohort of patients, the authors could not find the optimal timing for first use of vascular access.

Hakaim *et al.* [4] carried out a prospective clinical trial including a total of 76 patients. They divided the patients into two groups: early cannulation (within 72 h) and late cannulation (>2 weeks). They found that early cannulation did not increase morbidity and had similar patency rates as late cannulation.

New generation of grafts

A number of new AVGs have recently been marketed with abilities for early cannulation. Flixene™ grafts have been investigated in two recent papers. Schild *et al.* [5] showed that early cannulation of Flixene grafts was successful in their cohort of 33 patients within 72 h (29 patients were cannulated within 24 h.) Chiang *et al.* [6] also showed that Flixene grafts can be cannulated within 72 h as well as have similar long-term patency and complication rates as PTFE grafts. Lioupis *et al.* [7] showed that the Flixene graft had better 18-month patency rate than transposed brachiobasilic arteriovenous fistula and could be cannulated within days of implantation.

The polyurethane vascular access graft (PVAG) has also been investigated. Glickman *et al.* [8] compared PVAG with PTFE grafts and showed that PVAG grafts can be cannulated earlier than PTFE (53.9% within 8 days). Long-term patency and adverse events were similar in both grafts. Jefic *et al.* [9] showed even more promising results with 81% of PVAG being cannulated within the first 4 days of placement.

Chemla *et al.* [10] looked at early cannulation with Flixene and Rapidax grafts. It agrees with the previously mentioned literature with Flixene grafts having a mean delay to 120 cannulation of 1.1 days. Rapidax grafts had a longer delay of 2.7 days; however, the cohort was small with a total of 16 patients included in the study.

A recent study looking at the use of Acuseal graft showed that early cannulation had been permitted within 24 h of placement and that patency rates were comparable to standard PTFE grafts [11]. This was found to be useful as it avoided the use of central lines in the majority of their patients.

Conclusion

In conclusion, the current literature does not seem to support the current guidelines as there is no evidence to suggest that a delay in cannulation of PTFE grafts will improve graft survival and patency. It is arguable that the guidelines might currently prolong the use of central catheters that are associated with higher morbidity and mortality as well as increased cost to health services. The new generation of grafts (Flixene, PVAG, Acuseal and Rapidax) also seem to have very promising results with early cannulation and similar long-term patency results as PTFE. Our own experience of AVGs is that cannulation can be carried out within days of placement as long as there is no contraindication such as oedema or significant bruising. Therefore we feel that there is a strong need for large prospective studies to gain a better understanding of optimal timing of first cannulation.

Conflict of interest statement. None declared.

(See related article by Bray and Metcalfe. Improving patient safety in haemodialysis. *Clin Kidney J* (2015) 8: 262–264.)

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