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Vascular access in cystic fibrosis – does size matter?

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Abstract: Vascular access is an important part of patient management in cystic fibrosis. In most instances, vascular access is straightforward. However, a single bad experience with venepuncture has a lasting impact. Clinical experience suggested that for some individuals a smaller, shorter intravenous catheter (Leaderflex 22G, 0.7 mm × 8.0 cm, Vygon) might be a suitable alternative to standard vascular access via a standard long-line (2 Fr or 3 Fr Nutriline, Vygon).

Methods: **Between September 2002 and May 2004 we offered a free, fully informed choice between a standard 30 cm long line or a shorter (8 cm) Leaderflex line and audited this change in practice.**

Results: **A total of 56 lines were inserted over the study period. Data were available for 54 of these (22 Leaderflex and 32 standard long lines). Mean and median line survival was comparable. Leaderflex lines survived for a mean of 12.2 days and median of 14 days. Standard long lines survived for a mean of 12.6 days and median of 14 days.**

Discussion: **Leaderflex lines offer a well-tolerated alternative to standard long lines for the administration of a 14-day course of intravenous antibiotics. Their reduced size and cost offer advantages to patients and doctors. (The Journal of Vascular Access 2005; 6: 72-5)**

Key words: *Venepuncture, Catheter, Cystic fibrosis, Vascular access*

INTRODUCTION

Vascular access is an important part of patient management in cystic fibrosis. Many children require intermittent courses of intravenous antibiotics throughout childhood (1). In most instances, vascular access is straightforward. However, a single 'bad' experience with venepuncture has a lasting impact on the child (2). This can make subsequent attempts at line insertion difficult without general anaesthesia or heavy sedation. Moreover, repeated long line insertion takes its toll on the veins that are available, making peripheral vascular access increasingly difficult over time.

The traditional solution to this problem is to offer a totally implantable vascular access device (3). These devices are surgically implanted and lie just beneath the skin. Although this makes subsequent intravenous access much more straightforward, these devices require regular (monthly) flushing with heparinised saline to ensure patency. In childhood, an implanted venous access device's life expectancy is limited by growth, there are many possible complications (4) and for some children and families the prospect of monthly device flushing is not acceptable. This is particularly true in children requiring only intermittent courses of intravenous antibiotics.

Between September 2002 and May 2004 we have offered children and adults a further option for intravenous courses of antibiotics – a "short" long line. We had previously used this type of line as a "second best" option if a traditional long line was not possible. Our experience with this type of line was that not only was it substantially easier to insert but if it was treated as a long line and flushed with heparinised saline between doses of antibiotics then it often lasted for a full two week course of treatment. We report here the result of an audit of our results.

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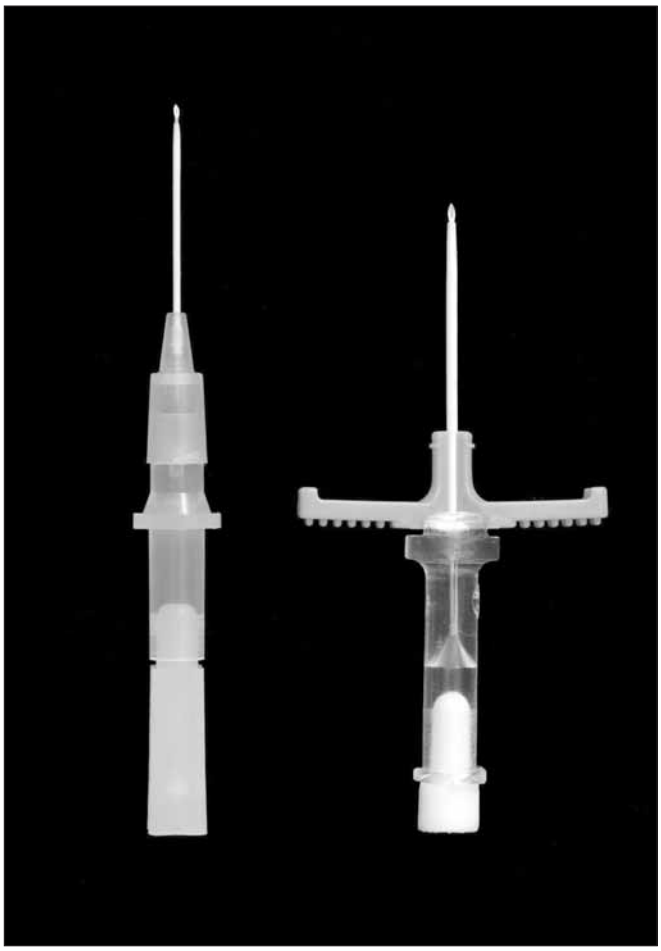

Fig. 1 - *Picture demonstrating the needle sizes required for line insertion - 24 G Jelco (left) versus 2 Fr peelable catheter.*

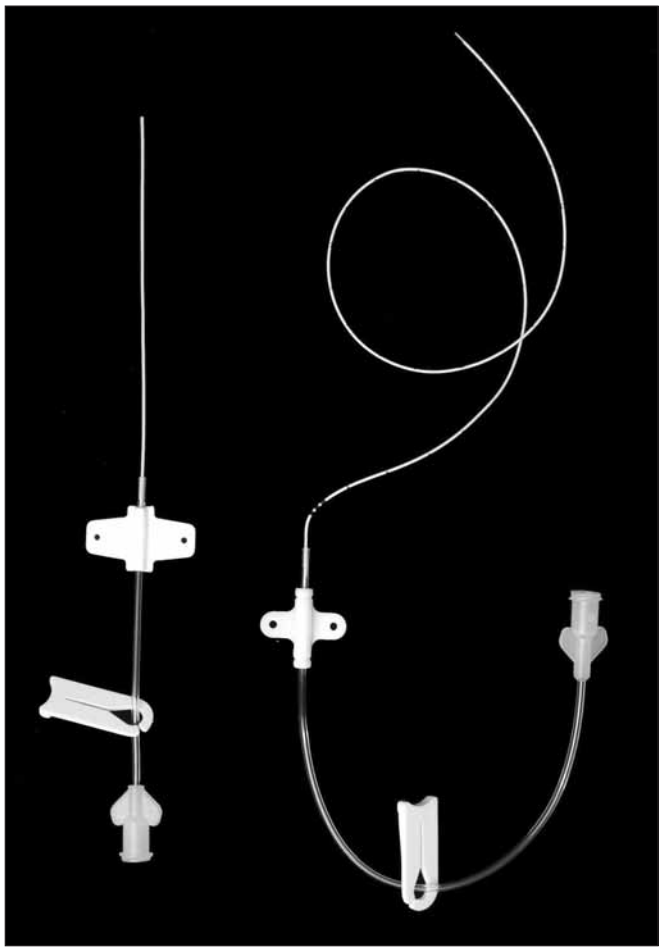

Fig. 2 - *Short versus standard. Picture of the two line types ex vivo.*

PATIENTS AND METHODS

From September 2002 children and adults with cystic fibrosis attending the University Hospital of North Staffordshire were given a fully informed choice of having either a standard long line (2 Fr or 3 Fr 30 cm Nutriline, Vygon) or a shorter long line (22 G Leaderflex 8 cm, Vygon). All lines were inserted by one of two doctors (RR and WDC). Leaderflex lines include a short guide wire which can be introduced via a 24 G (left in Fig. 1) Jelco (Johnson & Johnson) cannula. The 8 cm Leaderflex line is then threaded over the wire (Seldinger technique). Data were collected prospectively on both types of line as part of an ongoing audit. These data included date and time of insertion, type of sedation or anaesthesia used, type of line inserted, site of insertion, state of veins (doctor assessment prior to insertion (poor/good), lifespan of the vascular access and reason for removal. Retrospectively, it was possible to calculate the age of each patient and the number of antibiotic courses in the previous 2 years.

All statistical analyses were carried out using the STATA statistical package (version 8.0, Stata corporation, College station, Texas).

RESULTS

A total of 56 intravenous lines in patients with cystic fibrosis were inserted by WDC and RR over a 21 month period. Audit documentation was available for 54/56 (96%) of these (22 Leaderflex and 32 standard long lines).

Patients choosing Leaderflex lines were older and had worse veins (Tab. I). In univariate and multivariate regression analyses only a score of “poor” veins significantly influenced line survival (univariate regression $p = 0.03$, multivariate regression $p = 0.05$).

TABLE I - DIFFERENCES IN PATIENT CHARACTERISTICS AND LINE SURVIVAL

	Age (± SD)	IV courses in last 2 yrs (± SD)	Poor veins (%)	Mean survival (± SD) in days	Median survival
Leaderflex (n = 22)	19.3 (± 6.3)	1.8 (± 1.5)	12 (55%)	12.2 (± 3.1)	14 days
30 cm Long line (n = 32)	11.0 (± 7.3)	2.2 (± 1.2)	13 (41%)	12.6 (± 3.9)	14 days
p value different	**p < 0.001**	p = 0.245	p = 0.313	p = 0.681	

Mean survival time of Leaderflex and standard long lines were similar (12.2 vs 12.6 days). Median survival of both types of line was 14 days. This difference was not statistically significant (univariate regression p = 0.681, multivariate regression p = 0.966).

DISCUSSION

Initially we were concerned that Leaderflex lines may be less durable than conventional long lines. Previous studies have demonstrated that standard peripheral cannulae have a substantially shorter median survival than long lines (4 vs 14 days) (5). However, in the majority of our patients, both types of line lasted a full 14 days. Moreover, in patients with poor veins, Leaderflex survival was slightly longer (11.8 *vs* 11.2 days).

Our motives behind offering a choice of lines were not cost driven but Leaderflex lines are substantially cheaper than conventional 2 Fr and 3 Fr percutaneous long lines (£ 21.50 *vs* £ 45.33). Our experience suggests that children and adults choosing a Leaderflex line were more likely to have had a previous "bad" experience with a conventional long line. They offer a number of other advantages over conventional long lines. Firstly, they are easier to insert. They can be placed in most veins through a 24 G Jelco. This is in contrast to conventional long lines which are introduced via a larger 20 G peel-away sheath. Secondly, nearly all the Leaderflex patients in this study commented that they are substantially less painful. Finally, insertion time is nearly always much shorter. With one exception, patients who have had more than one type of line have asked for a Leaderflex for future courses of intravenous antibiotics.

We believe that Leaderflex lines offer an acceptable and cost effective alternative to standard long lines for 14-day courses of intravenous antibiotics in cystic fibrosis.

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These data were collected as part of an ongoing audit of vascular access within our departments. It was discussed with our hospital audit department who confirmed that anonymised data collection was necessary.

These data have been presented at the annual meeting of the Royal College of Paediatrics and Child Health (April 2005). The data is available in abstract format as part of the proceedings of that meeting.
Carroll WD, Anderson M, Reddy R, Pantin C, Lenney W. Vascular access in cystic fibrosis: short and sweet? Arch Dis Child 2005; 90 (Suppl II): A59-60.

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