The Sparks Mandril for Vessel Access in Haemodialysis

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Summary
The Sparks Mandril, placed as a forearm loop, provides excellent access for haemodialysis. The long-term patency rate however, is less than for other access devices and hence the mandril's place at present is in patients with access problems.

MATERIALS

Sparks Mandrils of 5 and 6 mm diameter were used in 12 patients as a forearm loop running from the brachial artery to the basilic vein in the upper arm. Of a further 4 patients, the cephalic or median cubital vein at the elbow was used for venous run-off in 3, and the fourth was a child in whom the loop was placed in the thigh between the femoral vessels. The mandril, with its silicone rod, was placed accurately in position, and the anastomosis was carried out six weeks later. The mandril was used immediately for haemodialysis. Anticoagulants were not used routinely, but were given after thrombotic episodes.

RESULTS

Patency
Our earliest mandrils have been in use for 10 months. Table 1 shows the incidence of immediate failure and function at 3 months and 6 months, first in all mandrils used and second in those used between the brachial artery and basilic vein above the elbow. This method is clearly preferable but the patency rate even of the 'standard' mandril is lower than vein loops used in our unit.
TABLE I. Primary Non-Function (PNF) and Patency in Mandril Loops

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<th>PNF</th>
<th>Patency</th>
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<tr>
<td></td>
<td>3 mo</td>
<td>6 mo</td>
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<tr>
<td>All Mandrils</td>
<td>1/16</td>
<td>10/15 (66%)</td>
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<tr>
<td>'Standard Mandrils'</td>
<td>0/12</td>
<td>9/11 (82%)</td>
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<tr>
<td>Vein Loops</td>
<td>0</td>
<td>90%</td>
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Complications

1. **Thrombosis**  Mandril loops clotted on 10 occasions and stable flow was re-established on six occasions, after conventional thrombectomy with Fogarty catheters. One patient required three thrombectomies in a week, and now has good flow.

2. **Erosions** The mandril may erode through the recent surgical scar overlying the fabric and hence must be inserted away from the skin wounds. Small erosions occurred on three occasions although the fabric was no longer porous, but one major erosion required excision before anastomosis.

3. **Other Complications** In spite of the substantial blood flow through the loop only one patient has ischaemic pain in the hand, and then only on dialysis. Though the Dacron fabric might predispose to infection, none has occurred, nor has there been any aneurysm formation. Standard dialysis needles are used, and excessive bleeding after withdrawal has not been a problem, except in the one patient with the mandril loop in the thigh. Radiology has often shown strictures of the basilic vein proximal to the anastomosis, with considerable retrograde flow.

**DISCUSSION**

The Sparks mandril offers many attractive features for access in haemodialysis. The wide vessel is easily cannulated and provides a good flow. The extra length of the mandril compared to a vein loop gives an opportunity to anastomose the venous end to the large basilic vein in the upper arm, and offers a long length of vessel for puncture. Another advantage of the mandril is that it can be inserted, with its rod, before access is required, and at any time after six weeks it can be anastomised and used immediately. It is unfortunate therefore that the mandril seems liable to thrombosis and despite the success of thrombectomy this will limit the use of the present type of mandril to patients whose conventional access devices have failed — it is thus a secondary access method (Morgan & Lazarus, 1975).
Reference


Open Discussion

REITINGER (Karlsruhe) Is it necessary to use a special needle to puncture the mandril?

HAMILTON Ordinary needles will do.

LINDSAY (Ontario) Does the mandril have any advantage over the bovine graft, which can be used immediately? In our experience with nearly a hundred bovine grafts the failure rate at six months was similar to yours — about 50% in the forearm. We reduced this to 20% at one year by putting them in the upper arm, between brachial artery and axillary vein where there is a high blood flow.

HAMILTON I agree that the mandril has no clear advantage over the bovine graft. Clotting is usually due to stenosis of the basilic vein above the anastomosis.

ROBINSON (Birmingham) I would like to ask about experience with proximal brachial positioning after more than six months. We have had a lot of trouble with arteriovenous fistulae in the arm with the median and sometimes ulnar nerve, sometimes after several months. Have you seen this with any long-term mandrils?

HAMILTON So far we haven’t been troubled in this way.

SCRIBNER (Seattle) You mentioned that you can leave the mandril in indefinitely. Have you actually done that? — it sounds intriguing.

HAMILTON Six months is the longest we have left the rod in place before use. The patients don’t dislike it although it is rather obvious. Anastomosis appears to be as easy as at six weeks.

DUFRESNE (Montreal) How easily are mandrils removed?

HAMILTON Loss of mandrils has been entirely due to thrombosis so we have left them in place. When the clot is resorbed, only the double layer of fabric is left. It would be quite a surgical problem if you had persistent infection in the mandril loop which required excision to get out the dacron fabric.

ANDREUCCI (Naples) Dr La Greca reported bleeding after withdrawal of the needle — what was your experience?

HAMILTON We have had no problem in the upper arm with prolonged bleeding. Did Dr La Greca, whose patency rate was higher than ours use anticoagulants routinely or not? We did not use them.

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LA GRECA  We had some difficulties at the beginning when we used the special needles. Since using normal needles we haven't had any problems, and no anti-coagulants.

WALLS (Leicester)  It is not uncommon for a distal arteriovenous fistula to thrombose after transplantation. Have you noticed clotting in your mandrils after transplantation?

LA GRECA  I have not had experience with transplantation.

HAMILTON  We have transplanted one patient with a mandril and it survived the transplant.

PARSONS (Leeds)  Could this particular technique be broadened for use in long term parenteral feeding?

HAMILTON  We put a mandril into one of our haemophiliac patients who has no superficial veins left for injections.

SCRIBNER  We have trained 40 patients for home parenteral nutrition, and have found that a major cause of morbidity and even mortality in these patients is attempting to create access with mandrils, bovine grafts, and so on. These patients have great difficulty with infection because of their short bowel and poor nutrition. The right atrial catheter we developed with its tip in the right atrium and the exit down on the chest works extremely well with practically no sepsis and no clotting. The catheters have been in place as long as two or three years. I urge you to use the right atrial catheter and not to try to make fistulae and bovine grafts in patients with severe malnutrition after bowel disease. The catheter is much safer.