

# Cannula Declotting: *1880 Patient Months Experience with the Fogarty Embolectomy Catheter.*

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## INTRODUCTION

The introduction of the Fogarty balloon catheter in 1963 has greatly facilitated the removal of arterial emboli and thrombi. Its application in dialysis patients with the Ramirez Wing Shunt\* at the University of Texas Medical Branch has increased cannula life and reduced the incidence of operative revision. This report is a review of the cannula problems in 403 patients treated from July 1, 1971 to June 30, 1973, and covers 1880 patient months experience. The patient population is made up of chronic home dialysis patients, renal transplant patients, and patients with acute renal failure.

The indications for use of the balloon catheter include *clotting* in the arterial and/or venous cannulas, and *slow flow* as determined by the speed with which the dialyzer fills, the speed of an air bubble in the cannula, a high venous pressure, or blood flow during dialysis.

## METHOD

A brief history is obtained from the patient by the Dialysis Technologist to determine the possible cause for clotting. Declotting may first be attempted by the use of large syringes and warm heparinized saline. If this is unsuccessful the patient is taken to the treatment room and prepared for the procedure.

The cannula is covered for 15 minutes with Betadine-soaked sponge. (Fig. 1).



Figure 1

The following supplies are obtained and placed on an overbed table:

1. 4 x 3 sponges—3 pkg.
2. 35cc syringes—2 ea.
3. 1cc T. B. Syringe—1 ea.
4. Sterile basin—1 ea.
5. 250cc saline (warmed)—1 ea.
6. Sodium Heparin (1000 Units/cc)—1 bottle
7. Barrier Sterile Fields—6 to 8 ea.
8. Cannula connector—2 ea.
9. Heparin Infusion "T" connector—1 ea.

\*Lifemed Corporation, 2107 Del Amo Blvd., Compton, California 90220

10. Sterile gloves—as needed.
11. Fogarty Embolectomy Catheter #3 or #4\*

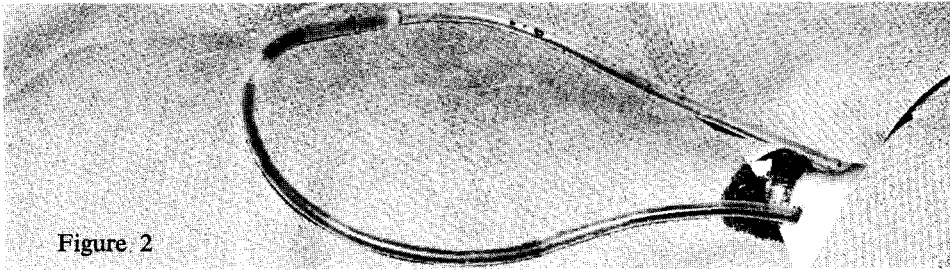
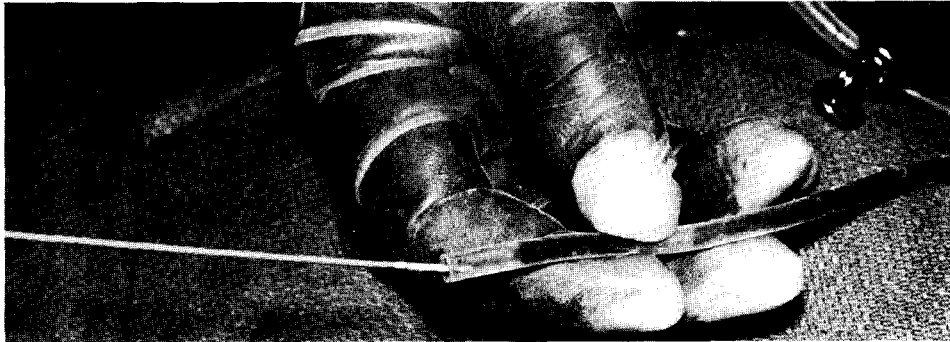


Figure 2

Sterile drapes are applied as depicted in Fig. 2. The cannula is separated and another attempt to declot with a syringe and warm heparinized saline is made.

The balloon of a #3 or #4 Fogarty embolectomy catheter is tested and the catheter is introduced into the cannula. (Fig. 3). If both artery and vein are occluded



the venous is declotted first. A gentle push with the Fogarty should enable it to enter the vessel. When the desired length is reached, the balloon is inflated, and the Fogarty is slowly withdrawn. (Fig. 4, 5, 6) Heparinized saline is used to irrigate the vessel, noting the amount of resistance on the syringe. If the resistance is high, the cannula is clamped and the procedure is repeated. Continued resistance to venous irrigation usually indicates the need for surgical revision.

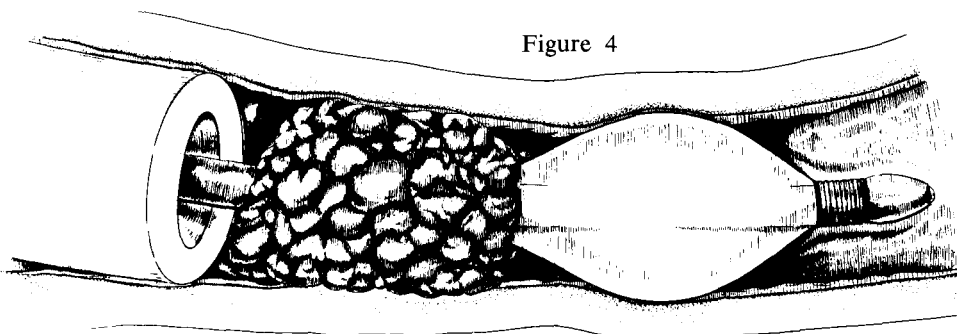


Figure 4

The arterial procedure is similar to that described above. The distance the Fogarty is introduced into the artery will vary with the flow problem. Poor arterial flow is usually due to intimal hyperplasia adjacent to the cannula tip. Inflating the balloon 1cm distal to the tip, may shear off this stenosis and improve the flow. Proximal clotting may necessitate inflating the balloon near the brachial bifurcation to insure complete clot removal. The procedure may have to be repeated several times to restore adequate arterial flow.

\*Edwards Laboratories, 624 Dyer Rd., Santa Ana, California 92705

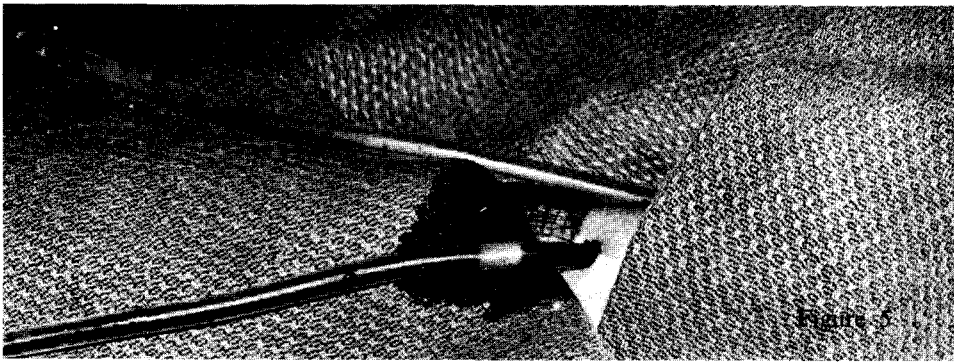
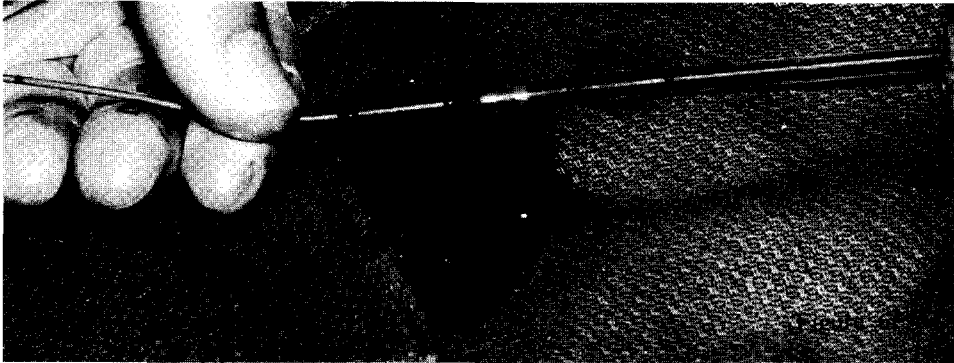


Figure 5



The cannula is connected and flow restored for a short period of time to overcome any vascular spasm. A small amount of air is introduced into the cannula to recheck the flow. If the flow is adequate, 4cc's Heparin are added via the Heparin Infusion "T".

The treatment for all patients after a Fogarty procedure is:

- a. 4cc Heparin (1000 USP units/cc) every 4 hours for 48 hours or until the next hemodialysis. Hospitalized patients with bleeding problems are given 2cc heparin + 28cc saline via constant infusion pump.
- b. Antibiotics, for 1 week.

Problems associated with the use of the Fogarty Catheter were uncommon, but either vessel may be injured by the catheter. Intimal injury may result from dissection

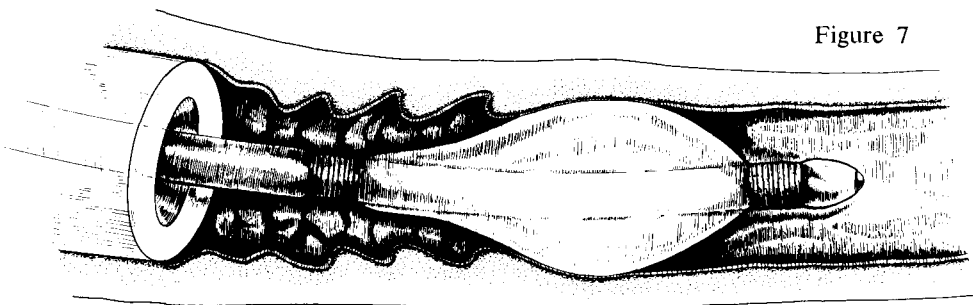


Figure 7

of the arterial intima by overinflating the balloon (Fig. 7). Heparinization is the treatment if this type of injury is suspected. The most common injury when an alignment problem or bifurcation is encountered is perforation of the vessel by the Fogarty tip (Fig. 8), and requires surgical revision. The vein may be ruptured by overinflating the balloon. (Fig. 9) It is also possible to perforate the vein if malalignment, stenosis, or a bifurcation are encountered. (Fig. 10, 11, 12).

Care must be used when introducing the Fogarty tip into a vessel. If resistance is encountered the tip is gently pushed into the vessel. The patient's history may aid

in determining the type of obstruction. If an alignment malfunction is suspected no further attempt is made to introduce the Fogarty into the vessel. In this study, there were 4 veins perforated which required cannula revision and two arterial injuries which did not require revision.

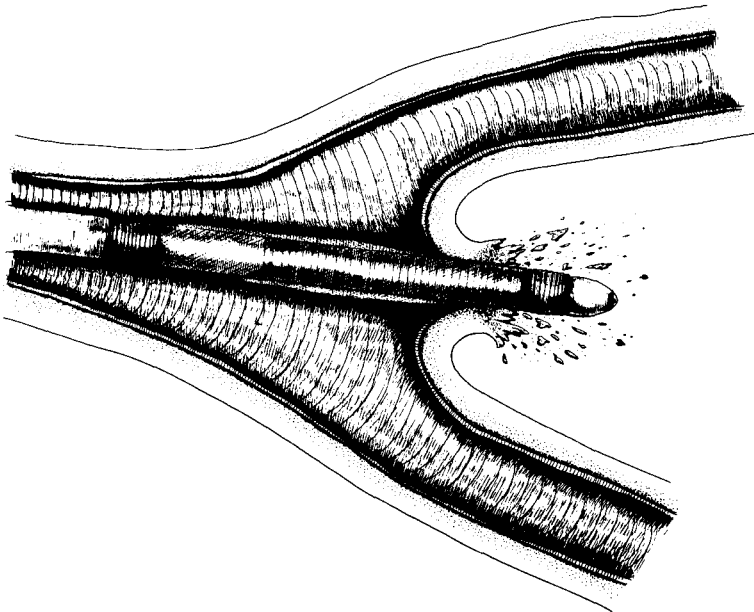


Figure 8

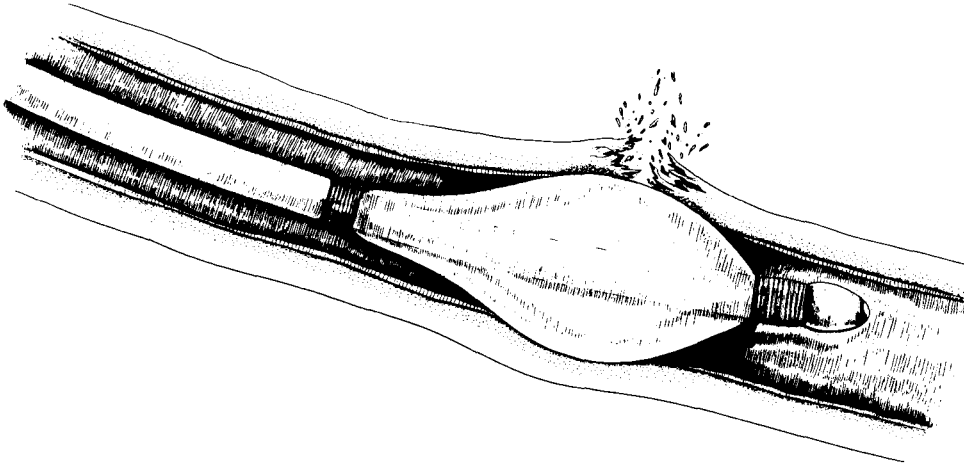


Figure 9

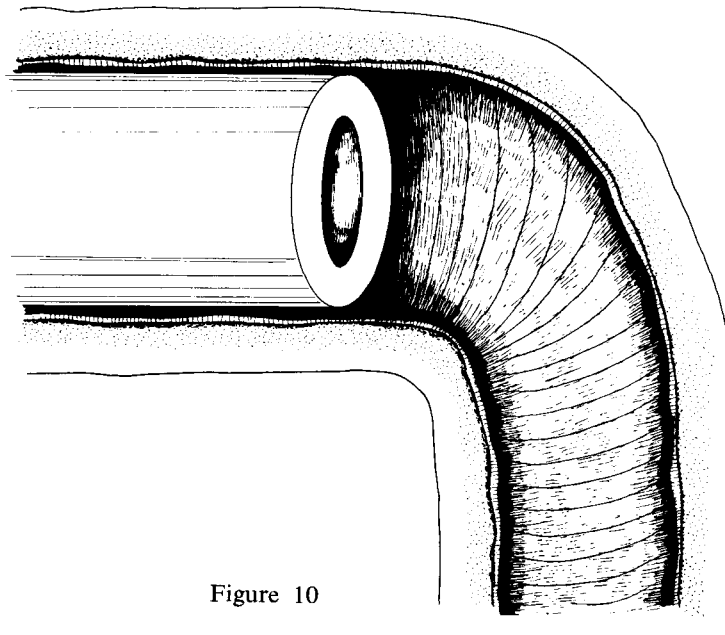
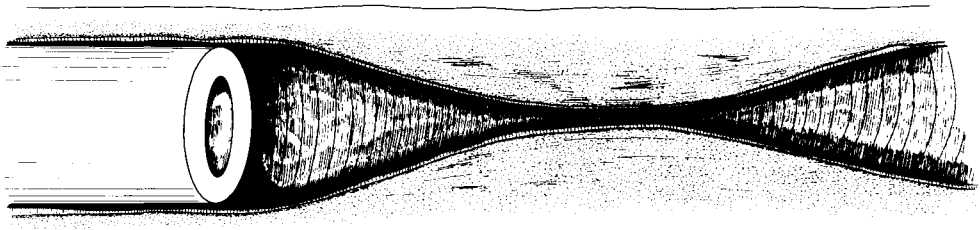
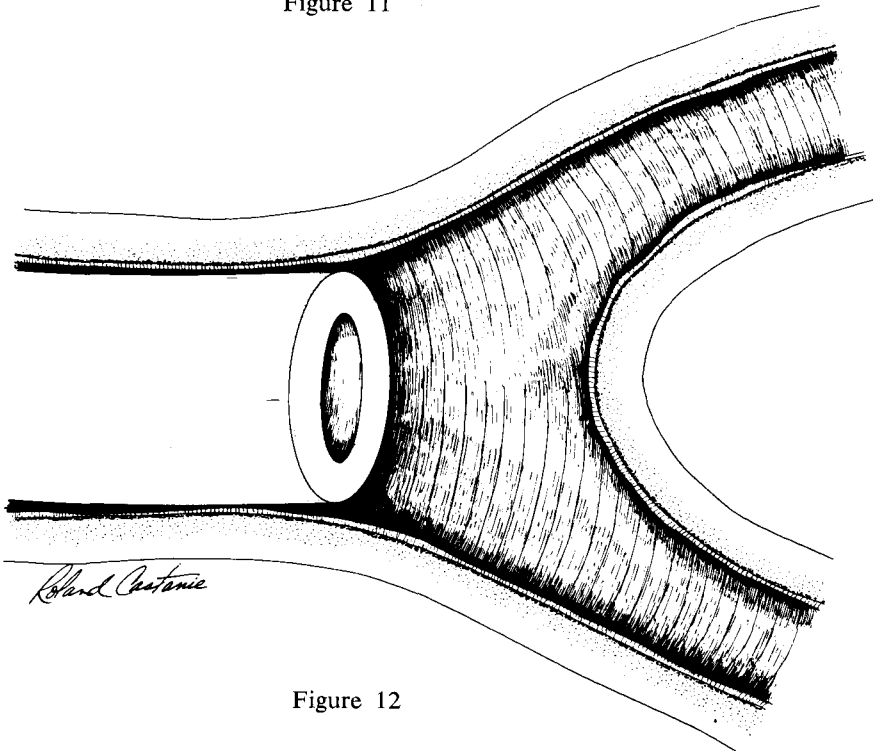


Figure 10



*Roland Costantini*

Figure 11



*Roland Costantini*

Figure 12

## RESULTS

In this population of 403 patients, 386 Fogarty Catheter procedures were performed during the two year observation period. Table I depicts the data when the results were calculated according to the number of procedures that were successful.

Table I—Procedure: Fogarty Thrombectomies

	Number Procedures	Number Successful	Percentage Successful
Artery Only	61	46	75
Vein Only	75	31	41
Artery & Vein	250	205	82
Total	<u>386</u>	<u>282</u>	<u>      </u>

Table II depicts this same data when it is analyzed according to the success of opening individual vessels, regardless of whether one or both were clotted.

Table II—Vessels: Fogarty Thrombectomies

Vessel	Number Vessels	Number Successful Thrombectomies	Percentage Successful
Artery	311	251	81
Vein	325	236	73
Total	<u>636</u>	<u>487</u>	<u>77</u>

Failure to restore shunt flow adequate for dialysis occurred following 104 procedures requiring revision of a total of 149 vessels.

Throughout the study, an attempt was made to document the time spent by both technician and surgeon on cannula problems. Since it was not possible to calculate time spent in evaluation of the problems, documentation was obtained by using the operating time for the surgical revisions and from beginning of the prep to completion of the clean-up for the Fogarty Catheter procedures. The average time spent by the surgeon was 54 minutes on the surgical revisions. The average time spent by the technician on both revision and Fogarty Catheter procedures was 66 minutes.

## DISCUSSION

The dialyzer problems should be ruled out initially when the patient gives a history of inadequate blood flow. In the Kiil this may necessitate gasket replacement. If the Kiil fills slowly and the gaskets are in good condition, arterial intimal hyperplasia is suspected. A fast filling dialyzer that shows decreased blood flow and/or increased venous pressure indicates venous stenosis.

## CONCLUSION

Data was collected from a two year analysis of the use of the Fogarty Embolectomy Catheter for declotting A-V shunts and for restoring normal flow in shunts with diminishing flow. Successful restoration of blood flow adequate for dialysis was accomplished in 75% of patients with only arterial problems, 41% of patients with only venous problems and 82% of patients in which both limbs of the shunt were clotted.

This procedure is clearly of value in reducing the number of surgical revisions required for A-V shunt malfunctions. It can be accomplished with relative ease in an outpatient setting in minimal time.

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