

## The Use Of Collagen Vascular Graft In Hemodialysis Access

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Autogenous venous access creation that is used for hemodialysis is the primary goal of all access surgeons. Great measures are employed to achieve accessible fistulas for hemodialysis and eventual catheter removal in those patients that are referred in later stages of chronic renal failure. However, occasionally fistulas do not mature or patients have inadequate anatomy for fistula creation and synthetic graft material is used to achieve vascular access. Bovine carotid artery heterograft (Artegraft, North Brunswick NJ) is one such option and its healing potential and ease of accessing successfully makes it an acceptable alternative. This retrospective review examines this material in 21 patients for hemodialysis access.

### Methods

All patients were end stage renal disease and were receiving dialysis by means of tunneled dialysis catheters. Six patients had the Artegraft placed as their first access and 6 patients had previously failed ePTFE grafts. Nine patients had failed fistulas, 5 being brachial basilic transposition fistulas and 4 being radial cephalic vein fistulas. Cumulative patencies were assessed using the R development statistical package. Comparisons were analyzed using Log Rank statistic.

### Surgical Technique

All patients had preoperative duplex mapping to determine the quality of the venous and arterial anatomy. In the group of failed brachial basilic vein transposition fistulas upper arm grafts were placed in straight fashion utilizing the the brachial artery as inflow and the proximal basilic or axillary vein as outflow. The failed radial cephalic vein fistulas were converted to straight forearm grafts with interposition grafts to the brachial artery as inflow or as a fore arm loop graft. One patient had a thigh loop graft placed from the common femoral artery and the common femoral vein with both upper extremities have been exhausted with previous ePTFE grafts placements. A primary goal in placing Artegrafts was to achieve usable access as early as possible and to remove the tunneled catheters. These Artegrafts were accessed ranging from 10 days to 2 months with catheter removal soon thereafter.

## Results

There were 16 females and 5 males in the study. Table 1 shows the patient characteristics. The vast majority had diabetes as etiology of their ESRD(15/21). The average patencies are shown in Table 2. There is clearly a major difference between upper arm and forearm grafts as to patency. This is further shown in cumulative patencies (Table 3). The primary patency is 33% at 1 year for forearm grafts and 50% for upper arm grafts. This difference is significant ( $p=0.05$ ). The effort to maintain patency is also greatly different. Forearm grafts required 27 procedures (1/223 days) while upper arm grafts required only 8 (1/694 days). Six grafts were lost to aneurysmal degeneration. Of the remaining patients 3 died with patent grafts, 2 were lost to follow up and 2 were transplanted. There were no cases of infection or ischemic steal.

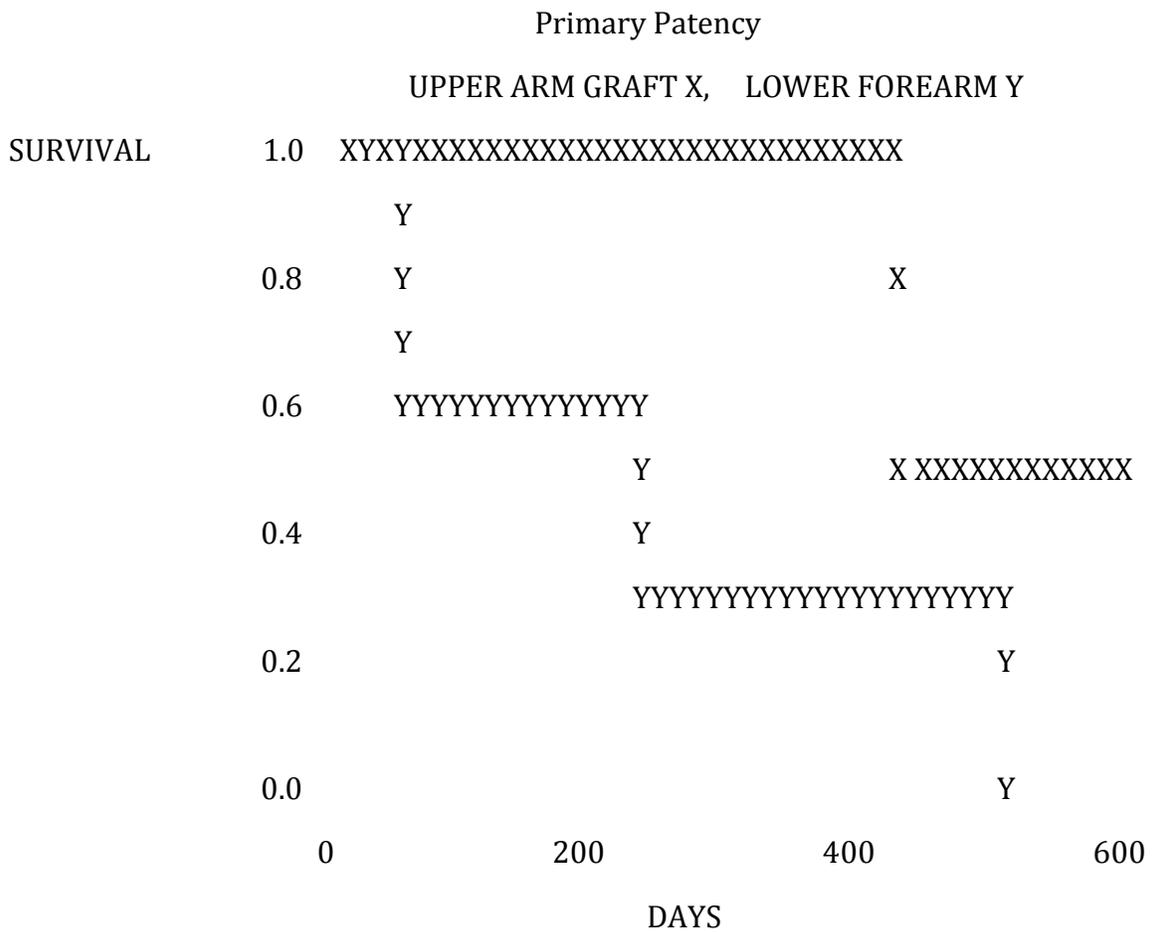
TABLE 1 Patient Characteristics

	Male	Female
AVG. AGE	67	46
RACE		
White	1	12
African American		1
Hispanic	1	1
Asian	3	2
GRAFT LOCATION		
Upper Arm	3	7
Forearm Loop	1	6
Forearm Straight	1	2
Leg Loop		1
PEVIOUS ACCESS		
Graft	1	5
Fistula	3	6
First Access	1	5

TABLE 2 Patency Results

	Total Group (n=21)	Upper Arm (n=10)	Forearm (n=10)
Average Primary Patency	316 days	324 days	171 days
Average Assisted Primary	428.5 days	419 days	311 days
Average Secondary Patency	627 days	555 days	604 days

Figure 1 Cumulative Primary Patency



## Discussion

The use of bovine carotid artery heterograft (BCA) in man was developed by Rosenberg et al in 1966 (1) and first reported for use in hemodialysis by Chinitz et al in 1972 (2). A prospective, randomized study of BCA and ePTFE grafts was reported by Hurt et al in 1983 (3) and showed no difference between BCA and ePTFE when analyzed for survival rates, complications, types of complications and reasons for failure through 3 years. These results were the same when diabetic patients were compared to non-diabetic patients. There is a technical learning curve when using BCA both in the operating room (4) and in the dialysis unit (5). These include avoiding angulation at the loop segment, axial rotation during tunneling and excessive tension during implantation. Technical considerations in the dialysis unit include undue pressure at the access site or use of clamps, spreading out the access sites along the length of the graft to avoid pseudoaneurysm formation and avoiding button hole formation. The use of BCA and ePTFE was more recently compared in a prospective, randomized study by Kennealey et al in 2011 (6). Those results demonstrated that primary and assisted primary patency of BCA grafts to be superior to ePTFE grafts with fewer interventions to maintain patency and lower complication rates (60.5% vs 10.1% and 60.5% vs 20.8% at 1 year). These results were most notable in grafts located in the upper arm. These results are similarly seen in this current retrospective review with upper arm grafts performing better than forearm loop grafts. Bovine carotid artery graft material (Artegraft) is a suitable graft for hemodialysis access if autogenous fistulas fail to mature or in if inadequate anatomy is present to allow for fistula creation. However, technical issues in surgery and the dialysis unit need close attention for these advantageous results to be realized.

## REFERENCES

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