ANGIOACCESS FOR HAEMODIALYSIS IN RENAL FAILURE- AN ANALYSIS OF THE ROLE OF THE BRESCIA-CIMINO FISTULA

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ABSTRACT

Forty-six patients with end stage renal disease underwent forty-eight arteriovenous fistula formation by the Brescia-Cimino method between Jan 1994 and Jan 1997. The purpose of the fistula in all cases was to provide angioaccess for haemodialysis through the arterialisated veins. Thirty-five (72.9%) of these fistulas were made on males, the remaining being on females. Mean age of the patients was 35.9 years. The fistulas were created in the left upper limb in 40 cases (83.3%) and the right upper limb was used in 8 cases (16.7%). The distal third of the forearm was used in all cases. During follow up, thirty-nine (94.1%) fistulas functioned for durations between 6 months to 2 years (average follow up of 14 months), permitting a mean of 2 dialysis per week. Seven cases (14.6%) had early fistula blockage. The end point for follow up was a successful renal transplant in the majority of patients. Except for nonpatency, and limb edema in two cases, no other complications were encountered.

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KEY WORDS: Angioaccess device, Brescia-Cimino fistula; Haemodialysis.

Introduction

Fifty years since Wilhelm Kolph [1] first reported the successful dialysis of a patient with end stage renal disease (ESRD), the criteria of selection for those requiring dialysis has increased vastly. Initially reserved for young and healthy patients with acute and reversible renal failure, today dialysis is routinely done in ESRD with refractory hypertension, difficult fluid and electrolyte balance and deteriorating intellectual performance [2].

Reliable vascular access, a pre-requisite for haemodialysis, mandates a blood flow of 200-500 ml per minute to enable multiple haemodialysis over a long duration. The endogenous arteriovenous fistula between the radial artery and the cephalic vein developed by Brescia and Cimino in 1966 [3] is perhaps the most suitable method of access in developing countries obviating the requirements of shunts and interposition grafts which are both costly and difficult to maintain. Notwithstanding its functional utility and ease of maintenance, it is a procedure which requires a coordinated approach involving the surgical team, the nephrologist and at times the radiologist.

We undertook a 3 year prospective study with the aim of assessing the role of the fistula and to examine the correlates of a successful outcome in our setting.

Material and Methods

46 patients with ESRD underwent angioaccess surgery by the Brescia-Cimino method between Jan 94 to Jan 97. The criterion for inclusion was solely the likelihood of a prolonged period of haemodialysis pending transplant or for life if no renal donor was forthcoming.

Patient Evaluation: All patients were examined for hypertension, diabetes, peripheral vascular disease, ischaemic heart disease, and Systemic Lupus Erythematosus (SLE). In addition, upper limb flow was evaluated by the Allen test and an examination of the radial artery and the cephalic vein. Presence of other angioaccess devices like subclavian catheters or evidence of previous fistula surgery or other surgery that could have an effect on the blood vessels was noted. Investigations included a complete blood count, prothrombin time, serum electrolytes, chest radiographs and an electrocardiogram. We did not do a detailed coagulogram. Neither did we find it necessary to use Doppler studies preoperatively.

The left upper limb being nondominant was usually chosen, and no injectibles administered in that limb. Pre-operative Ampicillin was started on the morning of surgery.

Operative Technique: Patients were operated using brachial block or 1% lignocaine as local anaesthesia. The limb having been prepared and draped in the standard fashion, was laid on a side trolley and an oblique incision about 4 cm in length was made over the selected site of anastomosis.

A 3-4 cm segment of the cephalic vein was isolated from the surrounding subcutaneous tissue, stripped of its adventitia to prevent kinking and segmental stenosis, and its tributaries divided to impart mobility.

The radial artery was then exposed by vertically incising the deep fascia, isolated from its venae comitantes and its muscular branches divided. Slings of No 1 silk were then applied over both ends to provide vascular control. We found this more useful than

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Fig. 1: Brachial arteriograms, showing the arteriovenous fistula at the wrist and a good venous run-off.

bulldog vascular clamps. Arterial spasm commonly occurred on handling and was dealt with by infusion of 1% lignocaine.

Based on the calibre the type of anastomosis was decided—a side to side anastomosis was done when the vessel calibres were large and equal, whereas an end to side anastomosis was resorted to when the vascular calibres were small, unequal or if there was likelihood of tension on the anastomosis. When side to side anastomosis was made, longitudinal venotomy and arteriotomies about 1 cm in length were made and continuous sutures of 6/0 prolene placed with knots on the adventitial surface. Prior to completing the anastomosis, the slings were momentarily released and the vessels were flushed with heparin saline (1000 units of heparin per litre of 0.9% saline). In addition we also passed a blunt venous catheter in all limbs of the anastomosis to ascertain that no sub-clinical stenosis was present. The distal arterial sling was removed first, haemostasis secured and the wound closed. In end to side suturing, the proximal venous limb was ligated and the divided distal limb spatulated and anastomosed to the arteriotomy.

At completion, the presence of a thrill was noted. We found that a pulsation in the vein, in the absence of a thrill was indicative of a poor flow. Such cases were treated with periarterial lignocaine. If no improvement occurred the vein was punctured and the anastomosis flushed with heparin-saline or mechanically cleaned with a polythene cannula.

Post Operative Care: Post operatively, normal alimentation was allowed, the limb elevated and gentle hand exercises started. Ampicillin was routinely given till suture removal. Heparin (5000 I.U. six hourly for 24 hours) was given if no thrill had become manifest immediately after surgery. Blood pressure recordings and

injections were prohibited on the limb. Skin sutures were removed after one week. Angiographic appearances of a fistula showing a high flow run-off in the venous circulation are depicted in Fig 1.

Results

48 fistulas were made on 46 patients with ESRD. 35 (72.9%) fistulas were made on males while 13 (27.1%) were made in females. The ages of the patient ranged between 18 to 60 years with a mean of 37.1 years for males and 34.7 years for females (Combined mean 35.9 years). Seven patients were severely hypertensive, one of whom had SLE and another had diabetes. 17 cases had an existing vascular access device in the form of an indwelling double lumen subclavian catheter while two had Scribner shunts. Four fistulas (8.3%) were made under a brachial block—three by the supraclavicular route and one by the axillary route. The remaining 44 were made under local anaesthesia.

40 fistulas (83.3%) were made on the left wrist and 8 (16.7%) on the right. Six of those who had a right sided fistula had poor veins on the left side while two were redo cases who had had a fistula failure on the left side. 42 fistulas (87.5%) in 40 patients were made end to side while six fistulas (12.5%) in an equal number of patients were fashioned in a side to side manner as the calibre of the artery and vein was large and equal. One of the latter was converted to an end to side fistula as the flow rate was found poor after completing the anastomosis.

In our series, 7 fistulas (14.6%) failed to function, evaluation being based on palpation of a thrill and on increased venous filling. One fistula which was thought to be a failure developed a palpable thrill 3 weeks after surgery and later became suitable for dialysis. This phenomenon is unusual.

A correlation between failure to function with the sex, site and age of the patients is depicted in Table 1. In 4 of these failures, the calibre of the vessels was unusually narrow. Failure also occurred in the patient with hypertension and SLE. Revision surgery on the right wrist was successful in both these as also in another patient with no underlying disease. One of the failures underwent redo surgery at the elbow (Brachial artery to Brachial vein) at another hospital which failed as well. She was managed with a subclavian cannula until she underwent a transplant.

These patients were followed up at 6 monthly intervals for two years (mean-14 months). As the fistulas outlived their utility after a successful transplant, this was taken as end point of follow up. In three cases the end point was upto their death. Seven fistulas being immediate failures were not included in the follow up. One case was lost to follow up. Two patients, both of whom had an indwelling subclavian line, developed transient limb edema which disappeared when the line was removed.

Discussion

This study was undertaken with the aim of assess-

TABLE 1
Sex, site and age correlation between fistulas and failure rates (n=48)

Occurrence	Sex		Site		Age (Years)				
	Male	Female	Left	Right	11-20	21-30	31-40	41-50	51-60
Total	35	13	40	8	2	13	16	10	7
Failures	5	2	5	2	1	4	2	0	0
Total %	72.9	27.1	83.3	16.7	4.1	27.1	33	20.8	14.6
Failures %	14.3	15.4	12.5	25	50	30.8	12.5	0	0

ing the efficacy of the Brescia-Cimino fistula and to examine the correlates for successful surgery in our hospital.

Primary AV fistulas remain the best form of access for every nephrologist [4,5] and the wrist the preferred site of anastomosis as the vessels are superficial and a failure can be tackled by revision surgery more proximally. The initial procedure adopted a side to side anastomosis [3] which was subsequently modified to an end to side one [6]. The latter came into vogue because not all patients had a similar calibre of artery and vein [6]. A comparative prospective study between an end to side and a side to side fistula showed patency rates of 79.2% and 78% respectively, showing no intrinsic superiority in terms of outcome between either procedure; however 7 of 32 patients with side to side fistulas developed hyperaemia of the hand [7]. In our study, 36 of 42(85.7%) end to side and 5 of 6 (83.3%) side to side fistulas were patent.

Between males and females, the latter have been observed to have lower patency rates, a smaller calibre of vessels and a greater tendency towards vasoconstriction playing a major role in the higher incidence of failure [8]. Compared to failure rates of 13.8% in females versus 7.4% in males noted in literature [8], our series showed failure rates of 15.4% and 14.3% respectively. The observed difference is of dubious significance because of the small size of the samples of females in our study.

We observed a high immediate failure rate (30.7%) in the age group 21-30 years. Correlation between age and failure has not been described earlier. Ulnar artery-basilic vein fistulas have poorer patency rates as compared to the Brescia-Cimino fistula [8,9], with no significant difference between those made in the anatomical snuff box [10] and the elbow [11]. Our consolidated early failure rate (14.6%) is comparable with the overall failure rate in literature (9-12%) [12-14].

Infection (3%), thrombosis (9%), aneurysms (7%), stenosis of proximal venous limbs [15], distal venous hypertension (2.3%) [4,16,17], hyperemia of the hand (7 of 32 cases) [6] and steal syndrome (0.6-1.6%) [15,17,18] have variously been described as complications. Apart from edema in two cases with a subclavian angioaccess device, we encountered no other complication.

The definite incidence of distal vascular complications and lower blood flow rates in the side to side fistula would make the end to side configuration more acceptable and the preferred method of anastomosis.

Our fistulas, allowed a mean of 2 dialysis per week,

fulfilling the *raison d'être* of their creation.

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