



VENOUS HYPERTENSION FOLLOWING ARTERIOVENOUS FISTULA CREATION FOR HEMODIALYSIS ACCESS- OUR INSTITUTIONAL EXPERIENCE

Surgery

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ABSTRACT

Introduction: Venous hypertension(VH) is a debilitating problem for patients on hemodialysis with upper extremity arteriovenous fistulae (AVF).The most common etiology is central line induced Stenosis. The primary goal of management is symptomatic relief while maintaining AVF function. **Methods:** A retrospective study was conducted on 11 patients with VH who underwent interventions in a 2 year interval. Previous symptoms, poor AVF function of Hemodialysis access, preprocedure central vein(CV) Doppler were collected. Procedures attempted,outcomes following intervention and reinterventions were followed up over a year. **Results:** 5 patients had Right sided AVF and 6 patients had Left sided AVF. 3 patients had previous Right IJV access of which 1had BCF and 2 had RCF .2 patients had permanent right sided Subclavian catheters both had BCF. 5 patients had left IJV access 3 had BCF and 2 RCF. One patient had a left sided permanent catheter in the subclavian vein with BCF. Pre operative imaging was done with duplex in 11 patients. In addition CT venogram was done in 6 patients .Preoperative DSA was done in 9 patients which revealed subclavian stenosis in 5 patients and brachiocephalic stenosis in 2 patients. 2 patients had Subclavian +Brachiocephalic stenosis. 8 patients underwent angioplasty, 1 patient underwent angioplasty +Stenting, 2 patients underwent fistula ligation. **Conclusions:** Salvaging a failing AVF while preserving potential future sites should be attempted. PreAVF CV Doppler is an important tool and BD and EVS are interventions

KEYWORDS

Central Venous Stenosis, Fistula salvage, Fistula ligation, Central Venoplasty, Central Venous stenting

INTRODUCTION

The most common cause of Venous hypertension(VH) is due to central venous catheters inserted in the subclavian /IJV as a vascular access for Hemodialysis(HD).[1]Patients with VH presenting with symptoms such as bursting pain, heaviness of the limb, edema,gigantism of the limb and Arteriovenous fistula(AVF) access related complications such as,failure AVF,difficulty in cannulation,puncture site bleeding, prolonged duration of hemodialysis. Treatment options include,Open surgical-Fistula ligation(FL) or Percutaneous treatment of VH with balloon dilatation (BD) with or without an endovascular stent (EVS). Angioplasty is a safer, easier, and minimally invasive procedure for VH with AVF salvage[2][5-9].We present our experience in management of severe VH.

METHODS

Type of study

A retrospective observational study.

Period of study

The study period was from September 2018 to September 2020.

INCLUSION CRITERIA:

All Patients who underwent interventions for VH were included in the study.Presence of clinical features of venous hypertension such as severe distal extremity swelling ,collaterals over chest, failure of AVF , bluish discoloration, pigmentation of the skin , ulceration of the finger tips and neuralgias. Positive imaging studies suggestive of Central venous stenosis.

EXCLUSION CRITERIA:

Patients managed conservatively on OPD basis

Data Collection:

Data was collected with respect to patient demographics,details of comorbidities,previous history of Ipsilateral central vein cannulation, its site , number of cannulations, presence of a permanent catheter ,Pacemaker or TPN. Site and side of AVF , Radicephalic (RCF)/ Brachiocephalic (BCF) were noted.Pre operative imaging and post diagnosis imaging(i.e. Duplex-Central vein(CV)doppler, CT Venogram , MR Venogram) and digital subtraction angiography(

DSA) were performed. Procedure performed for VH, and outcomes following the procedure were noted.

Table:1

Symptoms			
Patient associated symptoms and signs		Dialysis related symptoms	
Bursting pain	3		
Heaviness of the limb	5	Difficulty of AVF cannulation	8
Extremity swelling	8	Prolonged duration of HD	9
Collaterals over the chest	5	Puncture site bleeding	6
Failure of AVF	7		
Bluish discoloration or cyanosis	4		
Pigmentation of skin	2		

RESULTS:

N=11

STATISTICAL TESTS:

Incidence data and percentages.Ages in intervals of decades , 30-40 yrs -2, 40-50yrs-4,50-60 yrs -4 , >60 years -1. 6 patients were male and 5 were female. Distribution of co morbidities revealed 2patients diabetes mellitus (DM), 3 with Coronary artery disease (CAD), 3 with Hypertension (HTN), 3 patients had DM and HTN , 2 patients had DM,HTN and IHD .

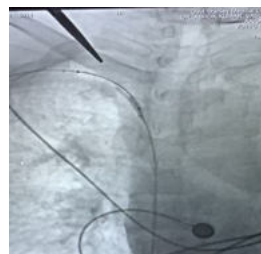


Figure:1 (Central Venoplasty-fluoroscopic image)

Table:2

Antecedent Central Venous procedures	
Single canulation	7
Multiple canulations	4
Permanent catheter	3
Previous access for TPN	1

**Figure:2 (Fistula ligation)**

Site of HD Catheter access.

5 patients had Right sided AVF and 6 patients had Left sided AVF .

3 patients had previous Right IJV access of which 1 had BCF and 2 had RCF .2 patients had permanent right sided Subclavian catheters both had BCF. 5 patients had left IJV access 3 had BCF and 2 RCF. One patient had a left sided permanent catheter in the subclavian vein with BCF.

Pre operative imaging was done with duplex in 11 patients. In addition CT venogram was done in 6 patients .Preoperative DSA was done in 9 patients which revealed subclavian stenosis in 5 patients and brachiocephalic stenosis in 2 patients. 2 patients had Subclavian +Brachiocephalic stenosis.

8 patients underwent angioplasty, 1 patient underwent angioplasty +Stenting, 2 patients underwent fistula ligation.

Post procedure improvement was noted with complete or partial resolution of symptoms, improvement in followup imaging and salvage of AVF.

Follow-up and outcomes:

Table:3

Postoperative Surveillance and outcomes			
OUTCOMES	Immediate	3 MONTHS	6 MONTHS
Resolution of clinical features	9	6	4
Duplex confirmation	9	6	4
Lost to followup	-	1	-
Recurrence requiring additional BD	-	2	3
Recurrence requiring additional BD+EVS	-	-	1
Salvage of AVF	9	8	7

DISCUSSION:

VH in AVF bearing upper limb is one of the distressing complication of the HD access. Common cause is central venous catheters especially subclavian used as a vascular access for HD.[1] Mechanism for stenosis includes central venous catheter-induced trauma to the venous endothelium and secondary inflammatory damage within the vessel wall at the time of insertion. Turbulent blood flow -incite an inflammatory response and stimulate intimal hyperplasia. Clinically asymptomatic before the creation of vascular access and become symptomatic only when flow is increased across the stenosis. If a critical stenosis is unable to accommodate increased flow rates, it becomes functionally significant stenosis and results in edema and gradually bluish discoloration of the whole of the upper limb with formation of collaterals on the shoulder and chest wall. When collateral circulation is not able to establish hemodynamic compensation, upper limb edema worsens and evolves towards gigantism. May manifest itself as a vascular access thrombosis. Rarely bluish discoloration and pigmentation of the skin and, in more severe cases; finger tips ulcers, neuralgias and functional loss of the limb. [2] With the emergence of percutaneous catheter based methods as BD

and EVS, VH is being treated with intent to salvage AVF. Angiography of the fistula and its arterial inflow and venography of the draining veins to the level of the superior vena cava-right atrial junction [3]. Bakken et al. in 2007 evaluated the patency rates with BD in 47 patients and demonstrated a technical success rate of 77%.

9 patients underwent angioplasty, 2 patients underwent fistula ligation. 3 patients with central venous stenosis had restenosis after 3 months of follow up and were managed with BD. 5 patients had restenosis with recurrence of symptoms at 6 months, 3 underwent BD and 1 patient underwent angioplasty +stenting, while 1 patient was lost to follow up. All the AVF were an end to side fistula. Our experience with percutaneous methods is preliminary and we are now managing VH with BD, EVS with a goal of preservation AVF. Fistula salvaged 7 (at the end of 6 months), 1 lost to followup, 1 failed procedure and 2 AVF ligated. All of our patients had a history of insertion of the ipsilateral central catheter as HD access.

CONCLUSION:

The percutaneous catheter based methods are the initial procedures of choice for central venous stenosis. These can be OPD /Day care procedures. They have reduced morbidity, reduced postprocedure pain and wound complications. There are variable primary and secondary patency rates, the treatment decisions are difficult and it has to be individualized. BD and BD +EVS for recurrent lesions is advocated by the KDOQI clinical practice guideline for vascular access-2019 update. KDOQI suggests an AV access (AVF or AVG) in preference to a CVC in most incident and prevalent HD patients due to the lower infection risk associated with AV access use [10]. Fistula first approach will avoid venous hypertension to a large extent.

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