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Digital Subtraction Venography Diagnostic for Suspected Venous Obstruction after A-V Shunt

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Authors' contributions

"This work was carried out in collaboration between all authors. Author WK designed the study and wrote the first draft of the manuscript. Authors ID designed the study and managed the literature searches."

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Case Report

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ABSTRACT

Aims: To determine the diagnostic function of digital subtraction venography (DSV) in suspected venous hypertension after the A-V Shunt procedure.
Presentation of case: Four patients were admitted to the hospital with swelling from the hand up to the shoulder and pain in the upper limb. All patients suffered from chronic renal failure and underwent hemodialysis. The assessment was suspect venous hypertension, and each of them underwent DSV examination procedure as diagnostic support. DSV examinations showed partial obstruction of 1/3 left media subclavian vein in the first patient, partial obstruction of 1/3 left media subclavian vein in the second patient, total obstruction innominate vein in the third patient, and total obstruction of 1/3 right media subclavian vein in the fourth patient.
Discussion: The use of digital subtraction technique may simplify imaging of the venous structures of the arm and upper mediastinum, especially in patients with compromised peripheral venous access. DSV offers more advantages than conventional venography and was recommended as diagnostic procedure for venous hypertension.

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Conclusion: DSV is the gold standard for the diagnosis of central venous stenosis and obstruction; it is accurate and safe to use to diagnose venous hypertension disease. DSV can also be used to determine the next treatment.

Keywords: DSV; A-V shunt; venous hypertension; hemodialysis.

1. INTRODUCTION

Central venous stenosis and obstruction (CVD) is an important and prevalent problem in the management of hemodialysis (HD) patients. It has been reported in the literature to be in the range of 25–40%. Successful HD treatment is only possible with a well-functioning venous access (VA). The first option for the construction of a VA is the creation of an autogenous arteriovenous fistula (AVF). An AVF is defined as an autogenous anastomosis between an artery and a vein and an AVG is defined as a VA using a prosthetic graft. CVD compromises the integrity of the hemodialysis access circuit by causing venous hypertension with or without debilitating symptoms [1,2]. Early diagnosis and management of complications related to AVF is also essential to prevent loss of the vascular access [3].

Conventional or digital subtraction venography (DSV) is considered to be the standard of reference for assessment of the venous system [4]. DSV of the superior vena cava and subclavian vein is a time-efficient, cost-efficient, and useful method of examination. It is easily performed and readily adaptable to the clinical situation. DSV offers several real and theoretical advantages over conventional venography and is recommended as the diagnostic procedure of choice in all cases of suspected occlusion of the SVC, subclavian vein, and central venous catheters [5].

The use of the digital subtraction technique may simplify imaging of the venous structures of the arm and upper mediastinum, especially in patients with compromised peripheral venous access [6]. In this study, we present four patients diagnosed with venous hypertension by DSV after undergoing implantation procedure of dialysis catheter.

2. PRESENTATION OF CASE

We reported four patients suspected with venous hypertension. There were one male patient and three female patients with the age range of 30-60 years. These patients suffered from chronic kidney failure for at least 8 months. All patients came complaining of swelling and pain in one of upper extremity after undergoing dialysis catheter (A-V shunt) implantation procedure. A temporary dialysis catheter was inserted in the left subclavian, and an arteriovenous fistula was constructed between left cephalic vein and brachial artery in three patients and one patient on the right.

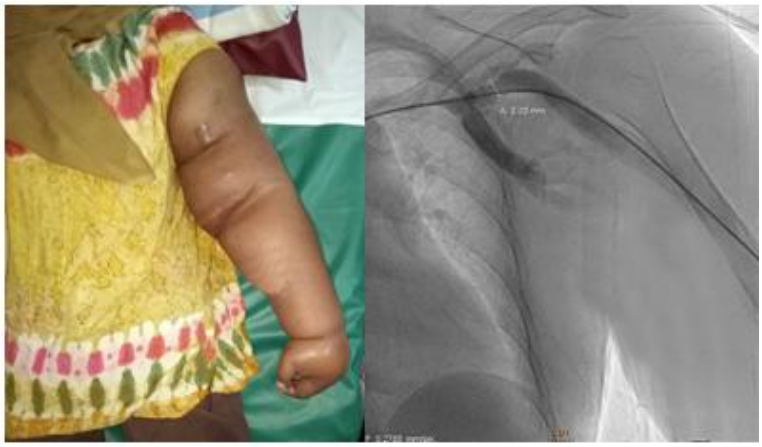

Fig. 1. (a) Clinical Picture of a 36-year-old female patient with venous hypertension, (b) Digital subtraction venography examination

Fig. 2. (a) Clinical Picture of a 55-year-old patient with suspected subclavian stenosis, (b) Digital subtraction venography examination

Increased venous collateral circulation, brown pigmentation, and fibrous thickening in the skin of right upper extremity, increased skin temperature, a palpable thrill, pigmentation, and oedema in arm were found on the clinical examinations in all patients. Three patients were suspected to venous hypertension, and one patient was suspected to subclavian vein stenosis.

We performed DSV examination to each patient. The results of two patients showed vein dilatation, partial obstruction of 1/3 left media subclavian vein, and a collateral appearance along the area of the axillary veins and left clavicular veins. They were planned for installation of ballooning angioplasty.

On the third patient, the DSV result showed total obstruction in nominate vein and total obstruction of 1/3 right media subclavian vein, and a collateral appearance along the area of the axillary veins on the fourth patients. They were planned for surgical bypass.

3. DISCUSSION

CVD compromises the integrity of the hemodialysis access circuit by causing venous hypertension with or without debilitating symptoms. Venous hypertension in AVF bearing upper limb may occur due to various anatomical and physiological reasons and more frequently due to the more and more utilization of central venous catheters especially subclavian as a vascular access for HD [1,7]. Early detection and treatment of complications such as thrombosis, aneurysm formation, vascular steal syndrome, venous hypertension, hemorrhage, infection, and neurological disorders, prevent more severe conditions and consequently save additional costs and reduce hospitalization periods [8].

Our case report describes 4 patients diagnosed with venous hypertension after placement of dialysis catheter. A temporary dialysis catheter was inserted in the subclavian vein. Significant stenosis or occlusion of the subclavian vein is known to occur in 20–50% of patients who have central venous catheters inserted into the subclavian vein or the internal jugular vein. There is a very high incidence of CVD in patients with a history of subclavian catheters of 42 to 50% compared with internal jugular vein catheters [9,10]. All patients were complaining pain and swelling upper extremity. Symptoms of venous hypertension include finger and hand edema that may progress to limit upper extremity mobility. Beyond swelling, extremely advanced stages of this complication can lead to hand and extremity discoloration and even venous gangrene [11]. These symptomps were also found in all patient's physical examination.

Duplex ultrasonography and magnetic resonance imaging are the most valuable non-invasive diagnostic test to identify an arteriovenous fistula. Development of subclavian vein stenosis and occlusion is probably best demonstrated by venography in symptomatic patients [9]. DSV is the gold standard for the diagnosis of CVD and is more sensitive than duplex ultrasound [12]. We

performed DSV to all patients and found obstruction subclavian vein.

Venography of the axillary and subclavian veins is frequently performed for arm and shoulder swelling, problems related to a chronic central venous access device. The use of the digital subtraction technique may simplify imaging of the venous structures of the arm and upper mediastinum, especially in patients with compromised peripheral venous access [6]. It is easily performed and is readily adaptable to the clinical situation. DSV offers several real and theoretical advantages over conventional venography and is recommended as the diagnostic procedure of choice in all cases of suspected occlusion of the SVC, subclavian vein, and central venous catheters [5].

Surgical solutions to this venous hypertension include ligation of fistula, surgical bypass of an occluded or stenotic subclavian vein segment or percutaneous transluminal balloon angioplasty, and stent placement [9]. In our case, we used DSV to help us determine the surgical options. Based on what we found during DSV, we decided to perform ballooning angioplasty on two patients, while the other two patients we decided to perform surgical bypass because balloning angioplasty was not possible. Study by Salahi et al. Showed 26 patients presented with venous hypertension. Six (23%) patients underwent ligation of the distal vein. Abandonment of the access was performed in seven (27%) patients. Thirteen (50%) patients underwent balloon angioplasty of the central veins with a clinical success rate of 54% [8].

4. CONCLUSION

In conclusion, DSV is the gold standard for the diagnosis of CVD, it is accurate and safe to use to diagnose venous hypertension disease. DSV can also be used by clinicians to determine the treatment.

CONSENT AND ETHICAL APPROVAL

As per university standard guideline, participant consent and ethical approval have been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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