Original Article

Cephalic Vein Thrombosis Plus Prosthesis Placement For Hemodialysis

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Abstract

Objective: contribution of new bibliographic material, useful in updating knowledge since it refers to expert criteria regarding the diagnosis and treatment of thrombosis of arteriovenous fistula, treated with prosthesis. Brief description of the case: well-functioning vascular access is essential for hemodialysis patients. Thrombosis is the main cause of vascular access failure. Thrombectomy and repair allow it to keep it functional and prolong its patency. Therefore, this approach remains the main objective for access rescue and prolongation of the vascular patency rate. Conclusions: PTFE (Poly-tetra-harin-ethylene) is the material from which the most commonly used vascular prosthesis is composed within our country VascuGraft, as it provides a unique flexibility, torsion-resistant that is porous enough to encourage cell growth, provides maximum protection against kinking or twisting of the prosthesis implantation, yet offers maximum protection against blood loss, suture pullout, tearing or delamination. The silicone prosthesis (polydimethylsiloxane, PDMS) provides stability and longitudinal and circumferential elasticity, greater suture retention strength and resistance to punctures, permeability and adaptability exceed the Graft type of prosthesis; however, by the cost, it is difficult to access.

Keywords: Arteriovenous fistula; Arteriovenous prosthesis; Thrombosis; Arteriovenous fistula

RESUMEN

Objetivo: aporte de material bibliográfico novedoso, útil en la actualización de conocimientos ya que refiere criterios de expertos en cuanto al diagnóstico y tratamiento de la trombosis de fistula Arterio Venosa, tratada con prótesis. Descripción breve del caso: un acceso vascular que funcione bien es esencial para los pacientes en hemodiálisis. La trombosis es la principal causa de fallo de un acceso vascule. La trombectomía y la reparación de los mismos permiten mantenerlo funcional y prolongar su permeabilidad. Por lo tanto, este enfoque sigue siendo el objetivo principal para el rescate del acceso y la prolongación de la tasa de permeabilidad vascular. Conclusiones: El PTFE (Poli-tetra-harina-etileno) es el material con el que se compone

la prótesis vascular más utilizada dentro de nuestro país VascuGraft, ya que proporciona una singular flexibilidad, resistente a la torsión que es suficiente poroso para fomentar el crecimiento celular, proporciona la máxima protección contra el pliegue o torsión de la implantación de prótesis, sin embargo, ofrece la máxima protección contra la pérdida de sangre, retirada de la sutura, lagrimeo o delaminación. También existe la prótesis de silicona (polidimetilsiloxano, PDMS), que proporciona estabilidad y elasticidad longitudinal y circunferencial, mayor fuerza de retención de las suturas y la resistencia a las punciones, la permeabilidad y la adaptabilidad supera a la prótesis tipo Graft, sin embargo, por costo es de difícil acceso.
Palabras clave: Fístula arteriovenosa; Prótesis arteriovenosa; Trombosis

INTRODUCTION

The Spanish Society of Nephrology notes that in 2018 there were 27,998 patients on dialysis and that 78.9% of them on renal replacement therapy were starting their treatment with hemodialysis (HD), which requires vascular access, being the native arteriovenous fistula (AVF) in preference to the venous catheter, according to national and international guidelines (1).

Central venous catheter versus autologous or prosthetic AVF is associated with morbidity and mortality due to its high risk of infectious and thrombotic complications, so current recommendations advise a programmed entry into HD with mature AVF around 80% (2).

Renal replacement therapy: vascular access is considered when eGFR < 15 ml/min/1.73 m2 and an estimated dialysis entry in 6 months (2). Vascular access provides the following advantages:

- Provides sufficient blood flow.
- Greater patency over time and the lowest possible complication rate.

The Venous Access that comes closest to this ideal situation is the Native Arterio-Venous Fistula (nAVF), an alternative being the Prosthetic AVF (pAVF) and the Central Venous Catheter (CVC) with all it's possible more or less imaginative or resourceful variations.nAVFs have a very low incidence of complications, especially in terms of infections and thrombosis (4).

NATIVE ARTERIO-VENOUS FISTULA: it is the direct union between the artery and the vein of the patient for the development and easy puncture of the latter; it should be performed as distal as possible in the upper extremity to preserve the greatest amount of puncturable vein segment and maintain the possibility of ascending the future anastomoses proximally, when necessary (5).

Radio-cephalic AVNF:

It is performed in the distal third of the forearm. It continues to be the reference and the one that should be tried as the first option given the low rate of complications and its excellent patency, although at the cost of a relatively high rate of primary failure ranging between 10 and 30% (and in some groups up to 50%), either by early thrombosis and lack of maturation (up to 30% at 3 months), especially in diabetic patients, elderly and women (6).

AVNF in the antecubital fossa (elbow crease): This type of AVF has many possibilities and variants given the high anatomical variation; they are larger caliber, so primary and maturation failures are lower, provide less puncture trajectory available, have more chances of limb edema and may have ischemic complications of the hand (arterial steal). Another consideration to consider when considering them is the adiposity of the arm, as this may hinder their routine use or require secondary interventions.

Humero-cephalic latero-terminal (L-T) AVNF: Its length should not exceed 6-7 mm [11], since this would increase the possibility of distal ischemia of the extremity. It is also possible to perform the anastomosis in latero-lateral with the median basilic vein without annulling the exit through the Basilica of the arm when it is not certain that the cephalic vein will mature sufficiently, leaving the door open to use the basilic vein with a later superficialization. Ligation of the ante ulnar perforating vein is recommended in the same surgical act to avoid venous hypertension and outflow into the deep venous system, which can detract flow to the superficial veins to be punctured in dialysis.

Humero-basilic AVNF: this is the alternative to the previous ones since the basilic vein of the arm, being a deep vein, is usually protected from venipunctures and usually has a very large caliber. In addition, the course of the basilic vein is adjacent to the vasculonervous bundle of the extremity, leaving these structures vulnerable to possible puncture injury during dialysis. The disadvantage of this last option is the need to perform 2 surgical interventions, if there is an early failure, it is not subjected to the traumatic surgery of extensive dissection of a vein with an intimate relationship with nerve structures that often have to be sacrificed, in addition to a wide scar subject to complications, the basilic vein must have a minimal path before the outflow into the deep venous system.

PROTESIC ARTERIO-VENOUS FISTULA: it is made through a synthetic PTFE prosthesis, always proposed when the possibilities of AVNF have been exhausted, although there are authors who advocate its creation in patients with short life expectancy (less than 2 years) or in patients who have to start hemodialysis immediately, as an alternative to CVC, due to its availability in two weeks or less if it is an immediate puncture prosthesis, with excellent permeability from the beginning and its ease of use. It has a higher economic cost because of the prosthetic material used and the need for reinterventions throughout its useful life to keep them permeable and usable (high incidence of thrombosis, stenosis in venous anastomosis, pseudoaneurysms and degeneration of the prosthesis due to repeated punctures in the same area).

Silicone prostheses: are prostheses of novel fabrication and mechanical properties, which use a coating of polyester prostheses with plasticized silicone (polydimethylsiloxane, PDMS), as well as additional modifications (on the surface, incorporation of drugs for its release, etc.) by chemical procedures.Their physical properties included longitudinal and circumferential stability and elasticity, suture retention strength and puncture resistance (tension evaluation device), permeability and adaptability (circulatory model). Prostheses can be coated with multiple layers of PDMS. With a PDMS content > 15 mg/cm2, sufficiently low levels of permeability (< 5 ml/cm2/min at 120 mm Hg) can be achieved. When considering stability, elasticity and adaptability, prostheses with a plasticized silicone content of 15-20 mg/cm2 are comparable to inherently rigid conventional prostheses. PDMS coating decreases suture retention strength and puncture resistance compared to conventional alloplastic materials (collagen-coated polyester and expanded polytetrafluoroethylene). The silicone coating surrounds the sutures passing through the prosthesis and is resistant to clamping-induced trauma.

Poly-tetra-harine-ethylene (PTFE) forms a microporous vascular implant with an advanced structure: V-shaped through pores, with an external pore size of 60μm and internal pore size of 20μm. VascuGraft PTFE offers a uniquely flexible, kink-resistant porous enough to encourage cell growth yet offers maximum protection against blood loss, suture pullout, tearing or delamination. The advanced technology architecture of the VascuGraft PTFE also provides maximum protection against kinking or twisting from prosthesis implantation. Compatible helix-structured grafts include a continuous spiral of PTFE monofilament that can be removed for additional compressive strength. In addition, tapered taper and stepped taper configurations are available for use in special hemodynamic conditions.
Advantages
V-shaped pores, for better healing
No folding and compressive strength
Easy needle penetration for hemodialysis cannulation
Elasticity to facilitate size characteristic
Characteristics:
Standard wall, straight wall thin tubes
Supporting propeller, propeller support in the center
Tapered, short taper, tapered with pitch

Different lengths and diameters
Note
Peripheral vessel reconstruction and peripheral by-pass

METHODOLOGY

In order to achieve the objective of this research, it was necessary to have working materials such as personal computers with Internet connection. Therefore, a search and study of the bibliographic material found in digital format were carried out. The digital literature was found by consulting databases, repositories and websites, among which we can highlight: Pubmed, Virtual Health Library (VHL), SciELO, Dialnet, Medigraphic and others. The type of bibliographic resources searched could represent papers in scientific and academic journals; case reports, bulletins or informative summaries of clinical studies, conferences or papers; undergraduate, graduate and doctoral theses; protocols, clinical practice guidelines, expert monographs and any other formal document showing information of interest with a scientific basis.

The images presented in this research work correspond to the placement procedure of PTFE-type cephalic vein prosthesis in a 67-year-old female patient with a history of left upper limb cephalic vein thrombosis in arteriovenous fistula as venous access for hemodialysis. This prosthesis was chosen considering its advantages, which favors the patient.

DISCUSSION

Arterial occlusion is a potentially serious vascular complication, given the sudden interruption of the limb's circulation; the most common cause is embolism and thrombosis, the site of formation of the embolus is the heart by atrial fibrillation acute myocardial infarction, aorta and great vessels.

Atrial fibrillation is associated with more significant cardiovascular morbidity and mortality and thromboembolic risk in patients undergoing hemodialysis, this arrhythmia being more frequent in these patients than in the general population (11). Risk factors include age, arterial hypertension, cardiac dilatation and alterations in phosphocalcic metabolism, among others. Regarding the treatment of acute arterial obstructions, the options are endovascular or surgical thromboembolectomy, or intra-arterial thrombolysis with urokinase infusion. Suppose thrombosis at the level of the arteriovenous fistula makes venous access for hemodialysis difficult. In that case, the use of prosthetic material is very useful, preferably poly-tetra-harin-ethylene, since it provides many advantages concerning silicone prosthesis, which despite having different characteristics, the cost makes it the least accessible for the renal insufficiency patient; however, it is necessary not to generalize

and rather to treat the patient individually in order to consider cost-benefit, individualizing the treatment and, what is more, acting as soon as possible, since long-term viability depends on it.

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