B) BRIEF PAPERS ON RESEARCH AND CLINICAL EXPERIENCES

Is peripheral and/or catheter blood necessary for performing blood culture in haemodialysis patients whose central venous catheter presents bacteraemia?

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To the Editor,

The profile of today's patients in haemodialysis (HD) programmes has changed. HD patients are now older and have more co-morbidities. The factors responsible for their poorer cardiovascular and immunological health are mainly the increase in diabetes, followed by increased survival rates of patients within the programme. As a result, their blood vessels (arteries and veins) are in worse condition for creating an internal arteriovenous fistula (IAVF), the number of punctures and the risk of infection are higher, and the patients have poorer HD clearance. This leads to increased use of central venous catheters (CVC) and a higher probability of catheter dysfunction, which is accompanied by a higher risk of bacteraemia.[1-4] The high percentage of patients who start HD treatment using catheters is well-known. One multi-centre study evaluated the onset of renal replacement therapy in 1504 patients from 35 different Spanish hospitals in 2003, and found that nearly half (46%) began with unscheduled dialysis sessions, and therefore used a CVC. Of these patients, 82% decided to continue with HD.[5-6] In the region of the Canary Islands, the 2009 Dialysis and Transplant report by the S.E.N.[7] reported an incidence rate of 129 patients per million population (pmp) on renal replacement therapy, with 85% undergoing HD. A total of 226 patients, with a mean age of 66 years, underwent dialysis at our peripheral hospital in 2010; 43% were diabetic, 28% had a tunnelled CVC, and the length of stay was very little for patients with non-tunnelled CVC. Despite the outsourcing efforts, we found that there are very long delays in achieving a permanent access site. This is due to delays in both the surgical procedure to create the access and in the arteriovenous fistula maturation time in the population described above. Furthermore, many of these patients refuse surgery repeatedly, and a large percentage do not have the option of a permanent surgical access. Furthermore, this patient population has a high rate of CVC-related bacteraemia.[8]

In Chapter 1 (procedures prior to creation of a vascular access) of the S.E.N. guidelines for vascular access in haemodialysis (November 2004), we find the following recommendations for preserving the venous network[9]:

1) Warn the patient about its importance. 2) Provide the patient with a card or recommend wearing a wrist band. 3) Recommend venipuncture in the back of the hand. 4) Use low-plasma laboratory techniques (capillary or dry samples). 5) Make other professionals aware of these problems. 6) Avoid implanting the CVC in the shoulder girdle, and especially in the subclavian vein. 7) Femoral vein catheters are recommended for patients who experience flare-ups in the course of their chronic kidney disease. 8) Stimulate muscular and vascular development through isometric physical exercises or venous dilation techniques. 9) Carefully monitor the venous network of peritoneal dialysis and kidney recipients as well. In kidney recipients, patients and professionals must be made aware of the importance of i) rescuing a thrombosed IAVF and ii) repairing rather than closing elbow IAVF in the absence of congestive heart failure.

Haemodialysis unit personnel are aware that bacteraemia due to CVC is the most common complication in vascular accesses. The incidence rate of bacteraemia varies, but it is higher for non-tunnelled catheters (3.8-6.5 per 1000 catheters/day) than for tunnelled catheters. (1.6-5.5 per 1000 catheters/day).[10-13] In our peripheral unit, the bacteraemia incidence rate for tunnelled CVC was 1.63 per 1000 catheters/day.

Non-hospitalised HD patients (outpatients) and those with a CVC may develop bacteraemia after beginning dialysis, which suggests a systemic influx of bacteria and/or endotoxins from the intraluminal wall of the catheter. We must consider how to take blood samples for blood culture without interrupting dialysis, unless this is necessary due to haemodynamic instability or another major clinical complication.

The definitive diagnosis of bacteraemia due to CVC requires that 1 the following criteria are met:

- Positive blood cultures that find the same microorganism in the catheter and in a peripheral vein, with a bacterial colony count 5 times higher in the catheter or a difference in bacterial growth of more than 120 minutes.
- Cultures of the same microorganism from both the tip of the catheter and from at least one peripheral blood culture.
- Cultures of the same microorganism from two different peripheral blood cultures where there is no other source of infection.

At least 2 blood cultures taken between 10 and 15 minutes apart.

According to section 6.10.2 on infections,[9] chapter 6 (central venous catheters) of the S.E.N. guidelines for vascular accesses in haemodialysis

(November 2004), when fever is present in a patient with a CVC, samples must be drawn of peripheral blood and from both lumens of the catheter, and samples must be extracted simultaneously and cultured using quantitative techniques if possible. Evidence B

There is no controversy regarding the universal criteria for obtaining blood cultures in patients with CVC and bacteraemia. There is abundant literature on CVC implanted for other reasons, such as for administering drugs, parenteral nutrition and haemodynamic monitoring, as well as CVC in HD patients. However, it does not specify whether patients who have CVC for HD developed bacteraemia after beginning haemodialysis treatment.[14-15]

In this context, complying with criteria for obtaining blood cultures is difficult due to the following reasons:

- Blood from the catheter: when dialysis is interrupted, disconnecting both lines to obtain blood cultures may even have an iatrogenic effect, given the risk of infection from handling the catheter[16] in a clinical situation that is already complicated. Such a step also entails the possibility of clotting the entire extracorporeal system and wasting precious time, since we do not know if the patient will be able to continue with dialysis treatment or how long the patient will have to wait for the next session following catheter removal. On the other hand, extracting blood samples from both CVC lumens gives rise to false positives in more than 60% of cases. These are related to colonisation of the CVC by microorganisms from the skin.[17-18]
- Peripheral blood: obtaining peripheral blood in the population described above is very difficult in as much as 40% of all patients, especially if they are under heparin, with the risk of developing haematomas and damage to veins, which may be needed for creating a permanent vascular access. At times, venipuncture is a labourious task which does not guarantee an aseptic field, in addition to causing added pain and suffering in a patient already subjected to a number of traumatic procedures.

Although culture blood samples obtained by venipuncture have been held up as the gold standard for diagnosing bacteraemia, we must consider the extracorporeal system an extension of the circulatory system. It is not likely that there would be significant differences between the blood sample obtained by venipuncture and that extracted from the **arterial line** of the extracorporeal circuit.[19]

In order to correctly perform haemodialysis through a catheter, maximum flow rates are required to overcome the deficit due to recirculation (where possible, blood flow rates of more than 300ml/min). Under these conditions, it is likely that large volumes of blood have circulated through the catheter in both directions (arterial and venous) and –when bacteraemia is present– the sample obtained from the catheter will not maintain the quantitative colony differential (with respect to peripheral blood) that is necessary to determine whether the bacteraemia arose in the CVC. However, this is not the case when obtaining samples from CVC implanted for other purposes or tunnelled/non-tunnelled CVC for HD during interdialysis periods.

In conclusion, a universal protocol for obtaining blood cultures from the patients described here may do more harm than good, and we believe that the S.E.N. expert committee should review this matter to determine whether or not they should establish an exception.

Conflicts of interest

The authors declare they have no potential conflicts of interest related to the contents of this article.

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Juan F. Betancor-Jiménez[1], Francisco Alonso-Almán[1], Yanet Parodis-López[1], Beatriz Quintana-Viñau[1], Sonia González-Martínez[1], Cristina García-Laverick[1], Patricia Pérez-Borges[2], José C. Rodríguez-Pérez[2]

[1] Centro de hemodiálisis RTS-GranCanaria. Las Palmas de Gran Canaria. Spain.

[2] Servicio de Nefrología. Hospital Universitario de Gran Canaria Dr. Negrín. Las Palmas de Gran Canaria. Spain.

Correspondence: José C. Rodríguez Pérez
Servicio de Nefrología.
Hospital Universitario de Gran Canaria Dr. Negrín.
Las Palmas de Gran Canaria. Spain.
jrodperd@gobiernodecanarias.org

Serial ultrasound of the vascular access

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To the Editor,

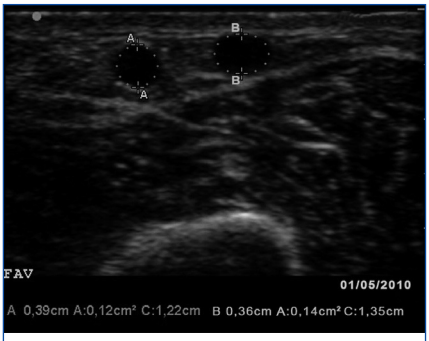
El actual avance de la nefrología y su Current advances in nephrology and similar advances in other areas of medical knowledge mean that nephrologists must develop technical skills that are not provided by traditional training in nephrology. We present a case that illustrates that fact.

The patient in question is an 83 year old male in a conventional haemodialysis (HD) programme with chronic kidney disease secondary to diabetic nephropathy. He had a history of type 2 diabetes mellitus with various diabetes-related complications, arterial hypertension and atypical chest pain with no evidence of ischaemic heart disease.

The patient started HD via a tunnelled catheter in February 2010, with good haemodynamic tolerance and adaptation. A left humeral-cephalic arteriovenous fistula (AVF) was created one month later. Following a 30-day maturation period, we began venipuncture in the AVF and observed suboptimal maturation, difficult anatomical interpretation, venous collapse, ´frequent extravasations and impossibility of reaching a blood flow (Qb) greater than 250ml/min.

Given these findings, we examined the vascular access (VA) with a portable vascular ultrasound machine (EcoAVP) in the HD room (Figure 1) and observed no stenosis in the arteriovenous fistula and a dual venous system with a collateral vessel branching off 3cm from the arterial anastomosis with a thickness similar to that of the two veins (diameter: 0.39cm vs 0.36cm; area: 0.12 vs 0.14cm^2). We found 2 stenoses in the proximal part of the cephalic vein.

The fistulography (Figure 2) confirmed the ultrasound findings, a haemodynamically



A: cephalic vein; B: collateral vessel to cephalic vein

Figure 1. First B-mode ultrasound image of the vascular access in which we see two veins of similar size

significant (80%) stenosis at 10cm from the arteriovenous fistula and another smaller one in the proximal third of the cephalic vein. Percutaneous angioplasty was performed on the 2 stenoses with good angiographic results. The identified collateral vessel was not treated in any way.

One month later, the AVF had progressed well, allowing for cannulation with no extravasations and an acceptable Qb rate. A second image from the EcoAVP (Figure 3) confirmed the increase in the diameter and the cross-sectional area of the main vein (diameter: 0.5cm, area: 0.24cm^2) with a decrease in the size of the collateral vessel (diameter: 0.35, area: 0.08cm^2).

One year later, the AVF was functioning properly, with a Qb of 350ml/min and a normal venous pressure of 140mmHg.

Table 1 shows the changes in some clinical parameters and ultrasound images taken after the treatment with percutaneous angioplasty.

The use of an EcoAVP is not common in daily practice. However, it is very useful for approaching, monitoring, and diagnosing AVF complications.[1] Ultrasound provides both morphological and functional information in a fast, reliable and non-invasive way, which helps us determine whether percutaneous or surgical treatment is necessary.[2] The EcoAVP enables us to combine B-mode imaging, which estimates