

## Intra-atrial catheter: a viable option for insertion beyond the central veins

Cateter intra-atrial: uma opção viável para a inserção além das veias centrais

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Since the initiation of renal replacement therapy, vascular access has continued to be the Achilles heel of hemodialysis therapy. The first published report of radial-cephalic arteriovenous fistula creation by Brescia *et al.*<sup>1</sup> provided a definitive solution to a difficult problem of gaining a reliable and repetitive access to the blood compartment. Over the years, various types and sites of arteriovenous fistulae have been created. While this form of vascular access has the lowest risk of complications, morbidity and mortality; many patients do not have adequate vascular capital available to create an arteriovenous fistula. Such patients often require dialysis therapy through a dialysis catheter.

Nearly 70% of incident dialysis patients start therapy with a dialysis catheter. Traditionally, these devices are placed in the central veins (most internal jugular veins and sometimes in the subclavian veins). Dialysis catheters are also placed in the femoral veins with tip situated somewhere in the iliac veins to inferior vena cava and the right atrium. These catheters damage the endothelial cells and lead to the development of vascular stenosis resulting in both superior vena cava and inferior vena cava stenosis. With the development of severe central stenosis the venous capital is exhausted. Similarly, exhausted peripheral veins also results in an inability to create an arteriovenous access.

In their report, Pereira *et al.*<sup>2</sup> tackle the issue of end stage renal disease patients who had exhausted their central and peripheral veins and who had no

other options to create an arteriovenous access or receive a tunneled hemodialysis catheter. The investigators are to be commended for their presentation of a relatively innovative surgical technique of inserting a tunneled dialysis catheter directly into the right atrium after sternotomy. In their cohort of 7 patients, 12 intra-atrial catheters were implanted surgically over a period of 12 years. Two of the seven patients died in the early postoperative period due to bleeding and sepsis. However, five remaining patients were successfully dialyzed and discharged from the hospital to their dialysis units. All of these patient had accidental catheter dislodgement and required reinsertion of their catheters. Catheter-related thrombosis and catheter-related infection occurred in two of these five patients. The mean catheter patency was 8±11 (0-34) months.

Several aspects of the study by Pereira *et al.*<sup>2</sup> are worth mentioning. First, it is important to indicate that in the absence of renal replacement therapy an end stage renal disease patient virtually faces death. Second, both superior vena cava and inferior vena cava were not available for these investigators to place a dialysis catheter through the central veins. Third, because of the occluded central veins the creation of an arteriovenous access in the arms or thighs would be futile even if peripheral veins were available. Fourth, renal transplant is often not readily available and patients needs to be kept alive and well through dialysis to receive a kidney. Indeed, in their cohort one patient eventually received a renal transplant. In

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the presence of these factors, the intra-atrial catheter presents a viable option for hemodialysis.

While the intra-atrial catheter is a viable option, the complications of this procedure must be considered. In their cohort, bleeding was the most frequent complication. Six of the seven patients suffered from bleeding. One patient died of hemorrhagic shock while bleeding stopped in all others and did not require an intervention to achieve hemostasis. The invasive nature of the procedure and uremic coagulopathy and platelet dysfunction present in end stage renal disease patients provide some explanation of bleeding encountered in this high-risk population. Similarly, infection that was encountered in three of the seven patients was not devoid of adverse outcomes. One patient died of sepsis in the early postoperative period.

It is worth mentioning that catheter dislodgement occurred in all five patients after discharge.<sup>2</sup> A new catheter was surgically reinserted in three patients. We have previously reported that accidental extrusion of a tunneled dialysis catheter can occur.<sup>3</sup> However, this complication is infrequent with traditional catheter sites. The cause of such a high catheter dislodgment rate is not clear from their study. The authors comment on better anchoring techniques of the catheter to the skin. In our cohort of dislodged catheter, we were able to insert a new catheter over the wire.<sup>3</sup> However, our technique may not work with intra-atrial catheter due to the catheter directly puncturing the atrium.

Modifications in catheter design might help mitigate the risk of catheter dislodgement.

Finally, peritoneal dialysis is a viable option when all vasculature has been exhausted to create an arteriovenous access or insert a tunneled hemodialysis catheter. This form of therapy, however, requires a motivated patient who is capable of doing her or his own dialysis therapy. It also requires good support at home to store dialysis supplies and observe infection control.

In summary, by placing a tunneled dialysis catheter directly into the right atrium, Pereira *et al.*<sup>2</sup> provide a viable option for vascular access to provide renal replacement therapy to patients who do not have any other option for dialysis catheter insertion. Nonetheless, the procedure is high-risk. We believe that modifications in both surgical procedure and catheter design may help in reducing complications associated with this procedure.

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