International Surgery Journal
Galanopoulos GT et al. Int Surg J. 2018 Aug;5(8):2693-2696
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20183186

Original Research Article

Modified over-the-wire technique for infected tunneled cuffed dialysis catheters exchange: a precious salvage procedure

Georgios Th. Galanopoulos*, Constantinos D. Lambidis

Department of Vascular Surgery, Iasò General Hospital of Athens, Athens, Greece

Received: 07 June 2018
Accepted: 02 July 2018

***Correspondence:**
Dr. Georgios Th. Galanopoulos,
E-mail: georgiosgalanopoulos@yahoo.com

ABSTRACT

Background: One of the major troubles related to tunnelled cuffed catheters for hemodialysis is infection. The outcomes of conservative treatment, as an attempt to access salvage, are often poor.
Methods: In the present retrospective study, authors reviewed all the patients who underwent infected tunneled cuffed dialysis catheter exchange through a modified over the wire technique. Briefly, this technique consisted in creating a new subcutaneous tunnel away from the old one, preserving the insertion site of the catheter to the vein.
Results: Authors have performed infected catheter exchange with this technique in 59 patients. The success rate was 93.2%. Median follow-up was 9 months. There were only 4 patients with signs and symptoms of recurrent catheter infection treated with catheter removal.
Conclusions: The modified technique may provide multiple benefits for patients with ESRD. Low recurrence rates, anatomic site preservation and cost effectiveness are some of the advantages of this technique.

Keywords: End-stage-renal-disease, Hemodialysis, Infection, Over-the-wire technique, Tunneled cuffed dialysis catheter

INTRODUCTION

The incidence of End-Stage-Renal-Disease (ESRD) increases in a galloping manner worldwide. Tunneled cuffed dialysis catheters play an important role as a means to perform renal replacement therapy. Dialysis Outcomes and Practice Patterns Study (DOPPS) III reveals interesting data about the diffusion of the use of these catheters. In the USA, approximately 25% of patients on dialysis perform it through a tunneled dialysis catheter, while in Canada the corresponding percentage is 39%.[1] In Europe, their use is not so diffuse, however the percentage is not to be misjudged. The Kidney Disease Outcomes Quality Initiative (K/DOQI) recommends that the use of tunneled catheters should be discouraged as a long-term vascular access and that fewer than 10% of patients should be using them as a permanent access.[2] It is a commonplace that tunneled dialysis catheters are prone to infection. The incidence of catheter-related bacteremia reported is variable between 0,8 and 5,5 infections per 1000 days of catheter use.[3-8] Herein, authors describe the modified technique for primary removal and substitution of the infected cuffed tunneled catheters.

METHODS

In the present study, authors retrospectively review all the patients with ESRD performing hemodialysis through a tunneled cuffed central venous catheter, who underwent catheter exchange because of infection, in the time – space between April 2014 and October 2017. All patients were referred by the nephrologists, with signs and symptoms of catheter infection. All patients enrolled had

bacteremia without an identifiable alternative source of infection other than the catheter. From these patients, blood cultures were obtained from a peripheral vein and an empiric broad spectrum intravenous antibiotic scheme was administered. In some patients, the antibiotic scheme was changed in accordance with susceptibilities derived from the culture results. After 2 weeks, the antibiotic therapy was suspended. In case of clinical recurrence of bacteremia (reappearance of fever and chills), the patients referred to present institution for catheter replacement. Patients with persistent fever 48 hours after the onset of antibiotic therapy were also referred for infected catheter replacement. Patients with evident catheter tunnel tract infection were not considered for catheter exchange with this technique. On the contrary, patients with evidence of exit site infection or infection extended from the exit site to the cuff were included.

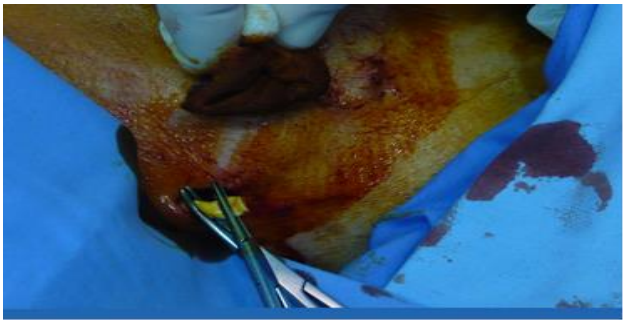

Figure 1: The infected catheter is cut at the entry point in the neck; its distal part is removed.

Patients underwent catheter exchange through the modified over-the-wire technique. Under sterile conditions, after meticulous catheter and skin prepping with antiseptic solution, authors performed a small incision of 1-1.5 cm at the level of the entry point of the catheter in the neck, in case of an internal jugular vein catheter. Respectively, in case of a subclavian vein catheter, the incision was made just below the clavicle, at the entry point of the catheter to the chest. Authors dissected the catheter, detaching it from the fibrous tissue developed around. After dissecting it, the catheter was transversally cut (Figure 1).

Figure 2: The guidewire is advanced through the proximal part of the catheter.

The proximal part was held by a mosquito clamp from one of the lumens. Through the other lumen a .038 inch. hydrophilic guidewire was advanced, under fluoroscopic guidance, to the level of the right atrium (Figure 2).

Figure 3: A new tunnel is created.

This part of the infected catheter was removed, while the introduced guidewire preserved the way to the vein. A second incision was made over the cuff (in case that the cuff could not be reached from the exit site), in order to detach it from the surrounding tissue and remove the distal part of the catheter. Using a new tunnel, usually laterally in respect of the old one, potentially infected, a new catheter was inserted (Figure 3). Through the guidewire, the sheath and the dilator of the new catheter were advanced under fluoroscopy. Attention was paid to remove the guidewire first and then the dilator. This is an important point of present technique. When the J-tip guidewire is removed, it comes in contact only with the dilator, which is longer than the sheath. Consequently, in case of guidewire contamination during the maneuvers, the only part that could be contaminated is the dilator. The latter has a conical tip which does not permit any contact with the sheath during removal. In that way, the potentially contaminated guidewire, could contaminate the dilator, but the dilator could not do the same to the sheath because they do not come in straight contact. At the end, having the sheath in situ, the new catheter was inserted. Antibiotic therapy was continued for 2 weeks after catheter exchange.

RESULTS

Authors have performed infected cuffed tunneled catheter exchange by this modified over-the-wire technique in 59 patients. Forty of the patients were male and 19 were females. Of the 59 patients, 26 were diabetic (Table 1). There were 32 right internal jugular, 16 left internal jugular and 5 right subclavian and 6 left subclavian infected catheters that have been replaced (Table 2). Six of the patients (6/59) treated had an exit site infection and another 6 (6/59) had an infection, clinically evident, extended from the cuff to the exit site. Twenty patients (20/59) had persistent fever and chills 48 hours after the onset of intravenous antibiotics and another 27 (27/59)

patients treated had clinical recurrence of infection after 2 weeks of antibiotic therapy. The mean age was 66 years with a range of 26-90 years. The median follow-up for all present patients was 9 months.

Table 1: Main patient demographics.

Characteristics	No of patients (n=59)
Sex	
Male	n=40
Female	n=19
Age	
Mean	66
Range	26-90
Diabetes	n=26
Male	n=18
Female	n=8

In 55 out of 59 patients (93,2%) the treatment of catheter infection through the modified over-the-wire technique had a successful outcome with no recurrences during the follow-up period. Only one female and 3 male diabetic patients, 2 of them with right internal jugular and 2 with left subclavian catheter exchange, presented with fever and chills, 16, 6, 8 and 10 days after the procedure respectively.

Table 2: Location of infected tunneled catheters.

Catheter location	r-IJV	l-IJV	r-SV	l-SV
Number	n=32	n=16	n=5	n=6

r-IJV=right internal jugular vein, l-IJV=left internal jugular vein, r-SV=right subclavian vein, l-SV=left subclavian vein.

These patients underwent removal of their cuffed catheters and placement of new temporary ones in the right femoral vein in order to perform hemodialysis. All these patients had an initial staphylococcal infection (S. aureus) and received a 2-week antibiotic therapy, based on antibiograms. After discontinuation of antibiotics a recurrence of bacteremia occurred. Then referred for catheter exchange. The catheters were replaced with the technique described above and intravenous antibiotics were administered for another 2 weeks. After discontinuation of antibiotic therapy, a second recurrence occurred in the time space between 6 and 16 days. Thus, remotion of the new catheters became mandatory.

DISCUSSION

In accordance with K/DOQI guidelines, fistula must be considered as the first option in patients performing hemodialysis, followed by synthetic grafts and tunneled catheters.[2] In present practice, authors preserve tunneled cuffed dialysis catheters in a limited cohort of patients. When all anatomic sites in the upper and lower extremities have been exhausted or in the very elderly with severe comorbidities and lack of suitable vessels to create a fistula or insert a graft, catheters could be a viable option.

In the literature, catheter related infectious complications are not rare. These infections are considered to be the most serious complications of tunneled catheters, because they often result in severe systemic infections, like osteomyelitis, endocarditis, septic arthritis or even death.[4,6] Trerotola suggested that infections occur in up to 54% of catheters and up to two - thirds of these infected catheters will need to be removed.[9] Respectively, Alomari et al suggested that approximately one third of tunneled hemodialysis catheters are removed for infections, depicting the dimension of this problem.[10]

Consequently, conservative treatment, with intravenous antibiotic administration or with instillation into the catheter lumen of antibiotic-anticoagulant lock solutions is not always effective. This is the reason why many catheters must be removed in order to take away the septic source. Previous experience consisted of removal of the infected permanent catheter, leaving the patient without any vascular access for a couple of days (until the next hemodialysis session). Then a temporary central venous catheter was inserted in another anatomical site in order to continue performing hemodialysis and receive antibiotic therapy. Two weeks later, antibiotic therapy was discontinued and in case of remission of symptoms, a new tunneled cuffed catheter was inserted. If no remission occurred, antibiotics were continued for a longer period. This treatment modality has the disadvantage of losing the initial anatomic site in which the infected catheter was inserted. Thrombosis often develops in central veins after removing a tunneled catheter, prohibiting their reuse in the future. Losing an anatomic site, such as the internal jugular or the subclavian vein, in these patients, should not be underestimated, because every access site is undoubtfully valuable and possibly the final remaining.

Other techniques have also been described which deal with infected tunneled catheters, such as the exchange of the existing infected catheter with a new catheter over a guidewire. Using the old subcutaneous tunnel for the new catheter could result in recurrence. For example, the tract from the exit site to the cuff may be colonized by bacteria of skin origin. These microorganisms could be carried along the entire tunnel, colonizing the new catheter. In present technique, authors totally exclude the old tunnel in order to avoid such recurrences.

Additionally, while the guidewire is advanced through the entire length of the infected catheter, it may be colonized by microorganisms responsible for the infection. Passing through this potentially infected guidewire, the new catheter, coming in strict contact with it, may possibly be infected. In the modified over-the-wire technique, the guidewire will not come in contact with the new catheter. During retrieval it comes in contact with the dilator, but the tip of the latter does not come in contact with the sheath. Thus, the new catheter, passing through the sheath, has a limited possibility to be infected.

CONCLUSION

Authors believe that the modified technique may provide additional benefits for patients with ESRD. The low recurrence rate of catheter infection in present series (6,8%), in association with access site preservation, constitute major advantages of this technique. Additionally, the patient hardship is significantly reduced, because infected catheter removal and exchange are effectuated as one stage procedure, avoiding temporary non-cuffed catheter placement in the interim. Besides all, the cost effectiveness of this technique becomes quite obvious.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Ethier J, Mendelssohn D, Elder S, Hasegawa T, Akizawa T, Akiba T et al. Vascular access use and outcomes: an international perspective from the dialysis outcomes and practice patterns study. Nephrol Dial Transplant. 2008;23:3219-26.
2. Kidney Disease Outcomes Quality Initiative: Clinical Practice Guidelines and Clinical Practice Recommendations, 2006 Updates, Hemodialysis Adequacy, Peritoneal Dialysis Adequacy, Vascular Access. Available at: http://www.kidney.org/professionals/KDOQI/guideline_upHD_PD_VA/index.htm.
3. Trerotola SO, Johnson MS, Harris VJ, Shah H, Ambrosius WT, McKusky MA et al. Outcome of tunneled hemodialysis catheters placed via the right internal jugular vein by interventional radiologists. Radiol. 1997;203:489-95.
4. Marr KA, Sexton DJ, Conlon PJ, Corey GR, Schwab SJ, Kirkland KB. Catheter – related bacteremia and outcome of attempted catheter salvage in patients undergoing hemodialysis. Ann Intern Med. 1997;127:275-80.
5. Beathard GA. Management of bacteremia associated with tunneled – cuffed hemodialysis catheters. J Am Soc Nephrol. 1999;10:1045-9.
6. Tanriover B, Carlton D, Saddekni S, Hamrick K, Oser R, Westfall AO et al. Bacteremia associated with tunneled dialysis catheters: comparison of two treatment strategies. Kidney Int. 2000;57:2151-5.
7. Mokrzycki MH, Zhang M, Cohen H, Golestaneh L, Laut JM, Rosenberg SO. Tunneled hemodialysis catheter bacteremia: risk factors for bacteremia recurrence, infectious complications and mortality. Nephrol Dial Transplant. 2006;21:1024-31.
8. Saad TF. Bacteremia associated with tunneled, cuffed hemodialysis catheters. Am J Kidney Dis. 1999;34:1114-24.
9. Trerotola SO. Hemodialysis catheter placement and management. Radiol. 2000;215:651-8.
10. Alomari AI, Falk A. The natural history of tunneled hemodialysis catheters removed or exchanged: a single-institution experience. J Vasc Interv Radiol. 2007;18:227-35.

Cite this article as: Galanopoulos GT, Lambidis CD. Modified over-the-wire technique for infected tunneled cuffed dialysis catheters exchange: a precious salvage procedure. Int Surg J 2018;5:2693-6.