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PROFESSIONAL PAPER

Mater Sociomed. 2015 Apr; 27(2): 112-113

Central Venous Catheter as Vascular Approach for Hemodialysis – Our Experiences

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ABSTRACT

Introduction: Application of a central venous catheter (CVC), as a temporary or permanent vascular access for hemodialysis, has been continuous practice at the Sarajevo Pediatric Clinic, Department of Pediatric Intensive Care. The main goal of the article is to present our experiences with central venous catheters in the treatment of these patients. **Material and methods:** In the period from January 2009 to December 2014 a total of 41 patients were treated and a total of 56 catheters were placed. **Results:** The results show the prevalence of the femoral venous catheter (69,64%), with significantly smaller participation of jugular (28,57%) and symbolic participation of subclavian catheters (1,78%). Frequency of infections of 8,92% in our article is lower than the percentage contained in the data of the National Nosocomial Infections Surveillance System, which provided data related to 17% of catheter related infections. The most common agents of the catheter related infections in our patients are gram-negative bacteria from the *Klebsiella pneumoniae* group. **Conclusion:** The issue of the higher complication percentage during the treatment is linked with hemostasis related to bleeding into or around the catheters in 28,57% of patients, and to clotting disorder in terms of thrombosis in 10,71% of patients.

Key words: central venous catheter (CVC), hemodialysis, complications.

1. INTRODUCTION

The central venous catheter is the first choice of venous access for all patients needing urgent hemodialysis. They are ideal access for all other patients included in the program of active treatment with certain types of temporary character dialysis therapy (hemodialysis, plasmapheresis, hemodiafiltration) (1). Large veins are most commonly used (jugular internal, subclavian, femoral vein), and Seldinger technique for the central venous catheter placement.

There are various complications related to central venous cannulation and they are related to both, CVC insertion and the use thereof (2).

The selection of a large vein depends on several factors such as age of patients (children or adults), patient's status, structure, local medical report, and physician's experience. The largest number of the world centres uses the femoral short-term catheter, but not longer than five days in hospitalized patients. The most recommended is internal jugular vein catheter, applied from the right side, which application has certain advantages such as: avoiding damage of subclavian vein which provides for better functioning of arteriovenous fistula if applied from that side, lower incidence of pneumothorax, and the damage of jugular vein is less frequent given that this vein is wider than subclavian and has better mobility with the placed catheter.

This method has been used at the Pediatric Clinic since January 2009 and is performed by a pediatrician – intensive care specialist. The very act of the central venous catheter insertion is performed in the small operating theatre of the Pediatric Clinic, with the use of dual lumen elastic hemodialysis catheter, which position is controlled by ultrasound and x ray if necessary (3).

The aim of the article is to provide personal observations and experiences related to the venous access, the central venous catheter in the treatment of patients requesting urgent application of certain type of hemodialysis treatment.

2. MATERIALS AND METHODS

In the period from January 2009 to December 2014 a total of 56 catheters were placed to 41 patient at the Department of Pediatrics Therapy of the Pediatric Clinic, Clinical Center University of Sarajevo. The patients were monitored from the moment of the catheter placement and after its removal, when the top of the central venous catheter was sent to microbiological analysis. The blood culture was determined based on the clinical picture.

3. RESULTS

Based on sex distribution there were 53,65% of female and 46,34% of male patients.

The youngest patient was 15 day old, and the eldest was 16. The mean age structure of the patients was 8.4 years.

A total of 31 femoral vein catheters were placed which was 69,14% of all central venous catheter applications. The jugular vein catheter, as venous access device, was used in 15 (28,57%) patients, and subclavian vein catheter in 1 (1,78%) patient.

The total functional length of all inserted catheters by place of insertion was as follows:

- Femoral catheter was functional in a total of 25 patients for the period from 0-7 days; in 9 patients from 8-14 days; in 1 patient from 15-30 days and in even 4 patients it was functional over 30 days. Femoral venous catheter was placed for the period from 1 to 63 days at the longest.
- Jugular catheter was functional in a total of 9 patients for the period from 0-7 days, in 6 patients from 8-14 days and in one patient for the period from 15-30 days. Jugular catheter was placed from 1 to 17 days at the longest.
- Subclavian catheter was functional in 1 patient for the period from 0-7 days.

Out of total number of complications in the application and procedures related to CVC there were 5 infections, 4 of which were caused by *Klebsiella pneumoniae*, and one by *Staphylococcus aureus* (MSSA), one infection with femoral and four with the application of jugular venous catheters.

Bleeding occurred in a total of 16 CVC of which 11 with femoral and 5 with jugular catheter. There were 6 thrombosed catheters, 3 with femoral and 3 with jugular catheters. Insufficient blood flow occurred in the application of 4 catheters, all femoral, and catheters falling out occurred as a complication of two femoral catheterization.

4. DISCUSSION

In the treatment of life-threatening patients requiring hemodialysis, as a choice of venous access, the Department of Pediatric Intensive Care of the CCUS Pediatric Clinics most frequently uses dual lumen flat CVC placed in femoral vein by Seldinger technique. The average duration of the femoral catheter is 30 days, which is 6 times longer than the recommended time (4).

There was no significant difference between female (53.65%) and male (46.34%) sex distribution. The majority of patients continued their treatment by chronic hemodialysis. Only one patient had arteriovenous fistula, which was a significant disadvantage of a safe and continuous venous treatment access necessary in the treatment of chronic patients.

From total amount of patients in our sample 8,92% of the catheter related infections is significantly low in comparison to the 17% of the catheter related infections stated by the National Nosocomial Infections Surveillance System (NNIS). Gram-negative bacteria strain groups are dominant which is

contrary to the literature stating the staphylococci group as the most common agents of the catheter related infections (5).

Relatively high percentage of thrombotic complications (10,71%) is most probably the consequence of comorbidity factors.

Insufficient blood flow (7,1%), and accidentally lost catheters (3,57%) draw attention to the need for continuous education of medical staff in the intensive care units where the central venous catheters are placed for the purpose of acute hemodialysis (6).

5. CONCLUSION

- Femoral catheters are the most frequently used venous access devices for acute hemodialysis in life threatening patients, with average duration of 30 days.
- Number of the catheter related infections in our article is significantly lower as compared to the literature.
- The most common agents of the catheter related infections are gram-negative bacteria, which is also contrary to the literature.
- The most important attention should be given to the education of staff who will in the future provide for the safe venous access in patients requiring chronic hemodialysis, that is via arteriovenous fistula.
- It is necessary to provide for continuous education of medical staff and others employed in the intensive care units for the purpose of strict and permanent application of all aseptic techniques of the catheter handling.

CONFLICT OF INTEREST: NOT DECLARED.

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