The infected central line in children: Should it be removed? *

Zvi STEINER, Yafim KANDELIS, Jorge MOGILNER, Samuel ELDAR, Isaac SRUGO

Department of Pediatric Surgery and the Clinical Microbiology Unit, Bnei-Zion Medical Center, Faculty of Medicine, Technion and Institute of Technology, Haifa, Israel

Özet

Çocuklarda enfekte santral kateter: Çıkarılmalı mı?

Yaşları 7 gün ile 16 yıl arasında değişen 47 çocuk olguya santral kateter yerleştirildi. Biri hariç tümü Broviac tipi olan kateterler, cilt altı tünelden geçirilerek, eksternal veya internal juguler ven yolu ile yerleştirildiler. Kateter yerleştirme endikasyonları; kemoterapi, TPN, uzun süreli antibiyotik tedavisi ve kan transfüzyonları idi. Onbiri immün yetersizlikte olan 13 olguda kateterden kaynaklanan enfeksiyon saptandı. Kateter enfeksiyonlarında en sık saptanan bakteriler; Staphylococcus aereus, Pseudomonas aeruginosa, Staphylococcus koagulaz negatif ve değişik gram negatif suşlar idi. Tüm olgular kateter yolu ile verilen antibiyotikler ile tedavi edildi. On olguda bu tedavi başarılı olup kateter çekilmesini gereksiz kılarken, iki olguda kateterler gelişen tünel enfeksiyonu nedeni ile çıkarıldı. Kalan bir olguda da kateter enfeksiyonu saptandıktan hemen sonra, tedavi başlanamadan çocuk tarafından kateter istenmeden çıkarıldı. Antibiyotik ile tedavi edilen grupta, vena cava superiorda trombüs gelişen bir olgu hariç komplikasyon saptanmadı. Toplam 13 kateter enfeksiyonlu olgunun yedisinin tedavileri evlerinde tamamlanmış olup, bu yolla 65 günlük hastanede yatış süresi tasarrufu sağlanmıştır.

Sonuçlarımız doğrultusunda, kateter nedenli enfeksiyonların çoğunda öncelikle konservatif tedavinin düşünülmesi ve uygulanması gerektiğini düşünüyoruz. Ancak, tünel enfeksiyonu saptanan olgularda kateterin hemen çıkarılması gerekmektedir. Seçilmiş olgularda tedavi evde sürebilir; böylece tedavi maliyeti düşürülür ve bu durum çocuk ve ailesi tarafından da olumlu karşılanır.

Anahtar kelimeler: *Kateterizasyon, santral ven, enfeksiyon*

Summary

Central venous lines were placed in 47 children whose age ranged from 7 days to 16 years. All except one were of the Broviac type, and installed through a subcutaneous tunneling, via the internal or external jugular vein. The indications for central venous cannulations were chemotherapy, TPN, prolonged parenteral antibiotics, and repeated blood transfusions. In 13 patients (28 %), 11 of which were immune compromised, infection originated from the catheter. The commonly identified bacteria were Staphylococcus aureus, Pseudomonas aeruginosa, Staphylococcus coagulase negative, and various gram negative rods. All cases were treated with antibiotics via the catheter. In 10 children, treatment was successful, omitting the need of removing the line. In two children, tunnel infection developed and hence, the catheter was extracted. One child accidently removed his catheter prior to initiation of treatment. No other complications were detected in the infected group treated conservatively except for one case who developed a superior vena cava thrombosis. In 7 out of 13, treatment was completed at home, saving 65 days of hospitalization.

We conclude that in most instances of catheter related infection, a conservative approach should be considered and applied. However, in cases associated with tunnel infection, the catheter should instantly be removed. In selected cases, treatment can be carried out at home; this is cost effective and well accepted both by the children as well as by their families.

Key words: *Catheterization, central venous, infection*

Introduction

Controversy exsists regarding the preferred treatment of sepsis, resulting from a central venous catheter line. Some postulate that sepsis could not be cured unless the central line is removed. On the other hand, other advocate that successful treatment of sepsis could be achieved in many instances even in the presence of the catheter [4,8]. The present clinical study represents our experience with catheter related infection. We plea for a conservative approach in most cases.

* This study was presented at XV Annual International Congress of the Turkish Association of Pediatric Surgeons (21-22 July 1997, İstanbul)

Adress: Dr. Z. Steiner, Dept. of Pediatric Surgery, Bnei-Zion Medical Center, 47 Golomb St. POB 4940, Haifa 31048, Israel

Material and Methods

From January 1994 to December 1995, central venous lines were installed in 47 children at the Bnei-Zion Hospital in Haifa. Except one, which was a port a cut line, all were of the Broviac type, introduced through a subcutaneous tunneling, via the internal or external jugular vein. The children's ages ranged from 7 days to 16 years. The indications for central venous cannulations were as follows: chemotherapy in 35, TPN in 5, prolonged parenteral antibiotics in 4, and repeated blood transfusions in 3 patients. Catheter related infection was detected in 13 out of 47 children (28 %), 11 of which were immune compromised.

*The catheter infection was classified into two groups: **1)** sepsis only, **2)** selpsis associated with tunnel infection. Central line sepsis was diagnosed upon obtaining positive blood cultures taken via the catheter, while excluding other sources of infection. Tunnel infection, was diagnosed by detecting skin inflamation along the catheter course, accompanied by cloudy discharge from the entry port, from which positive bacterial cultures were obtained. Until bacteria was specifically identified, initial treatment consisted of oxacillin and gentamycin which were administered through the infected catheter, while neutropenic children with less than 500 neutrophils, were treated with vancomycin, ceftazidime and amikacin. Once the bacteria were cultured, patients were treated according to their sensitivity.*

In cases with documented gram positive sepsis, the duration of treatment lasted for two weeks, while continued for 3 weeks in patients with gram negative sepsis. Neutropenic children were treated until the neutropenic state has been resolved. Cases in whom infection did not respond to antibiotics, or whenever the child deteriorated clinicaly, the catheter was removed. Completion of treatment in the community was feasable in those afebrile children in whom the neutropenic state was over, with negative blood cultures, and a reasonable family compliance.

Results

Catheter related infection was detected in 13 out of 47 children (28 %) (Table I). The identified bacteria were as follows: Staphylococcus aureus in 4, Pseudomonas aeruginosa in 4, Staphylococcus coagulase negative in 2, and various gram negative rods in 3. Twelve children were treated with only intravenous antibiotics. One patient accidentaly removed his catheter prior to the initiation of antibiotic treatment.

In 10 children, infection was successfully eradicated without the necessity of removing the line. None of these children sustained any tunnel infection. Associated tunnel infection was observed in two children, who required instant removal of the catheter. No other complications were detected, except for one case who developed a superior vena cava thrombosis. This occurred in a girl with associated tunnel infection, who responded partially to a 14 days course of IV antibiotics. Infection was treated thenafter by an additional antibiotic course, during which time she developed the thrombosis. In 7 out of 13 patients, treatment was continued and completed in the community, saving 65 out of 210 days (31 %) of hospitalization.

Discussion

Although fever may be the only sign of catheter related sepsis, in most catheterized patients, febrile episodes are unrelated to sepsis [1]. Bacterial colonization of central lines is uncommon in asymptomatic children, and hence it is not recommended to draw random blood cultures, nor to treat them with prophylactic antibiotics unless suggestive clinical features of infection are exhibited [3,9,11].

Some controversy exists regarding the preferred treatment of sepsis related to central venous catheter line. Some postulate that sepsis cannot properly be treated unless the central line is removed [7,8]. In contradistinction, Hiemenz et al [5] reported on 90 % success in conservative treatment of central line sepsis without removing the catheter. This approach has been shown to be beneficial in children, and strongly supports our own experience [6,12].

In the present study, we successfully combatted infection in 83 % of patients, omitting the need to remove the catheter. In our practice, this approach was not applicable in cases associated with tunnel infection which required instant extraction of the line.

Table I: Management of children with central line related infection

Patient no	Diagnosis	Cultured bacteremia	Antibiotic treatment (via the catheter)	Duration of IV treatment (days)	Duration of home treatment (days)	Catheter removed	Associated findings
1	ALL	S. aureus	Oxacillin	14			
2	ALL	P. aeruginosa	Gentamycin	21	3		
3	Neuroblastoma	S. aureus	Oxacillin	14			
4	ALL	E. cloacae	Ceftriaxone	21	7		
5	ALL	E. coli	Ceftazidine+ Amikacin	21			Neutropenic child
6	ALL	S. coag (-)	Vancomycin	14	10		Resistant to Oxacillin
7	ALL	S. aureus	Vancomycin	14	10		Resistant to Oxacillin
8	Thalassemia	S. aureus	Oxacillin	14			Tunnel infection
	First recurrence	S. aureus	Oxacillin	14	14		Tunnel infection
	Second recurrence	S. aureus	Clindamycin			Yes	Superior vena cava thrombosis
9	ALL	P. aeruginosa	Ceftazidime+ Amikacin	7		Yes	Tunnel infection Neutropenic child
10	Astrocytoma	S. coag (-)	Oxacillin	14	14		
11	ALL	P. aeruginosa	Ceftazidime+ Amikacin	21	7		Neutropenic child
							Neutropenic child
12	ALL	P. aeruginosa	Ceftazidime+ Amikacin	21			
13	Osteomyelitis	Flavobacterium				Yes	Positive blood& catheter cultures. The catheter was pulled out by the child

ALL: Acute lymphoblastic leukemia

In our series, patients who sustained gram positive sepsis, the duration of treatment lasted for two weeks, while 3 weeks for gram negative septic cases.

Management for shorter periods of time might cause the relapse of sepsis [2,10]. It is well accepted that in children, the main indication for central venous cannulation is chemotherapy, as exhibited by 74 % in our series. Since these children are immune depressed, they are susceptible to sepsis. In our series, 11 out of 13 children with central line infections, were immune compromised. In spite of that, and as was advocated also by others, we recommend to treat them conservatively without removing the line [3,12].

One should be aware of potential complications such as: septic emboli, hemodynamic changes, fever and chills which reflect unresponsiveness to treatment [1].

In our series, one case of superior vena cava thrombosis was observed. This patient was treated with antibiotics only for tunnel infection, without removing her line. Since infection responded only partially, a second course of antibiotics was administered, still at the presence of the line, causing thrombosis of the superior vena cava.

We speculate that earlier removal of the line, probably might have prevented it. In the present study, no other complications were detected. After the infection was eradicated, the lines were useful, and left in situ until they were no longer needed. We advocate that in selected afebrile patients, who are not neutropenic, showing no clinical features of systemic infection, with negative blood cultures and a reasonable family compliance, IV treatment could be completed at home.

This approach proved in our experience to be cost effective and was accepted by the children and their parent.

Our experience suggests that the conservative approach is feasible in most cases of catheter related infection. However, in those instances, in which infection of the tunnel is detected, the conservative treatment is ineffective, and hence, the IV line should be instantly removed. In selected cases treatment can be carried out at home; this is cost effective and acceptable both by the children as well as their parents.

References

1. Decker MD, Edwards KM: Central venous catheter infections. Pediatr Clin North Am 35:579, 1988
2. Ehni WF, Reller B: Short course therapy for catheter associated staphylococcus aureus bacteremia. Arch Int Med 149:533, 1989
3. Flynn PM, Shenep JL, Stokes DC, et al: In situ management of confirmed central venous catheter-related bacteremia. Pediatr Infect Dis J 6:729, 1987
4. Hartman G, Shuhat S: Management of septic complications associated with silastic catheters in childhood malignancies. Pediatr Infect Dis J 6:1042, 1987
5. Hiemenz J, Robichaud K, Johnson M, et al: Bacteremia in patients with indwelling silastic catheters. Proc Am Soc Clin Oncol 1:57, 1982
6. Hiemenz J, Skelton J, Pizzo P: Perspective on the management of catheter related infections in cancer patients. Pediatr Infect Dis J 5:6, 1987
7. Olson T, Fischer G, Lupo M, et al: Antimicrobial therapy of Broviac catheter infections in pediatric hematology oncology patients. J Pediatr Surg 22:839, 1987
8. Prince A, Heller B, Levy J, et al: Management of fever in patients with central vein catheter. Pediatr Infect Dis 5:20, 1986
9. Raad II, Sabbagh MF, Rand KH, et al: Diagnosis of catheter related infections: Comparison of the sonication and roll plate semiquantitive techniques (abstract 1073). Presented at 29th interscience conference on antimicrobial agents and chemotherapy. Washington DC, USA, 1989
10. Raad II, Sabbagh MF: Optimal duration of therapy for catheter related staphylococcus aureus bacteremia: A study of 55 cases and review. Clin Infect Dis 14:75, 1992
11. Raucher HS, Hyatt AC, Barzilai A, et al: Quantitative blood cultures in the evaluation of septicemia in children with Broviac catheters. J Pediatr 104:29, 1984
12. Simon B, Suttorp M: Results of antibiotic treatment of Hickman-catheter-related infections in oncologic patients. Support Care Cancer 2:66, 1994