Infection of Central Venous Catheters

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Summary

Insertion and care of central venous catheters is a surgical procedure.

Since the lowest percentage of positive findings were in those catheters put in the basilic vein, one must conclude that the further away the insertion is from the central vein, the better is the result as any infection will cause phlebitis rather than septicaemia.

Perfect fixation of central venous catheter is necessary to prevent its migration and trauma causing phlebitis.

If the patient suffers a rise of body temperature without any obvious reason, blood cultures must be carried out and a new catheter inserted in a different site.

There must be very strict indications for cannulation of large central veins.

Introduction:

Since the introduction of plastic catheters in clinical practice in 1945 complications connected with this procedure have become the object of many studies. The most common complication is infection.

In 1947 6 cases of sepsis were reported by H. Neuhof and G. Seley, which were blamed to canulation of vessels.[1] By the end of the 50's another two studies were prepared demonstrating half the patients with staphlococcal septicaemia had local staphylococcal infections in the place around intravenous catheters.[2] The first prospective study of the problem was published in 1963.[3]

Possibility of the origin of microbial contamination: The skin is an important source origin of microbes grown from catheters: Most frequently skin commensals: Staph. epidermidis, Klebsiella, Enterobacter, Serratia and Enterococi. The same types of these microbes are usually the cause of catheter sepsis.

Microbes can contaiminate the tip of catheters at the same time of insertion or later on by migration around the catheter. Another source of contamination is the nursing and medical staff with resistant gram-negative microbes as commensals on the hand. Cases were reported about an outbreak of Klebsiella sepsis from contaminated handcream used in I.T.U.[4] Positive bacterial findings from central venous catheters (CVC) used for measuring of CVP were found in 22% of cases: There was none in the catheters used only for infusion therapy, Hoshal.[5] The flushing of clots from catheters poses the danger of septicaemia, because of embolism of contaminated thrombus. Microbes from distant pockets of infection (tracheostomy, urinary system, wounds) can be found on the tip of catheter without demonstrable bacteraemia. Catheters inserted in patients with previous infection are more frequently contaminated than those in the other patients. The sepsis from contaminated infusion were reported in 1953 by Michales and Ruebner.[6]

In one Australian study it was found that nearly half a batch of infusion bottles contained fungi, these fungi were admitted by small pieces of rubber during the insertion of needles into the bottle's rubber sealer.[7] The solutions can also be contaminated from the tip of the I.V. cannula itself as it was shown, that microbes can travel more than 1,5 m against the flow of solution. Every handling of infusion can cause contamination i.e. later addition of drugs into the sets and bottles, changing to transfusion of blood, using manometres or taking of blood samples via CVC.

Methods

From may 1983 to September 1984 there were inserted 194 CVC in 158 patients in the I.T.U. of Hospital Bulovka, Prague. 163 of these (84%) were investigated bacteriologically. Blood-cultures and tips of catheter filled by blood were put in test-tubes with sterile N/Saline for investigation. 75 tips (46%) were sterile, 88 tips (54%) were contaminated and in 24 of these there was more than one species contaminating the catheter.

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Table 1

Bacterial finding on tips of Central Venous Catheters	
Staph, aureus	30
Pseud, aeruginosa	29
Enterobacter	15
Nicrococus albus	11
Serratia Mar.	9
E.coli	7
Staph, faecalis	7
Str. viridans	2
Proteus species	4
Proteus vulgaris	1
Proteus mirabilis	1
Str. beta-hamolyticus	1

31 cathetres were not investigated. Of these one patient was transfered to another ward with catheter and two cases pulled out the catheter by themselves. In some other cases the tips were contaminated during removal and were not fit for bacteriological investigation.

Table 2

Corelation between % of positive finding and duration of insertion

	to 72 hrs	3 – 7 days	8 – 10 days	above 10 days
Number of catheters	31	51	27	49
% of positive findings	51.6	50.6	51.8	55.1

Catheters were inserted all together for 1605 days, the average stay being 8.3 days. Our findings were different from those reported previously in the literature, which had shown that positive findings were dependent on the duration of cathetrisation.[10]

Entrance to vein	Number of catheters	Number investig. catheters	Number positive findings	% of positive findings
v.jug.int.	50	42	29	69
v.subclavia	84	64	34	53
v.basilica	61	52	19	36

Table 3 shows separation of catheters according to entry sites in peripheral or central vein, and the number of positive findings in each group. This is similar to the recent study of Gertner, which appraised 1500 catheters and which showed that catheters inserted via v. basilica had the lowest risk of infection.

Discussion

Reports in the literature a number of positive contaminant findings from catheters vary from 3% – 57%. Because of the high proportion of positive bacteriological findings many authors have stressed the importance of cathetrisation done by experienced staff and that these catheters should not be inserted for simple infusions but that insertion should be restricted only for some special indication.

In our I.T.U. we clean and prepare the site of insertion using some washing solutions used in the theatre, doctors wear sterile gloves and mask and the inserted catheter is fixed with a stitch to stop it moving in the skin channel. It is shown, that even in unconscious patients catheters move 1 – 2cm in subclavian and 5cm in the cubital region. The dressing is changed every third day or earlier if heavily soiled. When the patient is not routinely heparinised we add 500 – 1.100 units of heparin to every bottle to prevent the formation of thrombus. When it is necessary to measure the CVP after the catheter has been inserted for more than 48 hours we measure it by electronic methods in a closed system. The treatment of catheter sepsis is easy. In most cases removing of catheter is enough and the patient does not need any antibiotics.

Literature

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