

Is routine replacement of i.v. administration sets required after each change of intermittently administrated antibiotic infusions?

Muss das Infusionssystem bei Kurzzeitapplikation von Antibiotika mit jedem Wechsel der Infusionsflasche gewechselt werden?

Abstract

Aim: Manufacturers' instructions recommend changing the infusion line together with the infusion bottle after each administration. We investigated if the complete infusion line may be microbiologically contaminated after short-time antibiotic and rinse-solution application.

Method: Immediately after the change of an infusion administration set after 72 hours the remaining antibiotic solution was inactivated with yolk and cultured on blood agar for 48 hours at 36 °C to detect possible contaminants.

Results: Among 87 investigated samples no microbial growth was detected. One sample which hadn't any contact to antibiotics yielded 1 colony forming unit (cfu) of coagulase-negative staphylococci.

These results suggest that in case of consecutive antibiotic-short- and rinse-infusions the infusion line may be in place up to 72 hours without contamination. This, however, may be only the case for infusion sets, which are in contact with antibiotics. If no antibiotic is administered, the infusion bottle and the infusion line must be renewed together for every change. To clarify this question into more detail, a larger consecutive study is required.

Conclusion: I.v. administration sets without any contact to antibiotics must be changed together with their infusion bottle after administration. In case of consecutive antibiotic-short- and rinse-infusions our pilot study suggests using the i.v. administration sets for up to 72 hours without renewing it at every infusion-set exchange.

Keywords: CVC, antibiotic-short-infusions, changing of renew infusion, changing of infusion bottle change

Zusammenfassung

Zielsetzung: Gemäß Herstelleranweisung ist bei jedem Wechsel der Infusionsflasche der Wechsel des gesamten Systems erforderlich. Es sollte untersucht werden, ob das bei aufeinanderfolgenden Kurzzeitinfusionen ausschließlich von Antibiotika zutrifft.

Methode: Beim Wechsel des Infusionssystems nach 72 h wurde die im System verbliebene Restlösung nach Inaktivierung mit Eigelb für 48 h bei 36 °C auf Blutagar zum Nachweis einer Kontamination kultiviert.

Ergebnisse: In keiner von 87 untersuchten Proben konnte eine mikrobielle Kontamination nachgewiesen werden. Irrtümlich wurde eine weitere Probe aus einem Zugang entnommen, über den kein Antibiotikum verabreicht wurde. Diese enthielt eine Koloniebildende Einheit von Coagulase-negativen Staphylokokken.

Die Ergebnisse sprechen dafür, dass bei aufeinanderfolgenden Kurzinfusionen von Antibiotika das Infusionssystem beim Wechsel der Infusionsflasche nicht gewechselt werden muss. Sofern nicht ausschließlich Antibiotika verabreicht werden, muss der Wechsel jedoch durchgeführt

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werden, weil eine irrtümlich entnommene Probe aus einem anderen Zugang mikrobiell kontaminiert war. Zur weiteren Abklärung der Fragestellung wird eine Nachfolgestudie mit Einschluss einer größeren Patientenzahl als erforderlich angesehen.

Schlussfolgerung: Für den nicht-antibiotischen Zugang muss bei jedem Wechsel der Infusionsflasche auch das Infusionsset gewechselt werden. Die Ergebnisse unserer Pilotstudie sprechen jedoch dafür, dass dieser Wechsel nicht erforderlich ist, sofern nur Antibiotika appliziert werden.

Schlüsselwörter: ZVK, Antibiotikakurzinfusion, Wechsel des Infusionssystems, Wechsel der Infusionsflasche

Introduction

Manufacturers' instructions recommend changing the i.v. administration set together with the infusion bottle after each administration. The recommendation of KRINKO [1] requires similarly, that feed-lines in the case of short infusions must be discarded after the completion of the infusion. However, in practice it is observed in the case of several directly cascaded short infusions for a given drug compatibility usually the same administration line is used.

Particularly in intensive care, a number of different solutions are administered over the limb of the central venous catheter (CVC) daily. Therefore, following the manufacturers' recommendations is associated with costs and increased workload for healthcare workers.

To the best of our knowledge no studies have investigated if immediate renewing of the complete i.v. administration set together with an emptied infusion bottle is required. Even the very comprehensive CDC's 2011 Guidelines for the prevention of intravascular catheter-related infections [2] leave this aspect unanswered and categorized it as unresolved issue. Therefore we investigated microbiologically if the complete infusion line may be contaminated after short-time antibiotic and rinse-solution applications. However the issue was limited to short infusions of antibiotics, which were infused over the same limb. A constant limb flow was ensured by intermediate rinse solutions.

Methods

The sample collection for the pilot study was performed at the 72-hourly CVS-system-change of the antibiotic short infusions from July 13, 2012 to August 7, 2012 at participating intensive care units. The detailed sequence of sampling is summarized in Table 1.

The i.v. administration sets together with the infusion bottles containing antibiotics and rinse solution (0.9% NaCl) closed with seals were packaged individually and aseptically and transported to the laboratory in a cool bag (4 °C). Remaining fluid residuals were obtained aseptically from the inside lumen of i.v. administration sets inside a lamina-air-flow-bench.

To inactivate the antimicrobial activity of antibiotics residues, samples were neutralized with yolk (1 part

sample solutions – 9 parts yolk suspension) from hen eggs of bio-livestock without antibiotic feeding. Immediately before the usage, the yolk was taken with a sterile syringe suspension and mixed in the ratio of 1:1 with aqua dest. in a sterile tube. The effectiveness of the neutralization was validated in previous in-vitro dilution tests.

Approximately 15 minutes after adding the neutralizer, 0.1 mL of the solution was plated on blood agar and incubated for 48 hours at 36 ± 1 °C.

Results

Among 87 investigated samples no microbial growth was detected. One sample which hadn't any contact to antibiotics yielded 1 colony forming unit (cfu) of coagulase-negative staphylococci (CoNS).

Within 72 hours the exchanges of the bottles differed between 6 and 36, in average 18 exchange were performed (Table 1).

The results of our investigation suggest that i.v. administration sets which remain connected to infusion bottles (antibiotic short infusions and rinse solution) under a constant flow may be in place over duration of up to 72 hours without contamination. However for non-antibiotic flow we conclude that the i.v. administration set must be renewed at every change of an infusion bottle, because in the erroneously taken sample without any antibiotic-access 1 cfu CoNS was detected. CoNS can cause severe sepsis especially in neonates [3], [4], but they are also not harmless for adults [5], [6].

In order to interpret the results correctly it is important to note that the ICU staff who worked on the CVCs was not specifically instructed in the hygienic principles of changing an infusion bottle before the start of the pilot study. This should prevent the known effect of the training on the suppression of the central-line associated infections [7], [8], [9].

Conclusion

I.v. administration sets without any contact to antibiotics must be changed together with their infusion bottle after administration. In case of consecutive antibiotic-short- and rinse-infusions our pilot study suggests using the i.v.

Table 1: Frequency of infusion bottle exchanges within 72 h

Exchanges of infusion bottles (antibiotics and rinse solution) within 72 hours	Number of infusion sets within the running time			
	Interval of antibiotic administration			
	6-hourly	8-hourly	12-hourly	24-hourly
6				2
9				6
12			3	
18		37	18	
24	2			
27		14		
32		1		
36		4		

administration sets for up to 72 hours without renewing it at every infusion-set exchange.

However, to clarify this question into more detail, a larger consecutive study is required.

Notes

Competing interests

The study was sponsored by BBraun AG Melsungen, Germany.

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Please cite as

von Au F, Ryll S, Wegner C, Gessner S, Kramer A. Is routine replacement of i.v. administration sets required after each change of intermittently administered antibiotic infusions? GMS Hyg Infect Control. 2013;8(1):Doc08. DOI: 10.3205/dgkh000208, URN: urn:nbn:de:0183-dgkh0002088

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Published: 2013-04-29

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