

Endowashers: an overlooked risk for possible post-endoscopic infections

Endowasher: ein übersehenes Risiko für mögliche Infektionen nach endoskopischen Eingriffen

Abstract

Background: Prevention of post-endoscopy infections is an important objective to assure patient safety. Endowashers, or high throughput irrigation water pumps, are a frequently used device on endoscopes. Recommendations published by professional bodies and regulatory health agencies cover not only adequate reprocessing of fiber-endoscopes but also state accepted methods of regular microbial sampling. Although major instruments like endoscopes are covered by these recommendations, other devices used as optional add-ons for endoscopes are not included.

Objective: The aim of this prospective study was to investigate the potential for endowashers to act as a possible source of infection.

Method: 24 endowashers were sampled. Sterile rinse-water was pumped through the endowasher and tested microbiologically according to standardised tests.

Sampling was performed in 18 hospitals, including 2 university teaching hospitals, in northern Germany.

If endowashers were contaminated, devices were reprocessed and re-tested.

Results: Of 44 samples, 6 (14%) were contaminated with pathogens of up to >20,000 cfu/ml. *Pseudomonas aeruginosa* and other Gram-negative non-fermenters such as *Stenotrophomonas spp.* (18x) and *Acinetobacter spp.* (2x), followed by *Staphylococcus aureus* (1x), *Enterobacter cloacae* (1x), *Candida albicans* (1x), *Serratia spp.* (1x), *Streptococcus spp.* (1x) and others (2x).

Conclusion: Endowashers can be a potential source of infection. Despite their common use, they are not routinely sampled microbiologically. Endowashers should be clearly mentioned in respective guidelines and routine quality control sampling of endowashers should be part of such recommendations. If endowashers are not monitored regularly, devices with single-use hoses should be used.

Keywords: endowasher, post-endoscopic infection, endoscope, disinfection, reprocessing

Zusammenfassung

Hintergrund: Die Prävention von Infektionen nach endoskopischen Eingriffen ist Bestandteil der Gewährleistung der Patientensicherheit. Endowasher oder Hochdruckirrigationswasser-pumpen sind ein häufig benutztes Device in der Endoskopie. Empfehlungen von Fachgremien und Institutionen betreffen nicht nur die adäquate Aufbereitung von flexiblen Endoskopen, sondern auch die richtige mikrobiologische Probenahme. Obwohl die hauptsächlichen Instrumente wie Endoskope in den Empfehlungen berücksichtigt sind, trifft das nicht für Devices als optionaler Zusatz zu Endoskopen zu.

Zielsetzung: Mittels einer prospektiven Studie sollte das Risiko für Endowasher als mögliche Infektionsquelle untersucht werden.

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Methode: Zur Untersuchung der Endowasher (n=24) wurde steriles Wasser durch den Endowasher gepumpt und mikrobiologisch gemäß Standardmethode untersucht. Die Proben wurden in 18 Krankenhäusern einschließlich zwei Universitätsklinika in Nordostdeutschland entnommen.

Bei positivem bakteriologischem Befund wurden die Endowasher aufbereitet, erneut mikrobiologisch überprüft und erst bei negativem Befund erneut eingesetzt.

Ergebnisse: Von 44 Proben waren 6 (14%) mit Krankheitserregern in einer Menge von bis zu >20.000 KbE/ml kontaminiert. Es dominierten *Pseudomonas aeruginosa* und andere Gram-negative Non-Fermenter wie *Stenotrophomonas spp.* (18x), gefolgt von *Acinetobacter spp.* (2x), je 1x von *Staphylococcus aureus*, *Enterobacter cloacae*, *Candida albicans*, *Serratia spp.*, *Streptococcus spp.* und anderen (2x).

Schlussfolgerung: Endowasher können eine potentielle Infektionsquelle sein. Trotz ihres häufigen Einsatzes werden sie nicht routinemäßig mikrobiologisch überprüft. In Anbetracht der Befunde sollte die mikrobiologische Überprüfung von Endowashern in die einschlägigen Empfehlungen und Richtlinien aufgenommen werden. Falls Endowasher nicht in die reguläre Überwachung aufgenommen werden, sollten Einwegsysteme eingesetzt werden.

Schlüsselwörter: Endowasher, Kontamination, Infektionsprävention

Introduction

The prevention of post-endoscopy infections (PEI) is an important objective for assuring patient safety. Today, recommendations published by professional bodies and regulatory health agencies cover not only adequate reprocessing of fiber-endoscopes but also state accepted methods of regular microbial sampling in order to assure quality and patient safety. Although major instruments like endoscopes are covered by these recommendations, add-on devices used on endoscopes are often not surveyed microbiologically. A frequently device used on endoscopes are endowashers.

Endowashers are high performance irrigation pumps which flush large amounts of water through the endoscope in a short time. They were primarily introduced to improve vision during scoping and clean the bowel from residual faeces and the stomach from blood and mucus. In recent years, endowashers have become more and more popular as a useful tool and are nowadays used for a broad range of indications. However, the increasing use of endowashers could make them critical for nosocomial transmission or cross infection [1], but in nine recommendations published by professional societies and official bodies they are not specifically mentioned – including those by the APIC (Association for Professionals in Infection Control and Epidemiology, USA) [2], FDA (Food and Drug Administration, USA) [3], RKI (Robert Koch Institute, Germany) [4], [5], ESGE (European Society of Gastrointestinal Endoscopy) [6], [7], SHEA (Society for Healthcare Epidemiology of America) [8], BSG (British Society of Gastroenterology) [9], Austrian guidelines (Arbeitsgruppe Krankenhaushygiene Wien und Magistratsabteilung 15 der Stadt Wien) [10], SGNA Guidelines (Society

of Gastroenterology Nurses and Associates, USA) [11], and ASGE (American Society for Gastrointestinal Endoscopy, USA) [12].

The aim of this prospective study was to investigate the potential for endowashers to be a hidden and overlooked source of infection.

Material and methods

To assess the potential risk associated with the use of endowashers, 24 instruments in 18 hospitals, including two university teaching hospitals, in northern Germany were sampled microbiologically.

An endowasher (Endo-Technik, Solingen, Germany), essentially consists of a pump apparatus that transports water from a bottle reservoir through a tube to the endoscope. From a hygienic point of view, the reservoir, tubing, and apparatus can all be a source of contamination and hence, infection. Only the microbial control of the reservoir is covered by the recommendation from the RKI [4], [5]. We therefore assessed the contamination of pump and tubing by a method based on the recommendations of the German Society of Hygiene and Microbiology: 50 mL of sterile saline solution (0.9% NaCl) were pumped through the EW and tubing and thereafter microbiologically tested. Aliquots of 1 ml and 0.1 ml from the sampling fluid were spread on Columbia blood agar (with 5% sheep blood; Oxoid, Wedel, Germany). The remaining sample was filtered (membrane filter with pore size of 0.45 µm; Schleicher & Schüll, Dassel, Germany). Each filter was placed on a Columbia blood agar plate. All plates were incubated at 36±1 °C and visually evaluated after 24 and 48 hours. The grown colonies were differentiated morpho-

Table 1: Results of the first, second and third control

Sample	No microbial growth	Microbial growth	Total samples
Initial sample	5 (20.8%)	19 (79.2%)	24 (100%)
First control	9 (60%)	6 (40%)	15 (100%)
Second control	3 (60%)	2 (40%)	5 (100%)
Sum	17 (38.6%)	27 (61.4%)	44 (100%)

logically and biochemically (ATB-System, biomérieux, Nuertingen, Germany).

An initial sample was taken from all EWs. If the sample showed growth of micro-organisms, disinfection was attempted by changing all possible parts and pumping a chemical disinfectant through the EW following manufacturer's instructions. After rinsing the EW with sterile water to remove any residual disinfectant, a control sample was taken. If the result showed repeated growth, the procedure was repeated and the EW re-checked (second control). If this second control was still not acceptable, the EW was declared as non-disinfectable and disposed.

Results

Overall, 44 samples from 24 EWs in 18 hospitals were assessed. 19 of 24 EWs (79.1%) revealed growth of micro-organisms (Table 1). Only 5 out of 24 (20.8%) samples showed no growth after the initial sampling. 9/15 samples (60%) showed no growth after the first control, and 3/5 (60%) samples were acceptable after the third control only. In total, only 17/44 (38.6%) of all samples were acceptable. Detailed results are shown in Table 1. Of 44 samples, 27 (61.4%) were contaminated with pathogens up to >20,000 cfu/ml. *P. aeruginosa* and other Gram-negative non-fermenters such as *Stenotrophomonas spp.* (18x) and *Acinetobacter spp.* (2) were detected most often, followed by *S. aureus* (1x), *Enterobacter cloacae* (1x), *Candida albicans* (1), *Serratia spp.* (1), *Streptococcus spp.* (1) and others (2).

Discussion

This is the first study that investigates systematically samples and microbiologically assesses water from endowasher or high throughput irrigation flush pumps for endoscopy. About 79% of the samples showed heavy growth with micro-organisms of up to >20,000 cfu/ml. Although our results are based on a relatively small number of samples from 18 hospitals in northern Germany, we are confident that the results can be replicated in other institutions.

Endowashers have become a multi-purpose tool widely used in endoscopy. Regretfully, this development has been overlooked and almost neglected in infection control guidelines, as endowashers are still a "blank spot" in hygiene monitoring of endoscopic equipment. While endowashers are not specifically mentioned in various

guidelines and recommendations, the risk associated with contaminated water from endowashers could easily be assessed based on official recommendations by leading agencies and societies. According to APIC, RKI and SHEA, sterility is required for water to be used for endoscopic irrigation (category 1B recommendation by the RKI and SHEA). The ESGE and BSG state no particular recommendation on quality of water for irrigation, but water bottles are mentioned as a possible source for contamination and therefore should be autoclaved. There is no plausible reason why water originating from endowashers should not comply with the same standards as water for rinsing the optical lenses, which must be sterile. For endowashers therefore, the same standard should be required as for water from rinsing bottles.

The particular infection control emphasis of water for irrigation is based on a report on a severe septicaemia associated with contaminated EWs published by Helm et al. [1]. Septicaemia is clearly a severe complication in ERCP, associated with high morbidity and mortality. A frequently, but rare, cause of septicaemia after ERCP is perforation of the bowel [13], [14]. One of the common organisms in post-endoscopic septicaemia is *P. aeruginosa* [15], [16], an organism well known for its ability to form biofilms. These biofilms are a constant source of contamination and highly resistant to routine disinfection measures. When biofilms arise in the channels of an endowasher, water pumped through the endowasher will regularly be contaminated with micro-organisms harboured in the biofilm. Biofilm formation was also the reason for repeated positive cultures in some endowasher examined in our study. Previous reports [17] also indicate that in many cases a contaminated endoscope can be the source of infection. Based on our findings, in cases where the origin of an infection after endoscopy is not traceable, water from an EW or for irrigation may have been the source.

Conclusion

We conclude that the importance of endowashers as a source of infection is greatly underestimated in current infection control guidelines. Existing recommendations and guidelines should include endowashers as important devices to be microbiologically monitored and tested. As long as such a quality assurance program is not implemented we recommend testing endowashers for contam-

ination as an independent initiative to ensure the hygienic safety of patients undergoing endoscopy.

List of abbreviations

APIC – Association for Professionals in Infection Control and Epidemiology, USA
 ASGE – American Society for Gastrointestinal Endoscopy, USA
 BSG – British Society of Gastroenterology
 ERCP – Endoscopic Retrograde Cholangiopancreatography
 ESGE – European Society of Gastrointestinal Endoscopy
 EW – Endo-washer
 FDA – Food and Drug Administration, USA
 PEI – Post-Endoscopy Infections
 RKI – Robert Koch Institute, Germany
 SGNA – Society of Gastroenterology Nurses and Associates, USA
 SHEA – Society for Healthcare Epidemiology of America

Notes

Conflicts of interest

The authors have no financial or other conflict of interest to declare in relation to this manuscript and declare no financial or other relationships leading to a conflict of interest.

Dedication

During preparation of the manuscript, our dear friend and colleague Dr. Paul Kober passed away. We dedicate this study in remembrance to his work and his constant support for all matters related to infection control.

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