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Evaluation of a new disinfection procedure for ultrasound probes using ultraviolet light

G. Kac [a,*], M. Gueneret [a], A. Rodi [a], E. Abergel [b], C. Grataloup [c], N. Denarié [d], S. Peyrard [e], G. Chatellier [f,i], J. Emmerich [d,i], G. Meyer [g,i], I. Podglajen [h,i]

[a] *Unité d'Hygiène hospitalière, AP-HP, Hôpital Européen Georges Pompidou, Paris, France*
[b] *Service de Cardiologie, AP-HP, Hôpital Européen Georges Pompidou, Paris, France*
[c] *Service de Radiologie, AP-HP, Hôpital Européen Georges Pompidou, Paris, France*
[d] *Service de Médecine Vasculaire-HTA, AP-HP, Hôpital Européen Georges Pompidou, Paris, France*
[e] *Centre d'Investigations cliniques 9201 AP-HP/INSERM, Paris, France*
[f] *Centre d'Investigations épidémiologiques CIE4, AP-HP/INSERM, Paris, France*
[g] *Service de Pneumologie, AP-HP, Hôpital Européen Georges Pompidou, Paris, France*
[h] *Service de Microbiologie, AP-HP, Hôpital Européen Georges Pompidou, Paris, France*
[i] *Université Paris Descartes, Faculté de Médecine, Paris, France*

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Summary Following 183 ultrasound examinations, a randomized trial was conducted to compare three procedures for disinfection of probes under routine conditions: dry wiping with a soft, dry, non-sterile paper towel, antiseptic wiping with a towel impregnated with disinfectant spray and dry wiping followed by a 10 min ultraviolet C (UVC) cycle in a disinfection chamber. After ultrasonography, swabs were taken from transducer heads before and after cleaning and streaked onto plates that were then cultured. The number of colonies per plate was counted and organisms identified. The median microbial reduction was 100% for UVC, 98.4% for antiseptic wiping and 87.5% for dry wiping ($P < 0.001$). The percentage of negative specimens was 88% for UVC, 16% for antiseptic wiping and 4% for dry wiping ($P < 0.0001$). Microbial flora was isolated from 12 probes (6.6%) before cleaning, whereas specimens obtained after cleaning contained no pathogens except in one case after antiseptic wiping. UVC disinfection of ultrasound probe

* Corresponding author. Address: Hygiène hospitalière, Hôpital Européen Georges Pompidou, 20–40 rue Leblanc, 75908 Paris Cedex 15, France. Tel.: +33 1 56 09 29 73; fax: +33 1 56 09 39 19.
E-mail address: guillaume.kac@hop.egp.aphp.fr

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may provide a useful method for reducing the bacterial load under routine conditions.

Introduction

Ultrasound (US) procedures are commonly used in medical care for diagnostic purposes. US probes are reusable instruments, which can act as a reservoir for bacterial pathogens if not correctly cleaned after use. The prevalence of US probe contamination after contact with patients' skin during scanning has been found to be as high as 95% with frequent isolation of pathogens such as *Staphylococcus aureus*.[1–6] *S. aureus* may be transferred from a patient's skin to the probe during US procedures and may survive in the coupling gel.[7] Bacterial transmission can occur between patients via the use of unclean US instruments through direct contact with patients' skin or mucosa. Immunocompromised patients or those undergoing treatment using invasive devices, such as catheters, are particularly vulnerable to nosocomial infections with increased morbidity, mortality and healthcare costs.[8] Nosocomial outbreaks of infection originating from US probes and contaminated coupling gels have been reported.[9–11]

Several methods have been used for US probe disinfection, including single-paper and double-paper wiping and disinfection with alcohol or antiseptic solutions. Conflicting results have been obtained concerning the respective efficacy of these cleaning methods under routine conditions.[12–14] Thus, there is a need for alternative methods for US probe decontamination. The antibacterial efficacy of a newly developed decontamination chamber based on ultraviolet C technology (UVC), specifically designed for US probe cleaning has been evaluated in vitro and found to possess significant antibacterial activity. The aim of this study was to evaluate, under routine conditions, the antibacterial efficacy of the UVC procedure after wiping the probe with a dry towel compared with wiping with a dry towel alone and wiping with a towel impregnated with disinfectant.

Materials and methods

Setting

The study was a prospective, open, randomized trial with blinded evaluation of microbiological results. Informed consent of patients was not required because this study did not modify diagnostic or therapeutic strategies. It was conducted in three rooms with US equipment: one room in a cardiology ward, one in a general radiology ward and one in a vascular medicine ward over a 15-week period (November 2004 through March 2005).

Cleaning procedures of ultrasound probes

The antibacterial efficacy of three cleaning procedures of US probes were compared immediately after scanning of the patients: (1) dry wiping the probe to dryness with a soft non-sterile paper towel; (2) antiseptic wiping the probe to dryness with a towel impregnated with disinfectant spray containing didecyldimethylammonium chloride, polyhexamethylene biguanide, glycolic acid and 29% (v/v) ethanol (Aniospray 29, Anios, Lille-Hellemmes, France); and (3) UVC decontamination consisting of wiping the probe to dryness with a soft non-sterile paper towel followed by a 10 min UVC cycle in the decontamination chamber AntiGermix (TSR-Varay-Laborix, France). This is a closed chamber that contains a bracket from which three probes can be hung. The active part of the probes is exposed to direct rays from five tubes emitting UVC light (wavelength: 254 nm) fixed to the walls and the bottom of the chamber. One disinfection cycle lasts 10 min.

Study protocol

The three cleaning procedures were tested after trans-thoracic ultrasonography in the cardiology ward, abdominopelvic ultrasonography in the radiology ward and duplex ultrasonography of legs and cervical arteries in the vascular medicine ward. Ultrasonography was performed without prior skin disinfection according to routine practice.

An individual patient randomization scheme was not possible for practical reasons. Therefore a quasi randomization scheme was used where the consultation shift was used as the unit of randomization. Periods were randomized into the three groups using computer-generated numbers. Randomization was stratified by ward and used