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RESEARCH ARTICLE

BACTERIAL CONTAMINATION OF PROBES AND ULTRASOUND DEVICES IN THE CITY OF SAINT-LOUIS, SENEGAL

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ABSTRACT

Ultrasonography is an imaging modality which uses ultrasounds generated by a probe placed on the skin or in a natural cavity. The objective of this work is to assess the prevalence of microbial contamination of ultrasonography devices in Saint-Louis. The ultrasonography facilities of public health structures have been sampled. Thus for the gel, the probes and their storage, some scovels have been used then soaked in a broth of culture and incubated at 37°C. Concerning the environment two cans of Muller Hinton agar-agar have been exposed in each ultrasonography room during one hour before being incubated. Five health institutions have been gathered. One notices: Out of twelve superficial probes examined, two are infected with *Staphylococcus saprophyticus*. No endocavity probe was contaminated. Two out of seventh storages of probes were contaminated with *Citrobacter spp*. Two out of seventh bottles of gel in current use were contaminated with *Staphylococcus saprophyticus* and *Enterobacter spp*, two keyboards and screens were contaminated with stumps of *Enterobacter spp* among which one BLSE and *Pseudomonas spp*, two out of 14 cans of agar were contaminated. Some bleach for the disinfection of echographs and hydro- alcoholic gel for hand antisepsis were available in all the sites.

INTRODUCTION

Ultrasonography is a medical imaging modality which uses ultrasounds generated by a probe placed on the skin or in a natural cavity depending on the organs to examine. It is a common examination which can be a source of cross contamination between two patients if the conditions of hygiene are defective. Yet, as far as their configuration is concerned ultrasonography devices are difficult to maintain. Moreover, the endo-cavity probes deserve a special attention, they could be a potential source of contamination with element such as *Papilloma* virus, *herpes* virus, B and C *hepatitis* viruses or *HIV* (Berdin, 2012), (Casalegno *et al*., 2012). In our context of practice, the periodical microbiological control of ultrasonography equipments is not usual. The objective of this study is to assess the scope of the bacterial contamination of probes and other devices used for ultrasonography to improve the prevention of nosocomial infections.

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MATERIAL AND METHOD

The tools of ultrasonography in public health facilities in the city of Saint-Louis, Senegal were examined to detect the presence of bacteria. In each institution, we conducted swabs on the equipments (probes, probe storages, screens, keyboards and gels.) as well as on the environment of the rooms of exploration. The samples were taken in each room before the start of the examinations of the day on some facilities which are ready to use. About the gel, the probes and their storage, some scovels have been used then soaked in a broth of culture and incubated at 37°C. As far as the environnement is concerned two (02) cans of Muller Hinton agar-agar were placed in each ultrasonography room during one (01) hour before being incubated. The culture and the identification were made according to the process adopted by the laboratory for the study of morphological characters, cultural and biochemical. The antibiogram was performed on bacteria considered as pathogenic in accordance with the recommendations of the Committee of Antibiogram of the French Society for Microbiology (Bonnet *et al*., 2010).

All in all 05 health facilities were collected in the city of Saint-Louis with 07 devices. We have noted a multidisciplinary practice of ultrasonography including gyneaco-obstetrics in all the structures. We have observed:

- 07 abdominopelvic convex probes including 02 infected with *Staphylococcus saprophyticus*
- 05 superficial linear probes among which 00 contaminated
- 03 endo -vaginal probes including 00 contaminated
- 05 vertical storages including 00 contaminated
- 02 horizontal storages among which 01 contaminated with the presence of *Citrobacter spp*
- 07 bottles of gel which were in current use including 02 contaminated by the presence of *Staphylococcus saprophyticus* and *Enterobacter spp*,
- 07 screens + keyboards sampled including 03 contaminated with stumps *Enterobacter spp* among which one beta-lactamase with extended spectrum (BLSE) and *Pseudomonas spp*,
- 14 cans of agar-agar analyzed from 07 rooms with the presence of *Staphylococcus saprophyticus* and *Escherichia coli* BLSE in 02 different rooms,
- Some bleach for the disinfection of ultrasounds and hydro-alcoholic gel for hand antisepsis on all the sites.

DISCUSSION

Ultrasound machines are sophisticated equipments, fragile, difficult to maintain and potential source of cross-contamination between patients; hence the interest to respect the rules of hygiene inherent in the practice of ultrasonography. The probability of cross-infection further to an ultrasonography creates much controversy in developed countries such as France. For this purpose, probes are the most offending devices On the basis of the guidelines of disinfection of medical devices, **(**Rutala and Weber, 2008), (Direction générale de la santé, France, 2011).

Those probes are classifiable

- By semi-critical devices, meaning which are in contact with some mucous membranes or a superficially injured skin; that is the case for the endo-vaginal ultrasonography probes. They should be free from micro-organisms; however a small number of bacterial spores should be tolerable.
- And by noncritical devices, meaning which enter in contact with the intact skin, but not the mucous membranes, it is the case of abdominal probes and superficial tissues. In these cases a low level disinfection would be sufficient to avoid a cross-contamination.
- In case of preoperative ultrasonography, the probes are critical devices with a high risk of infection if they are contaminated whathever the micro-organism; in this case the probe must be sterile.

The use of a protective sheath on a disinfected probe improves the prevention of nosocomial infections which may result from an ultrasonography act (Haut Conseil de la santé publique, France, 2007). In our study the only available protective sheaths were condoms for endo-vaginal and endo- rectal ultrasonography. Furthermore, no endocavity probe was contaminated unlike abdominal probes for which two (02) out of seven (07) were contaminated with *Staphylococcus saprophiticus*. The bacteria isolated are potentially pathogenic, and the presence of stumps secreting beta-lactamase with extensive spectrum creates more fears of cross transmission. The absence of protective sheaths in our context of practice for transcutaneous explorations is incompatible with certain acts of common practices such as ultrasound-guided biopsies, skin examinations involving injuries or other wounds. Such practices are a real risk of cross contamination. The disinfectants we found were Sodium Hypochlorite for ultrasound machines and probes, some hydro-alcoholic gel for practitioners' hands. Indeed, Sodium Hypochlorite is a broad spectrum disinfectant with bactericidal, virucidal and fungicidal action (Duriat *et al*., 1997). However, it is always worth checking the compatibility of disinfectant solutions with the material since some products may damage the probes. The cleaning of the entire devices with wet wipe disinfectant including the support of the probe should be performed once daily. (Société Française de Radiologie *et al*., 2009) .Still this disinfection is optimal only when a good cleaning precedes the treatment and that appropriate guidelines are followed regarding concentration, contact time, temperature and pH for these products. The presence of stumps of *Enterobacter spp* among which BLSE and *Pseudomonas spp* on the screens and keyboards of three (03) out of seven (07) devices raises questions about the mastering of gestures and techniques of good hygiene practice. The storage of horizontal probes are favorable sites for hosting germs; thus one (01) out of two (02) storage had *Citrobacters spp*. For this purpose the vertical storages are to be preferred; the recommendation drawn from similar studies are clearly in favor of those.

(Guerras and Rudigoz –Lyon, 2014) In a context of practice with limited resources, the bottles of gel in current use since they are not thrown at the end of the day constitute a real source of contamination. Indeed, out of seven (07) bottles in use, two (02) had *Enterobacters spp Staphylococcus saprophyticus*. The choice of the bottles should be focus on the smallest packaging which is adapted to the situation with unexpired gel and it is absolutely necessary to throw every bottle started at the end of the day, even if it has not been fully used. Individual packagings (single dose) and sterile are suitable in the presence of recent surgical scar, skin wound or puncture and/or biopsy, as well as in case of an endocavity examination. France, Ministère de la Santé. Direction Générale de la Santé (1996) Moreover, a study reported the contamination of six (06) women and two (02) newborn babies in a hospital. They were contaminated with a stump of *Klebsiella pneumoniae* secreting beta-lactamase with extended-spectrum whose source was the ultrasonography gel (Gaillot *et al*., 1998). Finally the control of the environment is necessary in the fight against nosocomial infections in two (02) out of fourteen (14) cans of Muller Hinton agar-agar we have found *Staphylococcus saprophyticus* and *Escherichia coli* BLSE.

Conclusion

This work reveals the need to improve the conditions of hygiene in the use of ultrasonography in the city of Saint-

Louis Senegal. It is an experience to repeat in the ultrasonography centers in sub-Saharan Africa where the conditions of practice are almost identical. Indeed, in the fight against nosocomial infections systematic microbiological sampling at regular intervals on ultrasonography machines are useful. Nevertheless the training of practitioners on the gestures and techniques that can avoid the contamination of the equipment of exploration is necessary.

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