

USE OF DOMESTIC DRILLING MACHINES IN ORTHOPEDIC SURGERIES

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SUMMARY

Domestic ordinary drilling machines have been used in orthopedic surgeries in Brazilian hospitals, for bone drilling. However, it is an electric thermo-sensitive appliance, non-specific for surgical use, not assessed in terms of sterilization efficiency, as well as on potential surgical infections associated to its use. The objective of this review was to describe the state-of-the-art use of domestic drills in orthopaedic surgeries, considering the difficulties of cleaning and sterilization. The LILACS and MEDLINE databases were consulted using MeSH and free medical terms, without time restraints. Two specific articles were found about the use of domestic electric drills in orthopaedic

surgeries. In the first article, the author suggests the disposal of the equipment in cases of any noticeable blood contamination that could result in difficulties to clean it. The second article describes how to adapt a domestic drilling machine for orthopaedic surgery, but the sterilization process is performed by using formalin tablets at room conditions. Further studies are required for evaluating the current practice and to recommend safe conditions for its use or towards giving it up.

Keywords: *Sterilization; Orthopaedics; Orthopaedic equipment.*

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INTRODUCTION

The tools, materials and equipment used in a surgical procedure, i.e., those that make contact with a sterile body tissue, must be microorganisms-free, and therefore submitted to sterilization process. This is an important measure against postoperative infection occurrences^(1,2).

A cleaning procedure removes debris and reduces the microbial load, and it's the first step to assure a quality sterilization process^(3,4). Two studies addressed microbial load on materials used in sterile body sites, with and without lumen, and found a small microbial load. Yet the authors highlight the importance of cleaning procedures for reducing microbial load, residual protein and salts that might interfere on materials' sterilization process^(5,6). Alfa et al. verified that interference in several low-temperature sterilization methods⁽⁷⁾.

The selection of a sterilization method depends on physical features of the article to be submitted to the process, which can be heat-resistant or heat-sensitive. Ethylene oxide is the oldest low-temperature sterilization method and has been employed since the 1950's for heat-sensitive medical/hospital materials^(8,9).

Surgical Site Infection

Surgical site infection is the third most common hospital infection in the United States, accounting for 14-16% of the total number of hospital infections. Several factors contribute to a patient's risk of evolving to infection postoperatively, including

surgical instruments' sterilization⁽¹⁰⁾. Infections in orthopaedic surgeries may be serious, and osteomyelitis is regarded as the most serious complication in surgical orthopaedics and traumatology⁽¹¹⁾. The incidence of infection following knee total arthroplasty is a Brazilian university hospital remains around 3%⁽¹²⁾.

Orthopaedic surgeries and use of domestic drilling machines

Electric or pneumatic drillers are necessary in orthopaedic surgeries requiring bone drilling, such as for screws, steel wires, and internal or external fixators insertion. Special medical/ surgical-use drills are fully dismountable and autoclavable, allowing for an appropriate internal and external parts cleaning after use and sterilization assurance.

For over 50 years, domestic drilling machines have been used in orthopaedic surgeries in Brazilian hospitals for performing bone drilling, raising concerns among professionals acting in hospital-related infection control or, more specifically, in the area of materials sterilization, because those are electric thermo-sensitive equipment, not intended for surgical use, and not checked for potential damages to bone tissues or for sterilization effectiveness. This practice is certainly justified by financial reasons.

The objective of this review was to describe the state-of-the-art research on the use of domestic drilling machines in orthopaedic surgeries, considering the issues related to cleaning and sterilization of this kind of equipment.

Study developed by the department of Post-graduation in Adult Health Nursing, Nursing School, University of São Paulo.

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METHODS

The search on electronic databases MEDLINE and LILACS was performed by imposing no time limitations, on BIREME and U.S. National Library of medicine portals, using controlled keywords (Medical Subject Headings - MeSH) and free keywords in Portuguese and English, and the AND Boolean operator for specificity, the controlled ones being as follows: esterilização/sterilization; cirurgia ortopédica/orthopedics; orthopedic procedures; equipamento ortopédico/orthopedic equipment; infecção da ferida operatória/surgical wound infection; osteomielite/osteomyelitis, and the free terms: drilling machine; drill; drilling; orthopedic drilling.

RESULTS

The results of the search on BIREME portal totaled 29 publications on MEDLINE database; 9 of these referent to 1993-2004 period, and 20 to 1966-1992 period. We found no results on LILACS database. The search on MEDLINE database of the U.S. National Library of Medicine using controlled keywords combined with free terms resulted into 12 articles for Orthopedic Equipment [MeSH] AND drilling machine; 10 articles for Orthopedic Procedures [MeSH] AND drilling machine; 5 articles for Sterilization [MeSH] and drilling and 86 articles for orthopedic drilling. When combined, the free and controlled keywords: Orthopedic Equipment [MeSH] AND Sterilization [MeSH] AND drilling machine, resulted in no article being found.

All summaries of the publications found were read and analyzed; nevertheless, only 2 articles were regarded as relevant to the objectives of this study, because they addressed the use of domestic drilling machines in orthopaedic surgeries. The other articles, which were excluded, did not address cleaning and sterilization of drilling machines used in orthopaedic procedures. Of the two articles relevant to this study, one original article published on an English journal in the late 1980's⁽¹³⁾, was found by searching for (1) Orthopedic Equipment [MeSH] AND drilling machine and (2) orthopedic drilling. The other article – a letter to the editor, published on an African journal in the beginning of 2002⁽¹⁴⁾ – was found when searching for Orthopedic Equipment [MeSH] AND Sterilization [MeSH]. The first article addresses the use of a Makita® in orthopaedic surgeries and the second one describes how to adapt a domestic drilling machine to be used in orthopaedic procedures^(13,14).

DISCUSSION

The article discussing the use of a Makita® electric drill for orthopaedic surgeries was published in 1988, 18 years ago⁽¹³⁾. The authors recognize that cleaning may be an issue if the engine is contaminated with organic matter, and if it indeed occurs, they suggest discarding the equipment. It's clear that

by manipulating this kind of equipment, the external surface of the drilling machine is contaminated with blood, while its inner parts can get contaminated through the engine vents, and will not be detected by visual inspection, thus making the suggestion of discarding the equipment unfeasible. Another limitation of the study is related to the method for sterilization efficacy assessment by collecting material for swab microbiological studies; despite the negative result, this method considerably reduces the potential of microorganisms recovery.

The adaptation of a domestic drilling machine for use in orthopaedic surgeries, as presented in a letter to the editor by Musa in 2002, describes the method employed in a university hospital in Sokoto, Nigeria⁽¹⁴⁾. We can notice this author's concerns with equipment sterilization; however, he describes the adopted sterilization method employing formalin tablets, in non-validated conditions, placed next to the drilling machine in a closed container for 48 hours. This method, according to our references, constitute only a high-level disinfection method, but not a sterilization method⁽¹⁵⁾.

We understand that cleaning domestic drilling machines used in orthopaedic surgeries constitutes a major challenge for professionals, because they cannot be sunk into detergent solutions due to their engine vents, which would warrant damages as a result of water entering into the engine. Usually, the external cleaning is performed by using a wet clothe, but the potential presence of blood in inner parts could interfere on sterilization. Thus, when an electric drill is turned in at the OR, there will be a potential risk of generating contaminated aerosols and the potential for surgical field contamination.

The use of domestic drilling machines in orthopaedic surgeries in Brazilian hospitals is clearly inappropriate, in view of the existence of specially-designed equipment to that purpose. This practice in hospitals probably occurs due to the high cost of specific equipment and to the lack of studies assessing the risks of using them.

CONSIDERATIONS

Although the use of electric drills in orthopaedic surgical practice in Brazilian hospitals is common, there are no studies assessing the risks of using them in orthopaedic procedures, nor proven sterilization of these machines, once internal contamination by blood may occur.

Further investigations are warranted to confirm that external cleaning alone is not enough for a drilling machine, that no organic debris are left in the inner part of the equipment incurring in the risk of spreading contaminated aerosols when the engine is turned in at the surgical field, as well as the effectiveness of the low-temperature sterilization process. Further investigations must be conducted in order to support an old practice or to recommend for its dropout.

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