INFLUENCIA DEL LAVADO QUIRÚRGICO DE MANOS EN EL USO DE ANILLOS. ESTUDIO CONTROLADO ALEATORIZADO

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INTRODUCTION

According to the *Centers for Disease Control and Prevention (CDC) of the U.S. Department of Health*, the definition of "surgical wound infection" has been included within a broader concept, "surgical site infection" (SSI). According to *NNIS (National Nosocomial Infection Surveillance System)* reports, SSIs are the third most frequent cause of nosocomial infection reported, accounting for 14-16% of all nosocomial infections among hospitalized patients and 38% of surgical patients, resulting in a significant increase in morbidity, mortality, healthcare costs and hospital stay. In Spain, the prevalence of SSI is between 5% and 10%, this figure varying according to the type of surgery, the definition of SSI taken into account and the nosocomial infection surveillance system established in each hospital.

In Orthoapedic Surgery, *Staphylococcus* is the most common microorganism causing surgical infection, although *gram-negative bacilli*, *CoNS*, *Enterococcus* species and *Escherichia coli* are also regularly isolated.

It is widely recognized that approximately 80% of hospital infections are attributable to a lack of proper hand hygiene, which has led this practice to become one of the most effective preventive measures, widely studied and promoted globally. Innovative campaigns have been implemented and there is constant surveillance of possible risk factors that could compromise its effectiveness.

As a hypothesis of the present work, we propose that exposing the ring to frequent washing with antiseptic substances, as part of the wearer's usual routine, may reduce the bacterial contamination of the ring to a level similar to that of the surrounding skin. Consequently, the ring should not be a factor that increases the presence of pathogenic microorganisms in the wearer's hand.

OBJECTIVES

MAIN OBJECTIVE: To analyse the influence of regular ring use on increased bacterial colonization of the hand.

SECONDARY OBJECTIVE: To study the influence of routine surgical scrubbing on reduced bacterial colonization of the hand, with and without ring wearing.

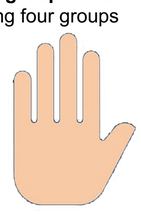
MATERIAL AND METHODS

This was a prospective in vitro experimental study. Participants comprised 4 groups of 8 healthy volunteer participants each who did not meet any of the exclusion criteria:

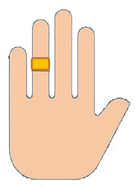
Inclusion criteria: Students of Medicine and Nursing.

Exclusion criteria: Dermatological diseases affecting the hands, habitual use of rings in the month prior to the study, active infection in any part of the body, taking antibiotics during the study, manicure (painted or artificial nails) during or in the month prior to the study, unhealed wounds on the hands, surgical activity with real patients during the study period. Allergy to antiseptics used during the study, regular and frequent contact with potentially contaminated material: livestock, aquariums, gardening, etc. (occasional contact was not considered an exclusion criteria).

Study groups. Participants were randomly assigned to one of the following four groups



Group A: Bare hands (control group)



Group B: Hands with a ring.

Group C: Bare hands with frequent surgical scrubbing in alternate days with chlorhexidine impregnated surgical brush

Group D: Hands with ring with surgical scrubbing in alternate days with chlorhexidine impregnated surgical brush

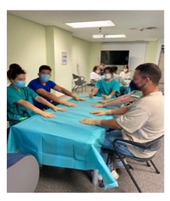
Sampling. Initial sampling T0. All participants underwent a baseline culture of the dominant hand. It was established that hands could not be washed in the 2 hours prior to sample collection.

Introduction of PBS into the sterile glove at initial sampling.

The moment when the participant's hand is rubbed during the initial sampling.

Final sampling T1 – Mock surgery. At 14 days, all participants performed a surgical hand wash with a chlorhexidine gluconate brush for approximately five minutes following a standard hand washing technique.

Scrubbing train where participants perform surgical scrubbing in the final sample collection.



Participants in the sterile field. Mock surgery of 90 minutes.

This duration was established as an average time for a surgical intervention of medium lenght, and as in surgeries of much longer duration there is usually a change of gloves after this period.

Analysed variables. Quantitative analysis of the samples: defined as number of colony-forming units (CFU/mL). Qualitative analysis of the samples: defining the types of microorganisms insolated in each sample.

Microbiology. Each T0 and T1 sample of glove juice was manually seeded following a quantitative technique, using calibrated loops of 10 µL. The culture media used were Blood Agar, MacConkey Agar, Sabouraud Agar and, in the final sampling (T1), for participants with rings, BHI liquid enrichment medium was also used. A mass spectrometry technique (MALDI-TOF-Bruker) was used to identify the microorganisms.

RESULTS

The four groups were comparable.

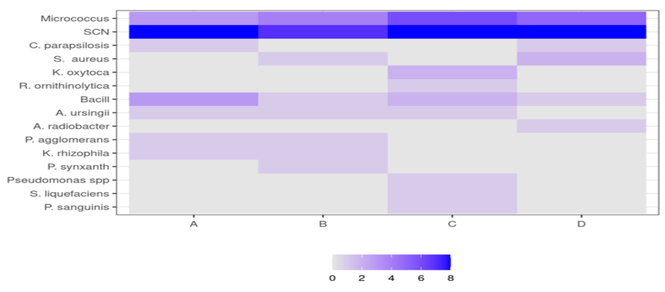


Figure 1. Qualitative composition T0

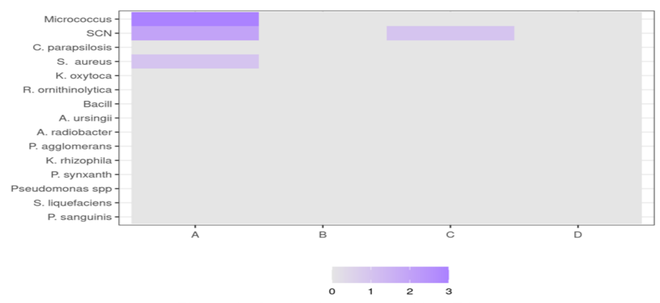


Figure 2. Qualitative composition T1

1. Comparison of bacterial colonization in ring users and barehand participants.

Without regular surgical scrubbing (group A vs group B)

Variable	Total *n =16	Group		P-value
		A n =8	B n =8	
Initial CFU/mL	80000 (50000; 100000)	85000 (72500; 100000)	80000 (47500; 100000)	**0.7034**

Table 1. Comparison group A vs. group B in initial culture count T0

Variable	Total n =16	Group		P-value
		A n =8	B n =8	
Final CFU/mL				**0.0769**
0	12 (75.0%)	4 (50.0%)	8 (100.0%)	
>=100	4 (25.0%)	4 (50.0%)		

Table 2. Comparison group A vs. group B in final culture count T1

With regular surgical scrubbing (group C vs group D)

Variable	Total n =16	Group		P-value
		C n =8	D n =8	
Initial CFU/mL	64375.00 ± 26575.36	52500.00 ± 23754.70	76250.00 ± 25035.69	0.0720

Table 3. Comparison group C vs. group D in initial culture count T0

Variable	Total n=16	Group		P-value
		C n =8	D n =8	
Final CFU/mL				1.0000
0	15 (93.8%)	7 (87.5%)	8 (100.0%)	
>=100	1 (6.2%)	1 (12.5%)		

Table 4. Comparison group C vs. group D in final culture count T1

2. Comparison of bacterial colonization of hands in groups with and without regular surgical scrubbing (Group AB vs Group CD)

Variable	Total n =32	Group ABxCD		P-value
		AB n =16	CD n =16	
Initial CFU/mL	80000 (50000; 100000)	80000 (50000; 100000)	60000 (52500; 82500)	**0.3007**

Table 5. Comparison of groups AB vs groups CD in the initial culture count T0.

ABSTRACT

Background: Healthcare-associated infections (HAI) are among the most frequent medical complications in the hospital environment. Eighty percent of them are mainly triggered by poor hand hygiene, making it one of the most effective preventive measures. However, there is controversy about the influence of ring wearing as a risk factor for surgical site infections.
Objectives: To test whether the daily use of the engagement ring, kept in situ during routine hand hygiene and preoperative hand scrub, increases the presence of bacteria on the surgeon's hand, and thus, the risk of surgical site infection.

Material and methods: This is a prospective in vitro experimental study, consisting of four groups of eight healthy volunteers, who wore rings or not and performed routine hand hygiene or surgical scrubbing depending on the group to which they belonged, and who did not meet any exclusion criteria. Two samples for microbiological culture were collected from the dominant hand: an initial and a final sample after 14 days, after a mock surgery which was performed under sterile conditions for 90 minutes. In the period between the two samples, the participants carried out their usual activities and the hand hygiene guidelines that corresponded to their group. Both quantitative data (number of CFU) and qualitative data (types of microorganisms) were collected as study variables.

Results: Of the ring carriers, all cultures were negative. There was no statistically significant difference between groups A vs B (regular hand hygiene and non-ring wearer (A) or ring wearer (B)) and C vs D (regular surgical scrub and non-ring wearer (C) or ring wearer (D)) with p=0.0769 and p=1.000 respectively. In the correspondingly comparison of AB (group with no regular surgical scrubbing) vs CD (regular surgical scrubbing), 4 volunteers (25.0%) from AB had positive cultures, while from CD, only 1 (6.2%) had growths (p=0.3326).

Conclusions: The results obtained support the hypothesis that the rings, kept during rutinary hand hygiene, are not a major source of bacterial colonization and therefore their removal during surgical procedures is not necessary. Frequent surgical scrubbing may be a factor for reduced hand bacterial colonization.

KEY WORDS: Rings, surgical scrubbing, bacterial colonization, surgical infection.

Variable	Total n =32	Group ABxCD		P-value
		AB n =16	CD n =16	
Psyclobacter sanguinis	1 (3.1%)	0 (0.0%)	1 (6.2%)	1.0000
Serratia liquefaciens	1 (3.1%)	0 (0.0%)	1 (6.2%)	1.0000
Pseudomonas spp	1 (3.1%)	0 (0.0%)	1 (6.2%)	1.0000
Pseudomonas synxantha	1 (3.1%)	1 (6.2%)	0 (0.0%)	1.0000
Kocuria rhizophila	2 (6.2%)	2 (12.5%)	0 (0.0%)	0.4839
Pantoea agglomerans	2 (6.2%)	2 (12.5%)	0 (0.0%)	0.4839
Agrobacterium radiobacter	1 (3.1%)	0 (0.0%)	1 (6.2%)	1.0000
Acinetobacter ursingii	3 (9.4%)	2 (12.5%)	1 (6.2%)	1.0000
Bacillus sp.	7 (21.9%)	4 (25.0%)	3 (18.8%)	1.0000
Raoultella ornithinolytica	1 (3.1%)	0 (0.0%)	1 (6.2%)	1.0000
Klebsiella oxytoca	2 (6.2%)	0 (0.0%)	2 (12.5%)	0.4839
Staphylococcus aureus	3 (9.4%)	1 (6.2%)	2 (12.5%)	1.0000
Candida parapsilosis	2 (6.2%)	1 (6.2%)	1 (6.2%)	1.0000
Staphylococcus coagulasa-negativo (SCN)	31 (96.9%)	15 (93.8%)	16 (100.0%)	1.0000
Micrococcus sp.	18 (56.2%)	7 (43.8%)	11 (68.8%)	0.1540

Table 6. Comparison of microorganisms found in group AB vs group CD in the initial sample at T0.

Variable	Total N =32	Group ABxCD		P-value
		AB N =16	CD N =16	
Staphylococcus aureus	1 (3.1%)	1 (6.2%)	0 (0.0%)	1.0000
Staphylococcus coagulasa-negativo (SCN)	3 (9.4%)	2 (12.5%)	1 (6.2%)	1.0000
Micrococcus	3 (9.4%)	3 (18.8%)	0 (0.0%)	0.2258

Table 7. Comparison of microorganisms found in group AB vs group CD in the final sample at T1.

Variable	Total n =32	Group ABxCD		P-value
		AB n =16	CD n =16	
Final CFU/mL				**0.3326**
0	27 (84.4%)	12 (75.0%)	15 (93.8%)	
>=100	5 (15.6%)	4 (25.0%)	1 (6.2%)	

Table 8. Comparison of groups AB vs groups CD in the final culture count T1.

CONCLUSIONS

- ✓ There has been no clear evidence to determine whether the use of the wedding ring increases the presence of bacterial microorganisms on the surgeon's hand, as there is contradictory and inconclusive literature.
- ✓ In the present study all cultures from ring wearers were negative. The most important finding of this work is that it does not appear that regular use of the ring increases the bacterial load of the hand.
- ✓ Regular surgical scrubbing with chlorhexidine impregnated sponges seems to decrease bacterial contamination of hands, even in the presence of engagement rings.

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