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Executive Summary

Surgical Glove Changes for Improved Safety

Introduction

Mölnlycke recognizes and supports the balance between translating clinical evidence and implementing evidenced-based guidelines into practice. Changing surgical gloves is not new to current guidelines, however a new paradigm of safety is now a necessity for appropriate surgical glove changing practices.

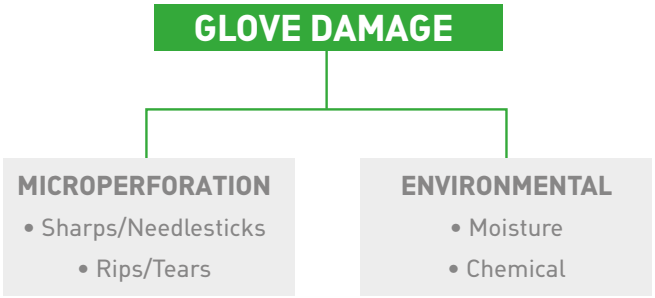
What happens if surgical gloves are damaged during surgery?

- The surgical glove barrier breaks down
- Pathogens and bioburden are transferred from clinician to patient and vice versa
- The patient is at risk for increased infection
- The clinician is at risk for bloodborne pathogen exposure

As new clinical studies continue to be published, it is important to assess and then implement new recommended guidelines for changing surgical gloves.

Glove Damage

Micro-perforations: Surgical glove barrier effectiveness is dependent on the integrity of manufacturing and the glove material. Micro-perforations are considered extremely small but can still allow transmission of bacteria to the surgical wound. Micro-perforations include rips, tears, needlestick and sharps breaches to the surgical gloves.



Environmental Contamination: Exposure to moisture can reduce the integrity of surgical gloves. Moisture can be found in the atmosphere and should also be considered when wearers experience sweaty hands while the gloves are being worn. Environmental contamination includes moisture deterioration as well as chemical deterioration that can occur when gloves come in contact with certain chemicals such as methyl-methacrylate(bone cement), cytotoxic chemicals, or many others.

It is understood that clinicians are aware of cause for surgical glove perforations when referring to physical stresses such as pulling and stretching. However, clinicians are often unsure when surgical gloves should be changed during surgery. In study by Partecke (2009),[1] wearing gloves for less than 90 minutes resulted in fewer micro-perforations. Since Partecke's study, experts have continued to build on when and how to change surgical gloves.[1]

In a study by Kobayashi (2020) the study concluded that glove perforations were present in all types of surgery. However, the study uncovered more than microperforations. During surgery, gloves are exposed to a wide range of chemical and physical stresses-pulling, stretching to name a few. But surgical gloves are also affected by sweat from the surgical staff, patient fluids and fat that influence the integrity of the gloves. In this study, most glove damage to the inner gloves were actually different from the outer gloves. Kobayaski listed that causes could be either Acceptable Quality Limits (AQL), irritation from sweat, or even the friction between gloves.[2]

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Glove Change Recommendations by Specialty

Now is the time for asking yet another question concerning surgical gloves - Is single gloving still acceptable in todays surgical landscape?

Service line specialty groups continue to focus on appropriate times to change their gloves during surgery. Mishcke, et al. when reporting within the Cochrane Database of Systematic Reviews (2014)[10], went even further with this statement *"The preventive effect of double gloves on percutaneous exposure incidents in surgery does not need further research"*.

Appropriate Glove Use = Patient and Clinician Safety

In a study by Enz (2021)[3], glove damage occurred in multiple areas of the glove based on the surgical specialty.

Enz goes on to discuss within his study that it was determined[3]:

- Thickness of gloves has direct influence on perforation rate.
- Given the rate of lesions detected in this study, double gloving should be strongly considered.
- Literature states there is an advantage in the use of indicator gloves.
- Rate of glove damage in soft tissue (minimally invasive) procedures are high.
- Special glove algorithms should be developed and applied into policy.

ORTHOPEDICS[4,5]

- After draping
- 60-90 mins
- Obvious perforation
- Before implant
- Bone cement

OPEN ABDOMINAL & MIXED SPECIALTIES[2]

- 60-90 mins
- Obvious perforation
- After bowel handling
- Support instrument change

CARDIAC

- ~~Double glove~~
- Obvious perforation
- ~~Certain stages of procedure~~
- ~~Handling implants~~
- ~~Vascular prostheses~~

OB-GYN[6]

- After delivery of fetus
- Before peritoneum and/or fascial closure
- Instrument & glove change prior to closure (GYN/ONC)
- No impact on post op endometritis

COLORECTAL/TUMOR[7]

- After bowel handling
- Pre-closure glove changes
- During cancer resection
- Instrument change

NEUROSURGERY/SPINE[8]

- Prior to introducing shunt material (Peds NS)
- ~~Possible single use instrumentation~~
- Immediately before implant handling

AORN Recommended Guidelines: Sterile Technique-Changing Surgical Gloves 2.5

Sterile Technique 2.5

Inspect all gloves:

- Change sterile gloves worn during invasive procedures
- Change outer gloves
- Change sterile gloves during procedures

Sterile Technique 2.5.1

Change sterile gloves worn during invasive procedures:

- After each patient procedure
- Every 90-150 minutes
- When a visible or suspected perforation occurs
- Immediately after contact with methacrylate
- Touching optic eye pieces, fluoroscopy machine, helmet or visor
- When actual or suspected contamination occurs

Sterile Technique 2.5.2

Change sterile gloves worn during invasive procedures:

- May be changed after draping is complete
- After handling heavy, coarse or sharp instruments
- After manipulation rough edges of bone
- Before handling implants

Sterile Technique 2.5.3

Change outer gloves:

- When a perforation occurs
- Using clinical judgement, determine if the inner glove should be changed
- It has been identified that almost 50% of outer glove perforations also involved inner glove perforations
- Perform visible inspections of the inner glove once the outer glove has been removed

Sterile Technique 2.5.4/2.5.6

Change sterile gloves during procedures:

- An unscrubbed team member should remove the glove to be changed
- Do not alter the position of the gown cuff
- A scrubbed team member should hold open the glove to be donned
- The person donning the glove should insert their hand into the glove touching only the inside of the glove

Conclusion

Multiple studies have even been the focus within this summary of how often and when to change surgical gloves during surgery. For today, as new studies are published and data continues to mount, the focus is increasing, concentrating on changing not only gloves but instrumentation depending on the stage of surgery to continue to minimize infection and injury risks.[11]

Data is strong in literature that there is clinical evidence to double glove and to do so with colored indicator undergloves as well as understanding glove changes during the surgical procedure.[3]

Following AORN recommended guidelines in conjunction with assessing current literature on when, why and how to change surgical gloves during the procedures should be implemented.

All surgical team members owe it to their patient, their own practice safety, and their team safety to review and to adopt recommended guidelines into their current surgical glove change practices.

References: 1. Partecke, L. et al. Incidence of Microperforation for Surgical Gloves Depends on Durations of wear. 2009. Infection Control and Hospital Epidemiology. May Vol 30 No.5 pgs 409-414. **2.** Kobayaski, M et al. Association between the Frequency of Glove Change and the Risk of Blood and Fluid Exposure in Gastrointestinal Surgery. 2020. World J Surgery. 44:3695-3701. **3.** Enz, etal. 2021. Is Single Gloving Still Acceptable? Investigation and Evaluation of Damages on Sterile Latex Gloves in General Surgery J. Clin. Med 10, 3887. **4.** Kim, K. eta; 2019. Glove change to reduce the risk of surgical site infection or prosthetic joint infection in arthroplasty surgeries: a systematic review. ANZ J Surg 89. 1009-1015. **5.** Beldame, J. etal 2012. Surgical glove bacterial contamination and perforation during total hip arthroplasty implantation: When gloves should be changed. Orthopedics and Traumatology: Surgery and Research 98. 432-440. **6.** Scrafford, J. et al 2018. Effect of intra-operative glove0changing during cesarean section on post-operative complications" A randomized controlled trial. Arch. Gynecol Obstet 297. (6)pgs 1449-1454. **7.** D.Berger-Richardson, et al. 2018. Glove and Instrument changing to prevent tumour seeding in cancer surgery; a survey of surgeons beliefs and practices. Current Oncology. Vol 25. No 3. pgs 200-208ch. **8.** Schomig, F. et al 2020. Implant contamination as a cause of surgical site infection in spinal surgery; are single use implants a reasonable solution? – a systematic review. BMC. Muskuloskeletal Disorders. 21:634. **9.** AORN Recommended Practices (2023). Sterile Technique pgs. **10.** Mishcke, C, et al. Cochrane Database of Systematic Reviews, 2014. Gloves, extra gloves or special types of gloves for preventing percutaneous exposure injuries in healthcare personnel. (3): CD009753. **11.** NIHR Global Research Health Unit on Global Surgery 2022 . Routine sterile glove and instrument change at the time of abdominal wound closure to prevent surgical site infection, ChEEtah study. Lancet. Vol 400 pgs 1767-1776.

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