

GLOVE PERFORATION DURING ORTHOPAEDIC SURGERY – A STUDY

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Introduction :

Surgical cross infection (from patient to Surgeon) can be considered "Occupational Injury". Surgeons and operating room personnel have the highest risk of coming into contact with patients' blood and body fluids. Operative gloves were originally developed to protect the patient from organisms on the physician's hands. On the other hand preventing patient-transmitted infection to the Surgeon gained importance too. The invasive nature of surgery, with its increased exposure to blood, means that during surgery there is a high risk of transfer of pathogens. Furthermore, neither knowledge of diagnosed HIV infection in patients, nor awareness of their high-risk status, influences the rate of parental exposure to blood during surgery.¹ Both patients and the surgical team need to be protected from this risk. This risk can be reduced by implementing protective barriers such as wearing surgical gloves. Adequate protection requires an Effective Barrier i.e. glove material to remain intact during the entire Procedure. Wearing two pairs of surgical gloves, as opposed to one pair, is considered to provide an additional barrier and further reduce the risk of contamination. Despite strong recommendations, only a few use double gloving.²

Objectives :

The risk of perforations in surgical gloves is thought to be very high but is often unrecognized. Our aim was to-

- Assess the frequency of perforation of surgical gloves during orthopaedic and trauma surgery.
- To evaluate the efficacy of Gloves in relation to the

duration of Surgery.

- To differentiate the risk of glove perforation between surgeon, assistant and nurses.

Materials & Methods:

A prospective study on glove perforations during different Surgical operations was carried out with special regard to user, number and location of perforations, duration and kind of the operation. This study was conducted in Tejasvini Hospital & SSIOT Mangalore, from March 2010 to March 2011. A total number of 1528 gloves which were used in 100 orthopaedic surgical procedures were examined. Of the 1528 gloves tested under actual surgical conditions, 622 were inner and 906 were outer gloves. In addition, one hundred unused pairs of gloves were examined as a control group. All the gloves that were taken for the study were manufactured by the same company. All gloves were collected by the observer and taken to the laboratory. The gloves were examined for perforations using the watertight test by a single observer. Each glove was filled with 1000 ± 50 ml of water and tested for leaks by gentle manipulation of the water into each digit. To facilitate the examination the gloves were positioned against a dark background. The location and number of perforations and the duration of surgeries were recorded. Gloves in relation to the duration of Surgery – student's t -test was used for Statistical analysis. To differentiate the risk of glove perforation between surgeon, assistant and nurses – chi square test was used.

Results:

- Frequency of Perforation:

The total perforation rate in the entire study amounted to 17.15% i.e. 262 out of the 1528 gloves. There were no perforations in the control group(unused gloves)(Fig. 1.)

	Total No.	With perforations	Rate (%)
Used gloves	1528	262	17.15 %
Unused gloves	200	0	0 %

Fig. 1: Frequency of perforation

I. Relationship with Duration of Surgery:

Wearing gloves for 90 minutes or less resulted in perforations in 36 (8.82%) of 408 gloves. Wearing gloves for 91-150 minutes resulted in perforation of 128 (18.18%) of 704 gloves. 98 (23.56%) of 416 Gloves were perforated when the duration of wear was longer than 150 minutes. Difference was statistically significant($p < 0.001$). (Fig. 2)

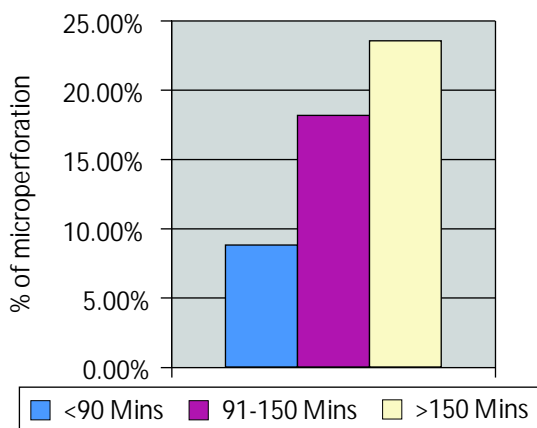


Fig. 2: Relationship with time

III. Differentiate the risk of glove perforation between surgeon, assistant and nurses

Surgeons had a higher glove perforation rate of 25.2% (169/668). Glove perforation rates of assistants was 8.3% (29/348). Glove perforation rates of nurses was 8.6% (44/512). It was statistically significant ($p < 0.001$). (Fig. 3)

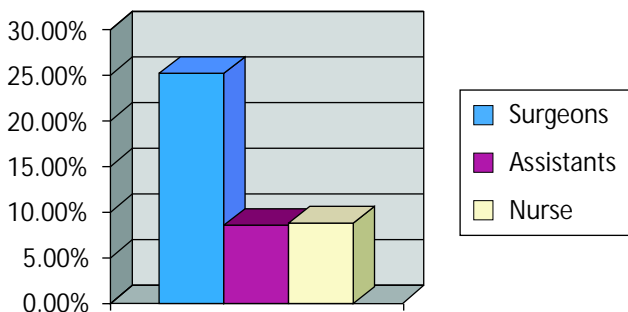


Fig. 3: Frequency among personnel

Location of Perforation	Right (Dominant)	Left (Non-Dominant)	Total
Index	41	70	111
Thumb	46	56	102
Middle	12	10	22
Ring	02	05	07
Little	00	04	04
Palmar	05	11	16
Total	106	156	262

Fig. 4: Sites of Perforation.

Discussion:

Perforated Gloves can transmit infection from:

1. Operating Room Members to Patient
2. Patient to Operating Room Members.

While the operating team members are at risk for contracting blood borne diseases from patients, it has been shown that with adequate pre-operative hand preparation, there is very limited risk of surgical site infection from surgical glove perforation.³ With increasing awareness of the risk of transmission of pathogens from patients to the medical staff during surgery, particularly the hepatitis B virus and HIV, there is increasing interest in protecting the surgeon from the patient. Surgeons have the highest risk of contact with patients' blood and body fluids, and breaches in gloving material may expose operating staff to risk of infections. Surgical glove perforations resulting from manufacturing problems are very rare. The mean risk of transmission of HIV after percutaneous exposure is thought to be 0.3%. This increases markedly with a larger volume of blood and a higher titre of HIV in the blood of the source patient. Several surgeons have already been infected with HIV and hepatitis from percutaneous exposure.^{4,5,6} It is natural that surgeons more frequently have perforations in their gloves than scrub nurses and assistants, as they do not use the knife or needles as much as the surgeon. This is because surgeons hold the instruments in the dominant hand and grasp the tissues with the passive hand.⁷ In addition, the needle holder is often held with the right hand and the needle may accidentally perforate the glove of the opposite hand. The use of surgical gloves markedly reduces the volume of blood inoculum present on suture needles,⁸ and double gloving is even more efficient than single

gloving.

“Prevention Is Better Than Cure”.

Conclusion :

Although we cannot definitively prove that double gloving reduces the risk of infection to the surgeon, its use can be defended for the several reasons as stated above.

Hence we strongly recommend :

1. The routine use of double gloving in orthopaedic procedures- both high and low risk and especially in

References :

1. Gerberding JL, Littell C, Tarkington A, Brown A, Scheter WP. Risk of exposure of surgical personnel to patients' blood during surgery at San Francisco General Hos-pital. *N Engl J Med* 1990;322:1788-93.
2. Patterson JM, Novak CB, Mackinnon SE, Patterson GA. Surgeon's concern and practices of protection against blood-borne pathogens. *Ann Surg* 1998;228: 266-72.
3. Dodds RD, Guy PJ, Peacock AM et al. Surgical glove perforation. *Br J Surg* 1998; 75: 966-968
4. Friedland G, Klein R. Transmission of the human immunodeficiency virus. *N Engl J Med* 1987; 317: 1125-1135.
5. Lemaire R, Masson JB. Risk of transmission of blood-borne viral infection in orthopaedic and trauma surgery. *J Bone Joint Surg* 2000; 82-B: 313-323.

surgeries involving internal fixation as there is a heavy use of sharp instruments.

2. Surgeons, first assistants, and surgical nurses directly assisting in the operating field should change gloves after 90 minutes of surgery as there is increase in the rate of perforation over time.
3. Although in our study there were no perforations in the control group, this (manufacturing defects) cannot be totally ruled out and hence the donning person must verify the same at the beginning of surgery.

6. McCray E. Occupational risk of the acquired immunodeficiency syndrome among health care workers. *N Engl J Med* 1986; 314: 1127-1132.
7. T. Laine, P. Aarnio. Glove perforation in orthopaedic and trauma surgery. *J Bone Joint Surg* 2004; 86-B: 898-900.
8. Bennett NT, Howard RJ. Quantity of blood inoculated in a needle stick injury from suture needles. *J Am Coll Surg* 1994;178:107-10.

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