

INCIDENCE OF PERFORATION OF SINGLE AND DOUBLE GLOVES DURING SURGERY

***S. K. Goyal¹ and M. Singh²**

¹Department of Surgery, Maharaja Agrasen Medical College, Agroha, Haryana

²Department of Surgery Government Medical College and Rajindra Hospital, Patiala

*Author of Correspondence

ABSTRACT

With increasing awareness of the possibility of exposure to blood borne pathogens during surgery, surgeons are becoming more and more concerned with protecting themselves against such exposures. Wearing of double pair of gloves is one method to protect against such exposures. The present study was carried out to evaluate the incidence of perforation of single and double gloves during surgery. 100 surgeries conducted in the Department of General Surgery, Rajindra Hospital, Patiala were taken for study, 50 using single gloves and 50 using double gloves. Gloves of surgeons, first assistant and scrub nurse were tested for perforations by air inflation test and water filling test. It was found that there was no significant difference between the incidences of perforation in single glove (24%) versus double outer glove (26%) but a significant difference was observed in the incidence of perforation in single glove (24%) versus double inner glove (6%). Of total perforations, surgeons were aware of only 42% of perforations. Index finger and thumb of non dominant hand were mostly affected. It was concluded from the study that double gloving offers significantly better protection than single gloving.

Keywords: Double Gloves, Perforations, Finger Offended, Surgical Team

INTRODUCTION

Intraoperative surgical glove use was introduced in 1889 by Willium S. Halsted to protect his scrub nurse from exacerbation of previously acquired mercuric chloride dermatitis (O'Connor, 1984; Geelhoed, 1988). Intact surgical gloves are an important barrier in preventing exposure of blood and blood borne pathogens like hepatitis B and C viruses, HIV, and others, to the surgical team during operation (Naver and Gottrup, 2000). Various precautions have been suggested to reduce the risk of accidents during operation; one of them is use of double gloves (Quebbemann *et al.*, 1992; Raahave, 1996). Punctures and tears of the surgical gloves is the cause of most blood contacts of operating personnel and glove perforations frequently go unnoticed by the wearer. Double gloving decreases this by decreasing product failure, exposures and inner glove tears and perforations. The present study was undertaken to compare the incidence of perforation in single gloves with that of double gloves.

MATERIALS AND METHODS

One hundred surgeries conducted in Govt. Medical College, Patiala were taken for study. In 50 operations single gloves and in other 50 double gloves were used. As control 50 pairs of unused gloves were tested. Preoperative skin abrasions on the hands of the surgical team members (surgeon, first assistant and scrub nurse) were tested by spirit wash method. Spirit was poured on their hands and the observer recorded any burning sensation considered to be an indication of preoperative skin abrasion. After surgery both inner and outer gloves used by the team members were tested by air inflation test and water filling test. Gloves were inflated with air by revolving the glove in open air and then tightening the open end with thumb and fingers. The gloves were then dipped in water in this position of inflation. Then the pressure was applied by squeezing the palm and fingers around the glove near its cuff and looking for escape of air bubbles in water. In the water filling test, gloves were filled with 400±25ml of water, twisted with top shut and while grasping the twist in the left hand sufficient pressure was applied with the right hand to make the palm of the glove bulge slightly. This pressure was held for about thirty seconds while the glove was observed for

Research Article

any leak of water from the glove indicating a perforation. Postoperative surgical team was asked if they were aware of any glove perforations and associated skin puncture during operative procedure and again sensitivity of their hands was checked with spirit. The data was recorded and analyzed using statistical methods t-test and chi square test and p values were calculated.

RESULTS

In case of single gloves, the incidence of perforation was 24% of gloves (12 out of 50) in surgeons, 20% of gloves (10 out of 50) in first assistants and 22% of gloves (11 out of 50) in scrub nurses. In case of double outer gloves incidence of perforation was 26% of gloves (13 out of 50) in surgeons, 20% of gloves (10 out of 50) in first assistants and 24% of gloves (12 out of 50) in scrub nurses. In double inner gloves, the incidence of perforation was 6% of gloves (3 out of 50) in surgeons, 4% of gloves (2 out of 50) in first assistants and 4% of gloves (2 out of 50) in scrub nurses.

The incidence of perforation between single glove and double outer glove was almost similar (Table 1) and on statistical analysis, these observations were statistically insignificant ($p > 0.005$).

Table 1: Showing comparison of perforation rate between single glove and double outer glove

	Single gloves (n=50)	Double outer gloves (n=50)	P value
Surgeon	12 (24%)	13(26%)	0.689
First assistant	10(20%)	10(20%)	1.0
Scrub Nurse	11(22%)	12(24%)	0.689

However, the incidence of perforations in double inner gloves when compared with double outer gloves and single gloves, was much less (Table 2) and statistically highly significant ($p < 0.001$).

Thumb and ring finger of non dominant hand were the most common sites of perforations.

Table 2: Showing comparison of perforation rate between single glove and double inner glove.

	Single gloves (n=50)	Double Inner gloves (n=50)	P value
Surgeon	12(24%)	3(6%)	0.001
First assistant	10(20%)	2(4%)	0.001
Scrub Nurse	11(22%)	2(4%)	0.001

DISCUSSION

Intact surgical gloves are an important barrier in preventing exposures to the surgical team. Double gloves are being increasingly recommended these days. Thomas *et al.*, (2001) conducted a study on intraoperative glove perforations and recommended the use of double gloves in all surgical procedures exceeding one hour or where chances of needle-stick injury are high. Similarly Ersozlu *et al.*, (2007) assessed the frequency of glove perforation during major and minor orthopaedic surgeries and concluded that routine use of double gloves was recommended during orthopaedic procedures.

Table 3: Showing the incidence of perforation found by different authors

Studies	Year	Surgery	Single gloves	Double outer gloves	Double inner Gloves
RDA Dodds	1990	Hernia	15%	16%	3.8%
Naver LP	2000	GIT	17%		6%
Malhotra <i>et al</i>	2004	Gynae	13.8%	13.6%	4.6%
Punyatankchai	2004	Episiotomy	18%	22.6%	4.6%
Lancaster C	2007	Gynae	11%	10%	2%
Present study	2008	G.Surgery	24%	26%	6%

Research Article

In our study there was no significant difference between incidence of perforation in single glove and double outer glove but a significant difference between single glove and double inner glove. Other studies by different authors (Table 3) have also reported significantly less perforations in the double inner gloves (Naver *et al.*, 2000; Dodds *et al.*, 1990; Malhotra., 2004; Punyatanasakchai., 2004; Lancaster., 2007). Thus, the results of our study are comparable to these authors, all of them showing that the double inner gloves get the least number of perforations. Surgeons, first assistants and scrub nurses all are equally exposed to the risk of perforation as incidence of glove perforation was found to be almost the same in all three. Previous studies also did not find any significant difference in the incidence of perforation in these three personnel (Nicola *et al.*, 1989; Bennett *et al.*, 1991).

More than half of the perforations remained unnoticed by the surgeons. This awareness of perforation in the present study was comparable to studies by others (Dodds *et al.*, 1990; Nicola *et al.*, 1989; Bennett *et al.*, 1991). As surgeons are aware of less than half of perforations, it shows that reports of needle stick injuries and puncture wounds is a gross underestimate of the actual incidence of exposure. Unnoticed perforations increase the chance of unknown exposure to blood and body fluids of patients.

The thumb and ring finger of the non dominant hand were most commonly offended in our study as deduced from the perforations found on the gloves. Other studies have also shown that the index finger and thumb are the most frequent locations of glove perforation (Naver *et al.*, 2000; Arena *et al.*, 1992). Holding of needles with hand is the most common cause of these areas being offended and that too mostly during closure of wound and retracting and supporting tissues with hands.

Conclusion

To conclude, the present study shows that double gloving offers significantly better protection than single gloving as the incidence of perforation of double inner gloves is significantly low as compared with single gloves. The inner glove protects the surgeon's hand from contamination. As majority of glove perforations go unnoticed by the surgeons and other members of the surgical team, routine use of double gloves in all surgical procedures should be recommended.

REFERENCES

- Arena, Maffulli N, Vocaturo I and Scognamiglio G (1992).** Incidence of glove perforation during episiotomy repair. *Archives of Gynecology and Obstetrics* **251** 111-114.
- Bennett B and Duff P (1991).** The effect of double gloving on frequency of glove perforations. *Obstetrics & Gynecology* **78** 1019-1022.
- Dodds RDA, Barker SGE, Morgen NH, Donaldson DR and Thomas MH (1990).** Self protection in surgery: the use of double gloves. *British Journal of Surgery* **77** 119-120.
- Ersozlu S, Sahin O, Ozgur AF, Akkaya T and Tuncay C (2007).** Glove punctures in major and minor orthopaedic surgery with double gloving. *Acta Orthopaedica Belgica* **73**(6) 760-4.
- Geelhoed GW (1988).** The preHalstedian and post –Halstedian history of the surgical rubber glove. *Surgery, Gynecology and Obstetrics* **167** 350-6.
- Lancaster C and Duff P (2007).** Single versus double-gloving for obstetric and gynecologic procedures. *American Journal of Obstetrics & Gynecology* **196**(5) 36-7.
- Malhotra M, Sharma JB, Wadhwa L and Arora R (2004).** Prospective study of glove perforation in obstetrical and gynecological operations: are we safe enough? *Journal of Obstetrics and Gynaecology Research* **30**(4) 319-22.
- Naver LPS and Gottrup F (2000).** Incidence of glove perforations in gastrointestinal surgery and the protective effect of double gloves: a prospective, randomized controlled study. *European Journal of Surgery* **166** 293-295.
- Nicola M, Giovanni C and Vittorino T (1989).** Glove perforation in elective orthopedic surgery. *Acta Orthopaedica Scandinavica* **60**(5) 565-6.
- O'Connor AG (1984).** Glove puncture during operation. *Nursing Times* **80**(suppl) 5-6.

Research Article

Punyatanasakchai P, Chittacharoen A and Ayudhya NI (2004). Randomized controlled trial of glove perforation in single- and double-gloving in episiotomy repair after vaginal delivery. *Journal of Obstetrics and Gynaecology Research* **30**(5) 354-7.

Quebbemann EJ, Telford GL, Wadsworth K, Hubbard S, Goodman H and Gottlieb MS (1992). Double gloving. Protecting surgeons from blood contamination in the operating room. *Archives of Surgery* **127** 213-216.

Raahave D (1996). Operative precautions in HIV and other blood borne virus diseases. *Infection Control and Hospital Epidemiology* **17** 529-531.

Thomas S, Agarwal M and Mehta G (2001). Intraoperative glove perforation – single versus double gloving in protection against skin contamination. *Postgraduate Medical Journal* **77** 458-60.