



RESEARCH ARTICLE

SAFETY PROFILE OF DOUBLE GLOVING: A NECESSITY OR MYTH IN PREVENTION OF ACCIDENTAL PRICK INJURY TO SURGEONS

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ARTICLE INFO

Article History:

Received 17th July, 2018

Received in revised form

24th August, 2018

Accepted 20th September, 2018

Published online 30th October, 2018

Keywords:

Double Glove,
Needle Injury,
Glove Perforation.

ABSTRACT

Introduction: Wearing sterile Latex gloves provide an essential protection to both surgeon as well as the patient and thus prevent disease transmission from surgeon to patient and vice versa. The risk of transmission of pathogens such as hepatitis B, Hepatitis C, and Human immunodeficiency virus (HIV) from infected patients to the operating surgeon as well as from surgeon to patient has lead to attention on the reliability of intact surgical gloves in preventing contact with the patient's body fluids.

Material and Method: A prospective study was conducted at Government Medical College Jammu with the objective to assess the incidence of glove perforations in routine as well as emergency surgery after wearing double gloves in the surgery. The perforation was assessed by leak test performed on the gloves collected from whole of the surgical team.

Result: Gloves of 96 routine and emergency operations (56 open surgeries, 40 laparoscopic surgeries) were studied. In all; 270 gloves were examined. 24 out of the 270 gloves (8.8%) had one or more perforations. Our study documents gloves of principle surgeon, during open surgery of prolonged duration had higher incidence of perforation. The water leak test detected all the perforated gloves.

Conclusion: In view of the increasing importance of safety at work, it is recommended to use double gloves, in both emergency and routine surgery as it is safe and may reduce transmission of hepatitis B, hepatitis C, and HIV. The other glove will protect the Surgeon from contact with body secretion of patients despite one of the two gloves being perforated.

INTRODUCTION

Healthcare hazards among employees and health care recipients have lead to increasing awareness towards transmitted infections. Latex gloves provide an essential barrier against contamination and are important item of personal protective equipment (Wright *et al.*, 1995; Cohn *et al.*, 1990). The invasive nature of surgery, with its increased exposure to blood and body fluids, means that there is a high risk of transmission of disease (Jensen *et al.*, 2003; Naver and Gottrup, 2000). An intact and proper barrier prevents the possibility of transmission, no matter how infrequently it might occur in its absence. The possible risk of transmission of blood borne pathogens such as hepatitis B, Hepatitis C, and Human immunodeficiency virus (HIV) from infected patients to the operating theatre personnel has lead to attention on the reliability of intact surgical gloves in preventing contact with the patient's body fluids (Carl *et al.*, 1982; Harpez, 1996; Ross, 2000). Needle prick injury is usually unrecognized and carries a risk of seroconversion of approximately 25% (6-30%) for Hepatitis B, 1% (0.8-8%) for hepatitis C, and about 0.3% for HIV (Macintyre *et al.*, 1994; Pietrabissa, 1997). Both patient and surgical team needs to be protected against

the risk of transmission of infections (Laine *et al.*, 2004). The risk can be reduced by the use of protective barriers like surgical gloves. Wearing two pairs of surgical gloves (Double gloving), as opposed to one pair is considered to provide an additional barrier and further reduces the risk of contamination (Laine and Aarnio, 2001; Jensen *et al.*, 1997). The Primary objective of our study was to determine whether double gloving as compared to single gloving, reduces the number of perforation to the innermost glove. The secondary objective was to determine whether the type of surgery and the duration of surgery have any impact on the number of surgical glove punctures.

MATERIALS AND METHODS

A prospective study was conducted at Government Medical College Jammu for three months, on consecutive 96 cases, (n = 270 gloves), undergoing routine or emergency surgery in the department of general surgery. In all the surgeries performed, whole of the operating team wore double gloves which included operating surgeon, assistant surgeon whether first assistant or second assistant and also the assistant nurse.

The aim of the study was:

- To study the incidence of glove perforation in surgical procedures.

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- To study the incidence of outer and inner glove perforation.
- To study the relation of glove perforation and duration of surgery
- To infer from the study whether we should use double glove in surgical procedure, or it is a myth only.
- To infer whether wearing single glove or double glove should be the standard protocol in all surgical procedure.

Inclusion criteria: All patients who were admitted in the Department of Surgery for undergoing any surgical intervention irrespective of age and sex were included in the study

Exclusion criteria: All patients where the status of viral markers was not known. All patients with positive history of AIDS, Hepatitis B or Hepatitis C disease were excluded from the study group. The gloves damaged by instruments, diathermy cautery, etc were excluded from the study. After completion of the surgery the gloves of whole of the surgical team were collected in a plastic bag after marking the outer gloves as “a” and inner glove as “b” with a black marker pen. Then gloves were taken out of the theatre and study was conducted. The gloves were labeled for the operator, first assistant and second assistant, and theatre nurse as “O”, “I”, “II”, ‘N” respectively. The glove punctures were studied using water leak test. The water leak test was done for 2 minutes and the results were noted as yes or no to determine whether it was perforated or not.

RESULTS

In the study period of three month, gloves of 96 routine and emergency operations (56 open Surgery, 40 laparoscopic Surgery) were studied. In all; 270 gloves were examined. 24 out of the 270 gloves (8.8%) had one or more perforations, of these 24 gloves, 17 gloves (70.83%) were outer gloves. Open surgery was associated with significantly higher incidence of glove perforations 22/24 (91.66%), as compared to laparoscopic surgery. Incidence of glove perforations to duration of surgery is shown in Table - 1.

Table 1. Showing glove perforation in relation to duration of Surgery

Duration of Surgery	No. Of gloves perforations (%)
< 30 minutes	0 (0%)
30 min-60min	09 (37.50%)
>60 minutes	15 (62.50%)
Total	24 (9.6%)

Gloves of operating surgeon had maximum perforations 17/24 (70.83%), followed first assistant 5/24 (20.83%) and second assistant 2/24 (8.33%). The water leak test detected all the perforated gloves.

Table 2. Showing percentage of perforations in relation to the Surgeon and his Assistant

	Perforations of gloves	Percentage
Operating surgeon	17	70.83%
First assistant	5	20.83%
Second assistant	2	8.33%
Total	24	

DISCUSSION

Perforation in surgical gloves depends on many factors, such as whether single or double glove being used, on the type of surgery: elective or emergency, open or laparoscopic, and also on the duration of surgery (Gani *et al.*, 1990). We had similar objective of our study and found that the outer glove had far significant number of perforations than the inner glove. This is in accordance with other studies (Laine and Aarnio, 2001; Jensen *et al.*, 1997; Gani *et al.*, 1990; Thomas *et al.*, 2001). Hence double gloving protects against accidental needle prick injuries (Mc Laughlin *et al.*, 2002). In our study 22 gloves were perforated in 56 open surgeries as opposed to only 2 gloves perforated in 40 laparoscopic cases. Therefore, laparoscopic surgeries are associated with significantly less incidence of accidental needle prick injuries, as described by Laine *et al.* (2004). Our study included both emergency and elective procedures. We found that emergency cases had increased risk of glove perforations than the elective cases. We also studied the impact of duration of surgery on the incidence of surgical glove perforation. The incidence of perforation increased with the duration of surgery as suggested by other studies (Carolyn, 2003). Our study suggested that incidence of perforation was highest for the surgeon, followed by, first assistant and second assistant (Gerco and Garza, 1995). Most of the perforations were detected in the non-dominant hand of the surgeon and the tip of the left index finger being the most common location. The assistant surgeon’s right hand had higher chances of accidental needle pricks, particularly the tip of the middle finger (Konig *et al.*, 1992; Bliss *et al.*, 1992). The justification for the most common site of glove perforations on the left index finger of the surgeon is that, most surgeons are right handed and most of the accidental needle prick occurs while grasping the needle with left hand. As others, we also found that water leak is far superior test and detected 100% perforations (Kotilainen *et al.*, 1990).

Conclusion

In view of the increasing importance of safety at work, it is recommended to use double gloves, in both emergency and routine surgery as it is safe and may reduce transmission of hepatitis B, hepatitis C, and HIV. The surgeons as well as the scrub nurse are at an increased risk of having accidental needle prick injuries and glove perforations. Double glove will protect the surgical team from contact with body secretion of patients despite one of the two glove gets perforated. Water leak test is better in detecting glove perforation than the dark room examination. Recently, newer and better techniques to detect glove perforation have evolved like color detecting system, electrical detecting system, and biogel reveal system.

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