Glove perforations in orthopedic practice

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Abstract Objectives: To determine the overall perforation of gloves due to needle-stick injuries, during orthopedic and trauma operations, to assess the protection provided and to suggest precautions to be instituted.

Design: Prospective collection and examination of 258 pairs of surgical gloves during 116 orthopedic and trauma operations.

Setting: King Fahd Hospital, King Faisal University, Dammam.

Results: One-hundred and forty seven gloves (28.4%) were found to be perforated out of which 81% were perforated during trauma and the rest during orthopedic operations. Right glove was punctured in 114 gloves (77.5%) and the thumb and index finger were the commonest sites. Seventy-two percent of the perforations went unrecognized. One-hundred and eleven gloves were perforated during operations of over one hour and thirty minutes (p value <0.005)

Conclusions: Glove perforations during trauma and orthopedic surgery is common and in the majority of cases goes unrecognized. Surgeons appear unaware of cross infection from patient to surgeon and vice-versa nor do they consider precautions mandatory.


Keywords: Gloves, perforations, trauma, orthopaedic surgery.

Infection in orthopedic and trauma surgery is disastrous for the patient and surgeon alike. To protect the patient from surgeon's contamination, gloves have been in use since the 1900's (Sebold and Jordan).1 McLeod,2 found that in 60% of operations surgeon perceives the perforation of the gloves and double gloves, were advised for but not absolute protection. With increasing incidence of needle-stick injuries in the 1990's there is an alarming concern regarding patient and surgeon infection, more serious being hepatitis B (Hbs Ag) and HIV (human immunodeficiency virus). The added risk of these infections in patients in our region is due to repeated blood transfusion in patients with sickle cell hemoglobinopathy, thereby the risk to patient and surgeon is also high.

We conducted this study in order to find out the overall perforation of gloves due to needle-stick injuries, during orthopedic and trauma operation, to assess the protection provided and to suggest precautions to be instituted.

Material and methods Two consultants, three senior registrars and two residents took part in this study. All gloves were collected at the end of the procedure and tested. The data collected included medical record number of the patient, age, sex, operative procedure, duration of operation, number of gloves changed intra-operatively. Gloves changed during surgery were noted and collected separately. Gloves were initially examined for visible perforations and later filled with 500 ml of water, each finger and palm squeezed individually (McCue, Berg and Saunders).3

Fifteen pairs of unused gloves (Gammex-Ansell) were tested as controls.

Results Two-hundred and fifty-eight pairs of surgical gloves worn by surgeons and 1st and 2nd assistants, and 110 pairs used by scrub nurses during 116 operations, were tested. Eighty-three operations were for trauma and 33 for orthopedic conditions. One hundred and forty-seven gloves worn by the operating team and 33 worn by scrub nurses were found to be perforated (Table 1). In 106 (72.1%), the perforation went unrecognized, whereas in 25 (17%) the surgeon perceived the
breach in the gloves. In 16 (12.5%) instances the perforation was identified by a scrub/operating team member. In 114 (77.5%) of gloves the perforation was on the right side and in 113 (76.8%) thumb and index finger was the site of perforation (Table 2). Twenty-three had more than one perforation. In an operation of one and half hours, 111 gloves were found to be perforated (p value <0.005).

In the unused gloves there were no perforations found.

### Table 2 - Operation group

<table>
<thead>
<tr>
<th>Trauma</th>
<th>Orthopedic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture fixation upper limbs</td>
<td>(16)</td>
</tr>
<tr>
<td>Fracture fixation lower limbs</td>
<td>(21)</td>
</tr>
<tr>
<td>Hip fractures</td>
<td>(12)</td>
</tr>
<tr>
<td>Fixation of spine</td>
<td>(11)</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>(23)</td>
</tr>
</tbody>
</table>

### Discussion

This study shows that glove perforations during orthopedic and trauma surgery in a teaching hospital is 28.4%, in comparison to other reports of 26% (Muffulli et al.), 30% (Mcleod) and 37.5% (Eckersley & Williamson). Even though the overall rate was comparative to the reports from the literature, it was alarming that in our study the unrecognition of the perforation was quite high. Seventy-two percent to 40% was reported in the literature (Mcleod.).

This definitely increases the risk of Hbs Ag and HIV cross-infection in our surgeons, despite the low seroconversion of 1% for HIV (MMWR 1987) and 6%-30% (MMWR 1985) for Hbs Ag.

Porteous believed that orthopedic and trauma surgeons expose themselves to risk of HIV and hepatitis virus. It is surprising, even after the 1991 guidelines issued by the British Orthopedic Association (BOA) for prevention of cross infection from patients to surgeons especially of HIV and Hbs Ag, (Asante and Tait) reported that the fellows and associates of BOA did not take the threat of HIV cross infection seriously. In our own institution one of our senior registrars while fixing a phalangeal fracture got pricked with a Kirschner wire which had gone through the bone. An HIV test for the patient proved to be positive and the surgeon was negative. It is possible that many patients are being operated upon without knowing the status of positivity of HIV or Hbs Ag. Added to this the presence of a large number of sickle cell patients in the Eastern Region (Sadat-Ali) who had multiple transfusions may further pose a threat of cross infection to the surgeon. Until the long term results are known of high resistance to perforated gloves, Repel cloth gloves (Sebold and Jordan) and the "pointless" suture needles (Wright, Moran, Briggs), precautions seem to be the only way of preventing the cross-infection during surgery.

We believe certain precautions are required to reduce the risk of cross infection.

1. All hospital personnel, particularly nursing staff and doctors, should have Hbs Ag immunization.
2. Mandatory pre-operative screening of high risk patients for HIV and Hbs Ag, and for major elective and trauma cases.
3. Protective eye shields during trauma surgery.
4. Use of double gloves in operations for high risk patients, major trauma and elective cases.
5. Special care during handling of sharp instruments and fractured bones.
6. In cases of doubt of gloves being perforated, change immediately.
7. All gloves should be checked pre-operatively by the surgeon and the scrub nurse.

### References

2. Mcleod GG. Needlestick injuries at operations for trauma. Are surgical gloves an effective barrier? J Bone and Joint
خروق القفازات في الجراحات العظمية

هدف البحث: معرفة كمية الخروقات في القفازات التي تحدث أثناء إجراء العمليات العظمية وجراحة الحوادث وكذلك تقدير الطرق المتاحة للحماية من الخروقات وتقترح الدراسة طرقة جديدة لذلك.

عينة الدراسة: هذه الدراسة إجرت على 258 زوجاً من القفازات من خلال 116 عملية جراحية.

المكان: مستشفى الملك فيصل الجامعي بالخبر التابع لجامعة الملك فيصل بالدمام.

النتائج: 17 قفازاً (4.48%) وجدت بها خروقات ومنها 81.8% انخرقت خلال جراحة الحوادث والباقي خلال الجراحات العظمية. القفاز الأيمن وجد مخروقت في 114 قفازاً (5.77%) والإبهام والسباب كانت أكثر الخروقات فيها.

22.7% من الخروقات لم تكن ملاحظة من الجراحين 111 قفازاً انخرقت أثناء إجراء عمليات مدتها أكثر من ساعة ونصف.

الاستنتاجات: خروق القفازات من جراحة الحوادث والجراحات العظمية كبيرة جداً وفي غالبها تتم دون ملاحظة الجراحين. والجراحين لم يعوا خطورة انتقال العدوى من المريض إلى الجراح والعكس، ولم يتخذوا الخليطة لذلك.