

Evaluation of Glove Damage during Dental Procedures among Dental Specialists in Tabriz

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Abstract

Background and aims. Dental practitioners are prone to occupational risk of infection. This can be prevented in part by wearing gloves. However, for this to be effective, gloves should be intact during the entire course of dental procedure. Leaky surgical latex gloves have been seen in 0.9% of cases before use. As much as 1.9% of latex gloves have been reported to be damaged during dental procedures. In this study, we decided to assess glove damage during dental procedures among dental specialists in Tabriz.

Materials and methods. Thirty-six dental specialists were selected for this study. Each practitioner received 40 pairs of intact powdered latex gloves. Upon the completion of dental procedures, the gloves were retrieved and any tears were evaluated separately for right and left hands. Data was analyzed using chi-square test.

Results. 159 punctures were detected in 144 gloves (5%) out of 2880 unpaired gloves used by practitioners. They noticed the tear(s) in 60 cases (2%), however, 99 cases (3%) of tear(s) were not noted during the procedure. The highest rate of glove damage was observed in the prosthodontists' group (12.3%), which was statistically significant comparing to other groups ($p=0.048$). The lowest rate of the damage was observed in the oral surgeons' group (2%) which showed no significant difference ($p=0.134$). The highest rate of punctures in the gloves was observed in the first and second fingers of the non-dominant hand.

Conclusion. The damage to 5% of the gloves is highly significant, with a potential role in occupational hazards. The higher rate of leaks in the prosthodontists' group compared to other groups demands for greater prudence in this field. The high rate of leaks in the first and second fingers of the non-dominant hand requires more attention to this area during daily practice.

Key words: Infection control, occupational hazard, protective glove.

Introduction

Dental office is considered a hazardous environment regarding the risk of infections. In such an environment, dental practitioners are prone to various kinds of infections. The main ports of entry for microorganisms during dental procedures are

skin, mucosa, respiratory tract and eyes. An important consideration in the preventive protocol is the manner of encountering the patients: all patients should be treated as if they are infected.¹ The best way to avoid transmissible infections through skin, such as viral hepatitis and HIV infection, is wear-

ing gloves.² Gloves were introduced to physicians and nurses for the first time in 1896 by William Stewart Halstead.³ In order to be effective in preventing infections, gloves must be intact until the completion of the treatment.⁴ The aim of the present study was to assess the glove damage during dental procedures among dental specialist in Tabriz in 2005.

Materials and Methods

This study was a descriptive analytical study. The study group consisted of 43 dental specialists in North-Western city of Tabriz, Iran. Seven specialists were excluded from the study since they were allergic to the powdered gloves or not involved in clinical practice. Thirty-six remaining subjects each received 40 pairs of powdered latex gloves (Arista, Malaysia). All of the gloves had the same batch number. To ensure the integrity of the gloves, a pump with a sterile connecting tube was used to push air into the gloves on baby powder. Ejection of air from the gloves stirred the baby powder, necessitating the exclusion of such leaky gloves from the study. All intact gloves were marked for the left and right hands and placed in separate boxes.

Practitioners were requested to use only the provided gloves during the study. Following the completion of dental procedures, the gloves were retrieved from the special-

ists. The same pumping procedure was used with water to check the gloves for tears at maximum of 48 hours after being used. Observing bubbles on a glove indicated tears. The puncture sites were separately recorded for the left and right hands and also for the fingers involved, for each group of specialists.

Data was analyzed using chi-square test. SPSS 11.0 computer software was used for statistical analysis.

Results

A total of 3000 new unpaired gloves (1500 pairs) were tested before being distributed among dental practitioners; 30 gloves (1%) had leaks.

1440 pairs of latex gloves (2880 unpaired gloves) were used by the practitioners. 159 punctures were discovered in 144 gloves (5%). Some of the gloves had more than one tear. Out of these, 60 cases (2.1%) of puncture had been noticed by the practitioners, while 99 cases (3.4%) were missed and not reported. The highest number of punctures were observed in the prosthodontists' group (12.3%), which was statistically significant compared to other groups ($p=0.048$). The lowest number of punctures was observed in the oral surgeons' group (2%), which was not statistically significant ($p=0.134$). The results are presented separately for all of the groups in Table 1.

Table 1. Tears in the gloves separately for all groups

Variable Group	Noticed Puncture	Unnoticed Puncture	Total (noticed and unnoticed)	Total number of used gloves
Prosthodontists	25 (5.21%)	34 (7.08%)	59 (12.29%)	480
Oral pathologists	3 (3.75%)	4 (5.00%)	7 (8.75%)	80
Operative dentists	8 (2.50%)	13 (4.06%)	21 (6.56%)	320
Periodontists	9 (2.25%)	8 (2.00%)	17 (4.25%)	400
Orthodontists	6 (1.87%)	13 (4.06%)	19 (5.93%)	320
Pediatric dentists	4 (1.25%)	13 (4.06%)	17 (5.31%)	320
Oral medicine specialists	1(1.25%)	3 (3.75%)	4 (5.00%)	80
Endodontists	4 (0.83%)	7 (1.45%)	11 (2.29%)	480
Oral Surgeons	4 (1.00%)	4 (1.00%)	8 (2.00%)	400
Total	60 (2.08%)	99 (3.43%)	159 (5.52%)	2880

Table 2. Number and percentage of glove damage cases in the left- and right-handed individuals

Variable		Left-handed practitioners		Right-handed practitioners		
		Number of tears(percent)	Total number of tears	Number of tears (percent)	Total number of tears	
Gloves	The right hand	1st finger	6 (%19/3)	31	19 (%14/84)	128
		2nd finger	9 (%29/0)	31	10 (%7/81)	128
		3rd finger	1 (%3/2)	31	4 (%3/12)	128
		4th finger	0 (%0)	31	3 (%2/34)	128
		5th finger	3 (%9/6)	31	2 (%1/56)	128
		Number of gloves	2 (%6/4)	31	13 (%10/15)	128
		The left hand	1st finger	6 (%19/3)	31	29 (%22/65)
2nd finger	3 (%9/6)		31	24 (%18/75)	128	
3rd finger	1 (%3/2)		31	6 (%4/68)	128	
4th finger	0 (%0)		31	3 (%2/34)	128	
5th finger	0 (%0)		31	2 (%1/56)	128	
Number of gloves	0 (%0)		31	13 (%10/15)	128	

Separate evaluation of fingers showed that the highest number of punctures occurred in the thumb of the left hand (35 cases, 22%) and the lowest number in the little finger of the left hand (2 cases, 1.2%). Our sample consisted of 31 right-handed and 4 left-handed individuals. Thumb and index finger of the left hand in the right-handed individuals showed higher rates of damage (22.6% and 18.7%, respectively), while in left-handed individuals, thumb and index finger of the right hand had a higher damage rate (19.3% and 29%, respectively). Evaluation of glove damage in right- and left-handed practitioners according to each finger is presented separately in Table 2.

Discussion

The detection of 1% leaky gloves before use in the present study is an important finding which requires careful attention of all medical practitioners. A similar study carried out in 2002 yielded results consistent with the results of our study and demonstrated 0.9% leaky surgical latex gloves before use.⁵ All clinicians should be aware of the risk of leaky gloves before use, even if they are careful not to accidentally tear or puncture them during medical procedures.

The occurrence of punctures in 5% of gloves

after use is a significant finding that requires complete attention. It should be kept in mind that after the gloves are punctured, the barrier effect is negated, and intensity as well as duration of contact with infective materials may increase imbibition of fluids (water, saliva and probably blood) under the punctured point. In the present study, this is true for the cases where the dental practitioners did not notice the puncture and finished the procedure believing that the gloves had a barrier effect, and also for cases where the practitioners had noticed the damage. In the latter case, the practitioners' hands had been in contact with infective agents until the gloves were replaced by new ones. In a similar study carried out by Murrage⁶, latex gloves damage during dental procedures was reported to be as high as 1.9%. The difference between our results and the results of that study may be attributed to difference in the gloves' brand which includes differences in manufacturing process and the strengths of the materials used, as well as differences in the study design and the subjects under study. In Murrage's research only general dental practitioners were included in the study.

Some researchers have suggested a system of two gloves with two different colors to reduce the risk of glove damage. In this sys-

tem, if the outer glove is punctured, the inner glove will act as a protective barrier and the practitioner will notice the different color of the inner glove, and therefore, replace it with a new one.^{4,7} However, another study did not demonstrate statistically significant differences between the two-glove system and single gloves.⁸

In the present study, the highest rate of glove damage (12.3%) was observed in the prosthodontists' group, which may be due to the sharp and cutting instruments (such as disks, laboratory burs, etc.) used in their practice. In this regard, tears in gloves can occur while a cast post is held in hand and being refined with a bur. Furthermore, the highest rate of unnoticed damage was also observed in this group (7%), which may be due to ignoring safety precautions, improper glove wearing technique, etc. The lowest rate of glove damage was observed in the oral surgeons' group but the difference was not statistically significant compared to others. The reason for the minimum damage in this group may be the type and short duration of the procedures involved since the surgeons used such gloves only for tooth extraction, and for other surgical procedures, they used sterile surgical gloves, which were not in-

cluded in this study.

Contrary to what might be expected, the present study demonstrated that most punctures occur in the non-dominant (non-operational) hand. This finding underlines the importance of paying attention to non-dominant hand during dental procedures. Based on available data, no similar study has been carried out on the subject to date.

Conclusion

The presence of leaky gloves before use and the potential risk of glove perforation during dental procedures pose additional occupational hazards to dental practitioners, regarding the risk of transmittable infectious diseases such as AIDS and hepatitis C, which are incurable and refractory. Dentists should remember that wearing latex gloves does not completely solve the problem of contacting hazardous infectious materials.

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