Comparative study of single and double-gloving safety during arch bar placement for intermaxillary fixation

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Abstract.

This prospective study was conducted to comparatively evaluate, for providing single and double gloving safety during arch bar placement for intermaxillary fixation. A total of 62 consecutive patients in whom application of an Erich arch bar was indicated for intermaxillary fixation were equally divided into two groups. In group 1. Single surgical gloves were used; in group 2. Double surgical gloves were used. Wilcoxon's, Mann-Whitney test and binomial statistical test were used to analyzed the findings. A total of 152 perforations were found, in the group 1. 96 and group 2.total of 50 outer perforations and along with 6 inner gloves perforation were found . The nondominat hand presented with 71% of the perforations in single glove technique and double gloves technique's 68%. Double gloving techniques were found to provide effective clinicians protection than single gloving techniques. The single gloving techniques are less cost effective but did not maintain standardized cross-infection preventive measures.

Keywords: *arch bar, intermaxillary fixation, gloving method*

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Introduction:

According to World Health Organization rationale for using medical gloves: Medical gloves are recommended to be worn for two main reasons: 1. To reduce the risk of contamination of health-care workers hands with blood and other body fluids. 2. To reduce the risk of germ dissemination to the environment and of transmission from the health-care worker to the patient and vice versa, as well as from one patient to another. Gloves should therefore be used during all patient-care activities that may involve exposure to blood and all other body fluid (including contact with mucous membrane and non-intact skin), during contact precautions and outbreak situations. The efficacy of gloves in preventing contamination of health-care workers' hands and helping to reduce transmission of pathogens in health care has been confirmed in several clinical studies. Nevertheless, health-care workers should be informed that gloves do not provide complete protection against hand contamination. Pathogens may gain access to the caregivers' hands via small defects in gloves or by contamination of the hands during glove removal. Hand hygiene by rubbing or washing remains the basic to guarantee hand decontamination after glove removal. Preventive measures for the protection for patients, staff and doctor to reduce cross infection rate.Glove perforations may occur during surgical procedures, even though they often are not noticed during the procedure[1].This is achieved by using a protective barrier, such as gloves, to prevent skin contact with blood, secretion and mucosa[2]. Gloves practices aim to avoid direct contact maxillofacial surgeon personnel with organic material. Glove perforations rate is directly related to the duration of procedure performed[3], and the quality of the glove used[4]. The invasive nature of surgery, with its increased exposure to blood, means that during surgery there is a high risk of transfer of pathogens. Pathogens can be transferred through contact between surgical patients and the surgical team, resulting in post-operative or blood borne infections in patients or blood borne infections in the surgical team. Both patients and the surgical team need to be protected from this risk. This risk can be reduced by implementing protective barriers such

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as wearing surgical gloves. 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.

The primary objective of this review was to determine if double gloving (wearing two pairs of gloves), rather than single gloving, reduces the number of post-operative or blood borne infections in surgical patients or blood borne infections in the surgical team. The secondary objective of this review was to determine if double gloving, rather than single gloving, reduces the number of perforations to the innermost pair of surgical gloves. The innermost gloves (next to skin) compared with the outermost gloves are considered to be the last barrier between the patient and the surgical team.

In Bangladesh among Oral & Maxillofacial Surgeon intermaxillary fixation has performed by frequently use single glove. Erich arch bar is common practice, carries a significant risk of perforation due to the rough edges of the bars and the stainless steel wires used for placement. However no qualitative or quantitative difference in postoperative infection rate when wearing sterile gloves or wearing nonsterile gloves during oral surgery has beenfound[5]. We performed here a comparative and randomized analysis of single and double-gloving protection during arch bar placement for intermaxillary fixation with Erich arch bar and stainless steel wires performed under local anaesthesia by oral and maxillofacial surgeon. In this procedure, using 2 sterile gloves is common practice to increase the protection against possible perforations and piercing wounds and help maintain operative asepsis[6]. We performed comparative and randomized analysis of single and double gloving in terms of protection against perforation during Erich arch bar intermaxillary fixation with stainless steel wires performed by oral and maxillofacial surgeon.

Material and methods:

This clinical prospective randomized study was done Oral & Maxillofacial Department, Dhaka Medical College Hospital, Dhaka, during 2014 and 2015 tenure. The management of maxillofacial fracture by placement of Erich arch bar with stainless steel wires to comparative analysis of single and double-gloving protection during intermaxillary fixationunder localanaesthesia. 62 consecutive patients with maxillofacial fracture attend Oral & Maxillofacial department, Dhaka Medical College Hospital. The study groups were classified according to the type of glove used. In group 1. Single surgical glove were used. In group 2. Double surgical gloves were used. Glove perforation was evaluated by filling each glove with half liter of water, and then applied slight pressure on the glove with the palm and fingers. The number of perforations, evidenced by water flow through the holes, was counted. The same examiner performed all the evaluations.

Both the surgeons and the assistants were questioned about their perceptions or suspicions regarding glove perforation time and evaluation of any discomfort while wearing gloves. The perforations found were associated with surgeon gender and dominated hand, most frequent areas and durations of surgical procedure. Wilcoxon, Mann-Whitney and binomial statistical tests were used to evaluate the results.

Results:

A total of 372 gloves were used in this study where 152 perforations were found, with group 1. Single gloves 96 perforations were found and group 2. Double gloves 50 outer perforations and 6 inner gloves perforation were found. Of the single gloves used 96 perforation were found among them 52 surgeon and 44 assistant was slightly higher in surgeons. And double gloves used 56 perforations were found, among here also surgeon more perforation than assistant. In double gloves user that is group 2. Perforations were lower in number against single glove user that is group 1,The distribution of perforation showed (Table-I) a slight prevalence in the surgeon (54%). No accidents with a sharp edged instruments occurred. The difference among single and double glove perforations was significant at 1% (Wilcoxon's test).

Table-I

Number of perforations in the single and double gloves

Procedure	Surgeon	Assistant	Total
Single gloves	52	44	96
Double gloves	30	26	56
Total	82	70	152

*Significant statistical difference at 1% (Wilcoxon's test).

The average length time (ALT) of the procedure was 92 minutes (range 60 to 120 minutes). There was no significant statistical difference between the two gloving groups (Mann-Whitney test; á= 0.5) when comparing the number of perforations and the durations of surgical procedure. Almost all of the surgical procedures (84%; 27/32) than took more time than the ALT produced perforations, average 3.1 holes per procedure for the single glove method (Table-II). About 81%(22/27) of the procedure took less time than the ALT produced perforations, with

Table-II

Number of perforations compared with duration of procedure

Procedure duration	Total procedures	%	Procedures with perforations	%
Up to 90 minutes	30	48.39	22	73
90 minutes or longer	32	51.61	27	84

*There was no significant statistical difference among the procedures with perforations of the occurrence above or below the Mann-Whitney test (á= 0.5).

an average of 1.8 holes per procedure for the double glove methods. The distribution of perforations according to surgeons sex showed 66 perforations in the female gloves (38 in 20 female surgeons and 28 in 24 female assistants), for an average of 1.5 perforations per practitioner. The male gloves had a total of 86 perforations (46 in 42 male surgeons and 40 in 38 male assistants) for an average of 1.075 perforations per practitioner. No statistical significant difference between the sexes was observed (Mann-Whitney test á %).

In single glove procedure, the surgeons and assistants in the early procedures comfort from wearing glove, with adaptation occurring as the study continued. Majority was sure had sustained a perforation. In double gloves methods of subjective assessment, the surgeons and assistants in the early procedures related slight discomfort from wearing double gloves, with adaptation occurring as the study continued without compromising the surgical procedures. No one was absolutely sure whether he or she had sustained a perforation in an inner or outer glove. Only 6 surgeon suspected that they had sustained a perforations in the outer gloves; testing confirmed all of them had in fact sustained perforations.

Comparing dominant and nondominant hands demonstrated a statistical significant difference at 1% (binomial test). In single glove method, the nondominant hand sustained 71%(68/96) of the dominant 29% (28/96). In the double gloves method nondominant hand 68% (38/56) and the dominant hand 32% (18/56) perforations (Table-III).More than half of the perforations occurred on the index finger (47.37%; 72/152), with 61 (84.72%) of these on the nondominant hand and 11(15.28%) on the dominant hand. The distal phalanges had the highest perforation rate (56/152), with 47 on the nondominant hand and 9 on the dominant hand.

Table-III

Hand compared with perforations

Hand	Single glove perforations (%)	Double gloves perforations (%)
Dominant (a)	28 (29)	18 (32)
Nondominant (b)	68 (71)	38 (68)

Note: a x b shows a significant statistical difference at 1% (binominal test).

Discussion:

Pieper et al[7]confirmed a higher efficacy from wearing 3 gloves compared with double period wear. Many author recommended wearing 2 gloves during surgical procedures using sharp edged instruments[1,4,8]. A protection index was achieved in the present study using gloving, but decrease comfort and dexterity and numbness of the finger occurring after a short double gloving wearing 2 gloves did not impair the surgeons ability to handle surgical instruments or place Erich arch bar. Single glove method perforation occurred during Erich arch bar procedure almost double compare to double gloving methods. Despite thelack of statistical difference in accidental perforations in both gloving groups in long and short procedures, more perforations occurred in surgeries lasting more than 90 minutes. In oral and maxillofacial surgery procedures, the incidence of glove perforations seems to be more closely associated with the type of surgical procedure than with the duration of surgery. Handling the sharp instruments like Erich arch bars increase the risk of glove perforation so drastically that perforations could be found within a few minutes after the start of surgery. Thus changing gloves at regular intervals is recommended[9], as well as obviously whenever as evidence of accidental perforation is suspected or noticed. Many authors changing glove every 120 minutes[3,5,8,10], but the result from this study strongly suggest changing gloves as shorter intervals when placing Erich arch bars for intermaxillary fixation under local anaesthesia. A glove after the placement in each dental arch would be quite reasonable. The low number of perforation in the inner gloves perforations demonstrates the effectiveness of protection affordable by double gloving surgical methods. Group 2. shows higher efficacy than Group 1. The use of clean, nonsterile procedures gloves for minimum invasive surgery procedure is viable and free of risk of infection or complications. Giglioet al[6] found no difference in terms of postoperative infection control from wearing sterile and nonsterile gloves during tooth extractions.

The slightly higher rate of perforations in the female practitioners compared to male practitioners was not statistically significant, reflecting a similar ability of each gender to perform this type of procedures. The rates of accidental perforations noticed at the moment that they occurred at the range from 50% to 98% of the previous reports[1,4,16]. In the present study, all suspected accidental perforations were confirmed to the actual perforations (3.95%; 6/152). The dictates changing gloves not only when a perforation is actually seen, but also whenever the practitioners think that perforation may have occurred. Although double-gloving decrease the practitioner' sability to detect a perforation when it occurs, the increased protection afforded by the practice, along with the minimal decreases dexterity and comfort, offset the relative disadvantages.In terms of the distribution of the perforation by the time of day when the procedure was performed. The incidence of glove perforation on the nondominant hand was 69.7% (106/152) and was most common on the index finger. In fact according to Burke et al[12], when placing oral sutures, glove perforation occur most often on the index finger. The high rate of perforation of the index fingers on the nondominant hand is well known, due to the use of them for support and protection of soft tissues[1,13]. Thus caution is recommended during Erich arch bar placement, along with proper use of surgical instruments, such as separators and tweezers, instead of the fingers.

Conclusion:

Use of single gloving method for placement of Erich arch bar placement strongly discourages. Double gloving has been shown to be effective in protecting against perforation. Changing gloves whenever a perforation is suspected and once a dental arch is completed is recommended.

References:

1. Nikawa H. Hamada T, Tamamoto M et al: Perforation of dental gloves during prosthodontic treatments as assessment by conductivity and water inflation test. Int. J Prosthod 9:362,1996
2. Dirschka T, Winter K, Kralj N, et al: Glove perforation in outpatient dermatological surgery. DermatolSurg 30: 1210, 2004
3. Yinusa W, Li YH, Chow W, et al: Glove puncture in orthopedic surgery. IntOrthop 28-36,2004
4. Molinary JA: Gloves: Continuing effectiveness, new technologies and recommendations. Compendium 21:186, 2000
5. Avery CME, Tailor J, Johnson PA: Double-gloving system for identifying glove perforations in maxillofacial trauma surgery. Br J Oral MaxillofacSurg 37:316 1999
6. Gilglio JA, Ronald RW, Laskin DM, et al : The use of sterile versus nonsterile gloves during out-patient exodontia. Quintessence Int 24:543, 1993
7. Pieper SP, Schimmele SR, Johnson JA et al: Aprospective study of the efficacy of various gloving techniques in the application of Erich arch bars. J Oral MaxillofacSurg 53:1174, 1995
8. Otis LL, Cottone JA: Prevalence of perforations in disposable latex gloves during routine dental treatment. J Am Dent Assoc 118:321, 1989
9. Al-Maiyah M, Bajwa A, Finn P, et al: Glove perforations and contamination in primary total hip arthroplasty. J Bone Joint Surg (Br) 87;556, 2005
10. Barbosa MVJ, Nahas FX, Ferreria IM et al: Risk of glove perforations in minor and major plastic surgery procedures. AesthicPlastSurg 27:481, 2004
11. Avery CME, Hjort A, Walsh S, et al; Glove perforation during extraction of wisdom teeth. Oral Surg Oral Med Oral Pathol Oral RadiolEndod 86;23, 1998
12. BurkeFJT,Baggett FJ, Lomas AM; Assessment of the incidence of punctures in gloves when worn for routine operative procedures. Br Dent J 174:412, 1993
13. Patton LL, Cqambell TL, Evers SP: Prevalence of glove perforations during double-gloving for dental procedures. Gen Dent 43:22, 1995