How to Cite:
Chatterjee, A., Sanober, A., Srivastava, P., Thakur, S., Venugopal, K., Budumuru, A., & Bhagyasree, V. (2022). A randomized controlled trial on cross infection control in maxillofacial trauma surgery a comparison of intermaxillary fixation techniques. *International Journal of Health Sciences*, *6*(S1), 8819–8824. https://doi.org/10.53730/ijhs.v6nS1.6990

A randomized controlled trial on cross infection control in maxillofacial trauma surgery a comparison of intermaxillary fixation techniques

Abhirup Chatterjee
BDS, MDS, Senior Lecturer, Department of MaxilloFacial Surgery, Rajasthan Dental College and Hospital, Jaipur, Rajasthan, India
Corresponding author email: dr.abhi.maxfac@gmail.com

Arshiya Sanober
Senior Lecturer, Oral and Maxillofacial Surgery, Govt Dental College and Hospital, Hyderabad, Telangana, India
Email: drarshiyaomfs14@gmail.com

Pritika Srivastava
Consultant Oral and MaxilloFacial Surgeon, Lucknow, Uttar Pradesh, India
Email: drpritika0608@gmail.com

Sachin Thakur
Reader, Department of Oral & Maxillofacial Surgery, Modern Dental College & Research Center, Indore, MP, India
Email: drthakursachin@yahoo.com

Kannan Venugopal
Department of Oral and Maxillofacial Surgery, PMS College of Dental Science and Research, Golden Hills, Vattapara, Trivandrum, Kerala, India
Email: kannan7072003@gmail.com

Anil Budumuru
MDS, Senior lecturer, Department of Oral and Maxillofacial Surgery, Vishnu Dental College, Bhimavaram, Andhra Pradesh, India
Email: anilbudumuru123@gmail.com

Vegunta Bhagyasree
Consultant Periodontist & Implantologist, Vijayawada, Andhra Pradesh, India
Email: bhagyasree.b4u@gmail.com

Manuscript submitted: 9 March 2022, Manuscript revised: 18 April 2022, Accepted for publication: 1 May 2022

***Abstract*---**Aim: The purpose of the present research was to evaluate the intermaxillary fixation techniques in maxillofacial trauma surgery in terms of cross infection control. Methodology: A randomized controlled trial which included 120 patients with fractures of the mandible requiring open reduction and fixation. The participants were allocated either to the study group and treated with intraoperative Rapid IMF or to the control group and managed with intraoperative eyelet wire ties. Results: Rapid IMF group had significantly fewer glove perforations than the traditional method (0.67 per operation compared with 1.5), ($P < 0.0001$). The incidence of skin-penetrating injuries was the same in both groups (rate 0.02/ procedure). The application of Rapid IMF was significantly faster than wiring ($P < 0.0001$). Minor intraoperative complications were noted in both groups, but more in the Rapid IMF group. Most concerned loosening or fracture of the anchorage ties but the surgical outcome was not affected. Conclusion: Rapid IMF is a safer alternative to wiring methods with significant reduction in glove perforation rates and is quicker to apply than conventional wiring techniques.

***Keywords*---**Intermaxillary fixation, cross-infection, blood-borne infection.

Introduction

Maxillomandibular Fixation (MMF) is a fundamental component in the management of facial trauma, reconstruction and orthognathic surgery. This is done to ensure the interrelationship of the dental occlusion, which is necessary in the reduction of traumatic or surgically induced segments of the mandible and maxilla. MMF is used intraoperatively to aid in Open Reduction Internal Fixation (ORIF), in the closed treatment of fractures, and during orthognathic procedures. Exposure-prone procedures include digital palpation of a needle tip in a body cavity or the simultaneous presence of the healthcare worker's fingers and a needle or other sharp instrument or object in a poorly visualized or highly confined anatomical site.[1] The routine use of glovesmay not prevent injuries or eliminate the potential for cross infection between surgeons and patients.[2] Operations for the treatment of facial fractures should be regarded as high-risk procedures because they are exposure prone, and involve the use of motorized instruments that cause spillage and the formation of an aerosol. Considering the various routes of bloodborne pathogen transmission, the greatest risk is from percutaneous injuries. These are not prevented by barriers and require changes in surgical technique.[3] Internal fixation with small plate osteosynthesis has greatly improved safetybut further changes in intermaxillary fixation (IMF) techniques are desirable.[4]Avoiding penetrating injuries remains a vital aspect of protecting the surgeon against exposure to blood borne diseases. Percutaneous injury is an occupational hazard for surgeons and other health care workers engaged in surgical procedures. Percutaneous injury may occur in up to 21 % of operations.[5] According to the Centre for Disease Control and Prevention (CDC), Department of Health and Human Services, USA, in March 2001, it was estimated that 0.6–0.8 million needle stick injuries (NSI) and other percutaneous injuries

occur annually among healthcare workers.[6] However, the incidence of surgical glove perforation during the treatment of some maxillofacial fractures may be as high as 50 % with over 90 % going unnoticed at the time of operation.[7] The use of an Erich bar for intermaxillary fixation, a common procedure in oral and maxillofacial surgery, carries a significant risk of perforation and other accidents due to rough edges of bars and stainless steel wires used for placement. According to Bali et al. the needle stick injury rate during intermaxillary fixation is 23.25 %.[8]According to Gaujac et al, residents working on patients who had to undergo intermaxillary fixation and other wiring techniques along with open reduction internal fixation were at maximum risk of receiving glove perforations (GP) and NSI or wire stick injuries (WSI).[9] No barriers can eliminate the risk of blood borne pathogen transmission from percutaneous injuries and the need for changes in high risk surgical techniques is obvious.[10,11] It is becoming a common practice for some surgeons to reduce mandibular fractures manually and avoid use ofIMF altogether without any compromise in surgical outcome.[12] This is more economical in time and cost, safer for surgical team and more comfortable for patient.[13,14]A prospective randomised clinical study of the incidence of glove perforation and percutaneousinjury with Rapid IMF and a traditional wiring IMF technique was carried out.

Aim of the present study

The purpose of the present research was to evaluate the intermaxillary fixation techniques in maxillofacial trauma surgery in terms of cross infection control.

Methodology

The study included 120 patients. Patients were included if they were 18 years of age and over, dentate, had a fracture of the mandible that required open reduction and internal fixation and temporary intraoperative IMF ould be achieved with either Rapid IMF or a wiring technique, as judged by the surgeon. Fractures that required postoperative IMF or elastic traction were excluded. Patients with a decreased level of consciousness, learning difficulties or a history of significant psychiatric disease were also excluded. Written informed consent was obtained from all participants along with ethical committee approval.The study group underwent IMF with Rapid IMF. The control group were managed with eyelet wire ties and intermaxillary wires. Six anchorage ties or eyelet wires were used for each patientand the devices were removed at the end of the procedure. Temporary bridle wires or transosseous wires were avoided. The primary outcome measure was prespecified as the incidence of glove perforations per operation. Secondary outcome measures were: the number and types of exposure sustained by the surgeon, the assistant and the scrub nurse and their cause; the incidence of unnoticed glove perforations; the time and degree of difficulty for IMF application; and numbers of surgical complications.The data collected included patient and staff details, the length of IMF application and the total procedure in minutes. The number of fracture sites was recorded. A visual analogue scale (VAS) of 1–10 with guidelines was used to grade the degree of difficulty of fracture reduction and fixation. Glove perforations and percutaneous injuries were recorded.Comparisons between the rates were made using Poisson regression, adjusting for centre andwhether the fractures were single or multiple.

The differences between arms were expressed as a rate ratio with its associated 95% confidence limits. All computations were performed in the R statistical package,

Results

A total of 120 patients who fulfilled the inclusion criteria were included. IMF group had significantly fewer glove perforations than the traditional method (0.67 per operation compared with 1.5), (P < 0.0001). This difference in incidence was similar in the noticed and unnoticed perforations and across the theatre personnel. The rate of blood/ fluid contact was similarly reduced by half, and this difference was of borderline statistical significance (P < 0.051). In the study (Rapid IMFTM) group, perforations noticed during the procedure occurred during IMF application in 5 cases. In the control (eyelet) group, perforations noticed during the procedureoccurred during IMF application in 23 cases. The application of the Rapid IMF system was significantly faster than wiring (mean 13.2 min compared with 18.9 min) (P < 0.0001). The incidence of complications was significantly lower in the eyelet group (rate ratio = 2.6, 95% CI: 1.0 to 7.0, P = 0.036). There were no postoperative complications related to the IMF devices. (Table 1).

Table 1
Perforation rates per operation and operation duration in the two trial arms

	Eyelets	Rapid IMF	Adjusted Rate Ratio (95%CI)*	P*
Total Perforations	90	40	0.46 (0.32 to 0.68)	<0.0001
Blood/ Fluid Contact	23	10	0.49 (0.23 to 1.04)	0.051
Skin Penetration	1	1	1.1 (0.1 to 19.4)	0.95
Total Gloves Used	387	366	0.95 (0.82 to 1.10)	0.51

Discussion

The blood-borne pathogens most commonly involved in occupational transmission are the human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV). Prospective studies of healthcare workers have estimated that the average risk for HIV transmission after percutaneous exposure to HIV-infected blood is approximately 0.3% (95% confidence interval = 0.2 to 0.5%).[15] Hollow-bore needles transfer greater volumes of blood and increase the risk of HIV infection.[16] There have however been cases of healthcare worker HIV seroconversion after percutaneous injuries with solid sharps. The risk of transmission of HBV after a needle stick or sharps exposure to a non-immune person is at least 30% if the source patient is HBeAg positive but is less than 6% if the patient is HBeAg negative.[15]

No barriers can eliminate the risk of blood-borne pathogen transmission from percutaneous injuries and the need for changes in high-risk surgical techniques is obvious. This has particular importance for maxillofacial surgeons and operating- theatre personnel because glove perforations and wire sticks occur commonly during reduction and fixation of facial fractures. Devices, such as IMF, must be avoided or modified.[17]

Most surgeons who treat mandibular fractures with small plate osteosynthesis still use IMF as a method of fracture reduction, for historical reasons, in the belief that this is essential to achieve a normal occlusion. It is becoming common practice for some surgeons to reduce mandibular fractures manually and avoid the use of IMF altogether without any compromise in the surgical outcome. This technique is more economical in time and cost, safer for the surgical team and more comfortable for the patient.[18] Several studies on intraoperative cross-infection control have assessed the incidence of outer/ single glove punctures. The rates vary from 0% for some ophthalmic procedures to 11–54% for general surgical operations and up to 100% for head and neck and maxillofacial trauma procedures.[19]

Intraoperative complications associated with the IMF devices were noticed in both the study and control groups but none led to an adverse outcome. Six cases of minor gingival lacerations were noticed in the eyelet wires group compared with only two in the Rapid IMF group. Most of the intraoperative complications in the Rapid IMF group concerned loosening of the anchorage ties.

Conclusion

Rapid IMF is a safer alternative to wiring methods with significant reduction in glove perforation rates and quicker to apply than conventional wiring techniques.

Acknowledgement

We thank Dr. Jignaben Patel, BDS, Bharti vidyapeeth dental college and hospital, Wanlesswadi, Sangli, Maharashtra, India for reviewing the manuscript.

References

1. Centres for Disease Control Prevention. Recommendations for preventing transmission of human immunodeficiency virus and hepatitis B virus to patients during exposure-prone invasive procedures. MMWR 1991: 40: 1–9.
2. Beltrami EM, Williams IT, Shapiro GN, Chamberland ME. Risk and management of blood borne infections in health care workers. Clin Microbiol Rev 2000: 13: 385–407.
3. Gooch BF, Siew C, Cleveland JL, Gruninger SE, Lockwood SA, Joy ED. Occupational blood exposure and HIV infection among oral and maxillofacial surgeons. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1998: 85: 128–134.
4. Avery CME, Johnson PA. Surgical glove perforation and maxillofacial trauma: to plate or wire? Br J Oral Maxillofac Surg 1992: 30: 31–35.
5. Avery CME, Taylor J, Johnson PA (1999) Double gloving and a system for identifying glove perforations in maxillofacial trauma surgery. Br J Oral Maxillofac Surg 37:316–319
6. CDC and prevention (2001) Recommendations for post-exposure prophylaxis (PEP) for exposure to HBV, HCV, and HIV. MMWR 50:22
7. Avery CME, Hjort A, Walsh S, Johnson PA (1998) Glove perforation during surgical extraction of wisdom teeth. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 86:23–25

8. Bali R, Sharma P, Garg A (2010) Incidence and patterns of needlestick injuries during intermaxillary fixation. Br J Oral Maxillofac Surg 49:221–224
9. Gaujac C, Ceccheti MM, Yonezaki F, Garcia IR Jr, Peres MP (2007) Comparative analysis of 2 techniques of double-gloving protection during arch bar placement for intermaxillary fixation. J Oral Maxillofac Surg 65:1922–1925.
10. Beltrami EM, Williams IT, Shapiro GN, Chamberland ME (2000) Risk and management of blood borne infections in health care workers. Clin Microbiol Rev 13:385–407
11. Pieper SP, Schimmele SR, Johnson JA, Harper JL (1995) A prospective study of the efficacy of various gloving techniques in the application of Erich arch bars. J Oral Maxillofac Surg 53:1174–1176
12. Pigadas N, Whitley SP, Roberts SA, McAlister K, Ameerally P, Avery CME (2008) A randomized controlled trial on crossinfection control in maxillofacial trauma surgery: a comparison of intermaxillary fixation techniques. Int J Oral Maxillofac Surg 37:716–722
13. Centres for Disease Control Prevention (1991) Recommendations for preventing transmission of human immunodeficiency virus and hepatitis B virus to patients during exposure-prone invasive procedures. MMWR 40:1–9
14. Centres for Disease Control Prevention (1998) Recommendations for follow up of health-care workers after occupational exposure to hepatitis C virus. MMWR 47:603–606.
15. Beltrami EM, Williams IT, Shapiro GN, Chamberland ME. Risk and management of blood borne infections in health care workers. Clin Microbiol Rev 2000: 13: 385–407.
16. Bennett NT, Howard RJ. Quantity of blood inoculated in a needlestick injury from suture needles. J Am Coll Surg 1994: 178: 107–110.
17. Martinez-Gimeno C, Acero-Sanz J, Martin-Sastre R, Navarro-Vila C. Maxillofacial trauma: influence of HIV infection. J Craniomaxillofac Surg 1992: 20: 297–302.
18. Fordyce AM, Lalani Z, Songra AK, Hildreth AJ, Carton ATM, Hawkesford JE. Intermaxillary fixation is not usually necessary to reduce mandibular fractures. Br J Oral Maxillofac Surg 1999: 37: 52–57.
19. Smith JR, Grant JM. Does wearing two pairs of gloves protects against skin contamination ? BMJ 1988: 297: 1193.