

# Percutaneous injuries in periodontal procedures

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## Abstract

Occupational exposures to blood borne pathogens can occur as a result of percutaneous injuries during periodontal procedures. Detailed attention to the pattern of injuries could help in developing improved strategies to further minimize their incidence. We surveyed 12 residents enrolled in the Master of Dental Surgery (MDS) course for one year to find out how many percutaneous injuries occurred during periodontal procedures. Survey questionnaire inquired in detail about the circumstances, site and the nature of injury. We also noted the risk status of patient and device which caused the injury. A total of 48 percutaneous injuries (7.84%) were received in 612 periodontal interventions consisting of 265 surgical and 670 non surgical procedures in the 1 year survey. The injury rate was 4/year/resident and individual residents suffered from 2-7 injuries during the study. The difference in number of percutaneous injuries sustained in surgical periodontal procedures (41/265) was highly significant statistically ( $p < 0.0001$ ) when compared to those in non surgical interventions (7/670). Most injuries occurred from suture needle followed by Castroviejo and injection needle. There is a low probability of occupational transmission of blood borne diseases in periodontal procedures. The findings of this study could possibly contribute further in efforts to reduce the incidence of percutaneous injuries during periodontal procedures.

## Key words

PERIODONTAL DISEASES – surgery; MOUTH – injuries; MOUTH MUCOSA – microbiology; OCCUPATIONAL EXPOSURE

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## Introduction

An estimated 0.6-0.8 million percutaneous injuries (PI) occur among health care workers (HCWs) annually.<sup>1,2</sup> These injuries predispose the HCWs to more than 20 different infections from blood borne pathogens, many of which can be potentially fatal.<sup>3,4</sup> Dental health care providers (DHCP) are routinely exposed to patient's blood, oral fluids and tissues, all of which may potentially carry lethal blood borne viruses (BBV). The principal blood borne pathogens of concern to the dental staff are Hepatitis B (HBV), Hepatitis C virus (HCV) and the Human immunodeficiency virus (HIV). The Centers for Disease Control (CDC) carried out a number of studies to establish the risk of transmission in dental settings and establish guidelines for universal precautions to be followed during dental procedures.<sup>5</sup> As a consequence of strict adherence to universal precautions, immunization and better occupational safety measures, the number of infections from PI's have declined during the last decade.<sup>6</sup> However, irrespective of all measures, injuries will continue to occur at a baseline level. No effective vaccination has been developed against HCV and HIV till date. Also there are significant numbers of health care workers worldwide who do not receive appropriate vaccination against HBV.<sup>7,8</sup> In view of these continuing occupational threats the quest to develop and apply specific strategies to decrease the incidence of injuries should not be abandoned.

Various studies conducted to determine the frequency of PI's in dental practice have estimated the annual rates to be between 3.4-3.6 in general dentists.<sup>9,10</sup> The 1995 American Dental Association (ADA) study was the first to evaluate prospectively the occurrence of PI in periodontists.<sup>9</sup> Based on the total sample of 2304 dentists that included 61 Periodontists, the ADA estimated an annual PI rate of 2.16 in Periodontists whereas the orthodontists had a PI rate of 1.9, endodontists 1.3, oral surgeons 2.4, prosthodontists 4.5 and Pedodontists 5.5.<sup>9</sup> Periodontal procedures account for 6.19% to 11.4% of the overall PI's sustained in dental settings.<sup>9,11</sup>

Although several studies have estimated the incidence of PI's in general dentistry and a few in periodontics, none has specifically focussed on their patterns and circumstances in periodontal procedures. The conventional periodontal therapy encompasses

both surgical and non surgical modalities; surgical management involves different type flaps and mucogingival procedures. The periodontist not infrequently works with sharps and rotatory instruments in areas of oral cavity which often have limited accessibility. There exists a significant possibility of acquiring infections from exposure to not only patient's blood but also from saliva and gingival crevicular fluid. Most periodontal procedures are carried out either without any anaesthesia or under local anaesthesia; since the patient is awake, reflex patient movements are always possible and raise the chances of injury to the operator.

Risk factors for PI's have been evaluated in different specialities and targeted interventions developed on the basis of the findings to prevent these injuries.<sup>10,12-18</sup> We therefore studied periodontal trainees in a teaching hospital in India for 1 year (Jan 2010 to Jan 2011) to establish the incidence and patterns of PI's during periodontal procedures.

Occupational exposures to blood borne pathogens can occur as a result of percutaneous injuries during periodontal procedures. Detailed attention to the pattern of injuries could help in developing improved strategies to further minimize their incidence.

## Methods

The study involved 12 residents enrolled in the Master of Dental Surgery (MDS) course from Jan 2010 to Jan 2011 in the Department of Periodontology at D.A.V Dental College, Yamunanagar, India. All respondents were required to fill in a questionnaire after carrying out each periodontal procedure. Surveys were accompanied by a blank sealable envelope for confidentiality. No details that could identify a contributor were collected. All procedures were carried out employing universal precautions. All operators except one were right handed. Completion of questionnaire was accepted as implied consent for participation in the study. Completed questionnaires were deposited in a box at the end of each procedure.

## Questionnaire

The questionnaire was developed by a multidisciplinary team working on various aspects of sharps safety in our hospital. It consisted of specialists in Periodontology, Preventive dentistry, Oral surgery, Orthodontics,

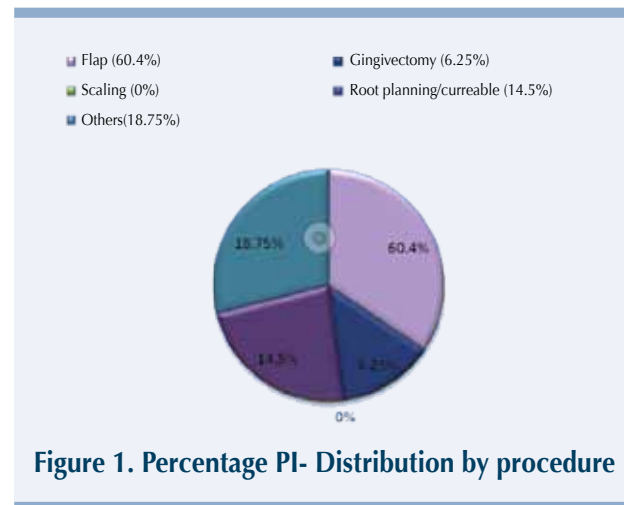
Nursing and Occupational medicine. The design involved review of existing publications, group discussions, and a pilot study in the department of Periodontology for two months to confirm validity and feasibility. It asked about the number of PI, the details of injury (superficial or deep, intraoral or extra oral), the type of procedure, site (maxilla or mandible, anterior or posterior segment) and the side (left or right) on which the procedure was being done at the time of the injury. Other questions included the time of procedure (morning or afternoon), device which caused injury, whether the device was contaminated and whether the injury involved a high risk patient (one with a history of infection with HIV, HCV, HBV, injectable drug use, multiple blood transfusions or someone who worked in the sex industry). The injuries with little or no bleeding were recorded as superficial, and ones with a deep cut or clear bleeding were categorized as deep. Procedures that began between 8-12 am and 12-4 pm were classified as morning and afternoon respectively. This study utilized self reporting for PI's, which may be subject to bias; although independent confirmations were not made, bias was minimised by anonymity and a clear explanation of the primary purpose of the study to all the participants.

Data are expressed as numbers and percentages (%). The significance of differences between the groups was assessed using fisher's two tailed exact test, and probabilities of < 0.05 was accepted as significant.

**Results**

A total of 48 PI (7.84%) were received in 612 periodontal procedures in a 1 year survey. Thirty nine of these exposures took place intra orally while nine

(18.75%) were sustained extra orally. There was a PI rate of four PI/ resident/ year and this ranged from two to seven. Figure 1 shows the distribution of PI by procedure.



Sixteen PI were sustained while working on maxillary right quadrant out of which seven were in anterior and nine in the posterior maxilla; whereas while working on left side total of nine PI were received out of which three were in anterior region and six in the posterior. While working on mandible nine PI were received on the right side out of which four were in anterior and five in the posterior region; whereas while working on left side total of five PI were recorded, two in anterior and three in the posterior region (Table I). It was noted, but not statistically significant, that there were lower number of injuries in mandible (15) as compared to maxilla (24) and less injuries on the left side (14) as compared to the right (25). These could be attributed to better accessibility and control over instrumentation in terms of finger rests in these areas.

**Table I. Location and Number of Percutaneous injuries**

Jaw and side	Anterior	Posterior	Total
Maxilla (24)			
Right	7	9	16
Left	3	6	9
Mandible (15)			
Right	4	5	9
Left	2	3	5
<b>Total</b>	<b>16</b>	<b>23</b>	<b>39</b>

Afternoon procedures were associated with a higher number of PI (11.57%) as compared to those carried out during morning (5.80%). This was statistically significant with a p value of 0.0049. Out of total PI sustained, 42 were superficial injuries and 45 took place on the non dominant hand. In 41 injuries the offending device was found to be contaminated (Table II). Suture needle was the most common device responsible for causing injuries (39.5%) (Fig. 2). Nonsurgical procedures accounted for 14.5% of the total injuries and surgical procedures 85.40%. The difference in number of PI's sustained in surgical periodontal procedures (15.47% - 41 PI during 265

**Table II. Details related to percutaneous injuries sustained**

	Number (%) Of Pi
<b>Time</b>	
Morning	23/396 (5.80%)
Afternoon	25/216 (11.57%)
<b>Injured</b>	
Operator	40 (83.3%)
Assistant	8 (16.6%)
<b>Depth</b>	
Superficial	46 (95.8%)
Deep	2 (4.16%)
<b>Site of injury</b>	
Non dominant	45 (93.75%) -30 Index finger, 15 Thumb
Dominant	3 (6.25%) -1 Index finger, 2 rest of the hand
<b>Patient status</b>	
Low risk	42 (88%)
High risk	6 (12%)
<b>Device</b>	
Contaminated	41 (85.42%)
Clean	7 (14.29%)

surgical procedures), was highly significant statistically ( $p < 0.0001$ ) when compared to PI in non surgical interventions (1.04% - 7 PI during 670 nonsurgical procedures). The highest PI rate occurred during flap procedures (19.86%) (Table III).

Another interesting finding was higher injuries when the operator-assistant was a left and right combination or vice versa. The PI rate in these procedures was much higher 15.52% (9/58) as compared to the overall PI rate of 7.84% in this study.

### Discussion

PI poses a significant occupational hazard of infection to all dental health care workers from blood borne pathogens such as HCV, HBV and HIV.<sup>6,9-11</sup> Although the use of strict barrier techniques and safety devices have minimised the incidence of these injuries, they still continue to occur and have not been totally eliminated. Various observational studies have been carried out among general dentists and specialists to assess the incidence and pattern of these injuries. The information acquired from these about the specific circumstances of exposures has helped in devising preventive strategies to reduce PI in dental settings.

Our study evaluated the incidence and pattern of PI during periodontal procedures among 12 residents. The results of this study indicate a PI rate of four PI/ year which is higher than the PI rate of 2.16 in periodontists estimated in the ADA study.<sup>9</sup>

We found a higher rate of PI in surgical procedures when compared to non-surgical procedures. The differences in instrumentation may account for the lower incidence of PI in non-surgical procedures. All health care workers who are involved in the use of sharps are at higher risk of occupational exposure, particularly surgeons.<sup>19</sup> The difference in number of injuries sustained in procedures done during morning

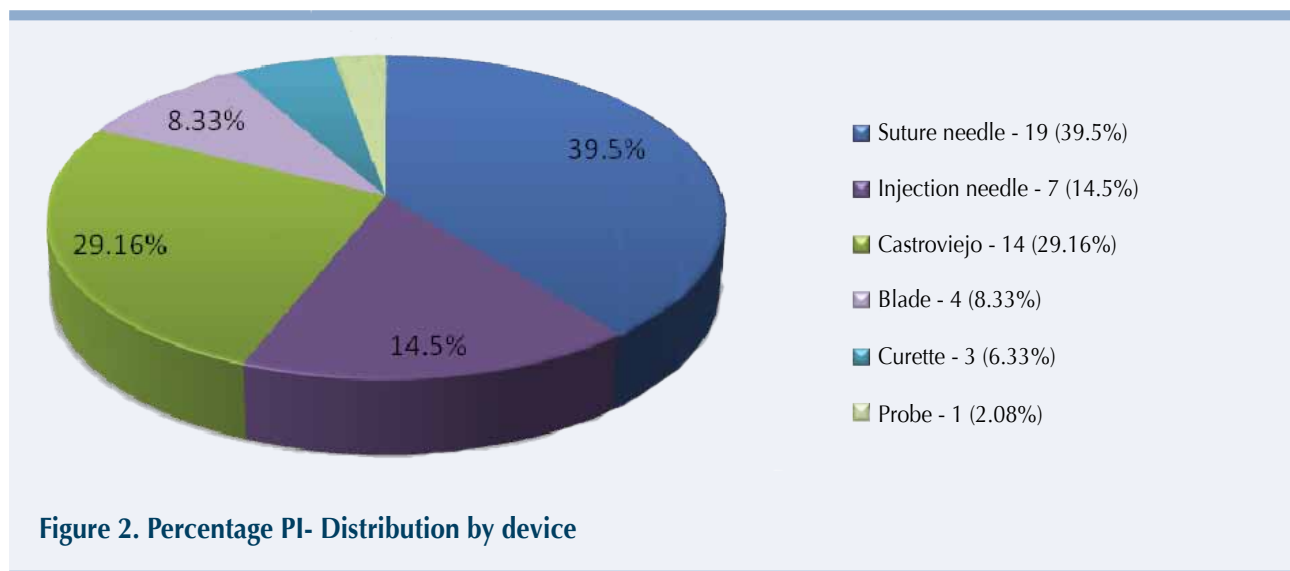
**Table III. Percutaneous injuries in various procedures**

Type of procedure	No. (%) of procedures (Total = 612)	PI (Total = 48)	PI RATE*
Flap surgery	146 (23.8%)	29 (60.4%)	19.86%
Gingivectomy	55 (8.9%)	3 (6.25%)	5.45%
Scaling †	548 (89.5%)	0 (0%)	0%
Rootplanning/ Curettage	122 (19.93%)	7 (14.5%)	5.73%
Others‡	64 (10.45%)	9 (18.75%)	14.06%

\* PI rate = No. of PI/ No. of Procedure x 100

†Including scaling only and scaling in association with other procedure including flap surgery, gingivectomy, root planning and curettage.

‡Frenectomy, soft tissue grafting, incisional biopsy, vestibuloplasty.



and afternoon was also significant. This could be attributed to higher alertness in the morning as compared to afternoon.

In the EPI net needle stick injury (NSI) report, suturing comprised the maximum number of injuries (24%).<sup>20</sup> We also found highest proportion of injuries occurred from suture needle (39.5%) followed by castroviejo (29.16%) and injection needle (14.5%).

In our view the risk of PI's during periodontal procedures could be minimized in numerous ways. Firstly, the use of double gloving can prevent the risk of fluid contamination 7 – 8 times because of the wiping effect of two layers.<sup>21,22</sup> The green inner glove helps in early detection of a perforation and so reduces the clinician's exposure time to the patient's body fluids. In this study, significantly higher injuries occurred during surgical procedures and more so to the non-working hand. We think that the use of double gloving at least on the non-working hand during surgical interventions could have reduced these injuries without compromising the dexterity and tactile sensation of the working hand to the extent of adversely affecting the procedure.

Secondly, one should consider appointing the surgical procedures preferably during early morning than in the afternoon. Trainee doctors are at 1.5 times higher risk of exposure incidents when working at night than during the day.<sup>23</sup> Also occupational health advice and post exposure prophylaxis may sometimes not be promptly available during late afternoon. This might be

vital as clinical trials have suggested reduction in HIV transmission risk by 81% if post exposure prophylaxis is initiated without delay.<sup>24</sup>

Thirdly suture needles of appropriate configuration and tips should be selected taking into account parameters like location, type of procedure and the tissue involved (blunt tips for non keratinized tissues).<sup>25,26</sup> This could possibly bring down the high number of injuries during suturing.

Lastly, we think that 18.75% injuries in this study, which took place extra orally, could have been prevented more easily. Studies recommend that sharps should not be passed directly by the operator to the assistant and instead a neutral zone should be used for passing sharps.<sup>27</sup>

This study utilized self reporting for PI's, which may be subject to bias although we think that it was minimised by anonymity and a clear elucidation of the rationale of the study. The study was carried out in trainee periodontists, so it is likely that the incidence might be higher, as they are more likely to be injured, especially when they are learning new skills with sharp instruments like castroviejo. Also it is our view that they might not have been selecting the correct suture needle shape and size for the particular procedure. However, data indicate that age or increased experience do not influence the injury rates and they will continue to occur at some baseline level at which no amount of training or expertise can prevent them.<sup>9,28</sup>

Our study has recorded the incidence of percutaneous injuries during periodontal procedures at a teaching hospital in India. In developed countries the overall incidence can be expected to be lower as a result of better institutional strategies in prevention, increased awareness among operators and use of safer devices.

Overall this study suggests a low likelihood of occupational transmission of blood borne diseases in periodontal procedures. The findings could perhaps further contribute in efforts to reduce the incidence of PI's during periodontal procedures.

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