

Patterns of previous tooth loss in patients presenting at five different types of dental practice

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ABSTRACT

Introduction: In an Orthodontic and a Periodontal practice the most frequently missing teeth were the third molars followed by the mandibular M1 and the maxillary PM1.

Objective: To record the incidence of absent teeth/missing teeth amongst patients attending differing dental practices.

Materials and methods: Data recording age, gender and missing teeth (jaw and side) were drawn from the records of the initial consultations of patients attending five practice types: orthodontic (n 194), periodontal (n 202), prosthodontic (n 137), general dental practice (n 115) and Oral Hygiene Clinic (n 156). Excluded were patients under age 20 and those attending for oral medicine consultation (no dental charting).

Results: Mean ages (group, sd) ranged from 34.7y (orthodontic 9.8y) to 50y (prosthodontic 12.2y). Jaw side had no effect on missing teeth in any group (Z test). M3 were the most frequently missing teeth, followed by maxillary PM1, mandibular 1, PM1 and PM2. Age in decades effected the most dominant influence, followed by Practice Group, with gender having a weak effect on M3 data (linear logic analysis).

Conclusions: Molars and premolars were the most frequently absent teeth. Different dental patient populations experience differing patterns of tooth loss, although the reasons are not readily identified.

Key words: Missing teeth, practice type.

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INTRODUCTION

This study followed a previous project which examined the dental records in a periodontic practice and an orthodontic practice. That study found that the most frequently missing teeth in both groups of patients were the third molars, followed by the mandibular first molars and then the maxillary first pre-molars.¹ The absence of the maxillary first pre-molar conjured a variety of orthodontic scenarios, while the absence of a first molar alerted the clinician to the possibility of clinical implications from dental, periodontal and occlusal stand-points. An example of this was seen in a previous study where molar tooth position and alignment was assessed in relation to periodontal health.² It has also been shown that there is a possibility that the early loss of maxillary pre-molars could lead to subsequent periodontal break-down.³ In the mandible, a clinical observation led to a study of the position and orientation of the first molar in relation to the severity of furcation involvement and possible tooth loss.⁴

LITERATURE REVIEW

The implications of tooth loss were looked at by Hirschfeld,⁵ who was concerned with the sequelae of losing mandibular first molars. He wrote that the loss of this tooth could result in "kaleidoscopic changes"; amongst these being the mesial tipping of the second and third molars and collapse of the anterior part of the dental arcade. Similar observations were made by Ramfjord.⁶ From an orthodontic standpoint, Proffit said "loss of posterior teeth, usually first permanent molars, is a frequent problem in adults".⁷ He continued to say "since the first molar is so frequently lost, one sees the second and third molars tipped mesially, rotated, and in a position that is conducive to neither long-term health nor to simple restorative procedures".

Much has been written in recent years of the reasons for tooth loss.^{8,10} Danielson *et al.*¹¹ mentioned that 64.4% of missing teeth were mandibular, with the molars making up 95.3% and the first molar accounting for 40.1%. In their group of 17 to 36 year olds, impaction of the third molar was the main reason for extraction. Shigli *et al.*¹³ examining an Indian population, recorded that the mandibular first molar was most often extracted due to dental caries, while the maxillary central incisor was most frequently lost due to periodontal disease. In a Kenyan population the most

Table 1: Number of patient records studied by age in decades and practice type.

Practice type	20-29y	30-39y	40-49y	50-59y	60-79y	Total
General dental	28	51	16	11	9	115
Oral hygiene	33	37	29	26	31	156
Orthodontic	67	29	16	16	2	152
Periodontal	12	26	61	61	31	190
Prosthodontic	8	31	42	42	29	143

commonly missing teeth were the lower molars followed by the maxillary molars.¹⁴ Similar findings were recorded for young Brazilian populations.^{15,16}

In the United States of America a survey conducted in 2004 by the National Institute of Dental and Craniofacial Research recorded that adults in the age range 20 to 64 years old had an average of 24.92 remaining teeth... ie seven teeth had been lost. Ten percent of the sample aged 50 to 64 years of age had no remaining teeth. The prevalence of tooth loss had however decreased since the 1970's.¹⁷ Gobally, the WHO estimated in 2012 that about 30% of people aged 65 to 74 have no natural teeth.¹⁸ A similar survey conducted in Australia reported that 6.4% of the population aged 15 years or older were without any teeth.¹⁹

Whilst there are several studies on the relationship between socio-economic factors and the loss of teeth,²⁰ there does not appear to have been any endeavour to consider loss of teeth in relation to the type of practice the patient consults.

OBJECTIVE

To record missing teeth amongst patients attending five dental practice types: general dental practice, orthodontic practices, a periodontal practice, a prosthodontic practice and the Oral Hygiene Clinic (Dental Hospital, University of the Witwatersrand).

MATERIALS AND METHODS

The choice of practices and the variation of types of dentistry were determined on the basis of ensuring a reasonable spread of the various categories of dentistry together with the selected practices having a reputation for excellence of records. The general practice and the clinic were included to ensure that there was an adequate range of socio-economic factors to balance the possibility that specialist practices could predominantly reflect the more affluent in society. The sample comprised the records of the first visit to the respective practice of adult patients over the age of 20 years and in each practice the records were accumulated sequentially. The age, gender of the patient and his/her missing teeth were recorded from the details collected at the initial consultation. Exclusion criteria were: patients under the age of twenty years and those who had been referred for an Oral Medicine consultation

to the Oral Medicine/Periodontal practice, as tooth charting was not carried out for these latter patients.

The following numbers of patient records were examined in each group: General practitioner: 115, Orthodontic: 156, Periodontal: 198, Prosthodontic: 137 and Oral Hygiene: 156.

Statistical analysis was completed using SAS for Windows, Version 9.1 (SAS Institute Inc, Cary, NC, USA). Tests used were the Z test and the linear logistic analysis (Proc Catmod). The dependent variable was the frequency of missing teeth; whilst the independent variables were jaw, side, patient's age in decades, practice type and gender. The level of statistical significance was set at p<0.05.

RESULTS

The patient records studied by decade (age) and practice type are listed in Table 1. In the Tables, in each cell, the first numeral is the tooth number of the most frequently missing tooth e.g. 6 = first molar, while the percentage after this indicates the frequency of that tooth being found to be missing.

Mean ages (n, sd) of the sample were general practice 38.1y (115, 12.1y), orthodontic practice 34.7y (156, 9.8y), periodontal practice 47.8y (198, 11.0y), prosthodontic practice 50y (202, 12.2y) and oral hygiene clinic 44.6y (127, 15.5y).

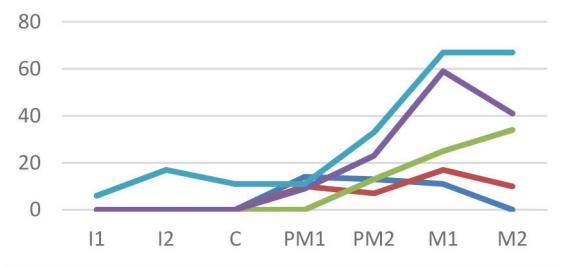
The graphs in Figure 1 demonstrate as a percentage the incidence of missing teeth in each of the samples drawn from the five practice types. The overall impression is the rising incidence with increasing age of the absence of some posterior teeth. A noticeable peak is seen recording the absence of upper premolars in patients in the periodontal practice, also reflected in the orthodontic practice but here for both upper and lower arches. A rather intriguing observation refers to the patients in the oral hygiene group where the older patients had suffered considerable deprivation of teeth in the maxilla. Lower incisors appeared to be the least frequently missing in all practice types.

The highest frequency of missing maxillary teeth by decade and practice type is shown in Table 2 (third molars were not included). The most frequently missing tooth in the general

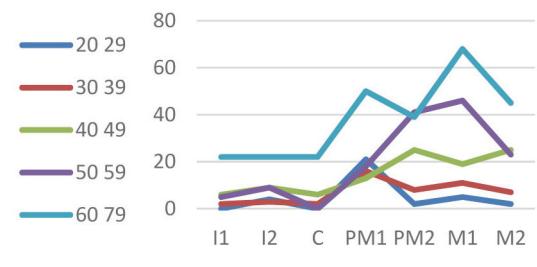
Table 2: Highest frequency of missing maxillary teeth by decade and practice type. The numbers in bold are tooth types e.g. 7 = second molar. Identical frequencies show two tooth types e.g. 5;7. (Third molars are excluded from these data but 82% of the combined sample were missing one or more of these teeth).

Practice type	20-29y	30-39y	40-49y	50-59y	60-79y	Combined sample
General dental	4 36%	4 28%	5;7 47%	6 71%	-	6 33%
Oral hygiene	7 25%	5 23%	7 56%	6;7 55%	7 79%	7 46%
Orthodontic	4 22%	4 35%	4;6 20%	4 50%	-	4 40%
Periodontal	4 40%	4 36%	4 21%	7 36%	7 58%	4 69%
Prosthodontic	-	4 33%	5 31%	7 59%	7 72%	5 44%

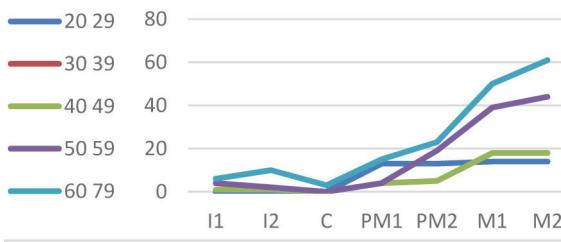
GENERAL DENTIST : MANDIBLE



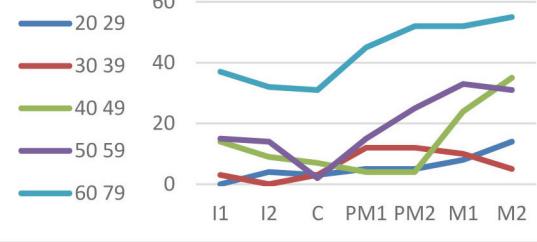
GENERAL DENTIST : MAXILLA



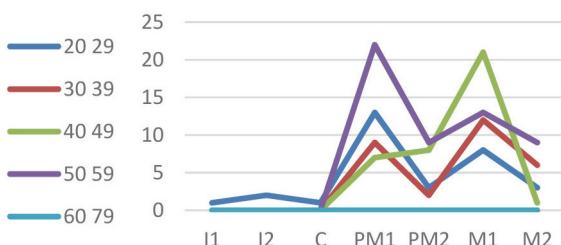
ORAL HYGIENIST : MANDIBLE



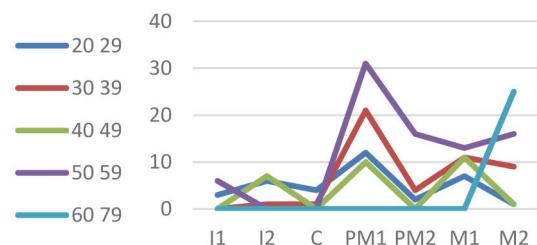
ORAL HYGIENIST : MAXILLA



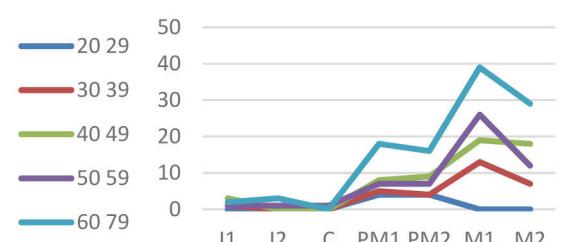
ORTHODONTIST : MANDIBLE



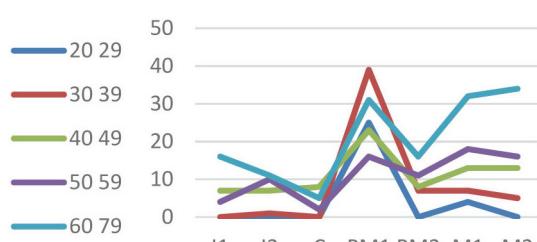
ORTHODONTIST : MAXILLA



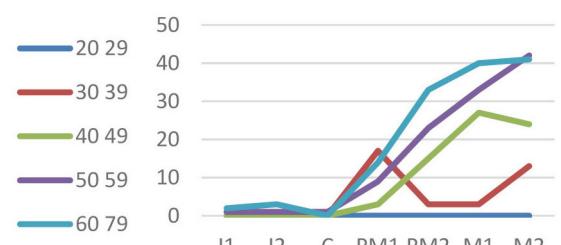
PERIODONTIST : MANDIBLE



PERIODONTIST : MAXILLA



PROSTHODONTIST : MANDIBLE



PROSTHODONTIST : MAXILLA

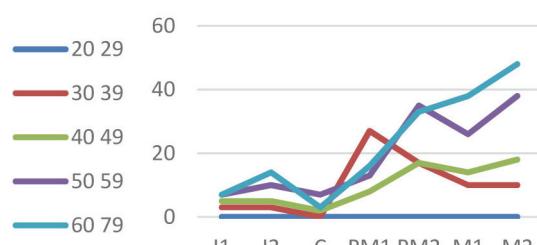


Figure 1: Graphs demonstrating the relative loss of teeth recorded in each of the dental practices according to age. (Note No data for the 20 to 29 year old sample in Prosthodontics and no data for the 60 to 70 year old sample in Orthodontics).

Table 3: Highest frequency of missing mandibular teeth by decade and practice type. The numbers in bold are tooth types e.g. **7**= second molar. Identical frequencies show two tooth types e.g. **4;5**. (Third molars are excluded from these data but 82% of patients were missing one or more of these teeth).

Practice type	20-29y	30-39y	40-49y	50-59y	60-79y	Combined sample
General dental	5 18%	6 30%	7 55%	6 81%	-	6 42%
Oral hygiene	7 25%	7 24%	6 48%	6 63%	7 88%	7 50%
Orthodontic	4 23%	6 23%	6 38%	4 37%	-	4 29%
Periodontal	4;5 15%	6 25%	6;7 30%	6 46%	6 67%	6 40%
Prosthodontic	-	4 17%	6;7 43%	7 64%	6;7 64%	7 53%

Table 4: A linear logistic analysis determined the statistically significant effects ($P<0.05$) of the variables (d=decade/age, p=practice type, g=gender) on the loss of teeth, recorded for each tooth type. Hence for example, the loss of a lower six was influenced by age, whilst the loss of a maxillary premolar was influenced more by age but practice type also had a bearing. Gender had a significant effect only for the third molars in both jaws.

Maxillary teeth	Significant effect	Mandibular teeth	Significant effect
1	$d > p$	1	-
2	d	2	-
3	d	3	-
4	$d > p$	4	$d > p$
5	$d > p$	5	$d > p$
6	$d > p$	6	d
7	d	7	$d > p$
8	$d > p > g$	8	$d > p > g$

dentistry group was the first molar, notwithstanding the first premolar being more frequently absent in the twenty to forty year-old patients. In the periodontal practice the most frequently missing tooth was the first premolar, with the second molar more often absent in the older ages.

The highest frequency of missing mandibular teeth by decade and practice type is shown in Table 3 (as in the maxillary groups, the third molars are not included, but when the practice types were combined, 82% of these teeth were missing). In the orthodontic practices the first molar was the most frequently absent tooth in the 30 year to 50 year old patients, in the other practice types it was the premolars that were the most often missing. In the total sample, it was the first premolar that was missing most frequently. Clearly when maxillary or mandibular teeth are missing it is most likely that it is the premolars or molars which will have been lost.

The Z-test showed no significant effect of jaw, or side, on the frequency of missing teeth in any practice type. Table 4 shows the linear logistic analysis determining the statistically significant effects of the independent variables: decade, practice type and gender. Age in decades was the most common factor followed by practice type. Gender had a significant effect only for the third molars in both jaws.

Table 5 is presented to reflect the number of teeth lost by the whole sample.... a considerable loss as evidenced by

the realization that the 804 patients were together missing 7048 teeth, an average of nearly nine teeth per patient!

DISCUSSION

The spreads of ages amongst the sample are what one would expect, with a lower age range in the orthodontic practices. The periodontal group included a higher number of patients in the forty to sixty year olds, while the prosthodontic practice sample had the highest prevalence of patients in the fifth decade. The patients in the oral hygiene clinic showed a relatively even spread through the decades, as indeed did the general dental group.

It is observed that the patterns of tooth loss are characterized amongst younger patients who may have sought orthodontic treatment and in contrast, amongst older patients who would be seeking periodontal and prosthodontic care.

In the maxilla the most commonly missing teeth in the 30's and 40's decades are the premolars, and this may indicate previous dental interventions, such as extractions to resolve crowding, with or without orthodontic treatment. The records were those taken on the occasion of the first visit to the practice so the premolars had been lost prior to the orthodontic consultation. It has been suggested that the absence of these teeth with no appropriate treatment could possibly pre-dispose to restorative and periodontal problems in the future.¹

The data from the mandibular arch showed the most frequently absent tooth to be the first molar. The loss of these teeth with advancing age decreases the number of posterior occluding pairs available for function. Replacement with conventional crowns and bridges is only possible if there is a distal abutment. Replacement using implants is not always possible, leaving the less effective option of distal extension partial dentures.²¹

This has been an observational study, so that the causes of tooth loss have not been included. It is difficult to compare these observations with other studies of missing teeth, as this investigation recorded only the absence of teeth in five practice types. There are, however, similarities with the findings of Danielson *et al.* who reported that caries was the dominant reason for the extraction of molars, and periodontal disease the cause of the loss of premolars.¹²

Table 5: Data reflecting the total number of teeth missing amongst the combined sample

Total tooth loss amongst sample						
	General Practitioner	Oral Hygienist	Orthodontist	Periodontist	Prosthodontist	TOTAL
Patients	115	156	194	202	137	804
Maxillary Teeth	963	881	583	728	807	3962
Mandibular Teeth	816	661	354	578	677	3086
						7048

CONCLUSIONS

When data for the third molar were excluded, overall the most frequently absent tooth in all the groups was the maxillary first premolar, then the mandibular first molar, next the mandibular premolars. Loss of maxillary first premolars could be due to periodontal disease, crowding and orthodontic needs. The loss of the mandibular first molar is of concern as its loss could be a precursor of periodontal breakdown.

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DENTAL PROTECTION APPOINTS NEW DENTAL DIRECTOR

Dental Protection has appointed Raj Rattan MBE as the new Dental Director, to succeed Kevin Lewis who steps down in summer 2016. Mr Rattan has over 30 years' experience in dental practice and has been associated with Dental Protection for over 20 years, first as a dentolegal adviser and more recently as a senior dentolegal consultant.

Mr Rattan is also Strategic Associate Dean at the London Deanery and he uses his extensive knowledge and experience to inform and open debate through his published articles, books and international lectures on risk management, quality assurance and practice management. In 2008, Mr Rattan was appointed MBE in the Queen's New Year's Honours List for services to dentistry and he is former Policy Adviser to the Department of Health.

Speaking on his appointment, Raj Rattan said:

"It is a huge privilege to be given the opportunity to lead a very talented team who are dedicated to dentistry. There are over 100 members of staff and consultants in Dental Protection in the UK, with an enormous breadth of expertise and experience. We also have colleagues who serve dental members in Africa, Asia, Australia, New Zealand and the Caribbean. Members should be reassured that if they face a difficult situation that arises out of their practice, they will receive assistance from experienced dentists with legal training, who will help them at every stage.

"Having been in practice for over 30 years, I understand our members' fears, aspirations and the issues they are facing. We are here to support and educate members, and protect them from risk throughout their career.

"I look forward to working closely with my colleagues in helping to shape a better future for our dental members and for the profession, by listening to their concerns, working closely with key stakeholders and continuing to provide tailored courses and events. I believe that by helping dentists in their professional careers, we are also creating a happier and safer environment for patients.

"I also want to take this opportunity to thank Kevin Lewis for not only his strong leadership and personal friendship, but also his sense of purpose that has made Dental Protection what it is today. I want to build on this past success and focus on providing a world class service for our members so that together we are better prepared to meet future challenges."

Pardeep Sandhu, Executive Director of Professional Services at MPS, said:

"I am extremely pleased that Raj is to lead our dental services; his vast experience and knowledge of the sector will be invaluable for both colleagues and members.

"For the dental profession the threat of patient complaints and litigation has never been greater, both in the UK and internationally. Thankfully, our members have access to the largest team of dentolegal advisers anywhere in the world, with a wide range of skills and expertise in every aspect of clinical and professional life. I am certain that Raj will lead Dental Protection to continue to provide the expert advice, support and education that dentists need throughout their career."