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Audit of Crowns and Fixed Partial Dentures in a Nigerian Teaching Hospital

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Aim: The purpose of this investigation was to document the reasons for placement, and replacement of crowns and fixed partial denture in a Nigerian Teaching Hospital. **Methods:** a retrospective review of patients that had advanced conservative procedures. A data collection form was used to gather the relevant information from the patients' case notes. Section A sought information on age , gender, educational level, patients' occupation etc. Section B recorded information on tooth/teeth involved, reason for fabrication of prosthesis and material used. **Results:** Three hundred and twenty six had 398 crowns while 23 patients received bridges. Patients' ages ranged from 16-85 years with a mean of 47.7 ± 17.2 years and a male to female ratio of 1:1.3. Thirty five percent of the crowned teeth were in the upper right quadrant, followed by the upper left quadrant with 29.4%. Upper right central incisors were the most frequently (15.6%) crowned teeth. Endodontics and esthetics were the most common reasons for initial crown placement and replacement respectively. About 60% of bridges fabricated were new, while 22.2% of replaced bridges were due to fracture of porcelain and unacceptable marginal adaptation. **Conclusion:** Endodontics and esthetics were the most common reasons for initial crown placement and replacement

Keywords: Prosthodontics. Denture. Partial, Fixed.

Introduction

The placement and replacement of crowns forms an important part of regular dental care which is provided in the general dental practice[1]. It covers half of the general practitioners time and it is usually quite expensive[2]. The main goal of crown placement is to provide patients with a long–lasting tooth–like restoration that is strong, easy to maintain, biologically compatible, and esthetically similar to natural teeth or improve the strength or appearance of natural teeth[3]. Dental restorations do not last forever. Studies[4,5] have shown that restorations have a limited lifespan and once a tooth is restored, 'the restorative cycle' commences where the restoration will likely be replaced many times throughout the lifetime of the patients[5]. It has been shown that over 60% of all restorative dentistry involves the replacement of restorations[6].

For intracoronal restorations, reasons for placement and replacement include primary caries, secondary caries, unacceptable marginal adaptation, bulk fracture of tooth, unsightliness, non–carious tooth wear and pain/sensitivity[7]. Deligeorgi et al. reported primary caries to be the main reason for the placement of initial restoration and secondary caries being the most frequent reason for the replacement of existing restorations[8]. Ajayi et al., however, found fracture of restorations to be the commonest reason for replacement[9]. Indirect restorations (crown and fixed partial dentures) can be fabricated using different materials such as metals, ceramics or the combination of the two materials. However, gold still remains the gold standard against which all other restorations are measured in terms of longevity. Secondary car- ies and retention loss are the commonest causes of failure, it hasGold restorations have a survival rate of 96% and a failure rate of 1.4% in the posterior permanent dentition[10], but secondary caries and retention loss are the commonest causes of failure. Porcelain fused to metal and all ceramic restorations have a survival rate of 90% and 75-80% respectively over 10 years.

Studies[11,12] conducted among Americans revealed that secondary caries account for 22% and 37% of failure of crown and fixed partial denture and the mean service life of single crown was 8-9.4 years[11,12]. Technical failure was reported to be the most prevalent (8%) cause of failure of crowns in a study by Cheung[13] in HongKong. Other studies[14,15] however, reported lack of retention to be the most common cause of failure of crown and bridges. Oginni[3] in his study in a suburban population in southwestern part of Nigerian however reported poor esthetics to be the most frequent cause of failure and the overall mean years of service for replaced restorations were 5.6 years

There is paucity of information on reasons for placement and replacement of crowns and fixed partial dentures especially in this environment. The purpose of this investigation was to document the reasons for placement, and replacement of crowns and fixed partial denture, as well as to assess the tooth/teeth involved and the different materials used in the fabrication of the restorations in a Nigerian Teaching Hospital.

Materials and methods

This is a retrospective review of all patients aged sixteen and above that had advanced restorative procedures done at the conservation clinic of the Dental Centre, University College Hospital between August 2011and July 2016. A data collection form

was used to gather the relevant information from the patients' case notes. Section A sought information on sociodemographic characteristics of patients such as age, gender, educational level, patients' occupation etc. Section B recorded information on tooth/teeth involved, reasons for initial placement and replacement of crown and fixed partial denture, type of material used in fabrication of prosthesis. One of the authors (ASIMF) searched through the case notes for the relevant information required. Patients case notes in which all the required information could not be found were excluded from the study. Ethical approval was sought and obtained from the University of Ibadan /University College Hospital ethical review committee.

There has not been a consensus on various socio-economic classifications in Nigeria. Therefore, for the purpose of this study, a modified version of standard occupational classification system designed by the Office of Population Census and Surveys, London (OPCS 1991)[16] was employed as given below;

- Class 1 = Skilled worker e.g professionals and managerial officers and retirees of this cadre
- Class 2 = Unskilled workers e.g Artisan and traders
- Class 3 = Dependants e.g housewives, students, non-pesionable retirees

Data were collected on the designed collection form, one sheet was used for each crown or bridge placed and the forms were bound together and then entered into the computer. Data analysis was carried out with SPSS version 22.0 (SPSS Inc, Chicago, Illinois, USA) using descriptive statistics. Association between categorical variables was determined using Chi – Square with a level of statistical significance placed at $p \leq 0.05$

Results

A total of 415 patients received crowns and bridges during the study period out of which only 349 with complete records were included and those with incomplete data were excluded giving a 'drop out' rate of sixteen percent. Three hundred and twenty six had 398 crowns while 23 patients received bridges. Patients' ages ranged from 16-85 years with a mean of 47.7± 17.2years. More than half (195, 55.9%) were females and the remaining were males giving a male to female ratio of 1:1.3.

The highest proportion (37.8%) of the patients were in the age range of 41-60years and the least (1.1%) were those older than 80 years. A high majority (88.5%) of the patients had University education or its equivalent. (Table 1). More than half (57.9%) of the patients were skilled workers (class1) and the least (10.6%) were the unskilled (class 2).(Table 1)

Three hundred and ninety eight teeth were crowned, out of which 140 (35.2%) were in the upper right quadrant, 117 (29.4%) were in the upper left quadrant and the least (67, 16.8%) were in the lower right quadrant. One hundred and seventy five (44%) of the total teeth crowned were incisors out of which 112 (28.1%) were central incisors and the highest proportion (15.6%) were the upper right central incisors. A total of 92 premolars were crowned and the upper right second premolar constituted the highest(6.3%) proportion, while out of the 106 crowned molars, the lower left second molars had the highest (23, 5.8%) proportion and the least were the third (upper

Table1. Socio demographic

Status of patients	
Age (years)	16 – 85
Mean	47.7 ± 17.16
Age Group	
≤ 20 years	20(5.7%)
21 – 40 years	106(30.4%)
41 – 60 years	132(37.8%)
61- 80 years	87 (24.9%)
> 80 year	4(1.1%)
Total	349(100%)
Sex	
Male	154 (44.1%)
Female	195 (55.9%)
Occupation	
Class 1	202 (57.9.0%)
Class 2	37 (10.6%)
Class 3	110 (31.5%)
Educational Level	
Primary/Arabic	17 (4.9%)
Secondary	23 (6.6%)
Tertiary	309 (88.9%)

The highest proportion of patients were in the age group 41-60years. Majority (88.5%) had university education and slightly over half (57.9%) were skilled workers

and lower) molars with only 4 crowned teeth. The maxilla had 258 (64.6%) of the crowned teeth while the remaining were in the mandible. Slightly over half (54.5%) of all the crowned teeth were placed in female patients. (Table 2). The average number of crowns placed in the patients ranged from one to twelve.

The commonest reason for initial crown placement was following endodontics (194, 59.5%) which is statistically significant across gender with more female crowning

Table 2. Distribution of crowned teeth according to gender

	UL1	**UL2**	**UL3**	**UL4**	**UL5**	**UL6**	**UL7**	**UL8**	
	50	17	6	9	19	12	4	0	117
M	25	11	2	4	6	3	1	-	52
F	25	6	4	5	13	9	3	-	65
	UR1	**UR2**	**UR3**	**UR4**	**UR5**	**UR6**	**UR7**	**UR8**	
	62	17	9	17	25	6	4	0	140
M	36	4	6	8	5	3	1	-	63
F	26	13	3	9	20	3	3	-	77
	LL1	**LL2**	**LL3**	**LL4**	**LL5**	**LL6**	**LL7**	**LL8**	
	11	6	3	3	7	20	23	1	74
M	10	3	1	2	3	6	5	1	31
F	1	3	2	1	4	14	18	0	43
	LR1	**LR2**	**LR3**	**LR4**	**LR5**	**LR6**	**LR7**	**LR8**	
	7	5	3	1	11	17	20	3	67
M	6	4	1	-	8	6	8	2	35
F	1	1	2	1	3	11	12	1	32

A total of 398 teeth were crowned; 175 (44%)were incisors, 92 (23%) were premolars and the remaining 106 (27%) were molars. The upper right central incisors constitute the highest proportion (15.6%) of all the crowned teeth and the least were the third molars. About sixty four percent of the crowned teeth were in the maxilla and slightly over half (54.5%) were in females

their teeth. Other reasons include previous failed crown, fracture, failed extensive restoration (Table 3) .

The most common reason for crown replacement was esthetics (23.1%), followed by

Table 3. Reason for crown placement and replacement according to sociodemographs

Sociodemograph	Endodontic	Fracture	Aesthetic reasons	Failed Extensive Restoration	Tooth Wear	1^0 Caries	Failed Crown	Total	P Value
Sex									
Male	73	29	5	9	1	1	27	145	0.007
Female	121	15	3	8	6	3	25	181	
Age Group									
≤20years	12	4	0	1	-	-	2	19	
21 - 40	63	16	5	7	1	1	10	103	
41 – 60	69	16	3	4	4	3	23	122	0.72
61 – 80	48	8	-	5	2	-	17	80	
>80	2	-	-	-	-	-	-	2	
Total	194	44	8	17	7	4	52	326	
Occupation									
Class 1	109	24	6	10	4	4	34	191	0.7
Class 2	18	6	1	0	1	0	5	31	
Class 3	66	14	1	7	3	0	13	104	

The commonest reason for initial crown placement was following endodontics (194, 59.5%) which is statistically significant across gender with more female crowning their teeth. Other reasons include previous failed crown, fracture, failed extensive restoration.

secondary caries (13.5%), pulpal necrosis (10) (resulting in the need for endodontics) and unacceptable marginal adaptation (10%) (Fig 1).

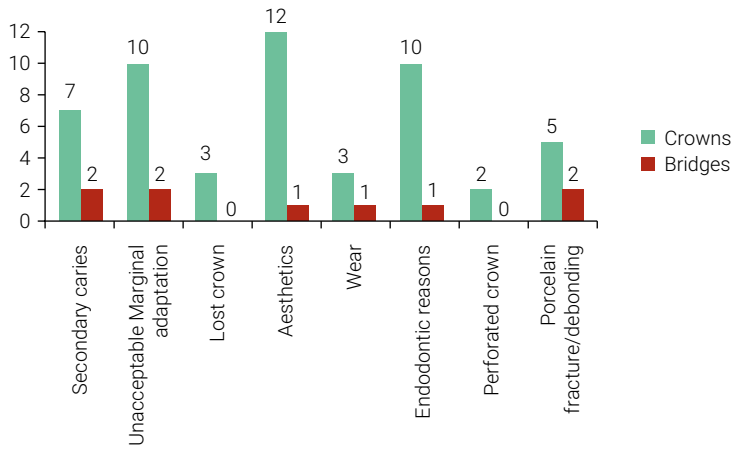

Figure 1. Reasons for replacement of crowns and bridges among patients seen.

Twenty three bridges were used in replacing 44 missing teeth in different parts of the arch. The bridge designs used were fixed fixed (91.3%) and cantilever (8.7%). The number of units per bridge varied from 3 to 8, with the 3- unit bridges constituting the highest (34.8%).(Table 4). Fourteen (60.9%) of the bridges fabricated were new while 9 (39.1%) were replacements. The reasons for replaced bridges include fracture of porcelain facing (22.2%), Unacceptable marginal adaptation with resultant cementation failure (22.2%), and others.(Fig 1). A high majority (88%) of all the prostheses (crowns and bridges) were fabricated using porcelain fused to metal.

Table 4. Distribution of bridges fabricated

	N	Percentage(%)
Mode of bridge fabrication		
New	14	60.9
Replacements	9	39.1
Types of bridges		
Cantilever	2	8.7
Fixed fixed	21	91.3
No of units/bridge		
3 units	8	34.8
4 units	7	30.4
5 units	2	8.7
6 units	4	17.4
8 units	2	8.7

A total of 23 bridges were fabricated out of which fourteen (60.9%) were new, 21 (91.3%) were fixed fixed. The number of units in the bridge vary from 3 to 8 with the 3 unit bridge been the most prevalent (34.8%)

Discussion

In a developing country like ours, it is usually quite difficult to assess or evaluate restorations on long term basis because patient compliant to follow up is usually poor and most patients will only present when there is a fresh complaint, or a need for repair or replacement of the previous restoration. This, therefore, accounts for the retrospective evaluation of patients records seen during the study period. A lot of data is usually lost when evaluation like this is employed, more so, different criterion may be used by clinicians in recording their findings.

The age range of patients seen in the present study of 16 – 85 years with a mean of 47±17.2 years is close to what was reported by Akbar et al.[17] in Pakistan but slightly higher than that documented by Oginni[3] in the same region in Nigeria while it is lower than that reported by Akar et al.[18] in Turkey. This can be due to the fact that older age group now pays more attention to their dental care. Epidemiological studies have shown that as life expectancy gradually increases, so does the percentages of elderly individuals in the population[19]. The tendency therefore is for this group of patients to retain more teeth in their late years and a desire towards fixed rather than removable prosthetic rehabilitation[20,21].

This study reported a higher frequency (55%) of female with fixed prostheses which is corroborated by 51.7% and 66.67% reported by Akbar et al and Valderhaug respectively[17,22] while on the contrary, a higher male preponderance of 57% was reported in another study[23].The higher number of females with fixed prostheses in this study could be attributed to the fact that they tend to be more concerned with their esthetics and general appearance than male as earlier reported by Ogunrinde et al.[24].

The fact that the highest proportion of patients that received crowns and bridges were in the age group 41 – 60 years may be an indication that this age group are those who are comfortable in their chosen profession and economically stable and can readily afford the cost of a fixed prosthesis more so that payments are done out of pocket[3].

In the present study, the upper central incisors were the most commonly (28.1%) crowned teeth. This is slightly lower than 33% reported by Wilson et al.[1] for the upper central incisors which were frequently crowned than lateral incisors. Overall, the upper right central incisors were the most commonly crowned (15.6%) unlike in a previous study[1] where the upper left central incisors were the most commonly (10%) crowned teeth. These incisors either the left or right are usually the most frequently involved in trauma thereby indicating them for root canal therapy followed by crowning. Furthermore, the esthetic demand to restore these teeth to form and function is usually high because of the location.

The upper second premolars were also found to be more frequently crowned than upper first premolar. This is similar to what has been previously reported[1]. This observation may not be unconnected with the positioning of the second premolar which is next to the first molar which takes active role in masticaion. Furthermore, composite materials for the restoration of access cavity have been found to be less successful on posterior than on anterior teeth[25]. Practitioners may therefore believe that the placement of crowns on posterior teeth with premolar inclusive remains a more predictable approach than placing large tooth-colored restorations. In addition, caries removal, access cavity preparation during endodontic treatment may also contribute to the fragility of the tooth[26] and hence the need for full coronal coverage.

In this study, almost 60% of teeth were crowned following endodontic treatment and 13.5% due to fracture. This is contrary to report by Wilson et al.[1] in which 26% of initial crown placement was due to intracoronal restoration failure, 38% to teeth fracture and esthetic reasons accounting for 15%. This therefore, suggests that contrary to certain perceptions, cosmetic considerations may not be a principal driver for resorting to the initial provision of crowns among practitioners in this environment. Moreso, late presentation with the attendant extensive coronal destruction will necessitate crowning of most endodontically treated teeth in this environment.

Walton et al.[11] and Schwartz et al.[12]found caries to be the most common reason for crown failure accounting for 22% and 37% of cases seen respectively. Loss of retention was also reported as the commonest reason for crown and fixed partial denture failure accounting for 28%[15] and 45%[14] in studies in Cameroun[15] and India[14] respectively. However, in the study by Oginni[3], poor esthetics was the commonest reason for 40.5% of crown failure, followed by dental caries accounting for 15.4%. This is similar to present study where the most common reason for crown replacement were due to loss of esthetics (23.1%), and secondary caries accounted for 13.5% . This loss of

aesthetic may not be unconnected to the fact that the majority of these restorations were fabricated in Porcelain-Fused-to-Metal and debonding of a large amount of the porcelain veneer will automatically lead to aesthetic failure. Thus, esthetic demands may be seen to be on increase as patients' expectations continue to rise, however further investigation is required. The ultimate goal of single crown replacement is to treat at first crown complication and secondly to improve esthetic and restore function[26]. The very few cases of fixed partial denture seen in this study does not allow for favorable comparison with other similar studies.

The metal ceramic restoration remains the restoration of choice both in this study and previous studies[1,15,18] because it combines both the esthetic and strength. In addition, this type of restoration can withstand high masticatory forces generated during chewing associated with the more fibrous Nigerian diet[3]. Though the strength of Zirconia is comparable with metal, the lack of adequate facilities in our center makes the fabrication impossible.

In conclusion, the most commonly crowned teeth in this study were the upper right central incisors. Definitive restoration of endodontically treated teeth and esthetics were the commonest reasons for initial crown placement and replacement respectively. Thus, esthetic demand may be on the increase as patients expectation continue to rise, however further investigation is required.

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