Original Article

Complications in Metal-Ceramic Fixed Dental Prostheses among Patients Reporting to a Teaching Dental Hopspital

Fazal Ghani, Muhammad Rizwan Memon

ABSTRACT

AIMS & OBJECTIVES: This study aimed to report the distribution of biological and technical complications and their levels in patients' fixed dental prosthesis (FDPs) reported to Prosthodontics Department, Khyber College of Dentistry Peshawar (Pakistan).

METHODS: During February 2007 to Jan 2008, a descriptive study was conducted. Data relating to 124 patients having complications with their levels in metal-ceramic FDPs were collected using a structured proforma, by the methods of patient's interview, clinical and radiographic examination. Data related to age, gender, types and levels of biological and technical complications, the FDP fitting place, FDP location in the dental arch as well as of the post-fitting duration were also recorded.

RESULTS: Subjects had mean age of 37±11 years. Male to female ratio was 1.3:1. Distribution of FDPs was; hospital-fitted (56.4%), private-practice-fitted (32.2%) and quacks-fitted (11.2%). Distribution of 210 noted complication events with reference to fitting place was; hospital-fitted (60%), private-practice-fitted (30%) and quack-fitted (10%). Some 29% complication events were in FDPs not older than a year, 46% in those not older than 5 years and 25% in those older than 5 years. Complication were; de-cementation (24.8%), caries (20.5%), peri-apical problems (18.1%), periodontal problems (11.1%), prosthesis fractures (9.1%), abutment fracture (7.1%), occlusal problems (6%) and esthetic-problems (3.3%). Not-withstanding the varying levels of individual complication events, level-1 complications were 43%, level-2 were 44% and level-3 were 13%.

CONCLUSION: Irrespective of the types and levels, some 75 % complications occurred in FDPs not older than 5 years.

KEYWORDS: Fixed dental prostheses, Technical and biological complications, Metal-ceramic.

INTRODUCTION

Introduced in the early sixties of the 20th century, metal-ceramic fixed dental prostheses (FDPs) are still most widely used all-over the world [1]. Compared to the many other design systems, metal-ceramic FDP's have many advantages. These include the increased strength, toughness, accuracy and marginal adaptation of the metal alloys and the ever-lasting esthetic appearance of ceramics [2]. Because of these and the inherent easy applicability of the technology involved, metal-ceramic restorations have gained wide popularity [3].

Complications are conditions that occur during or after appropriately performed fixed prosthodontic procedures. However, the categorization or classification of FDPs related complications has been felt difficult and not simple [4]. On the outcome of FDPs, in separate studies, caries and loss of retention were found as the major events complicating the FDP performance[5,6]. In a study involving 515 cases, it was found that 65% complications in the form of abutment fracture and periodontal breakdown caused FDP failure [7]. Another study noted occlusal problems in 35% of the retainers and 27% pontics [8]. Yet other complications were porcelain fracture, chippings and poor esthetics [9]. Longitudinal studies have indicated that irrespective of its nature and kind, complications necessitated extensive modifications or even replacement and remaking of FDPs in 50-60% cases during a 22-years followup period [10].

An earlier report from a developed country pointed out that 1.5% to 15% FDPs are failing annually [11]. Recently, a local study done in Pakistan on the analysis of reasons for dislodged metal-ceramic FDPs showed a disappointing situation [12]. All these variations reflect mainly the influence of factors related to patients and treatment providers including the clinical and technical skills of personnel.

The investment of time and money involved and the higher level of expectations and preference for FDPs can only be justified if they proved long lasting. The cost of dealing with any complication is not only high but it also discomforts the patients in addition to questioning the competence of the practitioner. Therefore in present study, we have provided information of the various biological and technical complications, reported at a dental college, by patients in their metal-ceramic FDPs. The data will provide pertinent information regarding planning of educational and training

strategies and self-evaluation of clinical practices. This information will ultimately ensure cost-effective use of resources that are very meager in every developing country including ours. With the help of this research exercise, we hope that the FDP services provided shall be expected of better and improved qualities. This descriptive study was conducted at Prosthodontics Department of Khyber College of Dentistry, Peshawar-Pakistan from January 2007 to February 2008.

SUBJECTS AND METHODS

Patients presenting with complications of metal ceramic fixed-fixed design FDPs were selected for this study by using non-probability convenient sampling technique. Data recorded in pre-structured proforma. Data regarding patient's complications in their FDPs were collected from 124 patients after considering extension of a research project. Patients' inclusion criteria for the study were; patients of both gender, age ranging between 20 and 45 years, seeking consultation regarding complications in their fixed-fixed design metal-ceramic FDPs having full-coverage design retainers. Patients excluded from the study were those having complications in other design FDPs including fixed-moveable, cantilever, and spring-cantilevered design FDPs as well as those made in all-ceramic, all-metal, acrylic or fibre-reinforced composite or having partial coverage or minor retainers.

After taking relevant history from each subject, the nature of the presented complication(s) was preliminarily understood from the patient's reason for seeking consultation. Detailed intra-oral clinical examination was carried out following the standard techniques of inspection, palpation, percussion and probing. Radiographic examination, when necessary, was also done. Prostheses evaluation included the recording of the numbers of units, retainers and pontics in addition to the technical complications of de-cementation, ceramic de-bonding and chipping, flexure and fracture of metal-frame, esthetic and occlusal problems. In addition, information pertaining to the service-life rendered by the FDP as well as of its fitting place (government hospital, private practice or by quack dental practitioners) was also recorded. Biological complications if any were also recorded. These included caries, periapical problems, periodontal problems and abutment fracture. In each case of the biological and technical complications, the levels of each individual complication were determined as given below:

Caries:

Level-1: Presence of white/black spots on the abutment.
Level-2: Level one plus cavitation of abutment.
Level-3: Level two plus abutment sensitive to hot and cold.

Periapical Problems in Abutment:

Level-1: Abutment tender on percussion.
Level-2: Level one plus radiographic evidence of periapical radiolucency.
Level-3: Level two plus swelling or sinus/fistula formation.

Periodontal Problems with Abutment:

Level-1: Soft tissue pathosis.
Level-2: Level one plus loss of alveolar bone and formation of pockets.
Level-3: Level two plus excessive mobility of abutment.

Abutment Fracture:

Level-1: Confined to the crown portion of the abutment.
Level-2: Involving the root portion of the abutment.

Decementation:

Level-1: When it occurred due to excessive dislodgement forces (accident, trauma, below).
Level-2: If occurred during normal chewing function.

Esthetics Related Problems with Prostheses:

Level-1: Confined to unacceptability by patients only.
Level-2: Confined to unacceptability by both the patient and investigator/researcher.

Prostheses Related Fracture:

Level-1: When only debonding/chipping of porcelain facing/veneers occurred.
Level-2: Level one plus fracture of metal core/ framework.

Occlusal Problems with Prostheses:

Level-1: From the mere presence of premature occlusal contact up to the feeling of localized high bite.
Level-2: Teeth remaining out of occlusal contact.

An increased level of a complication indicated the extent of the progression or of the ease or difficulty with which an individual biological or technical complication could be managed. The collected data were described as means$\pm$SD, percentages, proportions etc. as pertaining to the subjects, FDPs the nature of complication events etc.

RESULTS

Of the total 124 patients, the males (55.6%) outnumbered the females (1.26:1). They had a mean age of 37$\pm$11 years. The patient's distribution, according to various age groups is shown in **Figure I**. The distribution of the problematic FDPs were the posterior mandibular aspects 52 (41.9%), anterior maxillary aspect 38 (30.6%), posterior maxillary aspect 31 (25%) and posterior mandibular aspect 03 (2.4%).

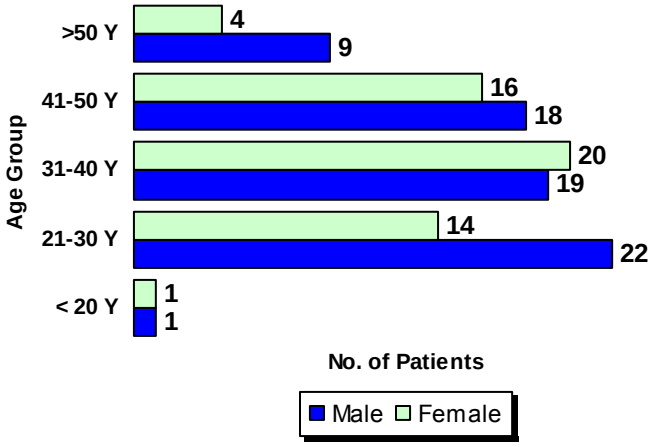
Distribution of complications according to fitting place were 70 (56.4%) FDPs fitted at hospital, 40 (32.2%) FDPs fitted by private practitioners and 14 (11.2%) FDPs fitted by Quacks. The information regarding the FDP proportions with reference to their service-life

rendered by them at the time of onset of the complication(s) are portrayed in **Figure II**.

De-cementation was the most common (24.8%) of all 210 noted complications. Seventy-seven percent level-2 de-cementation events indicating dislodgement of an FDP during the normal chewing function. The second most common complication was caries taking a proportion of 20.5% with figures for its various levels detailed in **Table I**.

The data in **Table II** show the relative distribution of the number of the various types of complication events with reference to the service-life of the FDP in the various aspects of the dental arches. Notwithstanding the differing distribution of the individual types of complications, 29% complications occurred during the first service-life year of the FDPs. Even the proportion of complications was much higher (46%) in the FDPs having served for a period of 1-5 years as compared to the remaining shorter duration (1-year or less) or longer than 5-years service duration. Excluding the smaller proportions of complication events in the FDPs fitted in anterior aspect of the mandibular arch, the remaining complication events were distributed mainly in the anterior maxillary (25%), posterior mandibular aspects (43.3%) and posterior maxillary aspect (31%). It is also to note that a larger proportion of complication events (60 %) were in those FDPs that were provided to patients in the teaching dental hospital setting **(Table III)**.

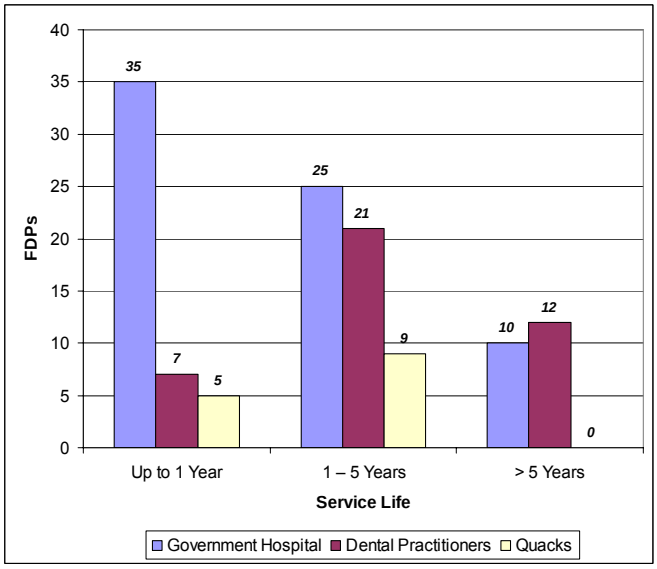
FIGURE I: AGE AND GENDER DISTRIBUTION OF PATIENTS HAVING FDP COMPLICATIONS



DISCUSSION

As also reported in a previous study on post-fitting clinical complications in full-coverage metal ceramic crowns[13], all the subjects of this study were also those who reported themselves the problems in their FDPs. Thus the data are not suitable for predicting FDP failures, complications or success. This study however, does show large figures for complications in dental

FIGURE II: SERVICE-LIFE RENDERED BY THE VARIOUS FDPs HAVING COMPLICATIONS



bridges (FDPs) that were not older than one or at the most 5-years which collectively figured 75% of all the FDPs. This study also confirms our previous finding from separate studies that showed similar situations in patients either presenting dislodged cases of FDPs or problems with existing metal-ceramic crowns.[12-13] It must be realized that there might, have been many FDPs made in the mentioned fitting places that could have survived over many years but this study, at the same time provides evidence for the many catastrophic failures occurring in FDPs soon after their fitting. These data would not truly give picture of the prevailing situation nor would give future forecasts in the area. Large scale randomized controlled trials involving local populace are needed to provide realistic reflections of the regional or national situation and to accumulate desirable data for comparison and evaluation of the prevailing situation with the global data available in the area of interest.

A comparison of the present results and findings with others would facilitate useful information. This would help in knowing about the very favourable survival data about FDPs made in places of the developed world. Some 80% of such FDPs have survived complication-free for 15 years[7], with yet others showing much better figures (92%) during their 10-years service-life.[16] Many consider it essential, even for the root treated teeth, to provide trouble-free support for FDPs over a minimum of 5-years period.[17-18] Both the patients and practitioners might have contributed to the complications seen with the patients for having remained non-compliant with oral hygiene practices, and the practitioners for having selected the inappropriate

TABLE I: BIOLOGICAL AND TECHNICAL COMPLICATION EVENTS IN FDPS AND DISTRIBUTION OF THEIR LEVELS

Complication Type	No. (%)	Level - 1	Level - 2	Level 3
De-cementation	52 (24.8)	12 (23)	40 (77)	-
Caries	43 (20.5)	16 (37)	10 (23)	17 (40)
Peri-apical problems	38 (18.1)	14 (37)	15 (39)	09 (24)
Periodontal problems	24 (11.4)	16 (67)	07 (29)	01 (04)
Abutment fractures	15 (07.1)	11 (73)	04 (27)	-
Prostheses related fractures	19 (09.1)	12 (63)	07 (37)	-
Occlusal problems	12 (06.0)	09 (75)	03 (25)	-
Esthetic problems	07 (03.3)	00 (00)	07 (100)	-
Total	**210 (100.0)**	**90 (43.0)**	**93 (44.0)**	**27 (13.0)**

Results are expressed as no. (%).

TABLE II: COMPLICATIONS IN FDPs IN RELATION TO RENDERED SERVICE-LIFE AND LOCATION IN THE MAXILLARY AND MANDIBULAR ARCHES

Complication					Location				
	Service-Life (Yrs)			Total	Maxilla		Mandible		Total
	<1	1-5	>5		Ant	Post	Ant	Post	
Decementation	16	26	10	**52**	15	12	00	25	**52**
Caries	01	26	13	**43**	09	19	00	15	**43**
Peri-apical problems	16	13	09	**38**	09	14	01	14	**38**
Periodontal problems	11	09	04	**24**	09	04	01	10	**24**
Abutment fractures	01	07	07	**15**	05	05	00	05	**15**
Prostheses related fractures	03	11	05	**19**	03	05	00	11	**19**
Occlusal problems	12	00	00	**12**	00	03	00	09	**12**
Esthetic problems	01	05	01	**07**	03	02	00	02	**07**

TABLE III: COMPLICATIONS IN FDPs IN RELATION TO PLACE OF PROVISION/MAKING

Complication	Government Hospital	Private clinics	Quacks	Total
Decementation	38 (30.2)	14 (22.2)	00 (00.0)	52 (24.8)
Caries	24 (19.1)	15 (24.0)	04 (19.1)	43 (20.5)
Peri-apical problems	18 (14.3).	14 (22.2)	06 (29.0)	38 (18.1)
Periodontal problems	14 (11.1)	05 (08.0)	05 (24.0)	24 (11.4)
Abutment fractures	06 (05.0)	08 (13.0)	01 (05.0)	15 (07.1)
Prostheses fractures	11 (09.0)	04 (06.4)	04 (19.1)	19 (09.1)
Occlusal problems	11 (08.7)	00 (00.0)	01 (05.0)	12 (06.0)
Esthetic problems	04 (03.2)	03 (04.8)	00 (00.0)	07 (03.3)

Results are presented as no. (%).

abutments for the FDP support or the inappropriate FDP design.

The most important aspect of the present research is its ability of showing and reporting an alarming situation. A more or less similar picture has been found regarding the provision of crowns in a previous study.[13] FDPs upto 38% unable to survive complication-free during their first post-fitting year or of 44.3% not completing upto a 5-years service life are indicating issues of serious concerns. It is urged to introduce a mechanism for a stringent clinical audit, monitoring and evaluation of the dental health care services provided to the population. At the same time, to improve the situation at the private dental practice sector, implementation, of stringent ethical regulations and compulsory participation of dental practitioners in continuing dental educational programmes, should be emphasized. The local dental associations and specialists societies must play their due roles in facilitating professional development courses and workshops frequently on regular basis so that practitioners remain life-long learners and up-to-date. It must also be ensured that training and teaching as well as dental care services are provided by those who are qualified, trained and professionally well-developed for the purpose and in an environment having necessary clinical infra-structure.

CONCLUSIONS

Complications in FDPs were more commonly reported by relatively older patients. The most common biological complication in FDPs observed in our study was caries, and technical complication was de-cementation. Less (13%) complications were seen at highest level-3. The recorded complications were more in FDPs fitted in the maxillary arch and in posterior sites of both arches. High incidence of complications was noted in FDPs that had been in service for one to five years. Majority of FDPs with complications was noted in those made in dental college, due to patients report at places where these are fitted initially.

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AUTHOR AFFILIATION:

Dr. Fazal Ghani *(Corresponding Author)*
Head, Department of Prosthodontics
Khyber College of Dentistry
University Campus Peshawar 25120 (Pakistan).
Email: f.ghani@yahoo.co.in & fazalg55@hotmail.com

Dr. Muhammad Rizwan Memon
Assistant Professor, Department of Prosthodontics
Liaquat University of Medical & Health Sciences
Jamshoro/Hyderabad, Sindh-Pakistan..