First two-year complications of fixed partial dentures, eight units or more. Swedish Guarantee Insurance claims

Bengt Öwall and Runo Cronström

Department of Prosthetic Dentistry, School of Dentistry, Faculty of Health Sciences, University of Copenhagen, Denmark

Öwall B, Cronström R. First two-year complications of fixed partial dentures, eight units or more. Swedish Guarantee Insurance claims. Acta Odontol Scand 2000;58:72–76. Oslo. ISSN 0001-6357.

This study is an analysis of fixed partial dentures (FPDs), 8 units or more, that failed or suffered severe complications within the first 2 years after cementation. The material consists of claims to the Swedish Gurantee Insurance for Fixed Prosthodontics. Claim reports, radiographs, etc. were available. Over a 6-month period, 36 FPDs were sampled, 34 of which were made by general practitioners. The sampling resulted in 41 complications in 26 maxillary and 10 mandibular FPDs, 29 of which were made in metal-ceramics. The mean extension was 10.9 units, with an abutment/pontic ratio of 1.4; 40.6% of the abutments were root-canal treated and supplied with root posts. The complications were: metal framework fractures 41%, loss of retention 24%, porcelain fractures 17%, tooth/root fractures 10%, and miscellaneous 7%. The high proportion of metal framework fractures is not in accordance with other studies of FPD complications. No factor that could explain this high frequency could be identified. The fact that the selection of FPD complications applied to the first 2 years only, that the FPDs had been constructed by general practitioners, and that there were many root-canal-treated abutments and distal extension cantilever pontics, might be factors of importance. □ *Complication; failure; fixed partial denture; guarantee*

Bengt Öwall, Department of Prosthetic Dentistry, School of Dentistry, Faculty of Health Sciences, University of Copenhagen, 20 Nørre Allé, DK-2200 Copenhagen N, Denmark. Tel. +45 3532 6740, fax. +45 3532 6602, e-mail. bengt.oewall@odont.ku.dk

Complications with fixed partial dentures (FPDs), even during the first 2 years of service, are probably unavoidable. The larger the construction and the shorter the period of service, the more frustrating and unacceptable is the problem, however. It is therefore important to analyze and disseminate as much information as possible about failures and complications, especially for large FPDs.

The Swedish Guarantee Insurance for Fixed Prosthodontics covered the costs of remake of constructions that had suffered complications during the first 2 years after cementation, except for a stated minimum amount that the patient had to pay (own risk). The principle of the insurance was a no-fault compensation system. The details are set out by Cronström et al. (1).

Previously published results from these insurance data (2, 3) show that FPDs constitute a major proportion of reported complications and that FPDs of all sizes were found among the claims (3). The frequency of mechanical failures: loss of retention, tooth/root fracture, and metal framework fracture, ranked in that order from most to least frequent, concurred with several other reports, even though the results were from different materials and observation times (3).

Early complications with FPDs during the first 2 years are very sparsely reported in the literature (2, 3), and the intention of this study was to analyze and describe a group of large FPDs, 8 units or more, that had suffered severe complications within the first 2 years after cementation, and had been reported to the Swedish Guarantee Insurance for Fixed Prosthodontics.

Materials and methods

The insurance company did not computerize the data until after the case had been settled. To be able to study background material (radiographs, photographs etc.) before it was returned to the dentist, the insurance staff clerks who dealt with the incoming claims were instructed to sample FPD claims, including 8 units or more. The sampling continued until a reasonable number had been obtained, i.e. for 6 months.

The material comprised information about 35 patients. One had complications related to FPDs in both maxilla and mandible, and another 4 had more than 1 complication related to the FPD in question. Thus, the final material consisted of 41 complications related to 36 FPDs in 35 patients.

The authors jointly carefully scrutinised the material and, if necessary, put questions to the dentists concerned. The complications were divided into 5 categories: metal framework fracture, loss of retention, porcelain fracture, tooth/root fracture, and miscellaneous. The extent of the constructions, number and position of abutments, number

Table 1. Types of complication, frequencies, and latency times for 41 complications in 36 FPDs

	Number		Mean latency time	
			Time (months)	Range (months)
Metal framework fracture	17	(41%)	13.2	(2.0–21.0)
Loss of retention	10	(24%)	7.5	(2.0–13.0)
Porcelain fracture	7	(17%)	11.4	(0.1–20.0)
Tooth/root fracture	4	(10%)	10.5	(5.0–17.0)
Miscellaneous	3	(7%)	—	—

Table 2. Characteristics of FPDs in different categories of complications

	FPD extension units mean (range)	Abutments no. mean (range)	Abutments with posts mean (range)	Pontics (all types) mean (range)	Cantilever pontics mean (range)
Metal framework fracture	10.8 (8–14)	6.7 (5–9)	3.2 (0–7)	3.8 (2–7)	1.8 (0–4)
Loss of retention	11.2 (9–14)	6.3 (5–9)	1.9 (0–4)	4.9 (2–8)	1 (0–2)
Porcelain fracture	11 (8–14)	5.9 (4–7)	1.3 (0–5)	5.1 (4–7)	0.6 (0–2)
Tooth/root fracture	10.8 (8–14)	4.8 (3–7)	2.5 (0–4)	4.3 (2–8)	1.3 (0–2)

and position of pontics, root-canal-treated abutments and antagonists were recorded from claims reports, the written answers obtained from the dentists, and from radiographs. Latency time was defined as the time from cementation of the FPD to the time when the complication was first professionally diagnosed.

Results

Patients

The 35 patients comprised 18 women and 17 men, their ages ranging from 38 to 75 years at the time of the initial treatment.

Dentists

All the dentists who had provided the initial treatment were, with two exceptions, in private practice. One was a specialist in prosthodontics (fixed and removable), and one was a specialist in periodontology. The dentists comprised 32 men and 3 women, their ages ranging from 28 to 66 years, with a mean of 46.6 years. No dentist was involved in more than one case. In all instances but 2, it was the same dentist who provided the initial treatment, diagnosed the complication, made the claim and performed the re-treatment.

FPDs

Twenty-six were in the maxilla and 10 in the mandible. Seven were made in gold with acrylate veneers; the rest in metal ceramics. The extent of the FPDs varied from 8 (the minimum for inclusion in the study) to 14 units, with a mean of 10.9. The overall abutment/pontic ratio was 1.4.

Of the abutments, 40.6% (range 0–100% for individual FPDs) were root-canal-treated, all of which were supplied with root posts. Twenty-six FDPs had 1 or more distal extension cantilever pontics. Three FDPs had bilateral double cantilever pontics. Two had 1 on 1 side and 2 on the other, 1 had 2 cantilevers on 1 side only, and 9 had bilateral single cantilever pontics. A further 15 FPDs had 1 cantilever pontic.

Dentitions

All of the studied FDPs had natural teeth, with or without fixed prosthodontics, as antagonists. In 5 opposing jaws there were also removable partial dentures. There were no implant-retained constructions.

Latency time

The latency time varied from 3 days to 21 months, with a mean of 11 months.

Complications

The complications are presented in Tables 1–3 and in Figs 1 and 2. Porcelain fractures involved a total of 13 units. In 2 FPDs the complication involved 1 unit, in 4 it involved 2, and in one case 3 units. Tooth/root fractures comprised long axis root fractures of abutments with root canal treatment and posts in 2 cases, and fractures of vital abutments in 2 cases, 1 of which included 2 teeth (see Fig. 1).

The 3 miscellaneous complications included 1 remake due to an aesthetically unsatisfactory maxillary FPD, and 2 instances of acrylate veneers/pontics that had loosened from the gold framework.

Table 3. Characteristics of the FPDs for different types of complication

	Ratio abutment/pontic	Ratio abutment/cantilever pontic	% cantilevers of pontics	% root-filled abutments
Metal framework fracture	1.7	3.8	43.5	50.4
Loss of retention	1.3	6.3	20.4	30.2
Porcelain fracture	1.2	10.3	11.1	21.3
Tooth/root fracture	1.1	3.8	29.4	52.6

Combined complications

In 5 cases there was more than 1 complication. Three of these are shown in Fig. 1: No. 10 had a metal framework fracture in the midline and at the same time horizontal fractures of the vital abutments 22 and 23. No. 21 had a metal framework fracture between 33 and 34 and at the same time a root fracture of 34. No. 24 had a metal framework fracture between 33 and 34 and at the same time decemented crowns on 43 and 33.

Another 2 combined complications related to: 1. A mandibular 12-unit FPD with 8 retainers and 4 pontics. Tooth 35 had a root fracture and was extracted under the FPD 5 months after cementation. After a further 6 months the tooth 37 retainer decemented. 2. A maxillary 14-unit FPD with 6 retainers and 8 pontics (Fig. 2) decemented on all abutments 3 months after cementation, was recemented but decemented again after 1 month and was once more recemented. After a further 11 months it decemented again, and a vital abutment fractured horizontally. The same patient (no. 23 in Fig. 1) had a mandibular FPD with a metal framework fracture.

Discussion

Several follow-up studies on FPDs include also early failures and complications, but it is seldom possible to separate the figures for the first few years. No studies are available concerning extensive FPDs made by general practitioners. The shorter the life-span of an FPD, the greater is the risk that there will be a conflict of responsibility and confidence. A financial conflict may also arise between the dentist and the dental laboratory. In Sweden this problem was dealt with by the introduction of a Guarantee Insurance based on a no-fault compensation system (1, 4).

The type and extent of treatment with fixed prosthodontics given in Sweden may have been influenced by this system, as the financial "risks" run by dentists with a relatively well protected first 2 years were small. It has not been possible, however, to describe the FPD treatment in general practice regarding pretreatment status, diagnosis, treatment planning, and risk-taking. The technical results with FPD treatments in Sweden have been analyzed in several studies (5, 6) and it seems that Swedish general practitioners, in an international comparison, produced many extensive FPDs. The selected material presented in this study, however, is not representative of Swedish fixed prosthodontics. It can only be used to reveal specific aspects of FPD complications.

Owing to the system of filing at the insurance company, the insurance staff clerks had to sample the material from incoming claims. There was thus a risk that some cases were missed by this method, particularly where the claim report was imprecise. It was not possible afterwards to control whether this was the case. If claims were missed, it was most probably not systematically, so the claims studied may be considered to be representative of the claims submitted.

In most published studies on FPD complications and failures, the frequency ranking among the mechanical ones are in descending order: loss of retention, tooth/root fracture, and metal framework fracture (3). In the present study, however, metal framework fractures ranked highest. If only these types of mechanical failures/complications are considered, the percentages are: metal framework fractures 55, loss of retention 32, and tooth/root fractures 13, which is a much higher metal framework fracture percentage than in any other published study.

The reason for this cannot be clearly established. A high frequency of cantilever pontics in the metal framework fracture group, as shown in Table 4, may be an explanation. Cantilever pontics have been shown to involve a high risk of mechanical complication, but not drastically during the first years of service (7–9).

The 17 FPDs with metal framework fractures are shown schematically in Fig. 1. As demonstrated, most of these were advanced constructions. There is, therefore, reason to believe that these FPDs were underdimensioned in the metal, which in turn may be related to the inexperience of general practitioners with the mechanical demands for such constructions. This hypothesis is supported by comparative results obtained from a specialist clinic, where there were very few fractures of this type (10).

It was not possible for this material to demonstrate any correlation with the dental laboratories that had produced the FPDs. According to the regulations governing insurance coverage, metal framework fractures are classified as a typical laboratory failure (1), which was based on an undocumented clinical opinion when the guarantee insurance was set up.

It is noteworthy that no periodontal or endodontic complications were identified in this study. This can probably be explained by the relatively short time of FPD function after cementation. Öwall et al. (3) found 4

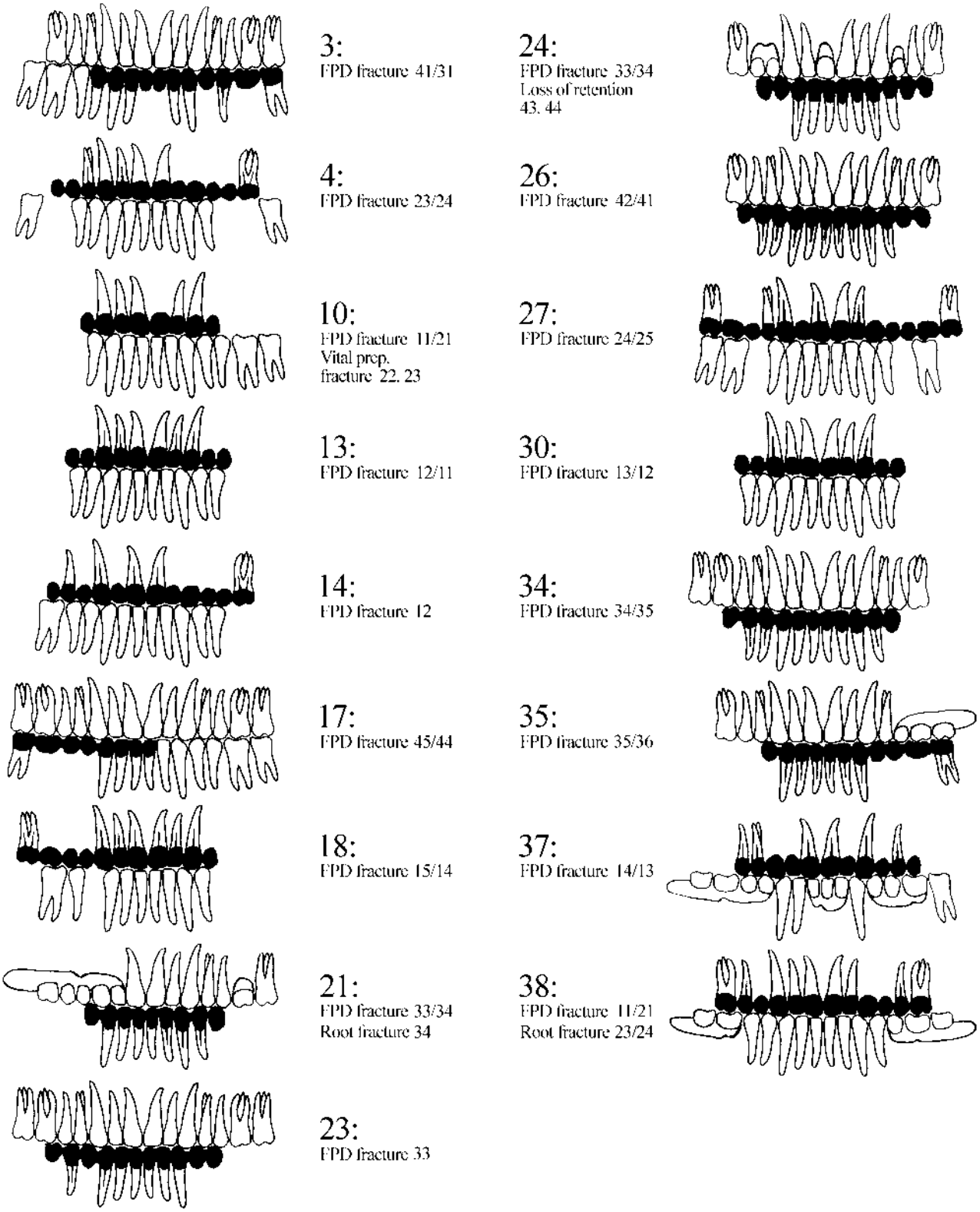

Fig. 1. Schematic representation of 17 FPDs that had metal framework fractures during the guarantee period of 2 years after cementation. Antagonists are presented as natural teeth, including FPDs, if any. Cases 14 and 23 had fractures within the abutment crowns, all others in joint areas. Case numbers and fracture sites are indicated.

Table 4. To compare this study with some other Swedish FPD studies, some study and FPD characteristics are presented

Study	Operator	Type of material	Extent of FPD		No. of FPDs	Distal extension cantilever FPDs %	Abutment/ pontic ratio
			Units	Mean			
Karlsson[9]	GP	Random selection	5–	6.8	140	26	1.5
Randow et al.[8*]	GP	Random selection	5–12	8.2	274	64	1.4
Palmqvist et al.[10*]	Specialist	Total production	3–14	8.2	103	33	1.4
Öwall et al.[3*]	GP	Failures only	2–14	6.2	49	35	1.8
This study	GP	Failures only	8–14	10.9	36	72	1.4

* Including additional information about the study material from personal communication.

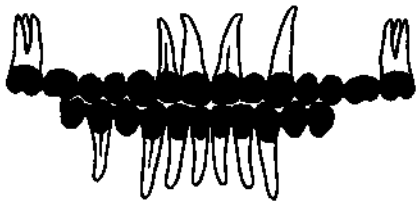

Fig. 2. Schematic presentation of combined complication of the maxillary FPD which had repeated decementations and recementations and a horizontal vital abutment fracture of 11. The mandibular FPD had a metal framework fracture (case no. 23 in Fig. 1).

periapical lesions, latency time 8–22 months, during the first 2 years in another FPD material from the same insurance files. These, however, were all due to incorrect endodontic diagnosis before the prosthodontic treatment.

One overall way to describe an FPD material is by the extent of the constructions, by the number that include distal extension cantilevering, and by the abutment/pontic ratio. Some other Swedish studies are of interest for purposes of comparison. Two of them are from general practitioners (8, 9), one is from a specialist clinic (10), and one is based on an insurance company material of FPD failures (3). Table 4 demonstrates that there are considerable differences in the percentage of FPDs with distal extension cantilevering. These figures indicate that the FPDs in this material of complications were, from a mechanical point of view, high-risk treatments.

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Received for publication 1 October 1999
Accepted 10 February 2000