Fixed restorations produced for recipients of dental prosthodontic treatment

A comparison between general dental practice and a dental school

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Fixed prosthodontic work ordered by general dental practitioners was examined through registrations made in commercial dental laboratories. A comparison was made with similar data from student files on fixed prosthodontic treatment at the University Clinic in Bergen, Norway, which is located in the same geographic area. The results indicated that the distributional pattern of fixed restorations within the dentition was much the same in the individuals attending the general dental practitioners as in those treated at the dental school. While the practicing dentists preferred metal–ceramics in most cases, most of the restorations inserted at the dental school were based on the metal–resin technique. □ *Crowns; dental materials; dental technology; fixed partial dentures*

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Treatment patterns and selection of dental materials for construction of crowns and fixed partial dentures varies in the world, as does the clientele. Most reports concerned with such aspects of prosthetic treatment present results from studies of individuals treated in dental schools. Several of these studies have given valuable information related to certain aspects of fixed prosthetic restoration (1–9).

Some reports have presented the sex and age distribution of the patients who had received single artificial crowns and fixed partial dentures. In addition, the frequency and location of the various types of restoration were reported (10–12). It is not known, however, to what extent the results of emphasis on prevention and its practice, which started in the late 1950s and early 1960s in the Western world, have outdated these statistics. Further, new materials and technology may have changed the practice of fixed prosthodontics. The metal–ceramic fixed restorations can be made with favorable cosmetic qualities and are now used by dentists who previously preferred metal–resin, all porcelain, or partial gold crowns (13).

For practitioners who tend to stress the importance of the length of service of their restorations, the metal–resin and partial crown systems are available (14, 15). There are also several other factors that influence the use of materials and technology chosen by dentists, such as economy, information and availability of technology and materials, and laboratory services.

There are relatively few reports available on the treatment pattern of prosthetic restoration and on the use of the various types of fixed prostheses in general practice (16–20). The dental school samples must be considered selected. Therefore, the results presented on the basis of school data may not be representative of the treatment patterns and types of restoration produced in practices outside the schools. The aim of the present study was to compare the restoration pattern and the treatment modalities of fixed prosthodontic treatment rendered in general dental practices in Bergen with those of the dental school in that city.

Materials and methods

All laboratories that were members of the Norwegian Association of Dental Laboratories were invited to participate in the study. These were 13 laboratories. The number of technicians employed, including apprentices/trainees in the commercial laboratories, ranged from 2 to 30. In the laboratory with the largest production staff, 10 of the 30 technicians worked full-time with fixed prosthodontic work, whereas 6 were engaged part-time in this type of work.

In a meeting with the managing dental technicians representing the different laboratories the intentions and the design of the project were discussed. On behalf of their laboratories, they all agreed to participate in the study. They were encouraged to take part in discussing the data to be recorded and the details of the outline of the registration forms to be used. Registration forms were distributed to the laboratories, and on the first day of the registration period telephone calls were made to all laboratories to make sure that the forms were filled in adequately. The intention was to record all single crowns and conventional fixed partial dentures produced during the month of February 1987. For each work order one form was filled in once the work had been completed. The registration form and the mailing system used made identification of the participating laboratories impossible. The laboratories were supplied with one type of form to be used for single crowns and another to be used for fixed partial dentures. The two types of forms, translated into English, are shown as Figs. 7 and 8.

The data for the fixed prosthetic appliances inserted at the Department of Prosthetic Dentistry at the University of Bergen during the years 1982–1987 were collected from the dental school and consisted of information collected from student records.

Results

Commercial dental laboratories

All laboratories returned the registration forms, and these were checked for completeness and logical errors. Less than 1% of the items were missing. Altogether 1324 work orders from dentists were completed during the registration period. The orders represented 1183 single crowns and 346 fixed partial dentures. Acid-etched fixed bridges were not included.

Single crowns. Most of the orders for single crowns (86%) came from general private practitioners. The remaining 14% came from public dental offices. The major part of single crowns (68%) restored maxillary teeth (Fig. 1). Central and lateral incisors together with first and second premolars were the tooth types most frequently crowned. Left-side premolars tended to be restored more often than premolars of the right side of the upper jaw. First premolars, second premolars, and first molars were the teeth most commonly crowned in the lower jaw. No marked differences between the left and right sides of the jaw occurred.

Bonding ceramic to metal was the technique most often noted on the work orders for single-unit crowns. In both jaws considered as an entity, 72.2% of the units were metal–ceramic crowns (Fig. 1). In the upper jaw the percentage was 75.5, and in the lower jaw 68.4. Resin-veneered single crowns totaled 20.7%. Maxillary teeth were restored with this type of crown in 21.5% of the cases and mandibular teeth in 19.1% of the cases. A few partial gold crowns occurred in both jaws. They were more frequent in the lower jaw than in the upper. Full ceramic crowns were scarce and occurred only on maxillary central incisors (Fig. 1). Full metal crowns were scarce in the upper jaw and somewhat more frequent in the lower jaw. The full metal crowns mainly restored molar teeth (Fig. 1).

Fixed partial dentures. Most of the work orders (84%) for fixed bridges in the registration period came from general private practitioners, and the rest (16%) from public dental offices. The length of the bridges varied between 2 and 15 units. Three-unit bridges occurred in 41.5% of the cases and were the most frequent type of construction. Of 346 fixed partial dentures 98 bridges (23.8%) had 1 or more cantilever pontic.

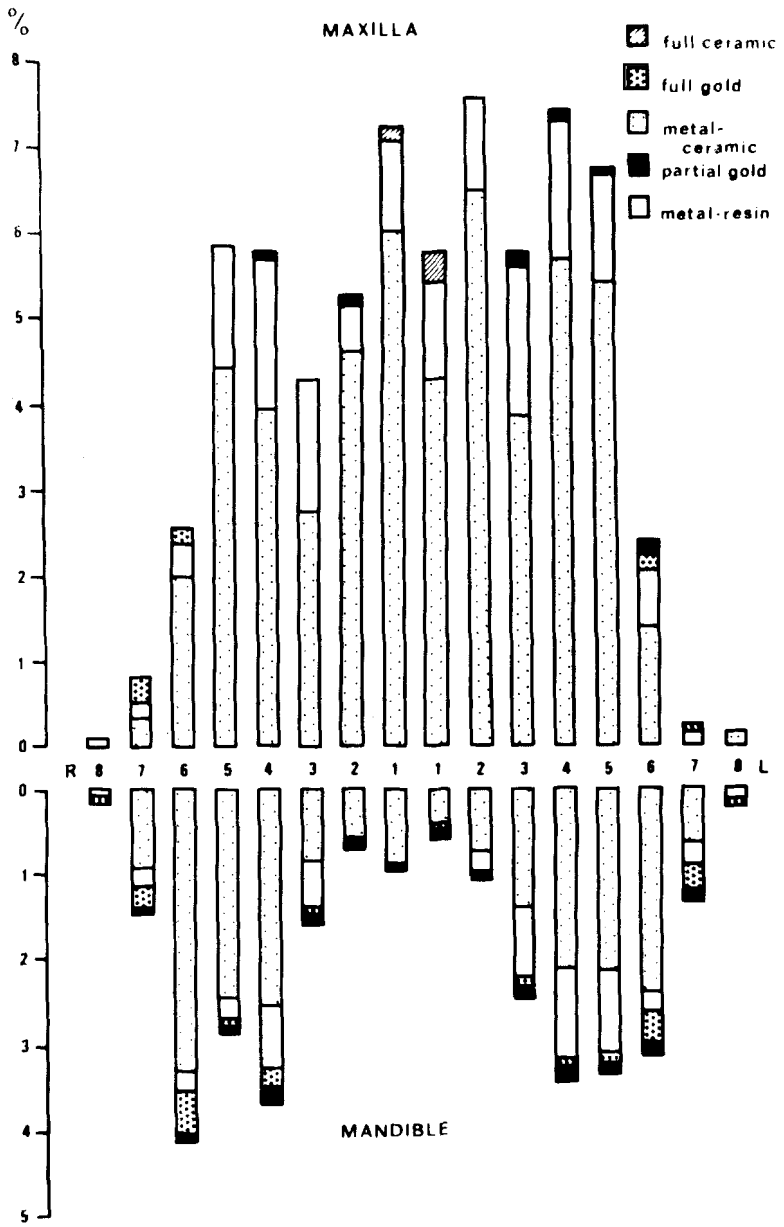

Fig. 1. The proportions and the distribution in the jaws of the different types of single crowns produced by the commercial dental laboratories.

The overall mean pontic to abutment ratio was 0.5. Most of the constructions (67%) were made for the upper jaw (Fig. 2). In this jaw canines and central incisors were the teeth most commonly used as abutments. In the lower jaw canines and lateral incisors were used as abutments more frequently than the other tooth types. The distribution of replaced teeth is shown in Fig. 3. In the maxilla first premolars, lateral incisors, and second premolars were most frequently replaced. Central incisors and first and second premolars were more frequently replaced than other tooth types in the man-

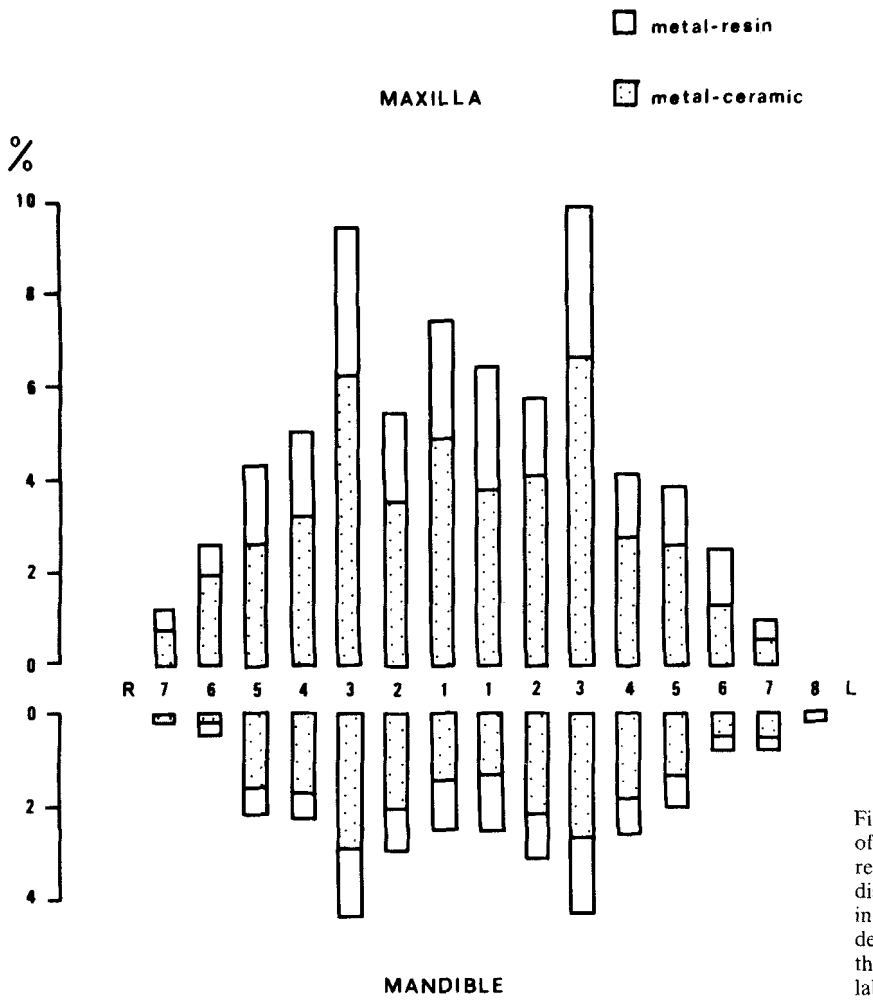

Fig. 2. The proportions of the types of bridge retainers and their distribution in the jaws in the fixed partial dentures produced in the commercial dental laboratories.

dibular arch. Teeth used as abutments and teeth replaced were rather symmetrically distributed on the left and right sides in both the upper and lower jaw.

All bridge retainers were of the full crown type. Most of the bridges (72%) were based on the metal–ceramic technique. The other constructions (28%) were based on the metal-resin alternative. The metal–ceramic bridges had a mean length of 4.4 units and the metal–resin constructions a mean length of 5.5 units.

Noble metal content type-IV alloys (Au + Pd + Pt > 75%, ISO 1562 (1976)) were used for the production of most single crowns and the fixed partial dentures. For bridges with resin veneers 7.8% were cast in low noble metal content alloys (25% < Au + Pd + Pt < 75%, ISO 1562 (1976)), and for the metal–ceramic constructions low noble content metal alloys were used in 5.9% of the cases.

Dental school

Single crowns. In the time period examined (1982–1987) 1452 single crowns were made by students in the Department of Prosthetic Dentistry (Fig. 4). Sixty per cent of the single crowns were made for maxillary

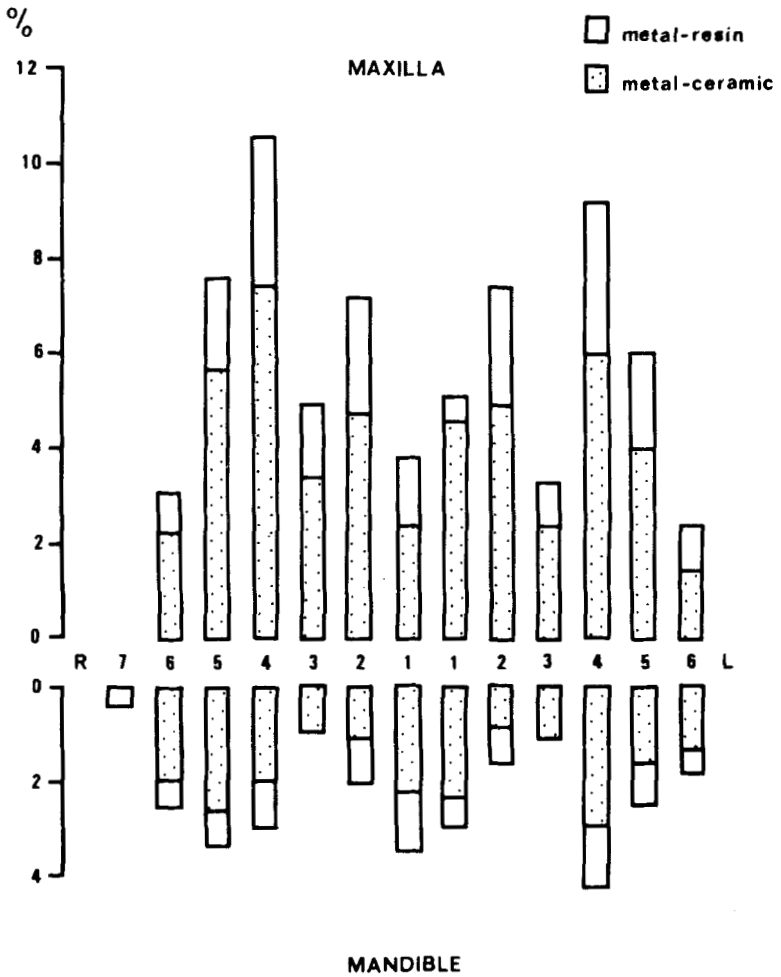

Fig. 3. The types of bridge pontics and the distribution of the teeth that have been replaced by the fixed partial dentures produced in the commercial dental laboratories.

teeth. Central and lateral incisors were most often restored, with premolars and canines next in order. No marked differences between the right and left sides were evident. First and second premolars had received single crowns most frequently in the mandibular jaw. Canines were next in order, whereas incisors and first molars had been restored to approximately the same extent. Differences between the left and right sides were not conspicuous.

Resin-veneered crowns totaled 80.3%. In the upper jaw this type of crown occurred in 79.6% of the cases. In the lower jaw the percentage was 81.1. Metal–ceramic crowns were made in 9.3% of all cases; in the upper jaw this type constituted 11.2%, and in the lower jaw 8.1%. Partial gold crowns were somewhat commoner (4.8%) than full porcelain and full gold crowns in the upper jaw but were uncommon in the lower jaw.

Fixed partial dentures. In the time period under study 633 bridges were made by the students. The length of the bridges varied between 3 and 14 units. Three-unit constructions made up 40% of the total number of bridges. One or more cantilever pontics occurred in 21.9% of the cases. The overall mean pontic to abutment ratio was 0.7. Upper-jaw bridges represented 70.6%. The frequency of the various morphologic tooth

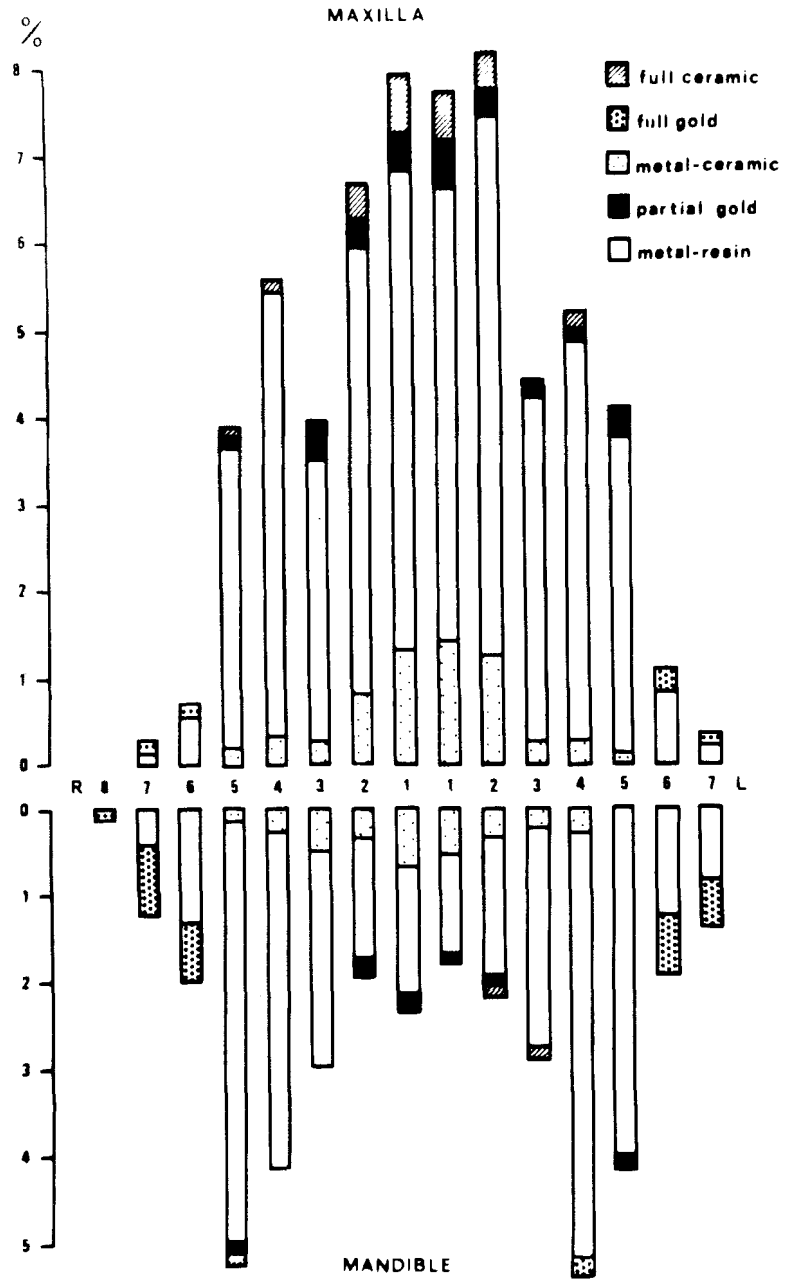

Fig. 4. The proportions of the different types of single crowns and their distribution in the dentition of individuals treated by students in the dental school.

types used as abutments is shown in Fig. 5. Maxillary canines (11%) and central incisors (6.5%) were most often used. In the mandible canines and lateral incisors were more commonly used as abutments than the other tooth types. Differences between jaw sides were not obvious either in the upper or in the lower jaw.

The frequency of teeth replaced by pontics is shown in Fig. 6. In the maxilla first premolars, second premolars, and lateral incisors were most frequently replaced, in

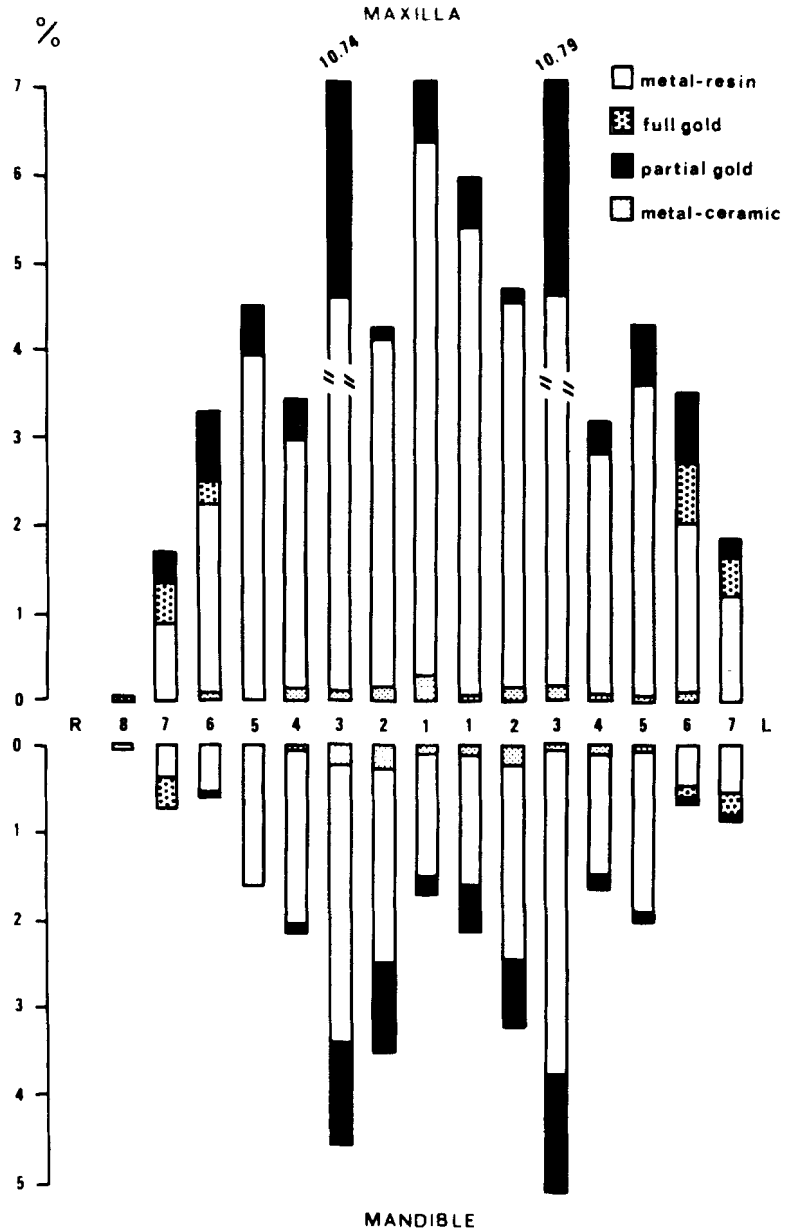

Fig. 5. The proportions of the different types of bridge retainers and their distribution in the jaws of bridge recipients treated by students in the dental school.

that order. In the lower jaw central incisors, first premolars, and second premolars were used as pontics more often than the other tooth types. Here again, no distinct differences between left and right sides of the jaws were found.

Full crowns totaled 85.7% of the retainers, and partial crowns 14.3%. All partial crowns were used with the metal–resin alternative. The greatest number of constructions (91.8%) were based on the metal–resin system, whereas the remaining 9.2% were based on the metal–ceramic system. The metal–resin bridges had a mean length of 5.0 units, and the metal–ceramic bridges a mean length of 4.2 units.

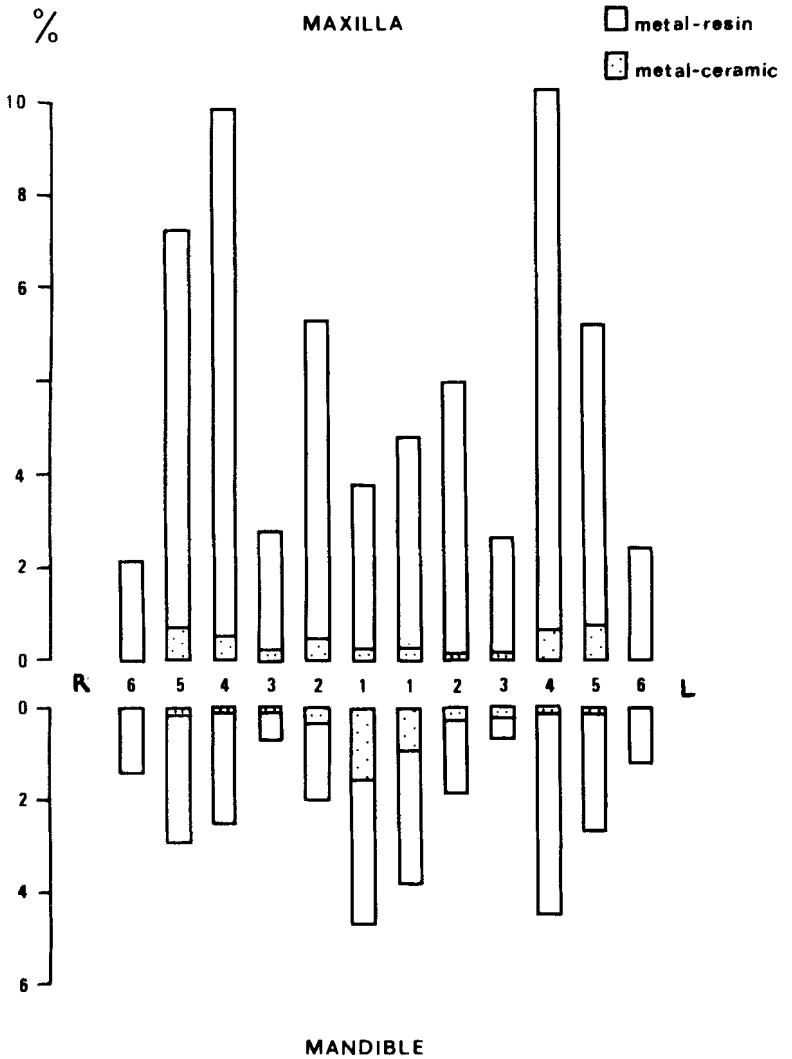

Fig. 6. The proportions of the types of pontics and the distribution of the teeth that have been replaced by the treatment with fixed partial dentures, carried out by dental students in the dental school.

All fixed partial dentures were made of noble metal alloys.

Discussion

The study was based on a close co-operation between members of the Norwegian Association of Dental Laboratories in Bergen and the Department of Prosthetic Dentistry, School of Dentistry, in the same city. The dates on the forms from the various laboratories indicated that the prosthetic work had been evenly spread throughout the registration period (February 1987). On the basis of the high return rate and the completeness of the forms, it is assumed that the investigation has recorded a representative sample of the work delivered by the dental laboratories in Bergen.

In similar surveys in Sweden by Øwall & Nyquist (16) response rates of 66% and 77% were achieved, and an 85% rate was reached by Glantz et al. (17). Murphy & Huggett (18) in a British survey had a 40% response, and Harrison et al. (19) in the United States

obtained a 27.8% response rate. We are inclined to believe that the preparations for the present study including a personal meeting with the representatives of the laboratories to exchange views on the design of the project and the telephone contacts just before and during the registration period made the response rate come close to a 100%.

The results of the present study have shown that the distributional patterns of artificial single crowns on the various tooth types in the laboratory sample and the dental school sample were similar in both jaws. In both groups most of the single crowns were made for maxillary teeth. The overall pattern showed that maxillary incisors and premolars were the most commonly restored teeth, followed by canines and molars.

In the laboratory sample mandibular premolars and first molars were most commonly crowned and to approximately the same extent, followed by canines, second molars, and incisors. In the dental school premolars dominated, followed by canines, incisors, and first molars. These distributional patterns were much like patterns described previously (10, 12).

Maxillary premolars and lateral incisors were the tooth types most commonly replaced in both groups. They were followed by central incisors and canines. In the mandible premolars and central incisors were the teeth most often replaced by pontics. They were followed by lateral incisors and first molars. The distributions of the two samples resembled each other. Similar distributional patterns of teeth replaced by fixed partial dentures have been presented previously (10, 12).

In both samples canines and central incisors occurred most usually as abutment teeth

DATE:

SINGLE CROWNS

	TYPE OF CROWN	RESTORED TEETH
PARTIAL CROWN, GOLD		
PARTIAL CROWN, METAL		
FULL CROWN, GOLD		
FULL CROWN, METAL		
FULL CROWN, GOLD-RESIN		
FULL CROWN, METAL-RESIN		
FULL CROWN, GOLD-CERAMIC		
FULL CROWN, METAL-CERAMIC		
FULL CROWN, ALL CERAMIC		

FABRICATION ORDERED BY: PUBLIC DENTAL HEALTH DENTIST ☐

PRIVATE PRACTITIONER ☐

Fig. 7. The registration form used in recording the production of the single crowns.

DATE:

FIXED PARTIAL DENTURES

	TYPE OF CONSTRUCTION	NO.OF UNITS	RETAINER/ ABUTMENT TEETH
PARTIAL CROWN, GOLD			
PARTIAL CROWN, METAL			
FULL CROWN, GOLD			
FULL CROWN, METAL			
FULL CROWN, GOLD-RESIN			
FULL CROWN, METAL-RESIN			
FULL CROWN, GOLD-CERAMIC			
FULL CROWN, METAL-CERAMIC			

FABRICATION ORDERED BY: PUBLIC DENTAL HEALTH DENTIST ☐

PRIVATE PRACTITIONER ☐

Fig. 8. The registration form used in recording the production of the fixed partial dentures.

in the upper jaw. Lateral incisors, premolars, and first molars followed next in order. Mandibular canines and lateral incisors were commonly used as abutments in both groups of patients. Central incisors and premolars were utilized almost to the same extent in each of the samples, whereas mandibular molars showed a low frequency of use.

The results of the comparative study of the distributions of single crowns and fixed partial dentures showed that the two samples had strong similarities. It may be concluded, therefore, that the patients who are available in the dental school present prosthetic problems that are characteristic of patients in general practices in the local community. From this point of view dental-school patients are adequate for the teaching of prosthodontic procedures to enable recently graduated dentists to meet the treatment needs of their patients. A similar conclusion was reached by Nikoukari & Gustavsen (20), who compared the occurrence of missing teeth and their replacement in dentate dental-school and community-practice patients.

The patterns of treatment with single crowns and fixed partial dentures resemble the patterns emerging from material collected in the period 1964–68 (10) and from data collected in the period 1967–73 (12). This must be taken to indicate that the different yet relative susceptibility of decay or loss of the various morphologic tooth types and the subsequent need for restoration have remained rather unchanged in patients over a period of time of approximately 20–25 years. The pattern of tooth loss as reflected by the replacements is in good harmony with tooth mortality patterns described by Lundquist (21) in Sweden and Johansen (22) in Norway. Likewise, Katz & Gustavsen (23), who studied a U.S. urban area, concluded

that the relative pattern of tooth loss by tooth type showed virtually no change over a period of 50 years.

When the prosthetic treatment modalities of the two samples were compared, certain differences became apparent. In the laboratory sample most single crowns and fixed partial dentures were based on the metal–ceramic system, whereas in the dental school most of the single crowns and bridges were based on the metal–resin alternative. This difference may suggest that the practitioners attach great importance to cosmetic aspects of the prosthetic treatment. In this respect they are in line with a general direction and tendency prevailing in dentistry in Norway (12) and in other countries (13). The guidelines for prosthetic treatment at the dental school are correspondingly concerned with the advantageous longevity characteristic of metal–resin constructions (14). By comparison it is noteworthy that in Swedish treatment plans submitted to the Dental Insurance System by general practitioners in the mid-1970s, most of the bridges (75%) were to be based on the metal–resin alternative (24, 25). To judge from the literature, no more recent data seem to be available.

Partial metal crowns were relatively seldom used for single crowns in both samples. The laboratory sample demonstrated no partial crown retainers, whereas 14.3% of the retainers in the dental school sample were of this type. Here again, its favorable length of service as a retainer (14), the preservation of tooth structure, and its hygienic merits (2) are influential determinants in choosing the partial crown in bridges. On the other hand, the display of metal may affect the esthetic result and thus restrict the use of the partial crown. This may be one of the reasons why no partial crowns were chosen as retainers in the laboratory sample.

The mean pontic to abutment ratio (0.7) in the dental-school sample was higher than that of the laboratory sample (0.5). At the same time the mean length in units of metal–resin and metal–ceramic constructions was greater in the laboratory sample than in that of the dental school. These facts may be taken to mean that on the average more abutments per bridge are used in general practice than in the dental school to make fixed partial dentures.

It seems to be justified to conclude that the patient material used in clinical training in the dental school is representative of the patients with prosthetic restoration needs whom the students will encounter in their professional careers. With regard to treatment planning and modalities the situation is different. Apparently, several factors, some of which are touched on here, are influential in determining prosthetic therapy in general-practice patients. Further studies on this topic are needed.

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