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Clinical Situation of the Coronal Part of the Teeth Including Restorations Types Placed prior to Endodontic Treatment – A Retrospective Study

H. Tekyatan, B. Willershausen, A. Kasaj, B. Briseño

Department of Operative Dentistry, Johannes Gutenberg-University, Mainz, Germany

Abstract

Aim: In the present retrospektive study the situation of the natural crown as well as the restoration types placed prior to endodontic treatment was examined.
Materials and methods: A total of 782 teeth from 545 patients (54.3% men; 45.7% women; mean age: 49.9 ± 12.1 years) were investigated. In addition to the evaluation of the medical history of the patients, x-rays and a clinical investigation were carried out in order to assess the clinical condition of the crown as well as the restoration types. Of special interest were: carious lesions, composite fillings, amalgam, ceramic or gold crowns and/or bridge restorations.
Results: 305 of the examined teeth were located in the mandible and 477 in the maxilla. 26.3% of the teeth were anteriors, 31.2% were premolars and 42.5% were molars. 24.2% of the teeth were restored with metal ceramic crowns, 15.1% were restored with gold cast crowns or served as abutment teeth for bridgework; untreated caries was found in 21.1%, and composite fillings were found in 13.7% of the cases. 23.8% of the front teeth, 26.6% of the premolars and 22.6% of the molars showed a metal ceramic restoration. 21% of all carious defects were found in the maxilla as well as in the mandible.
Conclusions: In addition to the high number of untreated carious lesions, the presence of metal ceramics restorations was significantly higher than other restorations types. Carious lesions are main aetiological factors for endodontic measures, but also ceramic restorations including premature contacts have to be considered as causal factors for pulpal irritations.

Key words: root canal treatment, filling therapy, metal ceramics crowns, pulpitis

Introduction

Over the last decades a rising number of endodontic treatments were observed. In addition to carious lesions as the main aetiological factors for pulpal diseases further ones were discussed. An inflammatory reaction of the pulp can also be caused by physical, chemical and toxic irritations [13]. In their studies Murray et al. (2002) and Mjor and Ferrari (2002) recommended a careful removal of dental hard tissues in order to avoid irritations of the pulp caused by preparation trauma [10, 12]. In contrast, Camps et al. (2000) could not establish in their investigation significant differences when comparing various preparations forms and techniques, and therefore proclaimed caries was mainly responsible for pulpal irritations [3]. Tronstad et al. (2000) examined 1001 teeth and showed that the engineering quality of an endodontic therapy exercises a significant influence on the apical healing process, but that this is not dependent substantially on the respective definitive restoration types [15]. In 2001 Harn et al. (2001) described that an occlusal trauma, including a persistent occlusal overloading, could lead to a restriction of the periapical healing processes after successful endodontic treatment [5]. Hommez et al. (2002) explained that both the definitive restoration after successful endodontic treatment and the high quality of the root canal treatment have a high importance [6]. Occlusal overloading and premature contacts especially in restoration types made with ceramic materials can also be considered as possible irritation parameters. As reasons for this a slighter material wear of ceramics compared to other dental materials were discussed. Laser-Doppler measurements showed that apical impressions can reduce the blood flow (up to 70%) in the pulpal tissue as well as the erythrocyte velocity (up to 40%) [8]. Among others pulpal disturbances caused by occlusal interferences and/or bruxism could often be repaired by grinding and removal of the interfering occlusal areas [11].

The purpose of the present study was to investigate the condition of the natural crowns and the restoration types placed directly prior to an endodontic treatment.

Material and Methods

In the present retrospektive investigation a total of 782 teeth which were in need of an endodontic treatment (545 patients; 54.3% men 45.7% women; mean age: 49.9 ± 12.1 years) were examined. Exclusion criteria were: systemic illnesses, pregnancy, long time medication and patients with periodontal diseases as well as periodontic-enddontic lesions. In addition to a comprehensive anamnesis, the following criteria were investigated: type and location of the tooth (anterior, premolar, molar, maxilla, mandible), the clinical intraoral inspection of the teeth, sensitivity measurement,

percussion test, the probing depths (PD), the radiological evaluation as well as the diagnosis of a possible carious lesion. Of special interest in this investigation were the restoration types placed prior to an endodontic treatment and the clinical condition of the natural crowns. A special evaluation form was used. The teeth were divided in two groups: restored (ceramic, gold, amalgam, composite filling and temporary materials) and not restored (untreated caries, trauma). Parameters such as the age of the restorations (often not traceable), the duration of the existence of premature contacts as well as bruxism or other habits were not included in this study. The statistical analysis was carried out by means of the programs Excel (Microsoft Office) and SPSS vers. 11.0. An initially descriptive consideration of the data according to absolute and relative frequencies was illustrated by means of tables and figures in Word (Microsoft Office). In order to determine the statistical significance (local statistical indicator $p < 0.05$) the Chi-square test and Fisher's exact test were used. In restorations where the occlusal relief was formed with ceramic materials a further retrospective analysis was carried out in order to establish the mean dwelling time (months to years).

Results

Altogether 782 teeth were evaluated and documented in the present retrospektive investigation. 61% of the teeth were located in the maxilla and 39% in the mandible. 26.3% of all cases were anterior teeth, 31.2% were premolars and 42.5% molars (Fig. 1). Based on the restoration types in the coronal area, metal ceramics restorations were found in 24.2% of the cases. In 21.1% an untreated caries was found, 13.7% of the teeth were restored with composite, in 10.4% of the cases metal restorations were present, 11.9% were restored with amalgam and 4.7% of the teeth were used as abutment teeth for bridgework (2% had a gold occlusal relief; 2.7% had a ceramic occlusal relief). In 2.2% of all the cases a gold partial crown and in 1.5% a gold inlay was present. The remaining 10.3% were summarized as others (ceramic inlay, ceramic partial crown, veneer, full ceramic crown, glass ionomer cement, telescope, trauma) (Fig. 2).

Related to the respective jaw the following findings arose for the mandible (n = 305). In 25.9% of all cases metal ceramic restorations were present. Caries was found in 21.1%, 10.8% of the teeth in the mandible were restored with composite, 9.8% with gold cast

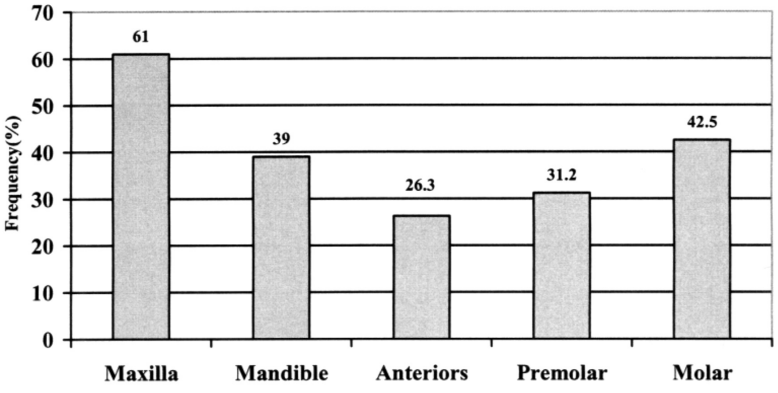

Fig. 1. Frequency distribution of the examined endodontically treated teeth related to the respective jaw and the respective dental group (n = 782).

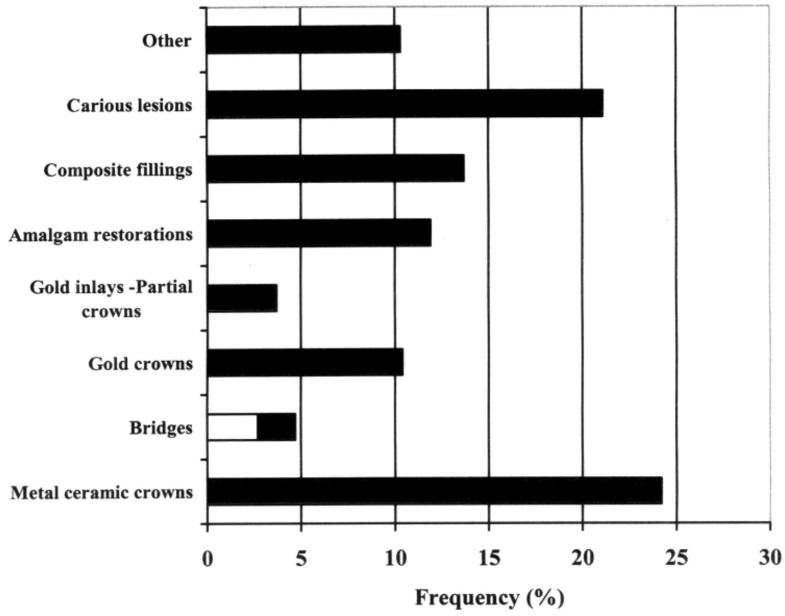

Fig. 2. Restoration and crown types of the examined teeth related to the respective restoration form and the respective condition of the natural crown prior to endodontic treatment (n = 782).

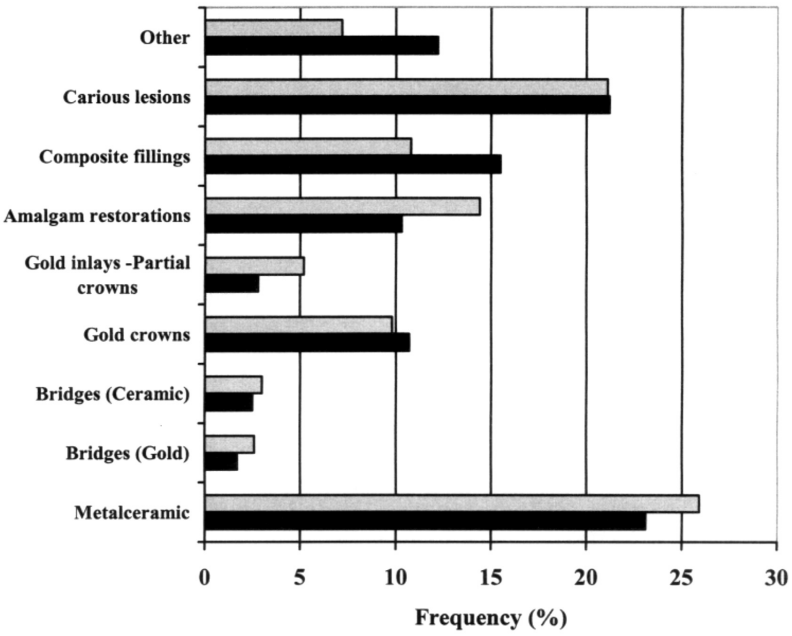

Fig. 3. Restoration and crown types of the examined teeth related to the respective jaw (maxilla n = 477; mandible n = 305).

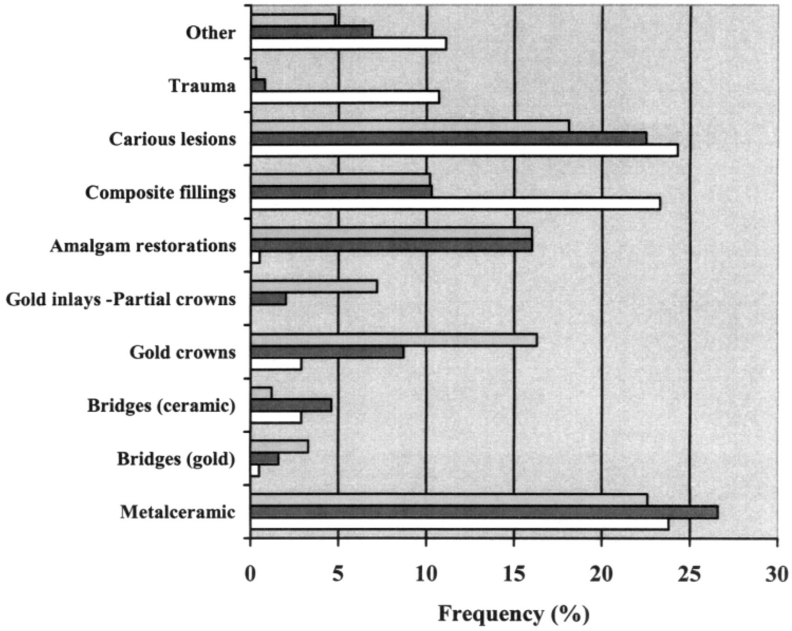

Fig. 4. Restoration and crown types of the examined teeth based to the respective tooth type (anterior = 206; premolars = 244; molars = 332).

crowns and 14.4% with amalgam. As abutment teeth for bridgework 5.6% of the teeth were used (2.6% had a gold occlusal relief; 3% had a ceramic occlusal relief). In 3.6% of the examined teeth a gold partial crown and in 1.6% a gold inlay restoration was present. Further clinical conditions as well as restorative types could be found in 7.2% (ceramic inlay, glass ionomer cement, veneer, trauma, telescope, full ceramic crown) (Fig. 3).

Related to the maxilla (n = 477) 23.1% of the teeth were restored with metal ceramic restorations. In 21.2% of all the cases untreated carious defects were present, 15.5% of all the teeth in the maxilla were restored with composite, 10.7% showed gold cast crowns and 10.3% were restored with amalgam. 4.2% of the teeth in the upper jaw were used as abutment teeth for bridgework (1.7% had a gold occlusal relief; 2.5% had a ceramic occlusal relief).

A gold partial crown was in 1.3% and a gold inlay was in 1.5% of all the cases present. The remaining 12.2% were summarized as others (ceramic inlay/-partial crown, veneer, full ceramic crown, glass ionomer cement, trauma) (Fig. 3).

Overall (anterior teeth n = 206; premolars n = 244; molars n = 332), metal ceramic restorations were found in 23.8% in the front tooth area, 26.6% (n = 65) in premolars and 22.6% in the molars. An untreated caries was found in 24.3% in the front, 22.5% in the premolars and in 18.1% of the molars. Composite fillings were localized in 23.3% in the front tooth area, in 10.3% in the premolars and in 10.2% in the molar area. In 2.9% of the anterior teeth, 8.7% of the premo-

lars and 16.3% of the molars gold cast crown restorations were present. Amalgam fillings were found as follows: front = 0.5%, premolars = 16%, molars = 16%. As abutment teeth for bridgework 3.4% of the anterior teeth, 6.2% of the premolars and 4.5% of the molars were used. In 10.7% of the front teeth, 0.8% of the premolars and 0.3% of the molars pulpal discomforts appeared after a trauma. 1.2% of the premolars and 4.2% of the molars were supplied with a gold partial crown, and 0.8% of the premolars and 3% of the molars with a gold inlay. In the anterior teeth other restoration forms were found in 11.1% of the cases, in the premolars in 6.9% and in the molars in 4.8% of the cases (ceramics inlay / partial crown, veneer, full ceramic crown, glass ionomer cement) (Fig. 4).

Overall the frequency of metal ceramic restorations was significantly higher ($p = 0.01$). This fact was also confirmed when considering the single dental groups and their location in the jaw. In 68.3% of all metal ceramic restorations a mean dwelling time of 29.3 months could be determined.

Discussion

The first reports on irritations of the pulpal tissue as possible results of traumatically conditioned occlusal disturbances, like increased sensitivity on thermal excitations to necrosis of the pulp have appeared more than six decades ago. Also numerous scientific studies investigated connections between an occlusal trauma and pulpal irritations [7]. Already in 1971 this could be confirmed in experimental studies with animals of Landay et al. [9]. Nevertheless, after differential-diagnostic clarification of a preparation trauma or thermally caused increased sensitivity, the aetiological causes for pulpal irritations are subject to complicated mechanisms which allow no unequivocal statements. Bruxism and parafunctions concerning an occlusal trauma were described as possible aetiological factors for pulpal irritations by several authors [2, 4]. Occlusal interferences and premature contacts are considered to be possible parameters which can cause overloading due to first reactions of the pulp [1, 14]. Taking into account the numerous overlapping possibilities for pulp necrosis, in particular in the area of the iatrogenic parameters (e. g. preparation trauma, occlusal interferences, long-term existing occlusal disturbances) or bruxism and parafunctions, knowledge of the relations and causal connections is not yet exactly known. Present parafunctions caused by occlusal interferences, the previous degree of destruction of the teeth and preparation techniques for the respective restoration forms have to be considered.

In the present study a high portion of teeth treated with metal ceramic restorations were found. This value was not dependent on the location in the jaw or dental group and showed the significant highest portion with 25.4%. Teeth restored with metal ceramic restorations had the lowest rate of secondary caries (48.7%) in comparison to the other restoration types. Consequently, these results should be studied in detail concerning their causal relations in continuing investigations and be quantified accordingly.

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Address for correspondence:
Prof. Dr. B. Willershausen
Department for Operative Dentistry,
Johannes-Gutenberg University Mainz
D-55131 Mainz, Germany
Tel: ++49 – 6131 – 177247
Fax: ++49 – 6131 – 173406
e-mail: willersh@uni-mainz.de