

Evaluation of the Quality of Endodontic Retreatments Performed at the Municipal Oral and Dental Health Center of Ouagadougou, Burkina Faso

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Abstract Failure of endodontic treatment seems to be related to the large number of patients treated by the dentist. The objective of this study was to systematically evaluate endodontic retreatments performed by dental surgeons at the Municipal Oral and Dental Health Center (MODHC) of Ouagadougou under optimal work conditions. This was a prospective study evaluating endodontic retreatments quality performed by dental surgeons at the MODHC between the 1st and the 28th of April 2017. Personal, clinical, and radiographic data of patients were compiled using a customized collection form. Thirty-eight patients were involved in this study. Most retreatments were of the lower first molars (44.7%). Thirty-four patients (89.5%) were asymptomatic. Three cases of overfilling of filling material were noted. One patient was referred to an endodontist for further treatment. Retreatment indications can be minimized by taking more care when performing initial endodontic therapy.

Keywords: *evaluation, quality, endodontic retreatments*

Cite This Article: Kaboré WAD, Ouédraogo CNT, Bane K, Avoaka-Boni MC, Seck A, Niang SO, Leye-Benoist F, and Sarr M, "Evaluation of the Quality of Endodontic Retreatments Performed at the Municipal Oral and Dental Health Center of Ouagadougou, Burkina Faso." *International Journal of Dental Sciences and Research*, vol. 6, no. 4 (2018): 83-86. doi: 10.12691/ijdsr-6-4-1.

1. Introduction

Endodontic retreatment is a treatment procedure for teeth that have previously undergone endodontic treatment involving cleaning, shaping, and obturation of the root canal. It is undertaken when the initial treatment appears to be inadequate or has failed, or when the canal network has been contaminated by a prolonged exposure to the intra-oral environment [1]. Despite technical and scientific advances in endodontics, high success rates for initial treatment, and a progressive increase in the number of specialists, a substantial number of cases in dental practices require retreatment [2,3]. This situation raises the question of the actual cause for retreatment. Technically, for retreatment, operative conditions need to be recreated for a normal endodontic treatment by accessing the canals and removing canal obturation materials, followed by cleaning, shaping, and reobturation of the canal [4]. Endodontic retreatment is a tedious and difficult undertaking for which patient motivation, strategic importance of the tooth, and the determination and skill of the practitioner are criteria that determine

decisions to retreat [5]. The aim of the present study was to undertake a clinical and radiological evaluation of the quality of thirty-eight endodontic retreatments that were performed at Ouagadougou's MODHC.

2. Materials and Methods

Ninety-five endodontic treatments performed at the Municipal Oral and Dental Health Center (MODHC) of Ouagadougou, Burkina Faso, between October 2014 and January 2015 were evaluated. Thirty-eight endodontic treatments that qualified as treatment failures received an indication for endodontic retreatment. These retreatments were carried out between March and April of 2016. The quality of these retreatments was evaluated between the 1st and the 28th of April 2017. This study included all patients whose medical files indicated that an endodontic retreatment had been undertaken between March and April 2016. Criteria for non-inclusion comprised patients who could not be reached or who refused to participate in the study as well as those for whom the extraction of the tooth involved had already been carried out.

A form was devised using Sphinx Lexica software version 5.0.0.75 to collect pertinent data for the study. This form was used to record the patient's personal information and also contained a record of the postoperative radiographic check-up. Patients were scheduled for an appointment and the practitioner was awarded a sufficient amount of time to perform the treatment.

A dam was systemically used in all of the retreatment sessions. Irrigation was performed with sodium hypochlorite at 2.5% in alternation with a solution of ethylenediaminetetraacetic acid (EDTA®) (Dentsply, USA). Patients were evaluated every week until the canal had been cleaned sufficiently to permit obturation. The cavity for endodontic access was remade using an Endo Access® kit (Dentsply, USA). Removal of canal obturations based on eugenol zinc oxide was achieved with Endosolv E® (Septodont, France). Several drops of Endosolv E® were delivered perioperatively to the pulp chamber with a syringe so as to allow for passage of the file. Endosolv E® was regularly renewed and, if apical progression was difficult, a dry cotton ball was placed in the pulp chamber which was resealed with IRM® "Intermediate Restorative Material" cement (Dentsply, USA) as a temporary dressing. Canal repair was carried out manually by serial filing, followed by conventional obturation with a fitted single cone. An orthocentered X-ray of the single- and multi-root upper teeth, and an offset X-ray of the lower molars and the upper premolars, was systematically performed with the file in place so as to determine working length, and postoperatively to evaluate the quality of the canal obturation. A final coronary restoration with amalgam or composite has been placed. Quality of retreatment was deemed to be satisfactory when the following criteria were met: distance between the tip of the obturation and the radiographic apex was ≤ 2 mm; a dense homogeneous obturation filling the entire canal. Thus, a canal was considered to be underfilled if the apical end of the obturation was situated at >2 mm from the radiographic apex and was deemed to be overfilled if the apical end of the obturation extended beyond the radiographic apex.

A post-therapeutic check-up was carried out in April of 2017, or a year later, to evaluate clinical success and stability of the obturation. Clinical examination was performed to probe for painful symptoms (e.g. percussion, digital palpation to probe for an arch in regard to the apex, mobility, and fistula). A radiographic evaluation was also carried out with the aim of visualizing the periodontal ligament (e.g. possible periodontal enlargement or disappearance of the enlargement, if present) and the presence or not of a gap between the dental wall and the coronal obturation, as well as to analyze the periapex by comparing it with the previous X-ray. Practitioners were not informed of a reevaluation of the treatments that had been performed. X-rays were evaluated throughout the study using a light box and a magnifying glass. The distance between the radiological apex and the obturation was measured using a plexiglass ruler with a scale in millimeters.

This evaluation was performed by three dental surgeons who did not belong to the unit. In case of a divergence

between two practitioners, input from the third was used to resolve the issue.

3. Results

3.1. Characteristics of the Patients

Thirty-eight (38) patients, of whom 15 (39.5%) were male and 23 (60.5%) female, were involved in this study. The predominant age range (40.2%) was from 19 to 40 years of age. The lower first molars were implicated in the majority of procedures (44.7%) (Table 1).

Table 1. Number of teeth retreated according to the type of tooth

Type of teeth retreated	Number of teeth retreated n (%)
Lower first molars	17 (44.7)
Upper second molars	9 (23.7)
Upper premolars	6 (15.8)
Canines	3 (7.9)
Upper incisors	3 (7.9)
Total N (%)	38 (100)

3.2. Indications for Endodontic Retreatments

The examined cases were not symptomatic and no patients had sought a consultation. Evaluation of the initial endodontic treatment revealed 18 (47.4%) underfillings, 11 (28.9%) cases with multiple canals that had not been obturated and 9 (23.7%) cases with a single canal that had not been obturated. Eight teeth exhibited a periapical lesion and eleven molars had an insufficiently open access cavity.

3.3. Endodontic Retreatment

On average, three sessions sufficed for complete cleaning, shaping, and reobturation. An immediate X-ray check-up revealed dense and homogeneous obturations (89.5%) that matched the apical end. Three cases of filling beyond the end of the canal were observed. Restoration was not possible for a distovestibular canal of a lower second molar, the progression being impeded by a substantial abutment. This patient was referred to an endodontist for further treatment.

3.4. Post-therapeutic Check-up

This was carried out a year after the canal reobturation. Clinical evaluation indicated that 34 patients (89.5%) were asymptomatic (i.e. absence of spontaneous pain or pain caused by percussion, digital palpation probing for an enlargement in regard to the negative apex, absence of mobility, and no fistula). Clinical success was defined as a lack of symptoms. Three patients had teeth that were still slightly tender to axial percussion. This pain was rated by the three patients as 1 (minor) on a straightforward verbal scale [6]. A periodontal enlargement was visible at the periphery of the root. Inspection of the periapex on the X-ray revealed that for teeth that exhibited an apical image,

these lesions persisted, although they appeared to be less pronounced.

4. Discussion

Endodontics is the discipline of odontology that comprises the diagnosis, prevention, and treatment of dental pulp and periradicular tissue afflictions, with the aim of preservation of the affected tooth [7]. Cleaning and shaping of the canal network followed by creation of a tight seal are the only way to ensure physiological conditions for healing [8] and to eradicate infection at the periapical level [9]. Maintaining the highest level of sterility during endodontic treatment is essential to avoid cross-infections [10]. In other words, undertaking an endodontic treatment requires diligence, time, and care. These are criteria without which therapeutic failure cannot be avoided [11]. Endodontic retreatment is a way to address an endodontic failure [11].

The present study involved 38 patients who had undergone endodontic retreatment. The most highly represented age group was from 19-40 years of age and female patients accounted for 60.5% of the study population. Seck *et al.* [12] in Senegal have reported similar results. The teeth involved were mainly the lower first molars (44.7%) and upper second molars (23.7%). The study from Senegal reported a predominance of first molars (26.4%) and central incisors (25%) [12]. This substantial level of affliction of first molars can be explained by the fact that first molars are the permanent teeth that erupt the soonest, at an age when the child is still at a learning stage. A lack of proper oral and dental hygiene at this age promotes carie formation in the permanent first molars. This can explain why they are generally the teeth that are treated the most. A study carried out in Ouagadougou reported that first molars are the teeth that most often give rise to consultations (23%) [13]. Difficulty accessing the second molars may justify why they are often subject to failure. Teeth with single roots, which are easy to access, comprised 15.8% of the sample. The substantial length of the canines may give rise to underfilling, as some endodontic instruments (e.g. files and filling spreaders) may not be able to reach the apex. Huuomonen *et al.* [11] reported that teeth that have been incompletely obturated more often develop periapical lesions than teeth for which endodontic obturation is complete.

Overcrowding in public dental care centers could also contribute to therapeutic failures, as the practitioners working at such facilities tend to have very substantial workloads. Of note, MODHC is a not-for-profit public health entity located in the center of the city. At most public dental centers in Burkina Faso, the number of patients tends to exceed the facilities' capacity due to factors such as equipment that is in disrepair and limitations in terms of the care that can be provided [14]. Dental surgeons at MODHC do not have enough time available to perform all of the stages involved in time-consuming endodontic treatments. Thus, the treatment quality that can be provided may be compromised by overcrowding. Furthermore, dams are not used systematically at this dental care facility. However, decontamination of the endodontic system requires use of

a dam [15] so as to ensure that there is no microbial reinfection during endodontic care of an infected tooth and to prevent a primary microbial infiltration during care of a vital tooth. This may underlie some of the failures that have been noted.

Post-therapeutic follow-up indicated that 34 retreatments of a total of 38 (89.5%) were clinical and radiological successes. Senegalese studies reported a similar success rate [5,12]. These results match those of Gaye *et al.* [5]. Endodontic access cavities were insufficiently open for 28.9% of the teeth and, as a direct consequence, canals were inaccessible and poorly or non-obturated. The technique of single-cone canal obturation predominated in general practice, and much could be gained by extending the application of techniques involving compaction with gutta-percha to obtain three-dimensional and hermetic obturations [16]. Indeed, the fitted single-cone technique has an disadvantage of leading to underfilling and fractures of Lentulo® (Dentsply, USA) or worse, substantial overfilling with filling materials. Such overfillings can have disastrous consequences if the filling material is pushed into the inferior dental nerve canal [17,18], particularly in cases where the apical constriction has been destroyed by bacterial toxins. Success of endodontic retreatment in general practice, like the initial treatment, requires having sufficient time and sessions to properly perform the full complement of procedures.

5. Conclusion

Planned endodontic retreatments yielded better canal obturations, with no postoperative symptoms in 89.5% of the cases after one year. These high rates of success show that dental surgeons at MODHC are proficient with the fitted single-cone technique, although they need to dedicate sufficient time to cleaning and shaping of the canal in order to rigorously adhere to operation times. A reevaluation at two years allows for confirmation of the stability and observed clinical success. Furthermore, dental surgeons at MODHC would stand to gain from using the technique of vertical condensation with warm gutta-percha associated with a sealing cement, as it alone allows three-dimensional obturation of the canal network and a better apical seal than single-cone techniques.

Conflict of Interest

The authors have no conflict of interest to declare.

Acknowledgements

The authors wish to thank the dental surgeons who kindly agreed to evaluate retreatments.

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