ORIGINAL ARTICLE

NON-SURGICAL ENDODONTIC RETREATMENT IN CASE OF FAILURE OF PRIMARY ENDODONTIC TREATMENT: CASE SERIES

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Abstract: (1) *Background*: Nonsurgical endodontic retreatment procedures have a high potential for success when case selection guidelines are followed, advanced technologies and techniques are employed, and the best materials are used. The aim of the study is to demonstrate that conservative orthograde endodontic retreatment represents a safe management solution for cases of primary endodontic treatment failure. (2) *Methods*: The study was undertaken between 2022 and 2024, involving a cohort comprising 30 patients of diverse gender and age demographics who sought treatment at the Endodontics Clinic from the University of Medicine and Pharmacy from Craiova and received an endodontic retreatment. The study included three groups: one with inadequate coronal and root canal obturation, another with clinical symptoms, and the third with radiological signs of apical periodontitis. (3) *Results*: Orthograde endodontic retreatment is a conservative method of keeping the tooth on the arch, but it needs technology to establish the diagnosis and to perform the treatment itself. (4) *Conclusions*: In cases of primary orthograde endodontic treatment failure, modern endodontic management emphasizes repeating a conservative approach, reserving surgical endodontic intervention only as a last resort.

Keywords: endodontic retreatment, nonsurgical, conservative

1. Introduction

Endodontic treatment aims to achieve a functional tooth while also enabling the complete repair of the supporting structures. It is essential to consider all treatment options—conservative orthograde retreatment, retrograde retreatment, or extraction—based on factors such as time, cost, prognosis, and the patient's decision [1]. According to the Glossary of Endodontic Terms, "retreatment" refers to the performance of endodontic treatment that involves removing filling material from the root canals, followed by their cleaning, shaping, and obturation [2].

The endodontic retreatment procedure is classified into two major categories: orthograde (non-surgical) or conventional retreatment, performed in cases where the primary orthograde treatment was inadequate or in the event of failure of previous endodontic therapies, and retrograde (surgical) retreatment, which involves treatment following the surgical exposure of the apical portion of the tooth [3]. Orthograde endodontic treatment has proven to be a predictable procedure with a high success rate; however, failures may still occur, with rates ranging from 14% to 16% [4-7].

Nonsurgical endodontic retreatment procedures have a high potential for success when case selection guidelines are followed, advanced technologies and techniques are employed, and the best materials are used [8,9]. Orthograde endodontic retreatment is indicated in cases of failed endodontic treatment; however, the efficient removal of root canal filling material from the canal system is essential to ensure a successful outcome for the procedure [10].

"Failure" has variable definitions, with some studies describing it as the recurrence of clinical symptoms accompanied by the presence of periapical radiolucency [11]. An endodontically treated tooth must be evaluated both clinically and radiographically, and the patient should be scheduled for periodic follow-ups to ensure that the treatment is considered successful and the tooth remains functional [12].

The European Society of Endodontology has proposed guidelines for assessing the outcomes of endodontic treatment, defining the terms "success" and "failure" in endodontics. Primary orthograde endodontic treatment should be evaluated at least one-year post-treatment. A favorable outcome is characterized by the absence of clinical symptoms (e.g., pain, swelling, fistula), a radiographic image free from pathological signs, and a functional tooth. Conversely, an unfavorable outcome should be assessed if any of the following findings are present: clinical signs and symptoms, a radiographically visible periapical lesion that developed after treatment, a pre-existing periapical lesion that has increased in size, a periapical lesion that has remained the same size, or one that has only slightly diminished during a four-year evaluation period, or radiographic evidence of root resorption. In cases where the lesion has either remained the same size or reduced in volume after one year, the outcome is deemed uncertain, necessitating additional follow-up for up to four years [13].

Patient-centered terminology has also been proposed for evaluating endodontic outcomes, categorizing cases as "functional," "healed," "unhealed," and "healing" [8].

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The aim of our study is to demonstrate that conservative orthograde endodontic retreatment represents a safe management solution for cases of primary endodontic treatment failure.

This paper aims to evaluate the various reasons that lead to the decision to perform orthograde retreatment, which must be individualized to ensure this therapeutic approach meet\ing the needs of both the patient and the clinician.

2. Materials and method

The study was undertaken from 2022 to 2024, involving a cohort comprising 30 patients of diverse gender and age demographics, ranging from 30 to 60 years. These individuals sought treatment at the Endodontics Clinic from the University of Medicine and Pharmacy from Craiova to manage various dental pathologies and to restore masticatory and facial functionality. All patients were subjected to clinical and radiological examination to ascertain the dentition underlying pathology and received an endodontic retreatment.

A comprehensive endodontic chart and treatment form was meticulously completed for each participant involved in the study. This document encompassed personal information, reasons for presentation, familial and personal medical history, diagnostic findings, and proposed treatment strategies. In the selection of cases, due consideration was given to the endodontic, restorative, and periodontal prognoses. All therapeutic interventions were conducted with explicit informed consent obtained from the patient.

Clinical cases involving endodontic retreatments were selected and grouped into three categories based on the reasons for retreatment:

- deficient coronal and root canal obturation,
- presence of symptoms,
- presence of radiolucent signs.

The protocols for conservative endodontic retreatments were conducted according to the following procedure:

- Anesthesia administration; rubber dam isolation; complete removal of the infiltrated obturations and altered dentin;
- The build-up was performed using light-cured composite (Filtek Z250 XT, 3M ESPE)
- The root canals were reopened using stainless steel hand files (ISO 0.02) and Ni-Ti rotary instruments S2, F1 (Pro Taper Dentsply-Maillefer), with orange oil as the solvent.
- In some cases, the missed canal was identified, and a glide path for the rotary files was created using stainless steel hand K-files sizes 10, 15, and 20).
- Working lengths were determined with the Root ZX apex locator (Morita) and verified with retro-alveolar x-rays.
- Mechanical debridement was performed by enlarging the root canals using the progressive telescoping technique (Crown-Down) with stainless steel hand files (ISO 0.02) and Ni-Ti rotary instruments ProTaper Gold (F2, F3 Gold, Dentsply-Maillefer) and Reciproc R40 (VDW, Germany), based on the apical constriction diameter for each canal.
- Endodontic irrigation was carried out using 5.25% NaOCl, with 2 ml irrigation

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after each file, maintained for 20 minutes, and refreshed every 5 minutes for each canal, followed by 10% citric acid and 9% saline, sonically activated with Eddy (Dentsply-Maillefer).

- The canals were dried using paper points matching the taper of the system used.
- Root canal obturation was performed using gutta-percha cones calibrated to the master file taper with the continuous wave vertical condensation technique, aided by the Fast Fill and Back-Fill devices (Eighteeth) and AH Plus Jet sealer.
- A crown-root reconstruction was performed by adapting a fiberglass post (Overfibres, Italy), cemented with LuxaCore Z-Dual (DMG, Germany).
- An immediate postoperative two-dimensional radiograph was taken to verify the accuracy of the retreatment.
- Notably, all procedures were executed under magnification employing the Leica M320 dental microscope, augmenting visual acuity and procedural safety.

3. Results

The study included 30 participants, comprising 18 females (60%) and 12 males (40%). Most participants resided in urban areas (21, 70%), while 9 (30%) lived in rural locations. The age distribution showed that 8 participants (26.7%) were aged 30–40 years, 7 (23.3%) were aged 41–50 years, and the largest group, 15 participants (50%), were aged 51–60 years.

Regarding the causes of failure, 13 teeth (43.3%) had infiltrated obturations, 7 teeth (23.3%) presented with symptomatic apical periodontitis, and 10 teeth (33.3%) exhibited periapical radiolucencies (Table 1).

Table 1. Demographic and Clinical Characteristics of Study Participants.

Characteristic	Category	n	%
Gender	Female	18	60
	Male	12	40
Place of Living	Urban	21	70
	Rural	9	30
Age Group (years)	30-40	8	26.7
	41-50	7	23.3
	51-60	15	50
Causes of Failure	Teeth with infiltrated obturation	13	43.3
	Teeth with symptomatic apical periodontitis	7	23.3
	Teeth with apical radiolucencies	10	33.3

This section exhibits 3 of the most representative cases.

Case no 1: A 37-year-old female patient presented at the clinic, reporting discomfort, food impaction, and fetid halitosis in the region of the upper left molars, where an improperly adapted dental bridge was observed. The patient mentioned that she rarely used this area for mastication due to occasional discomfort.

A thorough clinical examination was conducted using inspection, palpation, and axial percussion, revealing the following findings:

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- A dental bridge spanning 2.4–2.6 exhibited mobility and poor marginal adaptation at 2.4 and 2.6.
- At 2.6, a supporting tooth, the full-coverage crown was improperly fitted, with a marginal secondary carious lesion.
- Axial and transverse percussion tests were negative for tooth 2.6.
- Palpation of the vestibule at the apex of the 2.6 root was non-tender, with no fluctuation detected.
- Thermal vitality tests (cold and hot) were not performed, as the tooth had undergone previous endodontic treatment.

Radiological examination of 2.6 (Figure 1) revealed:

- An improperly adapted full-coverage crown with marginal secondary caries.
- A previously performed endodontic treatment with an incomplete and non-homogeneous canal obturation.

A three-dimensional radiographic examination further identified:

- The presence of a missed canal (MB2).
- A radiolucent lesion at the root of the MB canal (Figure 2).

Figure 1. Initial X-Ray.

Based on the clinical, subjective, and imaging evaluations, a diagnosis of chronic apical periodontitis was established for tooth 2.6. Following these investigations, the decision was made to perform conservative orthograde endodontic retreatment involving chemo-mechanical canal preparation and subsequent root canal obturation.

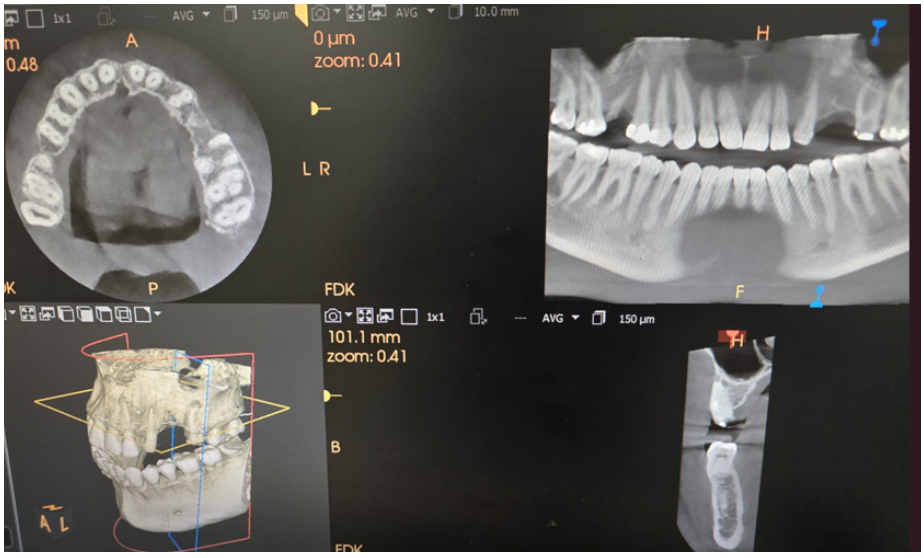

Figure 2. CBCT performed after dental bridge removal.

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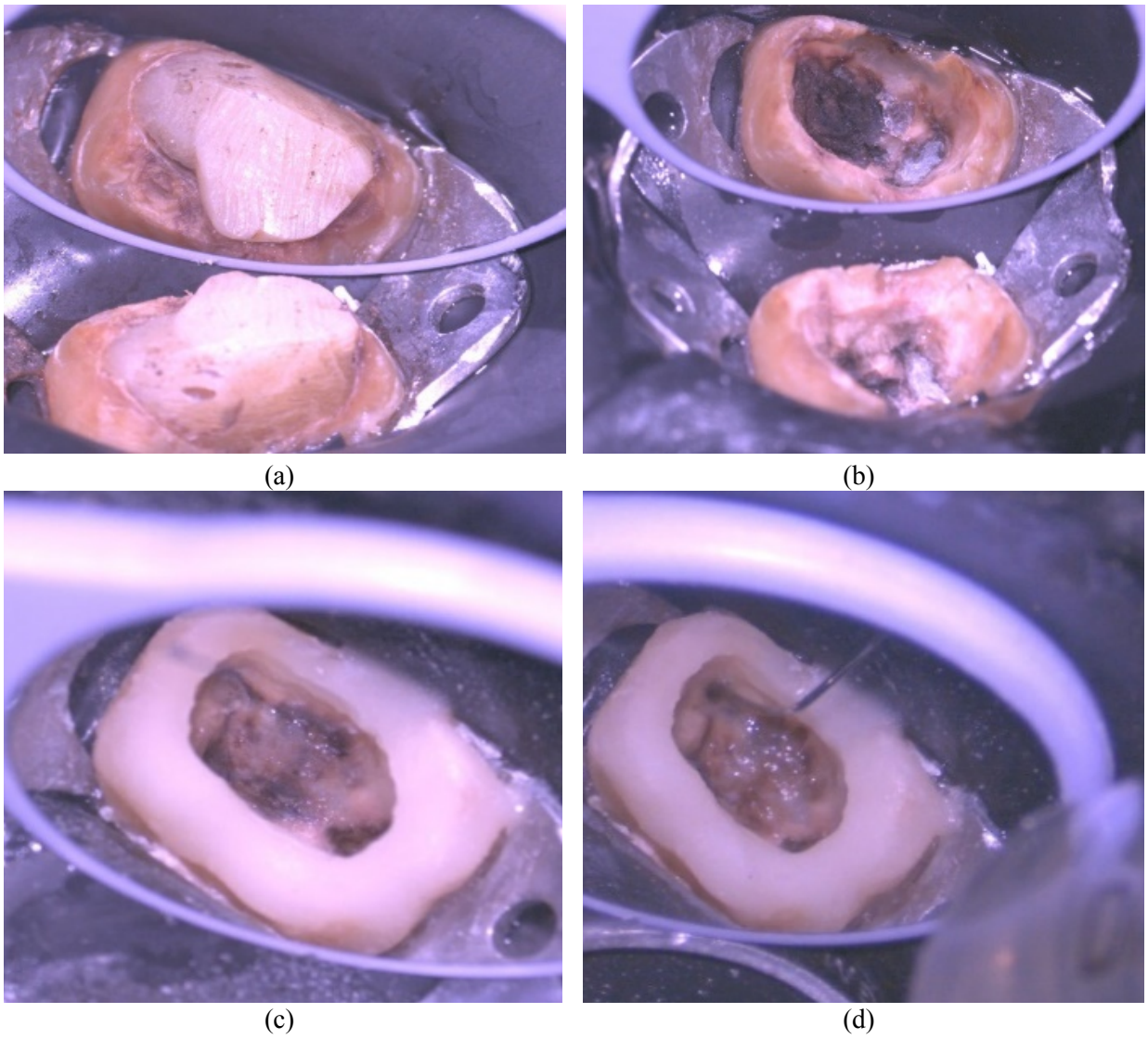
The endodontic retreatment was performed on tooth number 26 following the steps in the protocol explained in material and methods section (Figures 3, 4, 5).



(a) (b) (c) (d)

Figure 3. (a) Rubberdam isolation; (b) Removal of obturation and decay; (c) Build-up; (d) Finding MB2.

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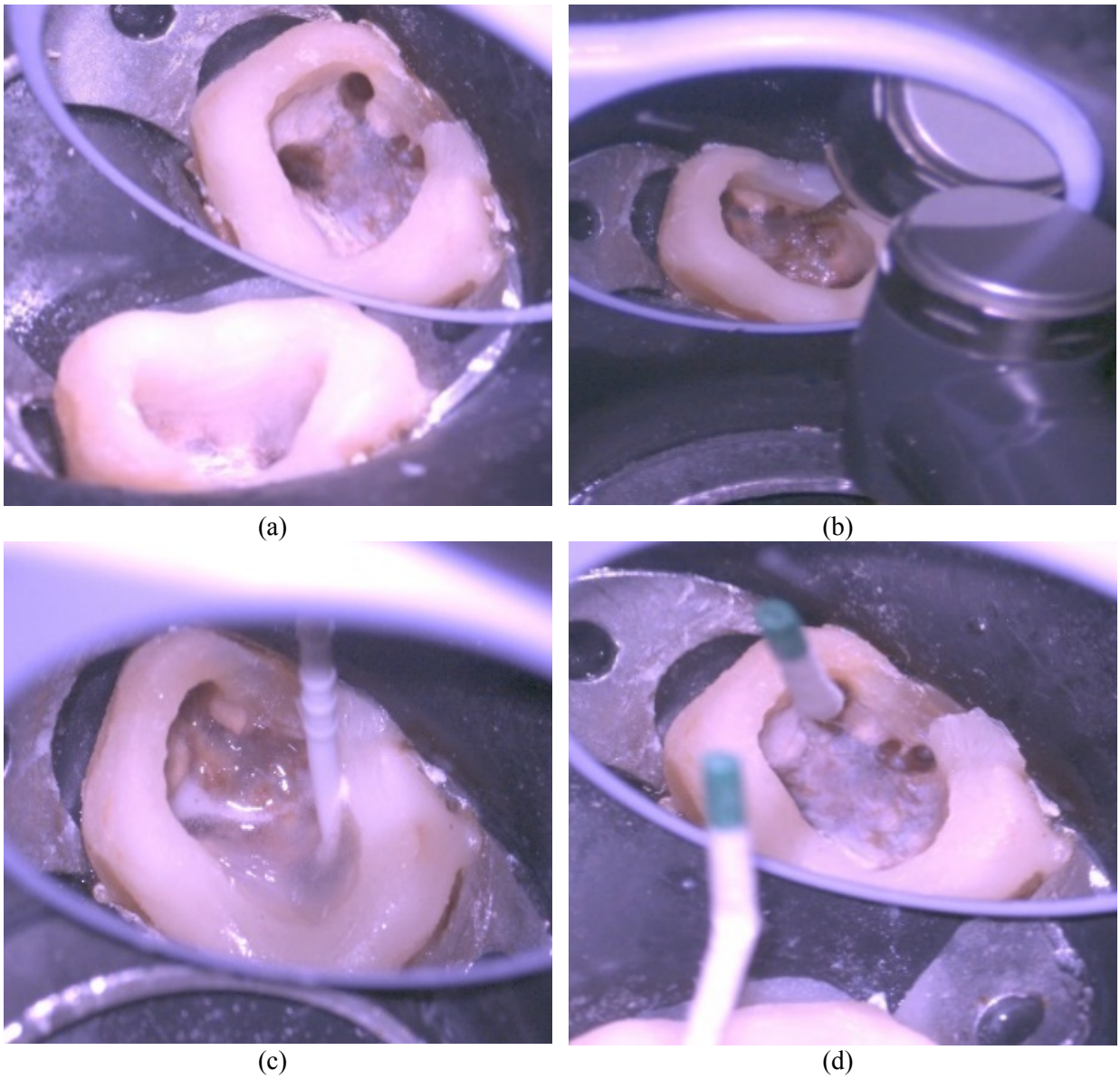

Figure 4. (a) Retreatment of main canals; (b) Shaping the MB2; (c) Activating the irrigant; (d) Drying.

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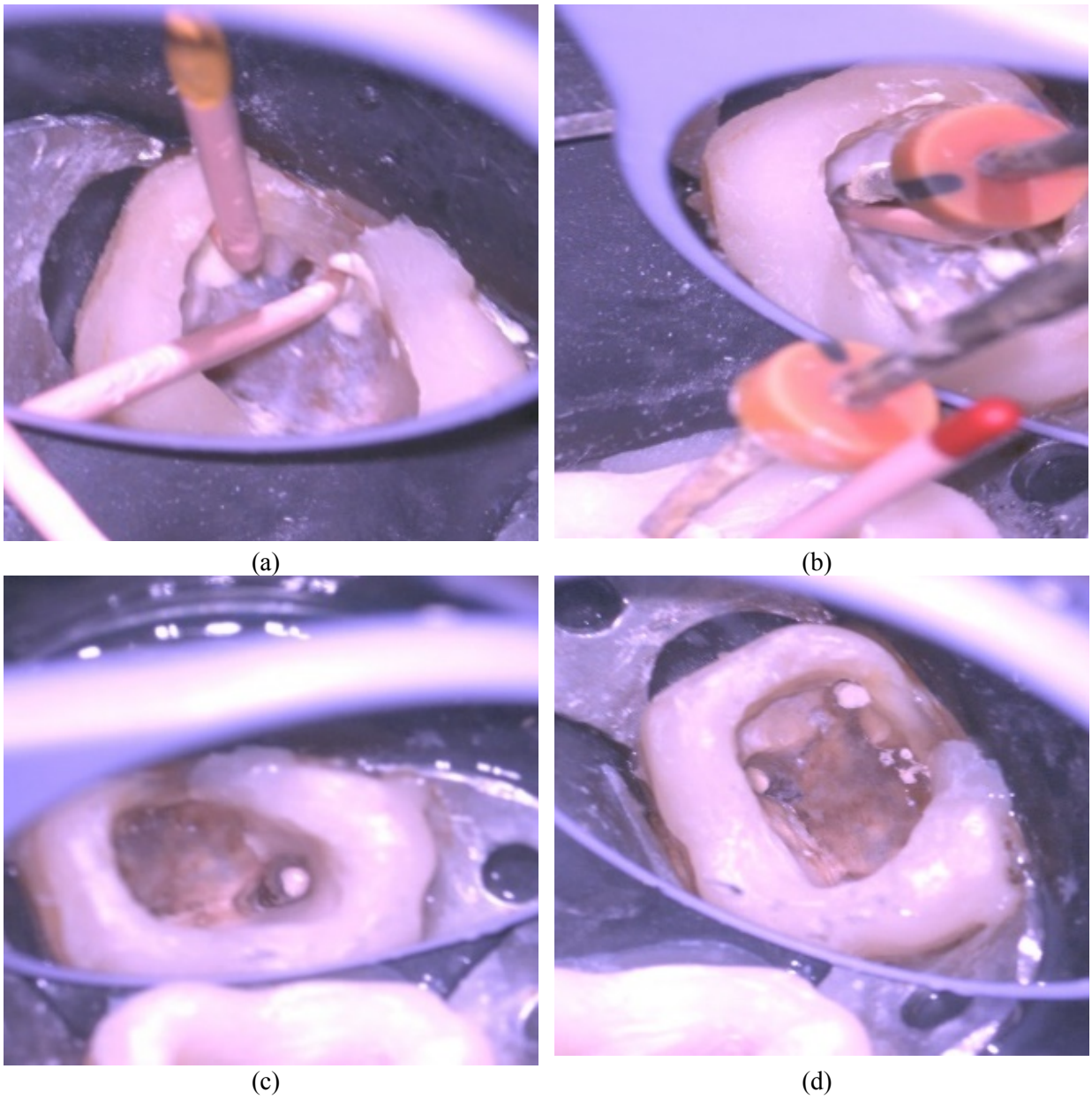

Figure 5. (a) Guttapercha master cones and sealer; (b) Down-pack; (c) Palatal root partially obturated prepared for fiberpost; (d) Root canal obturation.

After the endodontic retreatment it was performed a control X-ray (Figure 6).

Case no 2: A 59-year-old female presented to the clinic, reporting discomfort, food retention, and fetid halitosis in the upper right molar region, where a full-coverage crown was noted. The patient mentioned infrequent use of the affected area during mastication due to occasional discomfort.

A clinical examination, including inspection, palpation, and axial percussion, revealed the following findings:

- Slight congestion of the mucosa in the upper right vestibule near the first molar region.

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- A poorly adapted full-coverage crown with marginal secondary caries.
- Axial and transverse percussion tests showed moderate sensitivity in tooth 1.7.
- Palpation of the vestibule at the apex of tooth 1.7's root was painful, though no fluctuation was detected.
- Thermal vitality tests (cold and hot) were not performed due to the tooth having undergone previous endodontic treatment.

A three-dimensional radiographic examination (Figure 7) revealed:

- A poorly adapted full-coverage crown with marginal secondary caries.
- A previously performed endodontic treatment with incomplete and non-homogeneous canal obturation.
- The presence of an ill-defined radiolucent area around the distobuccal, mesiobuccal, and palatal roots.

Figure 6. Control X-Ray.

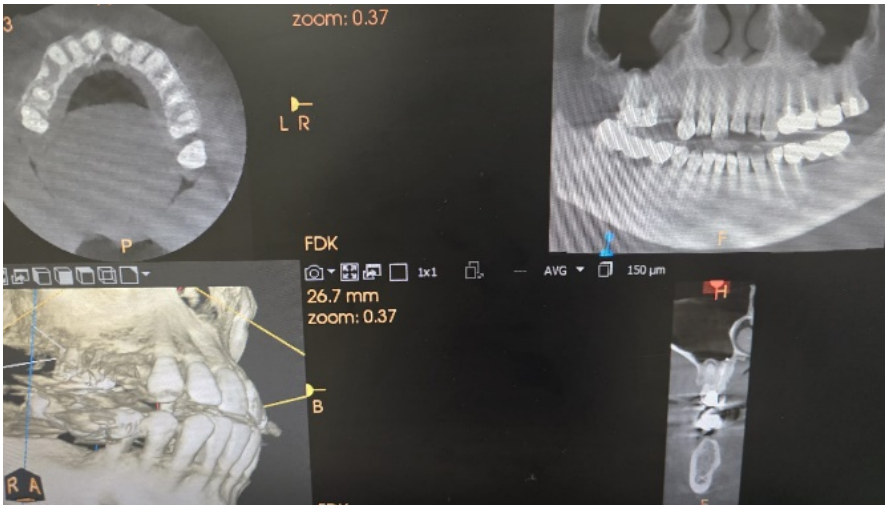

Figure 7. The initial CBCT.

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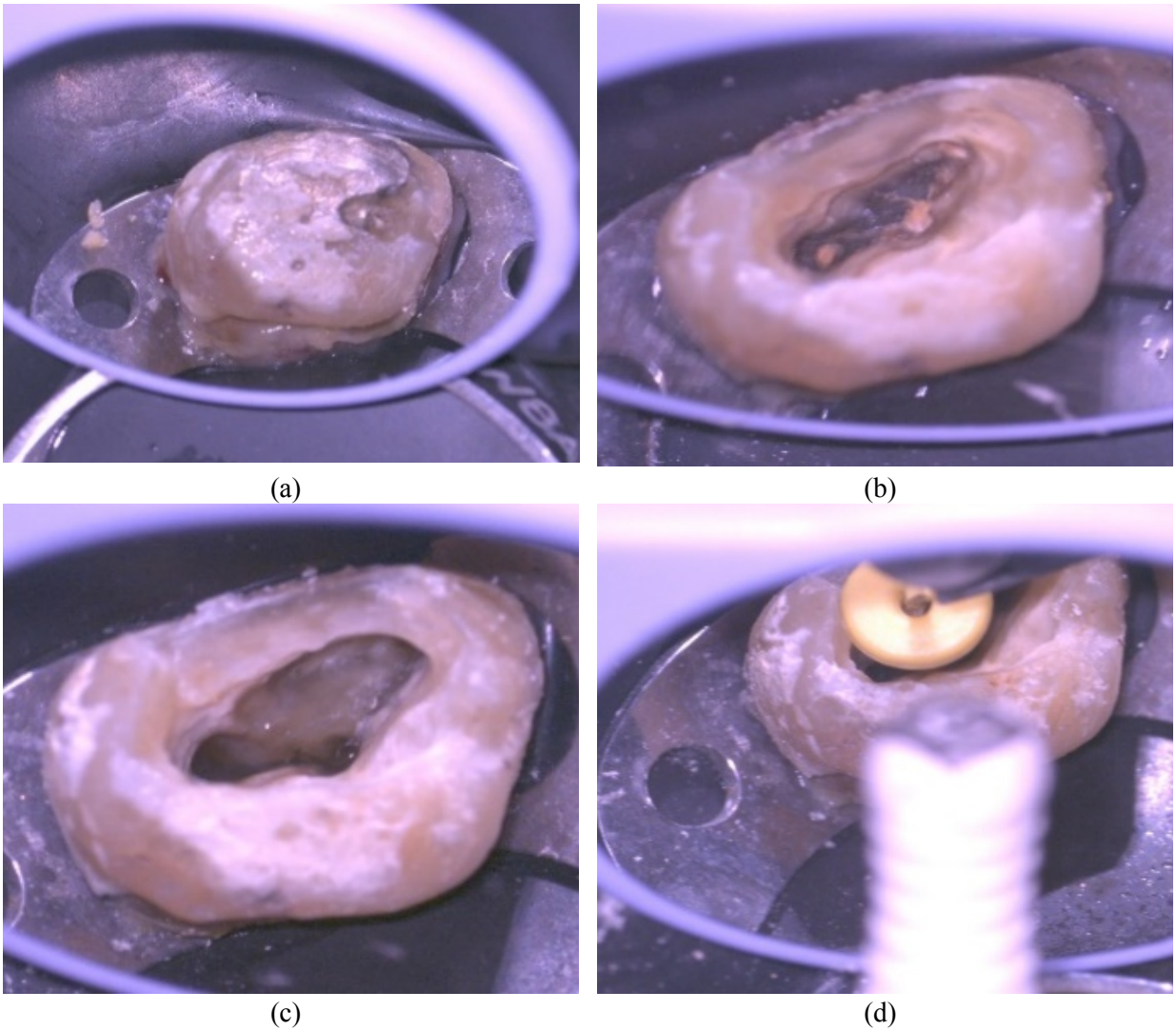
Based on the clinical, subjective, and imaging evaluations, a diagnosis of exacerbated chronic apical periodontitis was established for tooth 1.7. Following the investigations, the decision was made to perform conservative orthograde endodontic retreatment (Figure 8), involving shaping root canals followed by obturation (Figure 9). In the end, a X-ray for checking the quality of endodontic obturation was performed (Figure 10).



(a) (b)

(c) (d)

Figure 8. (a) Rubber dam isolation; (b) Removal of coronal obturation; (c) Removal of root canal obturation; (d) Determination of the working length.

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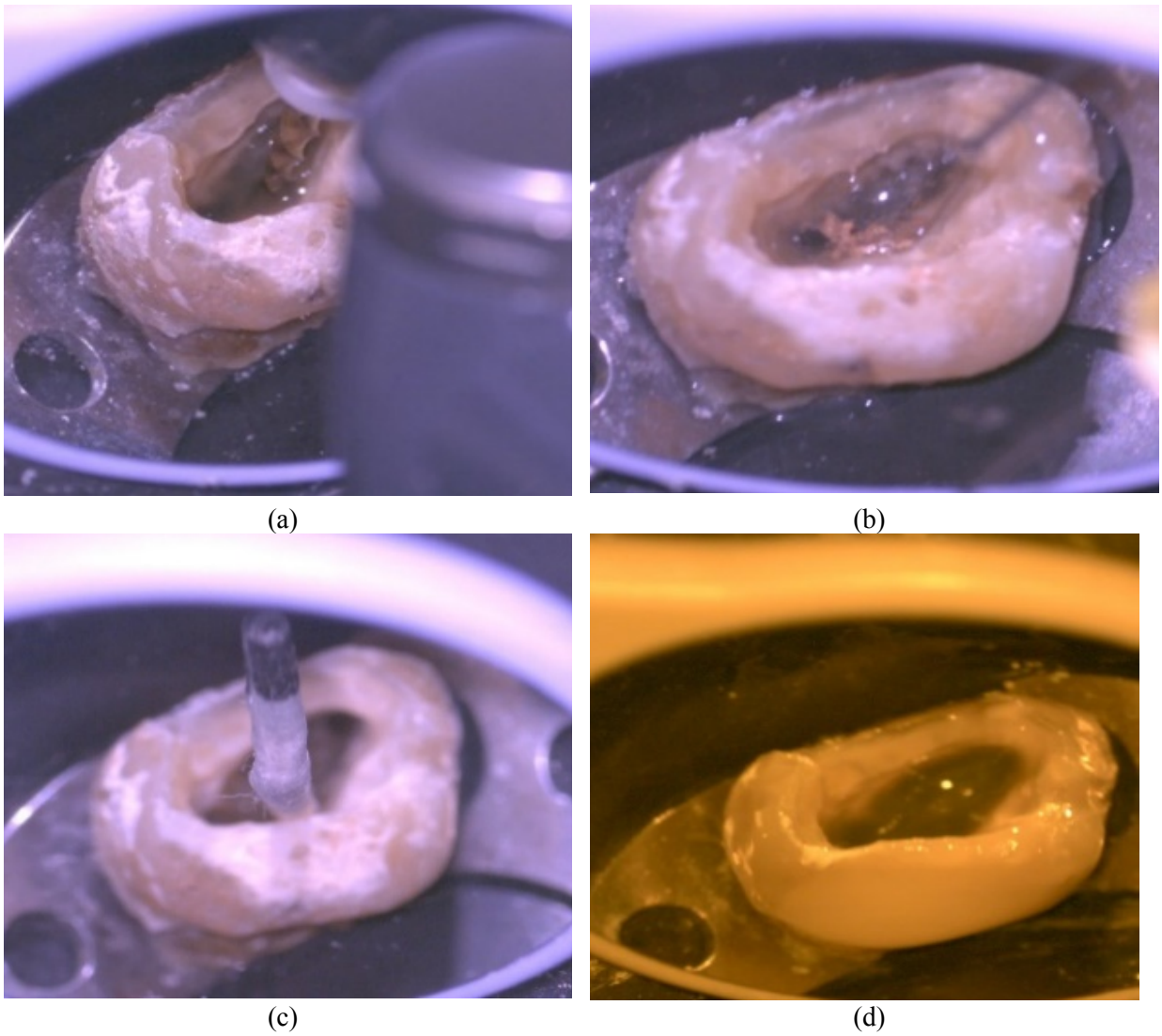

Figure 9. (a) Rotary shaping; (b) Endodontic irrigation; (c) Drying the canals using paper points; (d) Root canal obturation and coronal obturation with coloured flowable.

Figure 10. Control X-Ray.

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Case no 3: A 60-year-old female presented to the Endodontics Clinic, complaining of pain during mastication in the lower right premolar region, where a tooth was noted to be prepared as a post and a coronal occlusal filling was present. The patient reported having had acute episodes in the past and that the tooth underwent conservative orthograde endodontic treatment 9 months ago. The affected area was used infrequently for mastication, with occasional discomfort. A clinical and objective examination, including inspection, palpation, and axial percussion, revealed:

- Mild congestion of the mucosa in the lower right vestibule near the first premolar.
- An occlusal coronal filling with marginal secondary caries.
- Axial and transverse percussion tests revealed pronounced sensitivity at tooth 4.4.
- Palpation at the vestibule near the apex of tooth 4.4 was painful, but no fluctuation was detected.
- Thermal vitality tests (cold and hot) were not performed, as the tooth had undergone previous endodontic treatment.
- A three-dimensional radiographic examination (Figure 11) revealed:
- An occlusal coronal filling with poor adaptation and marginal secondary caries.
- A previously performed endodontic treatment with incomplete and non-homogeneous canal obturation.
- An ill-defined radiolucent area at the apical region.
- The presence of a missed canal, the lingual canal.

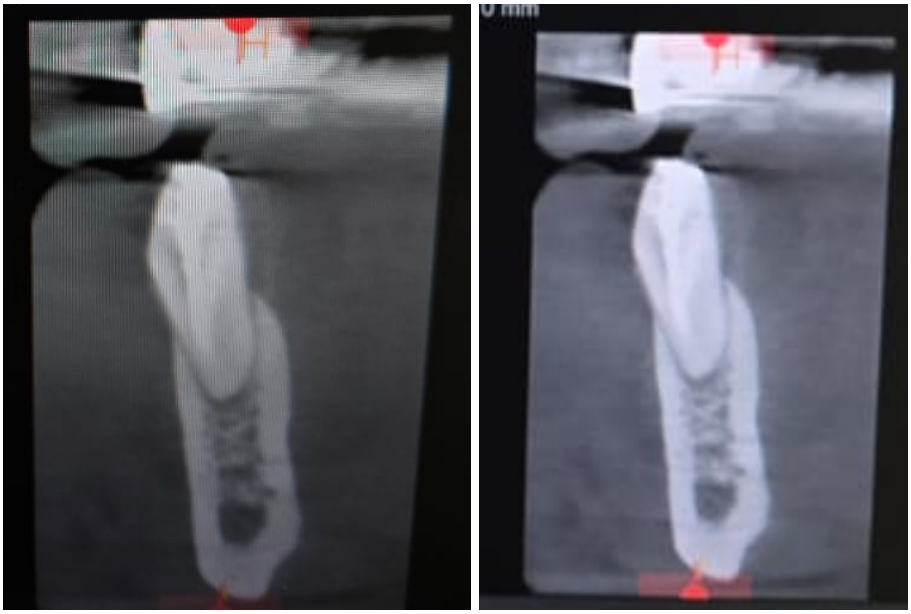

Figure 11. The initial CBCT.

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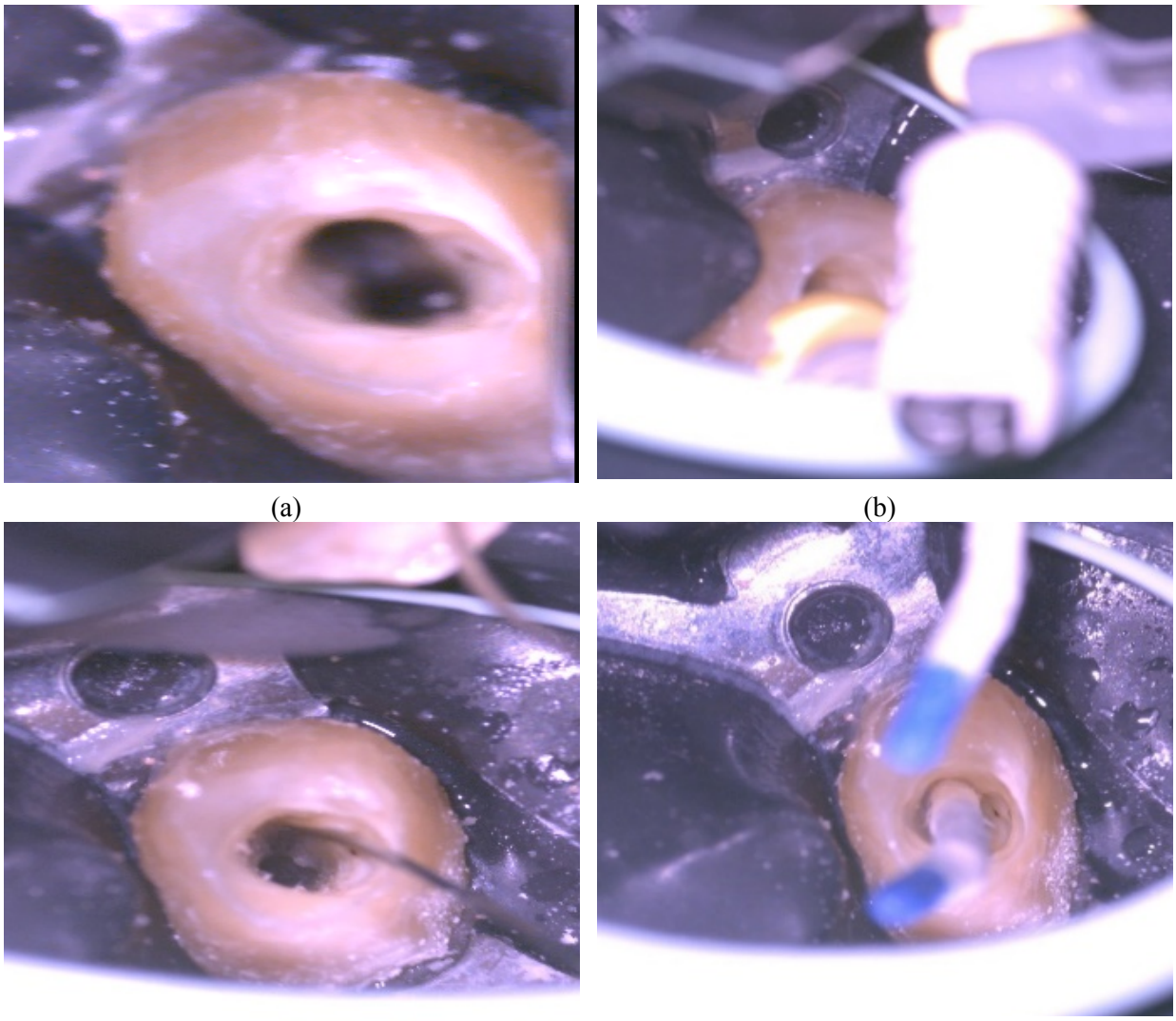
Based on the clinical, subjective, and imaging findings, a diagnosis of exacerbated chronic apical periodontitis was established for tooth 4.4. Following the investigations, the decision was made to perform conservative orthograde endodontic retreatment, involving chemo-mechanical canal preparation (Figure 12) followed by root canal obturation (Figure 13). In the end, the endodontic treatment was verified using a X-Ray (Figure 14).



(a) (b)

(c) (d)

Figure 12. (a) Finding the lingual canal; (b) Determing the working length; (c) Irrigation; (d) Drying.

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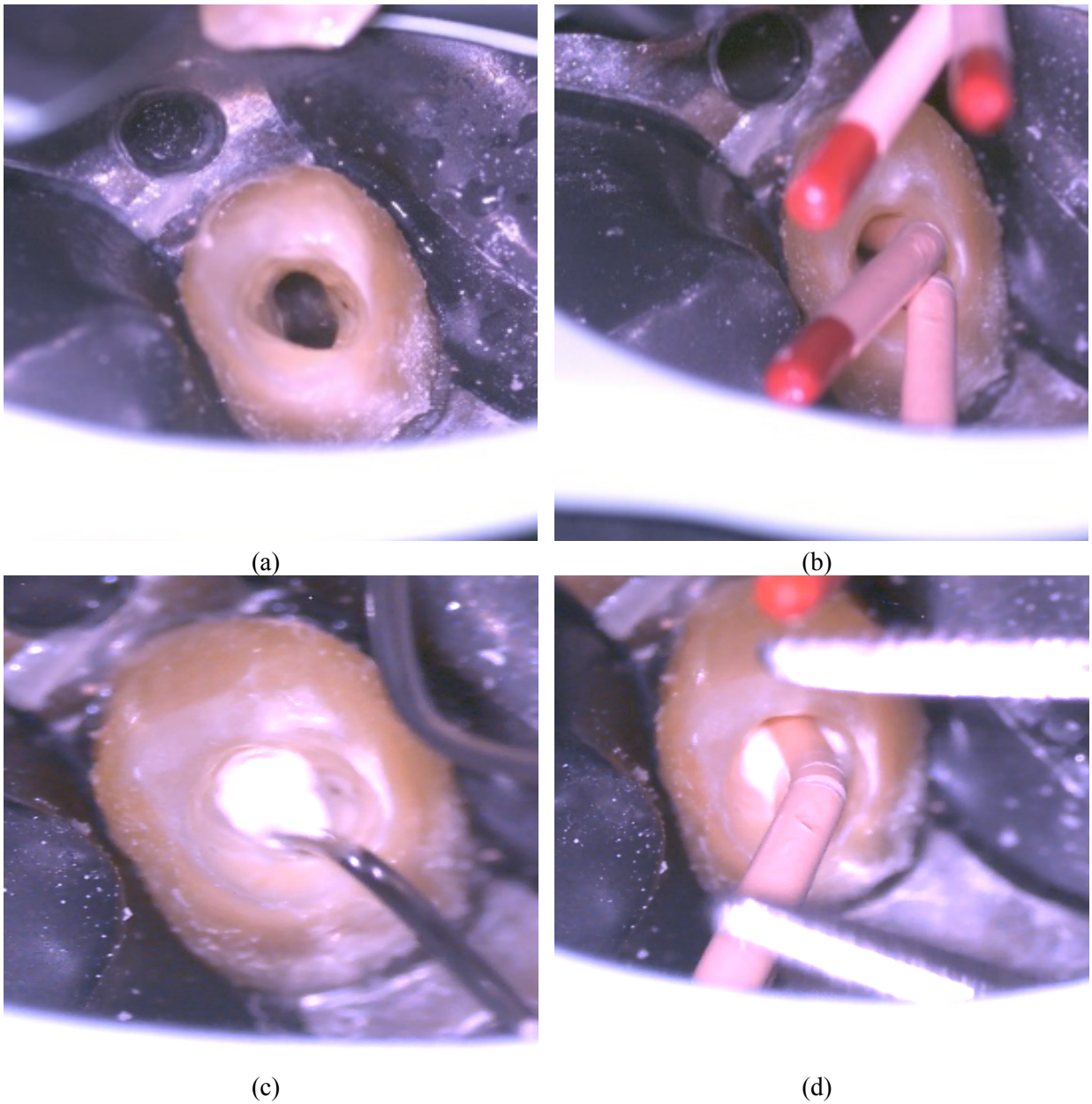

Figure 13. (a) Two dried canals; (b) Fitting master cones; (c) Introducing bioceramic sealer; (d) Introducing the gutta-percha cone.

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Figure 14. Control X-Ray.

4. Discussions

The lower healing rate of orthograde retreatments compared to primary endodontic treatments has been well documented in the literature [14], with persistent microbial infection being one of the significant causes of failure [12]. Research studies emphasize the advantages of orthograde retreatments over apical surgery and show that late failures are more likely to occur in teeth that have undergone surgical treatment. A slower healing dynamic might explain the higher success rate over time in teeth that were not retreated orthograde [15].

In our study, 33.3% from the evaluated teeth exhibited periapical radiolucencies. Holland et al. [16] concluded that in the absence of periradicular lesions, the orthograde retreatment success rate is higher. In contrast, in cases where lesions were present, the success rate ranged from a minimum of 31.8% to a maximum of 85% [16]. Friedman et al. [17] showed a success rate of over 90% for orthograde endodontic retreatment in teeth without periapical lesions, suggesting that in cases where infection is not present and the procedure is performed by specialists, the success rate is high. Sjogren et al. [14], performing endodontic retreatments on 173 roots in the absence of periapical lesions, achieved a success rate of 98%. If a periapical lesion is present before the start of the endodontic retreatment, the success rate can be estimated at no more than 70% [17].

Endodontic retreatment repeats the stages of primary endodontic treatment using an orthograde approach, with the goal of cleaning the root canals of irritants, most of the apical microorganisms that survived the previous treatment or infiltrated post-therapy. Therefore, endodontic retreatment aligns with the biological rationale of canal therapy and is preferred whenever possible [18]. Nonsurgical endodontic retreatment can be divided into two phases: removal of the root canal filling and re-instrumentation of the endodontic system [19], with various retreatment techniques being proposed, the most recent of which are performed using rotary nickel-titanium instruments [20].

Some studies conducted over time have highlighted the presence of persistent apical periodontitis in endodontically treated teeth

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in 45% of cases [21, 22]. The cause of persistent apical periodontitis is mainly attributed to microorganisms that survived the primary endodontic treatment. This issue can be resolved through conservative orthograde endodontic retreatment [23].

The cases treated in this study were diagnosed with apical periodontitis, with previous endodontic treatments being technically deficient; thus, conservative orthograde retreatments were performed as the first approach to resolve the pathology. The etiology of endodontic infections is bacterial, so the removal of bacteria and secondary byproducts from the endodontic system through appropriate chemo-mechanical treatment is crucial for a successful long-term outcome [24, 25].

Ricucci concluded that persistent intraradicular bacteria should be considered the main cause and reason why endodontic retreatments are necessary [22]. For the reasons mentioned above, missed anatomy is one of the most common causes of failure in primary endodontic treatment [26, 27]. Mashyakhy et al. discovered that the frequency of apical periodontitis in teeth treated with missed canals was about 90%, while Baruwa et al. found a frequency of 82.6%, and Costa et al. 98% [28-30].

According to the literature, missed canals predominantly affect maxillary first molars, particularly the mesio-buccal 2 (MB2) canal, followed by mandibular first molars, especially the second canal in the distal roots [31,32]. Additionally, a supplemental mesial canal, the middle mesial canal, is frequently found in lower molars, with prevalence ranging from 0.26% to 53.8%. For incisors (central, lateral) and canines, the percentage was 20.4%, 25.3%, and 5.9%, respectively, with the real prevalence closely linked to the ethnicity of the population, as described by Dhuldhoya et al. [33, 34].

For example, in our study in the first presented case, an orthograde conservative endodontic retreatment was performed on the upper first molar, where the MB2 canal was missed, prepared, and obturated. To identify the missed canal, three-dimensional radiographs, magnification, adequate lighting, endodontic probes (DG 16), and ultrasound were used, with the color and consistency of the dentin aiding in locating the entry orifice. n the third presented case, the failure of the primary treatment and the persistence of pathology were attributed to the omission of the lingual canal. With the technology described, the canal was located and detached from the main canal at an acute angle, thereby preventing the source of infection. Clinicians begin endodontic treatments by observing the anatomy of the root canals using radiographs. The presence of internal anatomical variations and anomalies is not uncommon [35]. Among these variations, the incidence of middle mesial canals ranges from 0.5% to 15% [36, 37], with a high frequency of intercanal isthmuses constituting an additional step in the chemo-mechanical debridement procedures [38].

A limited understanding of the tooth's anatomy, the complexity of the canal configuration, or procedural errors (such as inadequate cavity design) can contribute to the omission of a canal in a treated tooth. Missed canals are potential microbial reservoirs and a primary cause of persistent

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apical periodontitis [39]. Endodontic literature provides clear evidence supporting that nonsurgical endodontic retreatment is performed on teeth with many missed canals after initial endodontic treatment. Missed canals are identified in 42% of teeth that undergo nonsurgical endodontic retreatment [40]. A thorough understanding of anatomy is necessary to provide information on where to search for the canal entry. Proper visualization of the root canal anatomy is crucial, and at least two periapical radiographs with different angulations are needed to achieve this. For a complete understanding of the three-dimensional anatomy, CBCT imaging is used [41].

Magnification tools such as loupes and the operating microscope significantly enhance visibility, improving accessory canal identification [42]. Other studies have highlighted the importance of ultrasonic tips, resulting in better procedural quality during endodontic retreatments [43]. In all the cases presented in this study, endodontic retreatments were performed under magnification as a standard in endodontics, emphasizing every detail in the process, including difficult-to-reach areas, ensuring optimal working conditions and excellent visual control.

Three-dimensional imaging is more sensitive in detecting periapical lesions than two-dimensional radiographs, as demonstrated by Aminoshariae et al. Cone beam computed tomography (CBCT) doubles the chance of detecting periapical lesions compared to two-dimensional periapical radiographs [44]. For diagnosing the presented cases (cases 1, 2, 3), besides a thorough clinical examination, we used complementary diagnostic tools such as retroalveolar radiographs with the paralleling technique. Superior CBCT imaging was necessary, in terms of specificity and diagnostic sensitivity, to increase the accuracy of periapical status assessment. Studies like Bhatt et al. (2021) have recently investigated the impact of CBCT on initial diagnosis and clinical decision-making compared to conventional radiographs in endodontic treatments. They concluded that the additional information obtained from CBCT images led to changes in initial diagnoses and treatment plans in 59% of 96 cases (61%) and 64 of 96 cases (66%) [45]. Ee et al. drew a similar conclusion. They reported that implementing the three-dimensional radiographic examination led to changes in the treatment plan in approximately 62% of cases [46]. Several studies have evaluated the technical quality of root canal obturations radiographically, suggesting that this can affect the outcome of endodontic treatment [47].

A study of the extruded root canal filling material after primary endodontic treatment highlighted its association with unsatisfactory technical quality and noted that over-instrumentation favored root canal overfilling [48]. Overfilling can delay healing or even predispose to treatment failure. Teeth that underwent orthograde retreatment with adequate canal obturations showed higher success rates [49].

In our study 43.3 of the retreated teeth had previous infiltrated obturations. Poor quality root canal obturation in the primary treatment predisposes to endodontic failure, with studies showing that their compatibility with the physicochemical characteristics of

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various microorganisms' surfaces allows bacterial adherence and biofilm formation. Furthermore, microorganisms surviving the chemo-mechanical treatment may attach to the filling materials. In one study, nine bacterial species were isolated from filling materials, underlining the microbiological importance of additional sampling of obturation material in persistent infections to enhance understanding of the failure's etiology and healing process [50].

In all the cases retreated in this study, signs of incomplete previous root canal obturation were observed, which is a poor prognostic factor for primary endodontic treatments and maintaining periapical inflammatory responses. Removing previous root canal filling materials is critical to ensure proper disinfection and adequate root obturation, addressing the cause of primary endodontic treatment failure. Gutta-percha remains the most commonly used filling material, combined with sealers of variable chemical composition, and is applied through various obturation techniques, which can be categorized into "cold" and "hot" techniques [51].

The warm vertical condensation of gutta-percha in the root canal system results in its difficult removal when orthograde endodontic retreatment is necessary. Therefore, several solvents have been proposed to soften the obturation materials, including chloroform, eucalyptus oil, xylene/xylol, orange oil, methylene chloride, and halothane. However, concerns about their cytotoxicity remain [52]. Specialists have demonstrated that the use of solvents during retreatment can lead to residual gutta-percha and filling material on the root canal walls and inside the dentinal tubules, potentially compromising the disinfection of the endodontic system and threatening the outcome of the retreatment [53].

In all the cases treated in this study, orange oil was used as a solvent to soften the gutta-percha and facilitate the reaching of working length with rotary instruments using the Crown-down technique. Ultrasonic activation with flexible endodontic files allowed the detachment of fragments adhering to the canal walls, which were then removed through abundant irrigation. Regarding gutta-percha removal by the most common mechanical technique [51], both manual and rotary instruments have been proposed, with NiTi instruments being more effective and requiring less operating time, resulting in fewer residual remnants in the endodontic system [51,52].

The long-term success of endodontic retreatments is mainly dependent on the correct restoration of the coronal part of the tooth [54]. As previously mentioned, a tooth undergoing endodontic treatment requires a coronal crown. The clinician must decide whether to access the root canal through the existing restoration or remove it. Accessing through the coronal restoration can be risky, and uncementing the crown may lead to complications, including the need to remake the crown [55]. Minimally invasive access cavities are becoming more commonly used, but in retreatment cases, expanding the preexisting access cavity may be necessary to detect missed canals. Additionally, the presence of prefabricated crowns requires using ultrasonic tips to remove them. Alternating between water and air is needed

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to avoid overheating and damaging the periodontal ligament [56-58].

Endodontic pathology has a bacterial etiology, and any procedure that can enhance the antimicrobial activity of irrigants without causing adverse effects is recommended [59]. Based on available studies, the use of sodium hypochlorite (NaOCl) and freshly prepared EDTA, activated with ultrasound for several cycles (1 minute for each irrigant) during the final irrigation phase, remains the standard for irrigation protocols [168].

In the reported cases, we used sonic activation of the irrigants (Eddy device)or the ultrasonic activation. Sodium hypochlorite at 5.25% and EDTA at 17% concentration were irrigants, with a special syringe and needle with side vents as the delivery system. The success of nonsurgical endodontic retreatment depends on several factors, and the evaluation of healing rates relies on clinical signs, symptoms, and radiographs [54].

The success of endodontic treatment is often evaluated by the presence or absence of clinical symptoms and the status of periapical radiolucency. Key indicators for retreatment include poor root canal obturation, with correct obturation within 0–2 mm of the radiographic apex, and loss of coronal sealing, both of which increase the likelihood of failure. Periapical radiolucency and flare-ups between sessions are associated with lower success rates [13,60,61].

The quality of the primary endodontic treatment influences the success of endodontic retreatment. Factors such as fractured instruments and root perforations can complicate retreatment and negatively impact clinical and radiographic outcomes [50]. However, some studies suggest fractured instruments may not significantly affect periapical healing [62]. Morphological changes in the root canal during the initial treatment can also affect the outcome of retreatment [50]. Ultimately, symptoms, periapical lesions, and defective coronal restoration are considered primary reasons for undertaking endodontic retreatment, which aligns with the criteria used in the study discussed [50].

5. Conclusions

In cases of primary orthograde endodontic treatment failure, modern endodontic management emphasizes repeating a conservative orthograde approach, reserving surgical endodontic intervention only as a last resort.

Coronal restoration plays a significant role before initiating orthograde retreatment. Whether to remove or preserve the restoration depends on specific conditions, each presenting distinct advantages and drawbacks.

Anatomical variations significantly increase the likelihood of failure if unrecognized and improperly addressed. Comprehensive knowledge of root canal anatomy and its potential variations is essential for clinicians to minimize treatment failures and the need for subsequent retreatments.

Proper interpretation of periapical radiographs is critical. Intermediary radiographs are needed when complications like fractured instruments, perforations, or missed canals are suspected.

Despite risks such as dentinal wall undermining, canal wall perforations, ledge formation, and instrument fractures,

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orthograde retreatment is generally a predictable treatment option with high success rates.

Orthograde endodontic retreatment achieves a high success rate, and involving specialists in its practice reduces procedural errors. Incorporating advanced technologies and modern materials further minimizes inaccuracies in retreatment procedures.

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