



**QUALITY IMPROVEMENT IN
DENTAL AND MEDICAL
KNOWLEDGE, RESEARCH, SKILLS
AND ETHICS FACING GLOBAL
CHALLENGES**

Edited by

Armelia Sari Widyarman, Muhammad Ihsan Rizal,
Moehammad Orliando Roeslan & Carolina Damayanti Marpaung



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Armelia Sari Widyarman, Muhammad Ihsan Rizal,
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Damayanti Marpaung

Universitas Trisakti, Indonesia



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Single-visit retreatment in underfilled root canal of mandible second premolar: A case report

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ABSTRACT: Background: When the preparation and obturation are both shorter than the desired working length, an underfill occurs. The disease could result from persistent bacteria and a lack of apical seal. Therefore, retreatment and removal of underfilled gutta percha are suggested. Without any periapical discomfort, the procedure may be completed in a single visit. This case presents a previously treated and normal periapical second lower left premolar that was retreated non-surgically in a single visit. Case report: A 59-year-old female patient came to replace her old amalgam filling without any history of pain or discomfort. Clinical examination showed an extensive amalgam filling on the mesial occlusal distal (MOD) without any pain on percussion and mobility. Radiograph examination showed an underfilled canal with normal periapical. Case management: A single-visit retreatment was carried and gutta-percha was removed using a solvent and retreatment file. The canal was prepared using #30/.04 rotary file. Irrigation using sodium hypochlorite, ethylenediaminetetraacetic acid, and chlorhexidine gluconate with sonic activation. Obturation was done by using a warm vertical compaction technique during the same appointment. The tooth was restored with fiber post, core, and hybrid ceramic crown. Conclusion: Apical seal is known to be important to prevent residual disease-causing bacteria for a long-term favorable outcome. A single-visit treatment has shorter chairside time without a significantly different success rate compared to multi-visit treatment.

1 INTRODUCTION

Currently, root canal therapy is founded on larger ideas, including diagnostic and treatment planning; anatomical understanding; traditional principles of debridement, disinfection, obturation; and coronal restoration. According to Ingle and colleagues, 58% of treatment failures were related to incomplete obturation. Poorly obturated teeth are frequently poorly prepared (Johnson *et al.* 2016).

Poor technique can show in a several ways. These include length problems such as overfill and underfill, cleaning and shaping errors such as a ledge, perforation, and instrument fracture, and obturation quality errors such as voids (Purra *et al.* 2018; Yousuf *et al.* 2015). Poor quality root canal treatment and obturations are as likely to prevent the healing of apical pathosis (Johnson *et al.* 2016).

Underfilling occurs when both the preparation and obturation mass fall short of the intended working length, which can lead to inadequate healing. If the obturation is less than 3 mm from the apical foramen, current or potential irritants may remain in the root canal system (Kulild & Karabucak 2015). Remaining infected necrotic tissue, inadequately

instrumented and filled teeth cause continuous irritation to the peri-radicular tissues, failing the endodontic treatment (Garg & Garg 2015). Compared to an overfill, an underfill is less of a problem (Kulild & Karabucak 2015). When a tooth's first root canal treatment is considered insufficient, retreatment is the most common procedure choice (Terauchi *et al.* 2021).

2 CASE REPORT

A 59-year-old female patient came to RSGMP Universitas Trisakti to replace her old amalgam filling without any history of pain or discomfort. She had no systemic compromise and covid 19 swab antigen findings were negative. Clinical examination showed an extensive defective amalgam restoration on the mesial occlusal distal (MOD) on her second right mandibular premolar (Figure 1A). It wasn't tender on percussion or palpation, and no sign of mobility. The radiograph revealed an underfilled canal with a normal periapical (Figure 1B). She could not recall when she had the initial endodontic treatment. It was diagnosed previously treated with normal periapical.

The case was done in a negative pressure room, at the Faculty of Dentistry, Universitas Trisakti. Informed consent was obtained before the retreatment. A dental loupe was used to do single-visit retreatment. Using a rubber dam, the previous amalgam restoration was removed using a round diamond bur. An access opening was made, and gutta-percha was found to indicate the position of the canal (Figure 1C). An artificial wall was built using a tofflemire matrix and packable composite (Palfique, Tokuyama).

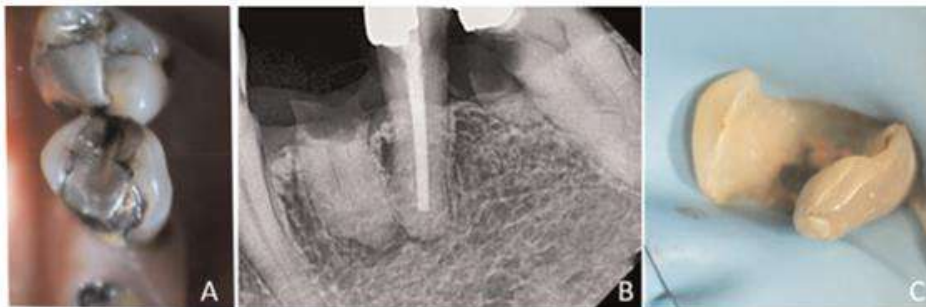


Figure 1. A. Preoperative clinical view of 36. B. Radiographic preoperative. C. Amalgam removal and access opening.

Gutta-percha was removed with retreatment files (M3-RT, UDG, Shenzhen) and gutta-percha solvent (Citrol, Biodinamic, Italy). Using an apex locator (Morita, Japan) and periapical radiograph (Figure 2A), the working length was measured. The canal was instrumented using NiTi rotary files (M3 Pro Gold, UDG, Shenzhen) until the working length of file #30.04 was reached, 2 mL of 5.25% NaOCl was used to irrigate between each instrument, and kfile #10 was used to assess apical patency (Dentsply, USA). The master gutta-percha cone was verified by radiography (Figure 2B).

The final irrigation consisted of 3 mL of 5.25% NaOCl, 3 mL aquadest, 3 mL of 17% EDTA, 3 mL aquadest, and 3 mL of 2% CHX for disinfection. Each solution was activated by endoactivator (Dentsply, USA). The canal was prepared for obturation after having been dried with paper points. A warm vertical compaction technique was used to obturate with calcium hydroxide sealer (Sealapex, Kerr, USA) and gutta-percha. Gutta-percha was cut 2 mm below the orifice using a heat carrier (M3-GP, UDG, Shenzhen) that was radiographically confirmed, and the cavity was temporarily sealed (Figure 2C).

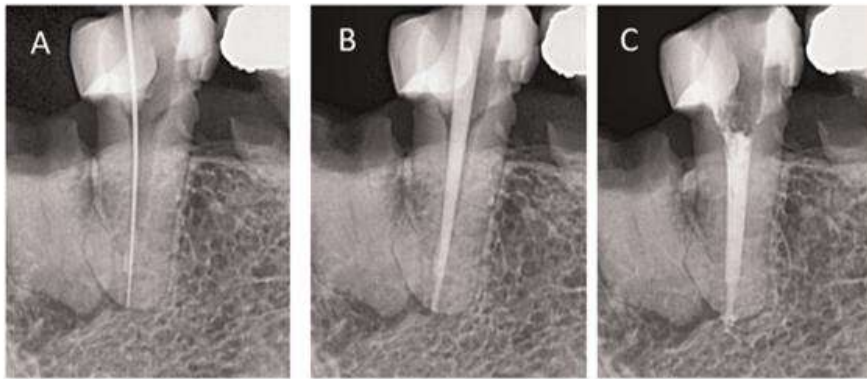


Figure 2. Periapical radiograph of A. Working length. B. Masterpoint. C. Obturation.

At the next appointment, the patient didn't have any complaints and the tooth was restored with fiber post-core (Figure 3A and 3B) and a hybrid ceramic crown (Figure 3C and 3D). She was also referred to the department of oral surgery to have her 34 teeth extracted, and to the department of prosthodontics for removable dentures.



Figure 3. A. Post and core build up. B. Crown preparation. C. Clinical view final restoration. D. Periapical radiograph

3 DISCUSSION

A key to a successful endodontic treatment is the eradication of bacteria from the root canal system, which is accomplished by precise technique (Yousuf *et al.* 2015). Underfill can be caused by insufficient length determination, loss of working length, insufficient filling method, insufficient irrigation between each filing, and so on (Purra *et al.* 2018). In addition to a fractured prior restoration, leakage, or unsatisfactory esthetics, teeth with insufficient root canal therapy should undergo retreatment notwithstanding the lack of clinical signs or symptoms and radiographic pathosis (Terauchi *et al.* 2021).

When a tooth's initial root canal treatment is inadequate, like in this case showed an underfilled canal, retreatment is considered the primary treatment option. The restorability of the tooth following the required removal of prior restorative materials is a crucial element in determining the need for nonsurgical retreatment (Terauchi *et al.* 2021). Because it was a direct restoration, there were no issues with removing an old restoration. After the prior

amalgam restoration was removed, the tooth had less than 2 mm of buccal and lingual wall left.

Gutta-percha must be removed since biofilm is the major cause of chronic and recurrent endodontic infections for the root canal system to be properly treated. In this case, gutta-percha was dissolved using orange oil solvent and removed by rotary retreatment file afterward. It was claimed to be efficient and convenient with continuous rotation from three various lengths and tappers. Even though it has been demonstrated that orange oil is less effective than chloroform, it may also be used for this purpose without causing substantial harm to the patient's health (Terauchi *et al.* 2021). This solvent was a suitable alternative for dissolving gutta-percha (Tanomaru-Filho *et al.* 2010).

Because it reduces apically extruded debris during root canal preparation, crown-down preparation is the instrumentation method of choice for endodontic retreatment. The determination of the working length is an essential step; consequently, both electronic apex locator (EAL) and periapical radiography should be used (Terauchi *et al.* 2021). In this case, the working length was established following radiography and an EAL confirmation that no more gutta-percha was present on the canal. Up until #30.04, cleaning and shaping were carried out using a NiTi rotary file and irrigation solution of 5,25% NaOCl. A larger preparation size results in less root canal filling material remaining, which considerably enhances bacterial reduction (Terauchi *et al.* 2021).

There is no consensus on whether endodontic retreatment should be performed in a single or multiple visits (Terauchi *et al.* 2021). In some cases where there are no contraindications for retreatment, the process can be completed in a single visit to prevent additional recontamination of the root canal space between visits (Kajani *et al.* 2021; Terauchi *et al.* 2021; Toia *et al.* 2022). Restoring canal patency and sealing the root canal system are essential for the long-term success of retreatment (Garg & Garg 2015). Without the presence of any subjective or objective complaints, periapical lesions, over one canal, abnormal anatomy, or patient limitations, therefor retreatment was completed in a single visit in this case. A radiograph revealed that the retreatment had completed and was ready for the final restoration.

A fiber post and a full crown were chosen as the last restoration given that there was only a minimal amount of coronal structure left. Restorations of endodontically treated teeth are intended to protect the remaining tooth from fracture, avoid reinfection of the root canal system, and restore lost tooth structure. Another purpose of the post and core is to prevent coronal leakage by protecting the crown margins from deformation caused by function (Dietschi *et al.* 2016). The presence of pre-operative periapical lesions, the use of rubber dams, the quality of root canal filling, and coronal restorations are all prognostic variables for the outcome of root canal treatment (Meirinhos *et al.* 2020).

4 CONCLUSION

For long-term success, it is vital to consider a suitable restoration on an endodontically treated tooth, since the coronal restoration not only prevents reinfection of the root canal system but also protects the tooth against fracture. It is well known that an apical seal is essential for preventing disease-causing microorganisms from persisting over time. The chairside time for a single-visit treatment is shorter, but the success rate is similar to that of a multi-visit therapy.

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Single-Visit Retreatment in Underfilled Root Canal of Mandible Second Premolar : A Case Report

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ABSTRACT

Background: When the preparation and obturation are both shorter than the desired working length, an underfill occurs. The disease could result from persistent bacteria and a lack of apical seal. Therefore, retreatment and removal of underfilled gutta percha are suggested. Without any periapical discomfort, the procedure may be completed in a single visit. This case presents a previously treated and normal periapical second lower left premolar that was retreated non-surgically in a single visit.

Case report: A 59-year-old female patient came to replace her old amalgam filling without any history of pain or discomfort. Clinical examination showed an extensive amalgam filling on the mesial occlusal distal (MOD) without any pain on percussion and mobility. Radiograph examination showed an underfilled canal with normal periapical.

Case management: A single-visit retreatment was carried and gutta-percha was removed using a solvent and retreatment file. The canal was prepared using #30/.04 rotary file. Irrigation using sodium hypochlorite, ethylenediaminetetraacetic acid, and chlorhexidine gluconate with sonic activation. Obturation was done by using a warm vertical compaction technique during the same appointment. The tooth was restored with fiber post, core, and hybrid ceramic crown.

Conclusion: Apical seal is known to be important to prevent residual disease-causing bacteria for a long-term favorable outcome. A single-visit treatment has shorter chairside time without a significantly different success rate compared to multi-visit treatment.

Keywords: Single-visit endodontic, Underfilled, Nonsurgical Retreatment

BACKGROUND

Currently, root canal therapy is founded on larger ideas, including diagnostic and treatment planning; anatomical understanding; traditional principles of debridement, disinfection, obturation; and coronal restoration. According to Ingle and colleagues, 58% of treatment failures were related to incomplete obturation. Poorly obturated teeth are frequently poorly prepared.¹

Poor technique can show in a several ways. These include length problems such as overfill and underfill, cleaning and shaping errors such as a ledge, perforation, and instrument fracture, and obturation quality errors such as voids.^{2,3} Poor quality root canal treatment and obturations are as likely to prevent the healing of apical pathosis.¹

Underfilling occurs when both the preparation and obturation mass fall short of the intended working length, which can lead to inadequate healing. If the obturation is less than 3 mm from the apical foramen, current or potential irritants may remain in the root canal system.⁴ Remaining infected necrotic tissue, inadequately instrumented and filled teeth cause continuous irritation to the peri-radicular tissues, failing the endodontic treatment.⁵ Compared to an overfill, an underfill is less of a problem.⁴ Despite the absence of clinical signs or symptoms and radiographic pathosis, endodontic retreatment should be performed on teeth with poor root canal therapy related to the fracture of an existing restoration, leakage, or undesirable esthetics. When a tooth's first root canal treatment is considered insufficient, retreatment is the most common procedure choice.⁶

1

CASE REPORT

A 59-year-old female patient came to RSGMP Universitas Trisakti to replace her old amalgam filling without any history of pain or discomfort. She had no systemic compromise and covid 19 swab antigen findings were negative. Clinical examination showed an extensive defective amalgam restoration on the mesial occlusal distal (MOD) on her second right mandibular premolar (figure 1A). It wasn't tender on percussion or palpation, and no sign of mobility. The radiograph revealed an underfilled canal with a normal periapical (figure 1B). She could not recall when she had the initial endodontic treatment. It was diagnosed previously treated with normal periapical.

The case was done in a negative pressure room, at the Faculty of Dentistry, Universitas Trisakti. Informed consent was obtained before the retreatment. A dental loupe was used to do single-visit retreatment. Using a rubber dam, the previous amalgam restoration was removed from the tooth using a round diamond bur. An access opening was made, and gutta-percha was found to indicate

the position of the canal (figure 1C). An artificial wall was built using a tofflemire matrix and packable composite (Palfique, Tokuyama).

Gutta-percha was removed with the use of retreatment files (M3-RT, UDG, Shenzhen) and gutta-percha solvent (Citrol, Biodinamic, Italy). Using an apex locator (Morita, Japan) and periapical radiograph (Figure 2A), the working length was measured. The canal was instrumented using NiTi rotary files (M3 Pro Gold, UDG, Shenzhen) until the working length of file #30.04 was reached. 2 mL of 5.25% NaOCl was used to irrigate between each instrument, and kfile #10 was used to assess apical patency (Dentsply, USA). The master gutta-percha cone was verified by radiography (Figure 2B).

The final irrigation consisted of 3 mL of 5.25% NaOCl, 3 mL aquadest, 3 mL of 17% EDTA, 3 mL aquadest, and 3 mL of 2% CHX for disinfection. Each solution was activated by endoactivator (Dentsply, USA). The canal was prepared for obturation after having been dried with paper points. A warm vertical compaction technique was used to obturate with calcium hydroxide sealer (Sealapex, Kerr, USA) and gutta-percha. Gutta-percha was cut 2 mm below the orifice using a heat carrier (M3-GP, UDG, Shenzhen) that was radiographically confirmed, and the cavity was temporarily sealed (Figure 2C).

At the next appointment, the patient didn't have any complaints and the tooth was restored with fiber post-core (Figure 3A and 3B) and a hybrid ceramic crown (Figure 3C and 3D). She was also referred to the department of oral surgery to have her 34 teeth extracted, and to the department of prosthodontics for removable dentures.

DISCUSSION

This case presented an underfilled canal with a normal periapical, an extensive amalgam restoration, and secondary caries which were treated in single-visit. A key to a successful endodontic treatment is the eradication of bacteria from the root canal system, which is accomplished by precise technique. Poor technique can present itself in a variety of ways. These mistakes include overfilling and underfilling, which can have major impacts.³ Underfill can be caused by insufficient length determination, loss of working length, insufficient filling method, insufficient irrigation between each filing, and so on.²

Always confirm the reason why a tooth requires endodontic retreatment. In addition to a fractured prior restoration, leakage, or unsatisfactory esthetics, teeth with insufficient root canal

therapy should undergo retreatment notwithstanding the lack of clinical signs or symptoms and radiographic pathosis.⁶ When a tooth requires a new permanent restoration, endodontic therapy options include nonsurgical root canal retreatment.⁶ The patient's complainant wanted her existing restoration replaced. The old amalgam restoration had leakage on the marginal, and there were secondary caries on the cervical.

When a tooth's initial root canal treatment is inadequate, like in this case showed an underfilled canal, retreatment is considered the primary treatment option. A radiographic evaluation may show inadequate canal obturation, recurring caries that were not seen during clinical examination, or unsatisfactory restorations with open margins that may contribute to non-healing. The restorability of the tooth following the required removal of prior restorative materials is a crucial element in determining the need for nonsurgical retreatment.⁶ While in this instance, after the prior amalgam restoration was removed, the tooth had less than 2 mm of buccal and lingual wall left. Because it was a direct restoration, there were no issues with removing an old restoration. The orifice's location was visible after the amalgam had been entirely removed due to old gutta-percha.

Gutta-percha must be removed since biofilm is the major cause of chronic and recurrent endodontic infections for the root canal system to be properly treated. This can be done using hand and rotary tools, ultrasonic instruments, heat systems, or solvents, and often involves a mix of these techniques. In this case, gutta-percha was dissolved using orange oil solvent and removed by rotary retreatment file afterward. It was claimed to be efficient and convenient with continuous rotation from three various lengths and tappers. Even though it has been demonstrated that orange oil is less effective than chloroform, it may also be used for this purpose without causing substantial harm to the patient's health.⁶ This solvent was a suitable alternative for dissolving gutta-percha.⁷

Because it reduces apically extruded debris during root canal preparation, crown-down preparation is the instrumentation method of choice for endodontic retreatment. The determination of the working length is an essential step. The presence of obturation material may affect root canal impedance; consequently, both electronic apex locator (EAL) and periapical radiography should be used at this stage to minimize issues such as excessive instrumentation or underestimation of working length. During the initial endodontic treatment, the **root canal preparation** determines the **shape of the root canal** space.⁶ In this case, the working length was established following radiography and an EAL confirmation **that no more gutta-percha was** present on the **canal**. Up until

#30.04, ¹ cleaning and shaping were carried out using a NiTi rotary file and irrigation solution of 5,25% NaOCl. A larger preparation size results in less root canal filling material remaining, which considerably enhances bacterial reduction.⁶

There is no consensus on whether endodontic retreatment should be performed in a single or multiple visits. There is insufficient evidence that retreatment across several visits significantly increases success rates. In some cases where there are no contraindications for retreatment, the process can be completed in a single visit to prevent additional recontamination of the root canal space between visits.⁶ Restoring canal patency and sealing ¹ the root canal system are essential for the long-term success of retreatment. Retreatment has been seen to be most commonly associated with procedural complications.⁵ Without the presence of any subjective or objective complaints, periapical lesions, over one canal, abnormal anatomy, or patient limitations, therefor retreatment was completed in a single visit in this case. A radiograph revealed that the retreatment had completed and was ready for the final restoration.

In this case, a fiber post and a full crown were chosen as the last restoration given that there was only a minimal amount of coronal structure left. ³ Restorations of endodontically treated teeth are intended to protect the remaining tooth from fracture, avoid reinfection of the root canal system, and restore lost tooth structure. The most significant alteration in biomechanics appears to be due to the loss of hard tissue following decay, fracture, and cavity preparation, including access cavity, before endodontic therapy. Another purpose of the post and core is to prevent coronal leakage by protecting the crown margins from deformation caused by function.⁸

CONCLUSION

For long-term success, it is vital to consider a suitable restoration on an endodontically treated tooth, since the coronal restoration not only prevents reinfection of the root canal system but also protects the tooth against fracture. It is well known that an apical seal is essential for preventing disease-causing microorganisms from persisting over time. The chairside time for a single-visit treatment is shorter, but the success rate is similar to that of a multi-visit therapy.

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FIGURES



Figure 1. A. preoperative clinical view of 36. B. Radiographic preoperative. C. Amalgam removal and access opening.

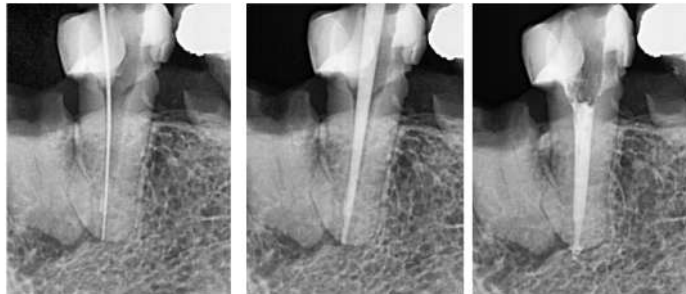
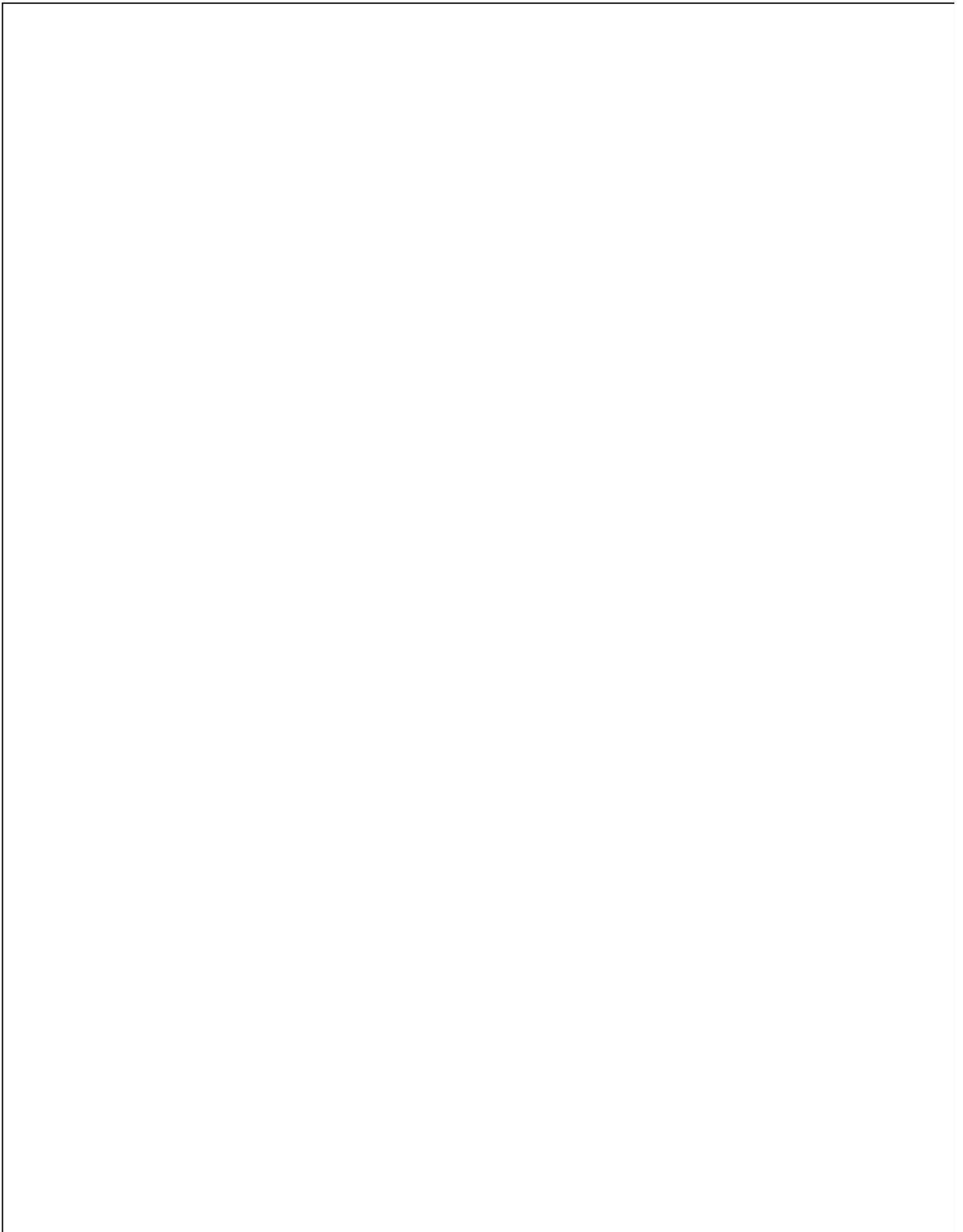


Figure 2. Periapical radiograph of A. Working length. B. Masterpoint. C. Obturation.



Figure 3. A. Post and core build up. B. Crown preparation. C. Clinical view final restoration
D. Periapical radiograph



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