

Comprehensive Treatment of Patients with Frequent Dental Caries: A Case Study

Abstract:

Objective: To explore the diagnostic and therapeutic logic of comprehensive treatment for patients with frequent dental caries, including the diagnostic and therapeutic content of each treatment phase and the design of treatment plans.

Materials and Methods: With up to 18 carious teeth among the 26 teeth in the patient's entire dentition, aetiological analysis was performed to address the existing issues. The diagnostic and therapeutic content for each treatment phase was designed, and comprehensive treatment was carried out gradually to change the patient's high caries risk status and establish good doctor-patient trust.

Results: After comprehensive treatment for multiple dental caries, the patient's oral hygiene, chewing function, and aesthetics significantly improved. The patient was satisfied with the treatment outcomes and was no longer fearful of dental treatment.

This case involves a young patient with multiple dental caries accompanied by dentophobia. For such patients, merely filling cavities without addressing the underlying issues often leads to a frustrating cycle where the pace of decay outpaces the speed of dental restoration. The author clearly recognizes this challenge and focuses on caries control, implementing a comprehensive treatment plan prioritizing prevention. This includes targeted oral hygiene guidance throughout the treatment process and employing techniques such as selective caries removal, temporary glass ionomer fillings, and full-mouth fluoride application to quickly control the progression of active caries, thereby creating conditions for the eventual comprehensive treatment of each affected tooth.

While the treatment difficulty for each affected tooth in this case isn't particularly high, the author needs to employ ample humanistic care and a carefully planned treatment sequence to gradually alleviate the patient's dentophobia. Simultaneously, continuous oral health education and thorough treatment are essential to effectively address the patient's oral issues, restoring their confidence in maintaining oral health. This endeavor exemplifies the caring, patient, and meticulous work of the

healthcare provider, and the author has executed it exceptionally well. The clinical data collection is comprehensive, the clinical photograph quality is high, and the analysis of the case's characteristics and challenges is thorough. The treatment plan is rational, and the treatment process is standardized.

One minor suggestion pertains to the restoration plan after root canal treatment for the upper left 1 tooth, where an option for direct composite resin filling was overlooked. This could be a feasible choice for anterior teeth with minimal discoloration.

Comprehensive treatment for patients with multiple dental caries is one of the most common oral healthcare interventions. However, establishing a good doctor-patient relationship, changing the high caries risk status of patients, and implementing a systematic and effective comprehensive treatment pose challenges for most healthcare providers and patients alike. Breaking the vicious cycle of treatment, relapse, and retreatment and transitioning into a preventive maintenance phase with regular check-ups signifies the effectiveness and sustainability of comprehensive treatment. In this case, the patient is a 25-year-old young woman who has developed a habit of consuming carbonated beverages daily, with little to no intake of plain water in recent years. Due to her fear of dental treatment, despite having multiple carious teeth for some time, she delayed seeking treatment until experiencing severe pain in her upper right posterior teeth, prompting her to seek medical attention.

Materials and Methods

1.1 Case Introduction

The patient is a 25-year-old female who has been experiencing spontaneous severe pain in the upper right posterior teeth for one day. The pain is intense, and she has been taking over-the-counter pain medication (ibuprofen) for relief. She has a history of sensitivity to hot and cold stimuli but denies experiencing nighttime pain, pain upon biting, gum swelling or tenderness, and pus discharge. The patient expressed a desire for thorough treatment of multiple carious teeth but also mentioned her fear of dental procedures and requested minimal pain during treatment. Her medical history includes chronic gastritis for five years and a smoking habit of 7-8 cigarettes per day for eight years. Additionally, she underwent orthodontic treatment at an external facility nine years ago and had her left upper and lower wisdom teeth extracted at our institution two and a half years ago, with a history of filling treatment. She consumes one bottle of carbonated beverage daily and rarely drinks plain water. Her oral hygiene routine includes brushing her teeth twice daily with fluoride toothpaste for one minute each time, using horizontal and vertical strokes, but she does not use dental floss.

Examination:

*Intraoral and extraoral soft tissue and temporomandibular joint examinations revealed no abnormalities.

*The patient reported tenderness to percussion in the upper right second premolar, but there was no mobility, and no abnormalities were noted in the gingiva.

*Cold sensitivity was present, and X-rays showed no abnormalities.

*Adhesive remnants were observed on the labial surfaces of all teeth, with uneven protrusions and abundant plaque accumulation.

*The upper right and left first molars and lower right and left second premolars were not observed.

*Periodontal examination revealed poor oral hygiene, abundant plaque, calculus deposits (+), dark red gingival swelling, probing depths of 3-5mm, bleeding on probing indices of 3-4, and attachment loss of 0-2mm.

*Three non-symptomatic carious teeth involving the pulp were identified: the upper left central incisor (with delayed response to cold stimulus), upper left second premolar (with transient sensitivity to cold), and lower left second molar (with cold sensitivity similar to the control tooth).

*Fourteen teeth with caries of varying severity that did not involve the pulp were also identified.

These teeth are as follows:

Upper right central incisor, lateral incisor, and canine.

Upper left lateral incisor, canine, first molar, and second molar.

Lower left canine, first premolar, and first molar.

Lower right canine, first premolar, first molar, and second molar.

*Deep caries were observed in the upper right and lower right wisdom teeth, with buccal impaction.

*Occlusal examination revealed Angle Class I occlusion, with shallow coverage in the bilateral posterior tooth area.

Picture 1:Pre-treatment intraoral image



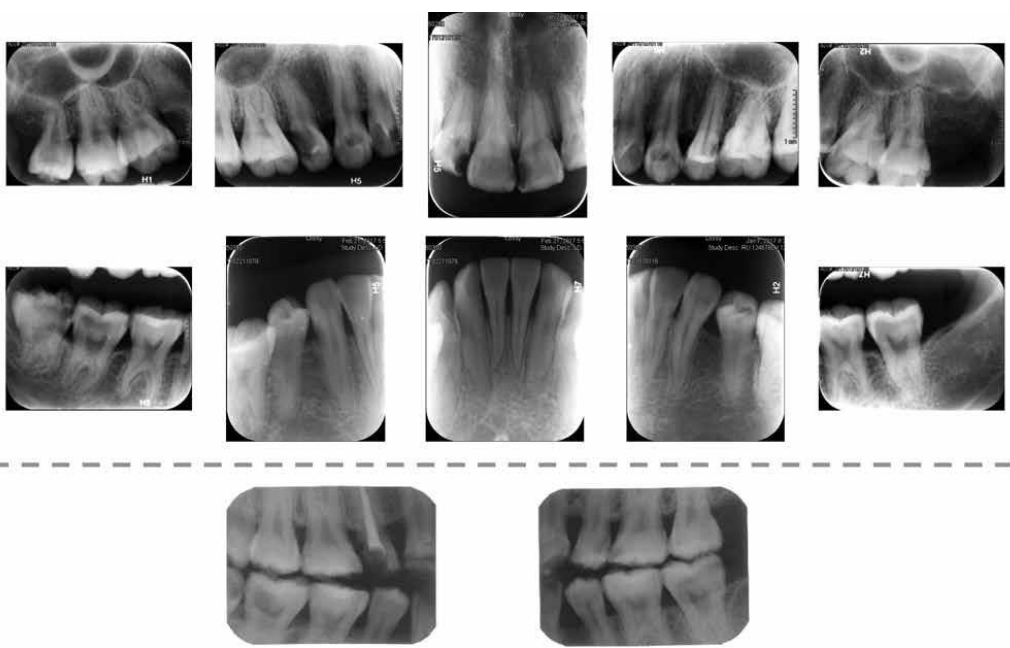
Picture 2:Pre-treatment periodontal examination intraoral image



Picture 3:Pre-treatment periodontal examination record

FI																
角化齦寬																
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PLI																
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BI			3	3	3		2	2	3	4	4	4		2	3	3
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BD	4	3	5	5	3	5	3	2	5	4	3	3	4	3	3	4
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	拔						缺							缺		
	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
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PD			5	2	5	5	2	4		4	2	3	3	2	4	4
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Picture 4: Pre-treatment full-mouth periapical and bite-wing radiographs



1.2 Diagnosis

Chronic pulpitis in the upper right second premolar and upper left central incisor.

Chronic periodontitis.

Reversible pulpitis in the upper left second premolar and lower left second molar.

Deep caries in various teeth:

Upper right central incisor (mesial and distal surfaces),

Upper right canine (labial surface),

Upper left canine (labial surface),

Upper left first molar (mesial occlusal surface),

Upper left second molar (buccal surface),

Lower left canine (labial surface),

Lower left first premolar (distal buccal surface),

Lower left first molar (buccal surface),

Lower right first molar (buccal surface),

Lower right second molar (buccal surface).

Deep caries and abnormal tongue groove in:

Upper right lateral incisor (labial and lingual surfaces),

Upper left lateral incisor (labial and lingual surfaces, distal surface),

Upper right first molar (mesial buccal surface),

Upper left first molar (mesial buccal surface, distal buccal surface),

Lower right first molar (mesial surface),

Lower right canine (labial surface),

Lower right first premolar (buccal surface),

Lower left first molar (mesial surface).

Secondary caries in the lower right first molar (mesial surface), shallow caries in the lower right canine (labial surface), and shallow caries in the lower right first premolar (buccal surface).

Impacted upper right and lower right wisdom teeth with deep caries.

1.3 Treatment Plan

(1) Systemic Phase: Since the patient has no systemic diseases that need to be controlled before oral treatment, the systemic phase is skipped, and the patient enters the acute phase directly.

(2) Acute Phase: It is planned to perform pulpotomy and extraction treatment on the upper right second premolar tooth, which is the chief complaint.

(3) Disease Prevention and Control Phase:

Oral hygiene instruction.

Basic periodontal treatment including scaling and root planing.

Extraction of the upper right and lower right wisdom teeth.

Fluoride application.

Root canal treatment for the upper right second premolar and upper left central incisor.

Direct pulp capping for the upper left second premolar.

Partial crown pulpotomy for the lower left second molar.

Resin fillings for various teeth:

Upper right central incisor, lateral incisor, canine.

Upper left lateral incisor, canine, first molar, second molar.

Lower left canine, first premolar, first molar.

Lower right first molar, second molar.

Penetration resin fillings for the upper right central incisor, lower right canine, first premolar, first molar.

(4)Aesthetic and Functional Restoration Phase:

Fiber post and resin filling for the upper right second premolar.

Fiber post and full crown restoration for the upper left central incisor.

Resin veneer restoration for the upper right lateral incisor, canine, upper left lateral incisor, canine.

(5)Maintenance Phase:

Periodontal maintenance.

Filling maintenance.

Oral hygiene education.

1.4 Treatment Process

(1)Initial Treatment:

Comprehensive examination of intraoral and extraoral soft and hard tissues, X-rays.

Introduction of treatment plan.

Root canal therapy for the upper right second premolar.

(2)Oral Hygiene Instruction:

Control of beverage and sugary food intake.

Smoking cessation advice.

Proper toothbrushing and dental flossing techniques.

Specific guidance for the patient's right-sided gingival inflammation, emphasizing improved oral hygiene practices.

Regular reinforcement and examination during follow-up visits.

(3)Periodontal Treatment:

Scaling and root planing.

Smoothing of root surfaces.

(4)Extraction of Impacted Teeth:

Extraction of the impacted upper right and lower right teeth.

(5)Caries Control and Treatment:

Removal of residual adhesive remnants on labial surfaces.

Glass ionomer temporary fillings after caries removal in all deeply carious teeth.

Application of 2.26% Duraphat fluoride varnish.



Then, caries treatment was performed, including root canal treatment on the upper right second premolar tooth and upper left central incisor, direct pulp capping on the upper left second premolar tooth, partial pulpectomy on the lower left second molar tooth, and composite resin restoration on the upper right central incisor, upper right lateral incisor, upper right canine, upper left lateral incisor, upper left canine, upper left first molar, upper left second molar, lower left canine, lower left first premolar, lower left first molar, lower right first molar, and lower right second molar.



Composite resin restoration was also performed on the upper right central incisor, lower right canine, lower right first premolar, and lower right first molar.



(6) Treatment Options for Upper Right Second Premolar:

Extraction with subsequent restoration.

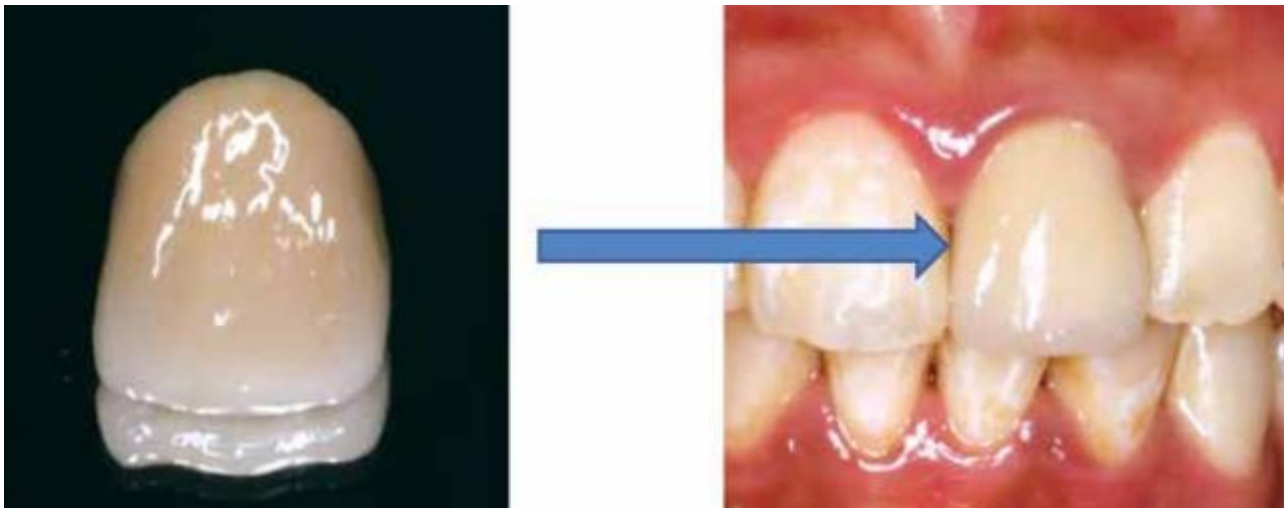
Crown lengthening surgery + metal post + porcelain crown restoration for palliative preservation.

Fiber post + resin filling for palliative preservation. The patient chose option 3.

(7) Treatment Options for Upper Left Central Incisor:

Fiber post + all-ceramic crown.

Fiber post + porcelain-fused-to-metal crown. The patient chose below.



(8) Treatment Options for Other Teeth:

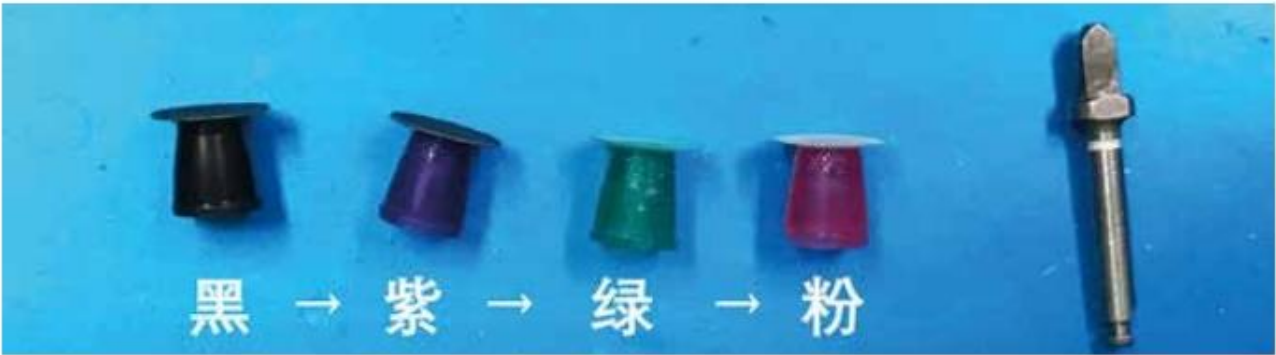
Crown restoration for upper right and left lateral incisors and canines.

Porcelain veneer restoration for upper right and left lateral incisors and canines.

Resin veneer restoration for upper right and left first and second molars, lower left canine, first premolar, first molar, lower right first and second molars.

(9) Polishing:

Sequential polishing of labial surfaces of all teeth to enhance smoothness, reduce plaque accumulation, and improve esthetics.

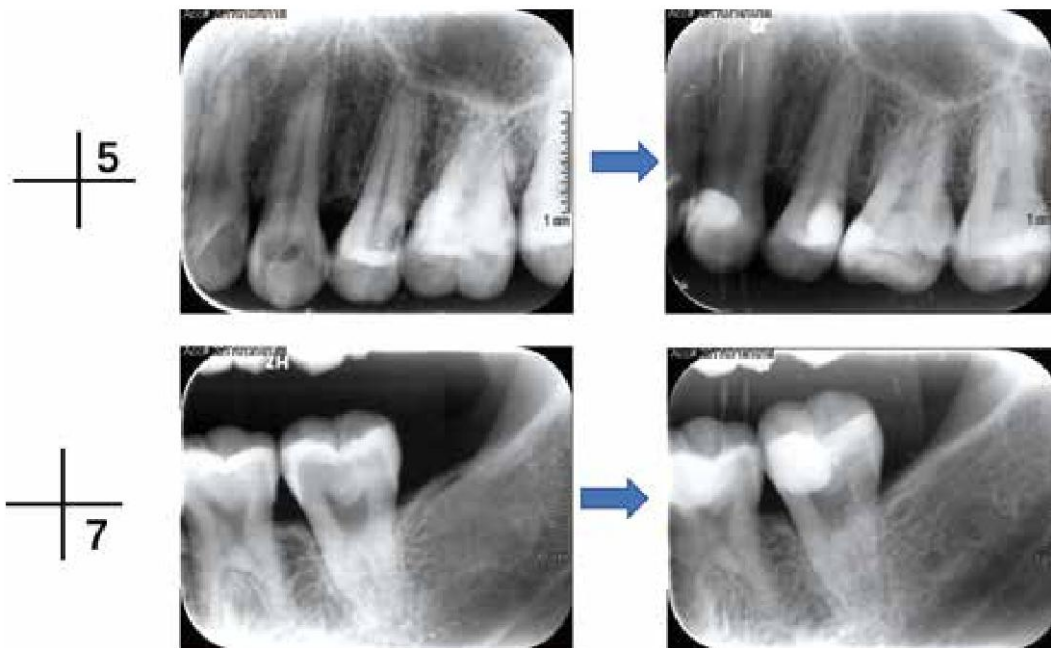


Completion of Treatment:

Completion of all planned treatment procedures.



Normal response to cold sensitivity testing was observed in the lower left second molar, and electric pulp testing was consistent with the control. X-rays showed no abnormalities



The treatment plan during the maintenance period includes oral hygiene instruction, scaling and root planing of all gingival margins, and root surface smoothing. The upper left second premolar will be observed after re-filling, and the lower left second molar will be observed and scheduled for full crown restoration. Regular follow-up appointments are planned.

2. Results:

This case involved comprehensive staged treatment and correction of poor oral hygiene habits for a patient with multiple caries, resulting in significant improvement and restoration of oral hygiene, chewing function, and aesthetics. The patient was satisfied with the treatment outcome and no longer feared dental treatment.

3. Discussion:

3.1 Major Problems and Solutions:

The main problems faced by the patient included poor oral hygiene, extensive plaque accumulation, caries in 18 out of 26 teeth, white-spot lesions affecting aesthetics, chronic periodontitis, and fear of dental treatment. The main causes of these issues were identified as long-term consumption of carbonated drinks, poor oral hygiene habits, irregular dental check-ups, history of orthodontic treatment, 8-year smoking history, sensitivity to pain, and psychological fear. The solution provided to the patient included discontinuation of carbonated drinks in favor of water or tea, oral hygiene instruction, systematic treatment, regular maintenance, veneers, infiltration resin, polishing, smoking cessation counseling, ensuring effective local anesthesia, and nitrous oxide sedation when feasible. Additionally, according to the American Dental Association (ADA) caries risk assessment guidelines, the

patient was classified as high risk due to frequent intake of sugary drinks and having three or more carious lesions in the past three years, necessitating in-office fluoride application and guidance on using fluoride toothpaste with a fluoride content of 5000 ppm or higher.

		Low Risk	Moderate Risk	High Risk
Contributing Conditions		Check or Circle the conditions that apply.		
I.	Fluoride Exposure (through drinking water, supplements, professional applications, toothpaste)	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
II.	Sugary Foods or Drinks (including juice, carbonated or non-carbonated soft drinks, energy drinks, medicinal syrups)	Primarily at mealtimes <input type="checkbox"/>		Frequent or prolonged between meal exposures/day <input checked="" type="checkbox"/>
III.	Caries Experience of Mother, Caregiver and/or other Siblings (for patients ages 6-14)	No carious lesions in last 24 months <input type="checkbox"/>	Carious lesions in last 7-23 months <input type="checkbox"/>	Carious lesions in last 6 months <input type="checkbox"/>
IV.	Dental Home: established patient of record, receiving regular dental care in a dental office	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
General Health Conditions		Check or Circle the conditions that apply.		
I.	Special Health Care Needs (developmental, physical, medical or mental disabilities that prevent or limit performance of adequate oral health care by themselves or caregivers)	<input checked="" type="checkbox"/> No	Yes (over age 14) <input type="checkbox"/>	Yes (ages 6-14) <input type="checkbox"/>
II.	Chemo/Radiation Therapy	<input checked="" type="checkbox"/> No		<input type="checkbox"/> Yes
III.	Eating Disorders	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	
IV.	Medications that Reduce Salivary Flow	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	
V.	Drug/Alcohol Abuse	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	
Clinical Conditions		Check or Circle the conditions that apply.		
I.	Cavitated or Non-Cavitated (incipient) Carious Lesions or Restorations (visually or radiographically evident)	No new carious lesions or restorations in last 36 months <input type="checkbox"/>	1 or 2 new carious lesions or restorations in last 36 months <input type="checkbox"/>	3 or more carious lesions or restorations in last 36 months <input checked="" type="checkbox"/>
II.	Teeth Missing Due to Caries in past 36 months	<input checked="" type="checkbox"/> No		<input type="checkbox"/> Yes
III.	Visible Plaque	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	
IV.	Unusual Tooth Morphology that compromises oral hygiene	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	
V.	Interproximal Restorations - 1 or more	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	
VI.	Exposed Root Surfaces Present	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	
VII.	Restorations with Overhangs and/or Open Margins, Open Contacts with Food Impaction	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	
VIII.	Dental/Orthodontic Appliances (fixed or removable)	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	
IX.	Severe Dry Mouth (Xerostomia)	<input checked="" type="checkbox"/> No		<input type="checkbox"/> Yes
Overall assessment of dental caries risk:		<input type="checkbox"/> Low	<input type="checkbox"/> Moderate	<input checked="" type="checkbox"/> High

3.2 Indications and Treatment Key Points for Permanent Tooth Pulp Preservation:

3.2.1 Selection of Indications for Permanent Tooth Pulp Preservation:

The 2016 American Association of Endodontics (AAE) guidelines for permanent tooth pulp preservation are relatively conservative. Direct pulp capping is only recommended for accidental exposure, while pulpotomy is suitable for reversible pulpitis in primary teeth, emergency measures before root canal treatment, and transitional measures before completion of pulp development in young permanent teeth. However, clinical studies have shown that there is active research on the treatment of permanent tooth pulp preservation, and most inclusion criteria are broad, with no age or tooth position restrictions, and even used for irreversible pulpitis. Clinical research is a pioneer in clinical guidelines, and adopting innovative treatment concepts in appropriate situations helps broaden clinical thinking. In this case, direct pulp capping was performed on the upper left second premolar and the lower left second molar. The reasons were that the patient was 25 years old, relatively young; due to

long-term consumption of carbonated drinks, caries progressed rapidly, dentin near the pulp was soft and unstained, and the probability of bacterial invasion was small; there was no history of pain, and clinical examination showed transient sensitivity to cold or the same as the control teeth; the condition of the pulp was good after pulp exposure was observed; the cost was less than root canal treatment, which was within the patient's budget.

3.2.2 Selection of Procedures for Permanent Tooth Pulp Preservation:

Procedures for permanent tooth pulp preservation include indirect pulp treatment, direct pulp capping, pulpotomy, and partial pulpotomy. Studies have shown that the success rate of direct pulp capping of permanent teeth fluctuates and is lower than that of pulpotomy and partial pulpotomy. The main reason may be that direct pulp capping does not remove infected tissue below the carious lesion, and the possibility of controlling pulpitis is small.

3.2.3 Selection of Irrigants and Pulp Capping Agents:

For teeth with easily bleeding pulp tissue, physiological saline irrigation is sufficient. Sodium hypochlorite as an irrigant has both hemostatic and disinfectant effects and can be used for cases with mild inflammation or those that are not easily stopped bleeding. Hilton et al. found that the failure rate of calcium hydroxide direct pulp capping was 31.5%, higher than that of MTA (19.7%). The main reason may be that the sealing effect of calcium hydroxide is not as good as that of MTA and is prone to marginal microleakage. Other scholars have reached similar conclusions. However, some scholars have reached different conclusions, believing that there is no significant difference in success rate between MTA and calcium hydroxide. In summary, the prognosis of permanent tooth pulp preservation mainly depends on the inflammatory state of the pulp during treatment, the sealing property of the pulp capping agent, and the crown-side closure. Under the premise of ensuring aseptic operation, partial pulpotomy is more likely to be successful than direct pulp capping and largely avoids the problem of root canal calcification caused by complete pulpotomy, making it convenient to switch to root canal treatment when symptoms occur; irrigation fluid can choose physiological saline or 0.5-5.25% sodium hypochlorite; Dycal or MTA can be chosen as the pulp capping agent, and MTA is preferred if conditions permit.