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Case Report

Challenges In Dental Proximal Diagnosis And Treatments Teeth 45-46 Case Report.

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Abstract

This clinical case illustrates the challenges in diagnosing and treating early proximal carious lesions, specifically those affecting teeth 45 and 46 in a 25-year-old female patient. The patient presented with dental sensitivity, maintained excellent oral hygiene, demonstrated strong compliance, and had both a high socio-economic status and normal saliva quality. Notably, her primary risk factor was a past history of eating disorders (bulimia-anorexia), which has been stable for last three years. According to the CAMBRA® assessment, she faces a high risk for caries but benefits from a promising outlook due to her adherence to preventive measures. Radiographs revealed a distal lesion on tooth 45 that spans the enamel and with a dentin reaction, alongside a shallow mesial lesion on tooth 46. Clinical evaluation proved challenging because a lingual gingival papilla obstructed access and visibility of the proximal surfaces, making it difficult to determine whether cavitation was present. Subsequent aero-polishing and enhanced accessibility through tooth separation and laser gingivectomy allowed for improved examination. Employing an intraoral camera and a microscope enabled precise diagnosis: two small active cavitary lesions were detected—one on the mesial side of tooth 46 and another disto-lingual on tooth 45 with no connection to the vestibular white spot lesion. A micro-invasive approach was selected for treatment, incorporating silver diamine fluoride to inhibit caries activity, followed by resin infiltration. Specialized posterior matrices were used to restore the micro-cavities while carefully managing excess material. Post-treatment follow-up indicated favourable tolerance without any complications. This case underscores the critical role of accurate diagnosis, accessibility enhancement, and high-magnification technology in guiding conservative management strategies for complex proximal caries.

INTRODUCTION

Patient information

This case report follows the Consensus Based Clinical Case Reporting Guideline [1] . This young patient, aged 25, presents herself to the consultation of the restorative dentistry department for dental sensitivities. The clinical interrogation reveals an educated patient, in the course of a medical university course but with a past of alternating bulimia and anorexia, cured for 3 years. The patient's compliance is high and her level of oral hygiene is good. The CAMBRA® (Caries management by risk assessment) [2, 3] analysis reveals for the **Protective factors:** brushing your teeth 3x a day, the use of fluoride toothpaste, no additional exposure to fluoride, xylitol and chlorhexidine, infrequent prevention visits beforehand, little or no application of fluoride varnish, and a balanced diet but only for 3 years. Regarding the **Patient's factors:** no snacking, a history of bulimia-anorexia cycle, no systemic diseases (diabetes etc.), a high socio-economic level, no orthodontic treatment or wearing of removable prostheses, the salivary flow is normal, the pH normal as well as the buffering power (Saliva Check buffer®, GC, Japan) and there is no old and visible acidic plaque (Triplaque®, GC, Japan), and no bacterial analysis was performed. The clinical examination revealed: the presence of active caries on distal 35 (ICDAS 4-5), on mesial , 36 (active) no enamel defects visible, active caries in 45 (ICDAS), 46 (ICDAS, 15 (ICDAS), no root lesions and finally no defective restorations (Bitewing Xrays control). The patient was evaluated as high caries risk, but with a good compliance and good prognosis. All the lesions have been treated and this work aims to focus on the difficulty of the diagnosis and treatments on teeth 45 and 46.

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TIMELINE

The best approach for treating proximal initial lesions requires several key considerations [4–6]:

- Evaluating the caries risk susceptibility of the patient
- Be able to accurately identifying the ICDAS lesion stages with or without cavitation
- Determining whether the lesion is non-micro, or cavitated
- Locating the precise position of the lesion within the proximal space
- Evaluating whether the lesion is active or not
- Assessing how accessible the lesion is for potential treatment options
- Assess the prognosis of treatment according the caries risk of the patient.

INITIAL DIAGNOSIS ASSESSMENT

Initial observation of bitewings X-rays reveals the presence of a distal enamel lesion on tooth 45 (ICDAS2-3) (**Figure 1**) which concerns the entire enamel thickness with dentin reaction and a mesial lesion on tooth 46 (ICDAS 1) without visible dentin reaction and affecting half of the enamel thickness. It is difficult to locate these lesions clinically in the vestibulo-lingual plane and to diagnose possible cavitation, especially for tooth 46 (yellow arrow). Clinical observation shows a lingual gingival papilla masking all visibility and a white spot (WS) on the distal vestibular area of tooth 45 without visible cavitation (**Figure 2**).

Figure 1. Bitewing X-rays of teeth 45-46 (A) large view (B) detail of the area (yellow arrow).

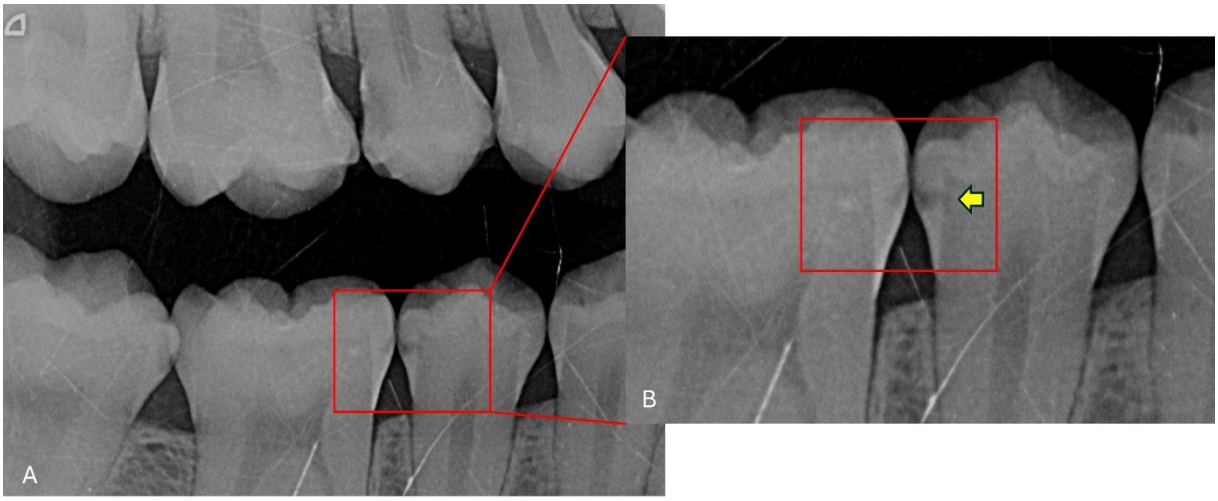


Figure 2. Intraoral camera (C50®, Acteon, France) view of the distal vestibular area of 45 revealing the white spot lesion without visible cavitation (red arrow).

Accessibility improvements

- To prevent any unintended harm, it's advisable to use powders like glycine or erythritol to clear away remaining biofilm and organic debris in the proximal areas. An optional dye plaque disclosure agent can also help highlight areas that are hard to reach [7–9]
- After cleaning, assess the lesion's accessibility. On the vestibular side (**Figure 2**), the lesion is non-cavitated (WS active due to being opaque and rough). On the lingual side, the gingival papilla limits both visibility and access [10, 11].
- Access to the lesion can be performed with the help of a retractor wire, the placement of a dam clamp and in this case a laser gingivectomy of the lingual papilla (Laser Gemini EVO™ diode 810 + 980 nm Ultradent, USA) increased visibility while ensuring a transient coagulation of the area (**Figure 3 A**)
- Separate the teeth via the Ivory tooth separator® and finish the cleaning with the same powder and air flow. Any scaling in the area must be performed with extreme caution so as not to break the residual enamel structures (visible or not) [6]

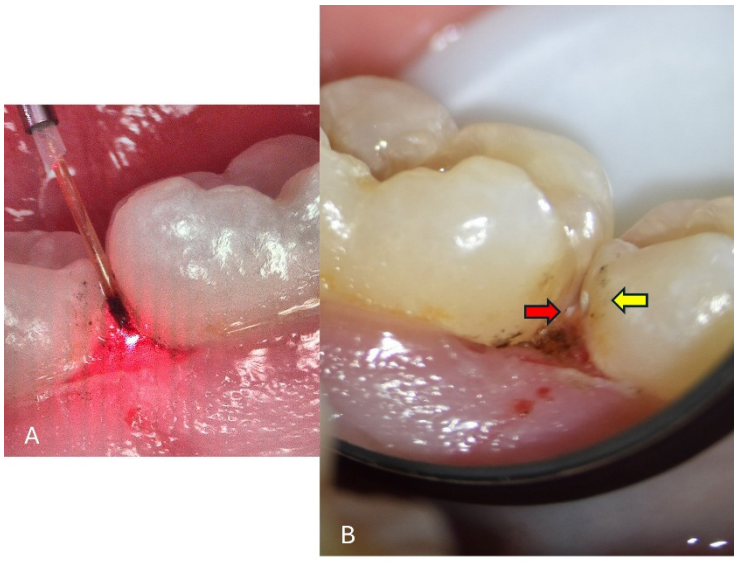
Diagnosis tools used after the cleaning steps

Among the available instruments [5, 12, 13], it is essential to prioritise those that provide intra-operative support, substantial magnification, optimal manoeuvrability, and the capability to capture images for subsequent comparison. In this instance, utilising a combined approach with an intraoral camera (C50® Acteon, France) [14] and a microscope (Zumax ®3200Pro,China) facilitating the image acquisition via a "Reflect" type mirror (Acteon, France) [12, 15].

Final caries lesions diagnosis of teeth 45 and 46

After cleaning with airflow + soft powder and laser gingivectomy of the lingual papilla, two new lesions appear clearly. In the middle of the mesial surface of the 46, a cavitated lesion of \ 0.5-1 millimetre width and a more voluminous cavitary lesion in the disto lingual area of the tooth 45, both active, without visible continuity with the vestibular WS on 45.

Figure 3. (A) Laser gingivectomy of the gingival papilla (Laser Gemini EVO™ diode 810 + 980 nm Ultradent, USA), (B) Microscope visualisation of the distal caries of tooth 45 (yellow arrow) and mesial cavitated caries on tooth 46 (red arrow).



THERAPEUTIC INTERVENTIONS

Material choices

Selecting appropriate materials presents a significant challenge [6], as most do not specify to be used if cavitation is apparent. The concept of cavitation itself is reliant on the magnification applied, with the relevant scales determined exclusively by this factor. Several choices seemed possible: Silver Diammine Fluoride (SDI®, Australia) [16, 17], Self-peptide [18, 19] (vVardis, Curodont®, Switzerland) the infiltrating resin (ICON®, DMG, Germany) [20, 21], fluoride varnish [22, 23] (VOCO Biomihn®, Germany). We chose to treat the patient with SDF because of her high risk of caries associated with the resin infiltration resin (ICON®, DMG, Germany) to fill the cavitated areas. The ICON® system with the permeable posterior matrices makes it possible to reach inaccessible areas, and in this case 2 matrices were used in turn for the mesial side of tooth 46 and distal side of

tooth 45. The whole area was covered with fluorinated varnish incorporating an active bioglass (VOCO Biomihn®, Germany).

Summary of the treatment

Once the final diagnosis was made, the dental dam was placed, the teeth were separated with the Ivory teeth separator, the SDF (Time 1 and 2) with a micro brush applied, then application of the posterior ICON® matrix were applied on teeth 46 and 45 with etching shortened by 20s. Air flow rinsing with soft powder and drying with alcohol were applied. Once check (no bleeding), new ICON® posterior matrices were placed in turn on the respective faces trying not to over-plate the matrix to fill the micro cavitations on 45 and 46 (3 min time application). The resin inflitrant was then light-cured, H program, 20 s (Bluephase PowerCure®, Ivoclar Vivadent, Liechtenstein) leaving in situ, the couple matrix-resin to ensure the overlap of the micro-cavities (**Figure 4**). Excess was removed with a blade and metal abrasive strips (yellow colour). A bitewing X-rays was taken to check the treatment outcome (**Figure 5**).

Figure 4. (A) Last cleaning step (CombiPro®, NSK, Japan) , (B) Cavity visualisation after the separation of the teeth (C50 camera®, Acteon, France), (C) Application of step 1 and 2 of SDF (RIVA Star®, SDI, Australia), (D)and (E) Resin infiltration of mesial area of 46 and distal area of 45, (F) Removing the excess with a blade, after light curing, (G) Cavity full filled with resin infiltrant (ICON® DMG, Germany).

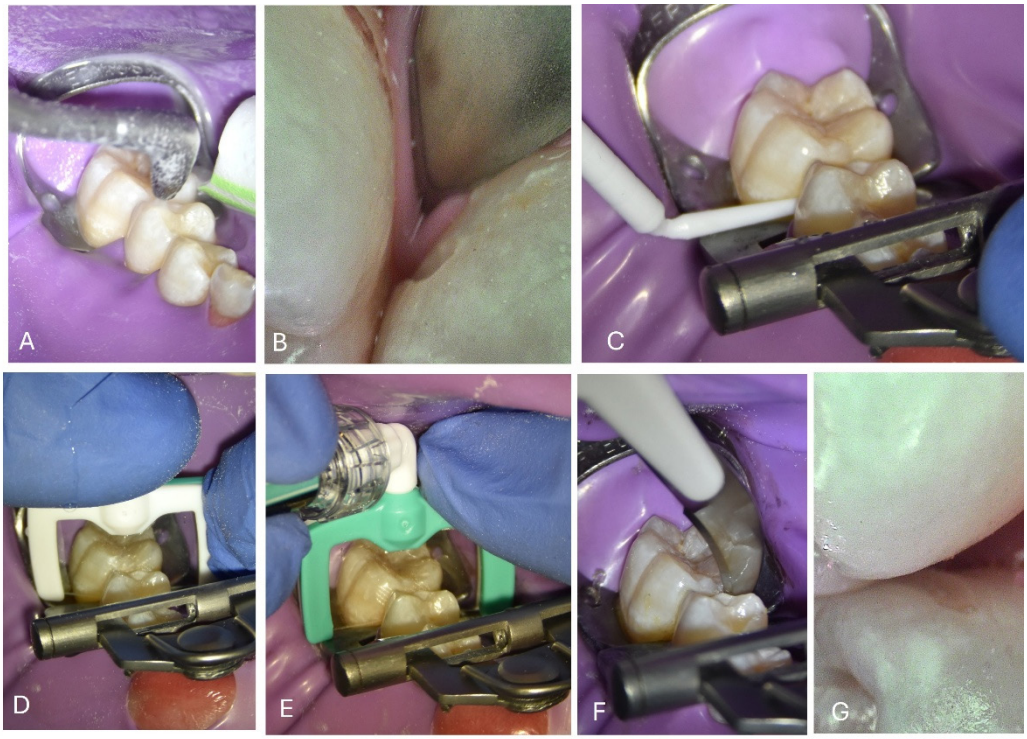


Figure 5. Bitewing X-rays control, SDF(RIVA® Star, SDI, Australia) infiltration on mesial part of tooth 46 (orange arrow, white spot of silver penetration), distal lesion on tooth 45 (yellow arrow, ICON® being non radio-opaque).

FOLLOW-UP AND OUTCOMES

Intervention adherence was strong, with follow-ups proposed every three months. No adverse or unexpected events occurred during or after treatment. Dental sensitivity was hopefully drastically reduced.

DISCUSSION

Regarding diagnostic tools, the complementary use of the DiagnoCam® HD (infrared photonic signal, Kavo, Germany) could have provided additional information about the proximal penetration of the lesions, though it does not indicate the risk of cavitation or lesion activity. Fluorescent tools that do not produce recorded images are not recommended, in these situation, as the new micro-cavitated caries lesion were diagnosed thanks to the high level of magnification and the comparison, in situation, of different pictures recorded in pre and per-operative steps. For materials, the main difficulty lies in the limited accessibility of the lesion while trying to fill the micro-cavities. The use of SDF is warranted due to its anti-caries properties, and the only limitation to its use would be the possible interaction with the infiltration resin, which so far has not been reported. Applying a patch with a filled adhesive would not necessarily fill the micro-cavities, and using a flowable composite applied with a dental floss or a spatula would pose a risk of overflow, which will be difficult to remove after polymerization. The choice of infiltration resin applied via the specific matrices allows for control over the thickness of the infiltration by pressing the matrix more or less against the tooth, and the resin can easily be removed with an abrasive strip or a blade. Finally without applying all the tools described, 2 caries lesions with no accessibility would have gone unnoticed, and in terms of future management, the patient should be followed up every 3 to 6 months and a next-generation fluoride varnish such as Profluorid Biomin® (Voco, Germany) should be applied in the proximal spaces.

Author Contributions

Concept—T.H, S.A.; supervision—T.H, S.A.; literature search—T.H, T.L.S, S.A.; critical review— T.H, T.L.S, S.A.

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Ethics Statement

This study do not need to follow the Declaration of Helsinki. This case report describes the treatment course of a single patient.

Consent

Written, informed consent was not necessary from the patient for the publication of the case report and the accompanying images. There is no image to recognize the patient.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available upon request from the corresponding author.

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