

# Multiple Bonded Restorations in a Patient with Severe Mental Disability: A Case Report

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## Clinical Relevance

Dental treatment for patients with special needs may be restricted due to the patient's lack of understanding and/or inability to cooperate, as well as other circumstances. Bonded restorations may be especially appropriate in dental restorations of patients with severe mental impairment.

## ABSTRACT

Dental treatment for patients with special needs may require general anesthesia, if these patients are unable or unwilling to cooperate. To administer a restorative treatment in a limited time-frame requires an interdisciplinary approach adapted to the individual. This case report describes a comprehensive restorative procedure in a patient with severe mental disability who has serious dental caries. Direct resin composites were used to reconstruct most of the damaged dentition. In the 22-month follow-up conducted by the authors, they found one restora-

tion failure, several primary caries lesions and one secondary-caries lesion. Every other restoration remained stable, despite limited postoperative care.

## INTRODUCTION

Persons with severe mental disabilities depend on their caregivers to meet many of their basic needs. The caregivers' lack of appreciation for dental health and the patients' resistance may result in poor dental care.<sup>1</sup> Often, serious dental problems, which require extensive restoration, are discovered in mentally challenged patients. These patients may be difficult to manage in a dental clinic; as a result, dental practitioners often need to use general anesthesia or sedation to treat them.<sup>2</sup> Despite the patient's extensive needs, the dentist may have to limit the number of treatments to avoid peri- and post-anesthetic complications and reduce treatment costs. Accordingly, some treatments may be modified when general anesthesia is administered. To avoid a procedure with a significant risk of failure, some teeth may be extracted.<sup>1,3,4</sup> However, dental clinicians share a general consensus that oral reha-

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bilitation should not only restore function, but it should also preserve a patient's dignity.<sup>1</sup> A defective dentition may generate distress in both the patient and the caregiver.<sup>3</sup>

Reconstructive procedures for extensively damaged or endodontically-treated teeth have traditionally utilized indirect techniques, such as using full-coverage metal or ceramic restorations.<sup>5</sup> Under special care conditions, however, direct restoration with resin composites presents significant advantages, including completion of the treatment in a single appointment, minimal invasiveness, affordability, appropriate esthetics and favorable long-term stability.<sup>6</sup>

In the scope of special care dentistry, clinical cases have rarely been addressed from a restorative perspective, such as decision-making, treatment planning, operative procedures, maintenance care, etc. This article discusses the restorative case of a severely mentally challenged patient who was unable to tolerate any dental treatment without general anesthesia or monitored anesthesia care. The patient received five consecutive restorative treatments and follow-up treatment 22 months later.

## CASE REPORT

### Initial Preparation (Phase I)

A 23-year-old female patient with mental retardation and a history of seizures visited the Seoul National University Dental Hospital Clinic for Persons with Disabilities. The patient was small in stature and weight for her stated age (145.3 cm/32.7kg; 4.8 ft/72 lb). She had no known drug allergies and was not on any medication. The patient was uncooperative and did not respond to verbal commands. She was being cared for by her parents and, during the day, by a local institute for the disabled. The patient could only be examined while sitting with her mother holding her. It was determined that comprehensive dental treatment would be completed under general anesthesia. The preoperative screening tests included a thorough clinical examination, electrocardiogram, chest x-rays and blood analysis. No specific abnormalities were found in the preoperative screening tests. The patient's mother reported that her daughter's last dental treatment had been performed five-to-six years ago in the Clinic of the Institute for the Disabled, at which time the patient received several fillings. During a seizure two years earlier, the patient had suffered an injury that caused multiple fractures to her front teeth. Her mother wanted comprehensive dental treatment and repair of the broken teeth, as the damage was hindering the patient's ability to eat normally. The mother admitted that she did not regularly brush the patient's teeth, due to a lack of cooper-

ation on behalf of the patient.

At the first appointment, general anesthesia was induced via inhalation of 8% sevoflurane. Nasotracheal intubation was performed, and an anesthetic status was maintained with sevoflurane, nitrous oxide and oxygen. One of the authors of this study (JC) performed a thorough oral examination, took radiographic and photographic pictures and prepared impressions to fabricate study models. Soft tissue of the patient's lips, cheeks, tongue, oral mucosa and pharyngeal tissue were all found to be within normal

limits. Proper oral hygiene seemed to have been lacking. Substantial amounts of food remnants, plaque and calculus were present around the teeth (Figure 1). The gingiva was erythematous and swollen due to generalized inflammation, and multiple teeth were found to be severely damaged due to fracture and caries (Table 1). The occlusal anatomy of the maxillary and mandibular premolars and molars was relatively well preserved, and the occlusal height was not noticeably decreased. The patient's occlusion displayed a Class I molar and canine relationship on both sides. The initial treatment plan was presented to the family; it was then modified to accommodate the patient's circumstances, including her physical condition, the family's financial status and an acceptable number of visits and concerns about general anesthesia. The actual treatment plan included four phases: initial care, disease control, restoration and maintenance (Table 2). However, the individual

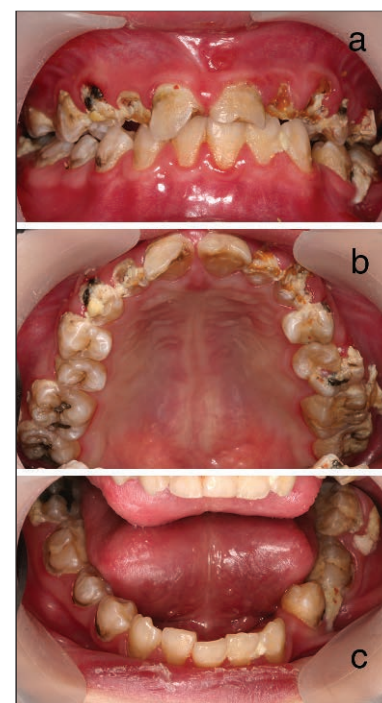


Figure 1. Full mouth views upon the first visit under general anesthesia. Multiple caries had developed throughout the entire dentition, due to poor maintenance of oral hygiene. A sinus tract had formed around the apex of #9.

Table 1: The Patient's Oral Condition Prior to Treatment

Disease Status	Tooth Number
Dental caries without endodontic involvement	2, 3, 4, 5, 8, 12, 14, 15, 18, 19, 21, 22, 23, 28, 29, 30, 31
Dental caries with endodontic involvement	6, 7, 9, 10, 11
Missing teeth	20, 24
Remaining deciduous tooth	J(20d)

procedures required interdisciplinary collaboration, due to the limited number of times general anesthesia could be administered. All of the dental procedures

Table 2: Sequential Treatment Plan	
Phase I	Initial Preparation
	General anesthesia administration Oral examination Intraoral photographs and radiographs Fabrication of study models Establishment of a definitive treatment plan
Phase II	Disease Control & Selected Procedures
	General anesthesia administration Endodontic treatment (#6, #7, #9, #10, #11) Extraction of tooth (#J) Scaling and oral prophylaxis Oral hygiene instruction (to caregivers) Topical fluoride application
Phase III	Restoration of Function and Esthetics
	General anesthesia administration Restoration of endodontically-treated teeth: Gingivectomy via electrosurgery (#6, #7, #10, #11) Fiber-reinforced post-and-resin core (#6, #7, #10, #11) Crown buildup with resin composite (#6, #7, #9, #10, #11) Caries treatment: Composite resin restoration (#4, #5, #8, #12, #18, #19, #21, #22, #23, #28, #29, #30, #31) Amalgam restoration (#2, #14, #15) Resin-modified glass-ionomer cement restoration (Class V facial) (#2, #3)
Phase IV	Recall and Maintenance
	General anesthesia or deep sedation administration Examination of oral condition Re-evaluation of restorations Plaque control and prophylaxis Topical fluoride application Oral hygiene instruction (to caregivers)

were performed by a single dental practitioner (JC), with cooperation from the special care dentistry staff, including a dental anesthesiologist (KS), two medical nurses, one dental hygienist and one dental assistant. The dental team performed comprehensive restorative treatments during five appointments over the course of four months; they also provided a recall treatment 22 months later (Table 3). A total of five operations were performed under general anesthesia, and a single operation was performed under intravenous sedation using propofol. In each instance, the patient recovered well from general anesthesia and was discharged on the same day after each operation.

Disease Control and Selected Procedures (Phase II)

The second phase of treatment was aimed at controlling the oral disease; the treatment was comprised of periodontal treatment, extraction, endodontic treatment and topical fluoride application. Gingivectomy using an electrosurgery device (Sesimatic 600SE Electrosurge, Parkell Inc, Edgewood, NY, USA) was performed to remove the flabby gingival tissue in the cervical areas of #6, #7, #10 and #11. A single-visit endodontic treatment was performed on #6, #7, #9, #10 and #11 (Figures 2A and 2B). Root canals were shaped with Profile (Dentsply Maillefer, Tulsa, OK, USA) and irrigated with 2.6% sodium hypochlorite. The canals were filled using gutta percha cones (DiaDent International, Almere, The Netherlands) and AH Plus sealer (Dentsply Detrey, Konstanz, Germany), followed by obturation via the continuous wave condensation technique at 200°C with System B (SybronEndo, Orange, CA, USA) and backfilling using Obtura II (Spartan, Fenton, MO, USA). In addition to the endodontic treatment, full mouth scaling and root planning were performed. After oral prophylaxis, fluoride varnish (Fluor Protector, Ivoclar Vivadent, Schaan, Liechtenstein) was applied to the tooth surfaces. The remaining deciduous molar (#J) was extracted.

Restoration of Function and Esthetics (Phase III)

Upon completion of the endodontic treatment of #6, #7, #10 and #11, glass fiber and zircon posts (Fibiopost, Anthogyr, Sallanches, France) were silanated (Monobond S, Ivoclar Vivadent) and thoroughly dried (Figures 2A and 2B). The posts were cemented into the canal spaces with a self-etch dentin bonding system (Clearfil SE Bond, Kuraray,

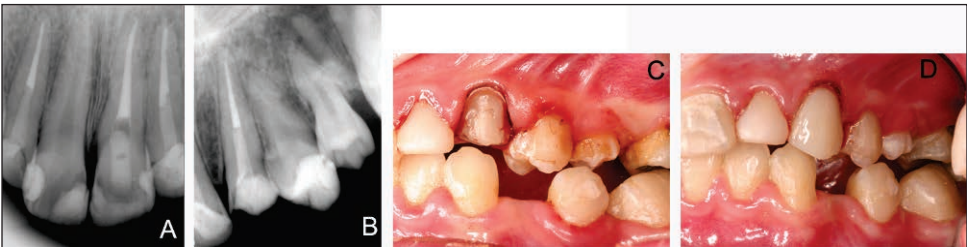


Figure 2. Radiographs of endodontically-treated teeth: #7, #9, #10 (Figure 2A) and #11 (Figure 2B). Preparation of #11 for indirect resin veneer (Figure 2C) and the cemented veneer (Figure 2D).

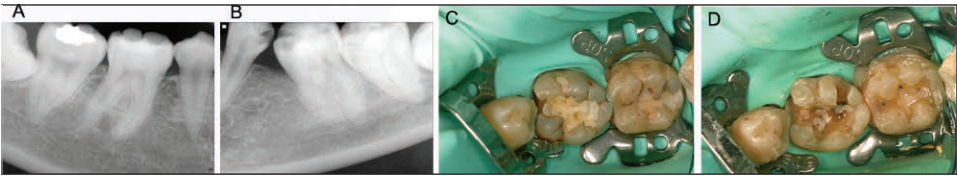


Figure 3. Radiographs taken before treatment (Figures 3A and 3B). Tooth #20 appears to be congenitally missing. Clinical steps are noted in the posterior resin composite restorations (Figures 3C and 3D). Secondary caries had developed in the old glass ionomer cement restorations of #18 and #19. The cavities were cleaned and restored using a resin composite.



Table 3: Summary of Treatments Performed During the Six Appointments					
Appointment	Type of Anesthesia	Duration of Operation	Treated Tooth (tooth # and surface)	Restoration and Related Treatments	Other Treatments
<b>Main Treatments</b>					
1 <sup>st</sup>	General anesthesia	3 hours	6 7  9	Gingivectomy, Endodontic treatment, Post & core Direct crown buildup Endodontic treatment Post & core Direct crown buildup	Oral examination, Radiography, Clinical photography, Impression for study models
2 <sup>nd</sup>	General anesthesia	6 hours	10 11  8(M/D) 12(O/D/B) 2(O) 14(O) 15(O) 2(B) 3(B)	Gingivectomy Endodontic treatment Post & core Direct crown buildup Resin composite restoration Amalgam restoration  Glass ionomer cement restoration	Scaling and root planing, Fluoride varnish application
3 <sup>rd</sup>	General anesthesia	5 hours 30 minutes	J	Extraction	Fluoride varnish application
			11  18(B/O), 19(B/M/O), 21(B), 22(M), 23(D), 28(B), 29(B), 30(B/O), 31(B/O)	Replacement of core Resin veneer preparation Resin composite restoration	
4 <sup>th</sup>	General anesthesia	2 hours 40 minutes	4(B/O), 5(B/O) 11	Resin composite restoration Impression for resin veneer	Fluoride varnish application
5 <sup>th</sup>	Deep sedation	1 hour	11	Resin veneer cementation	
<b>Follow-up Treatment (22 months later)</b>					
6 <sup>th</sup>	General anesthesia	6 hours 15 minutes	8	Endodontic treatment Post & core Direct crown buildup	Radiography, clinical photography, Scaling and root planing, Fluoride varnish application
			2(B), 15(B/MO), 29(DO), 30(DO), 31(MO)	Resin composite restoration	
			7	Marginal repair of resin composite restoration	

O: occlusal, M: mesial, D: distal, B: buccal

Tokyo, Japan) and dual-cure resin cement (Variolink, Ivoclar Vivadent). On the remaining cervical parts of the teeth, bevels were prepared to extend the bonding surface. The clinical crowns were reconstructed via freehand buildup using a three-step etch-and-rinse dentin bonding system (Optibond FL, Kerr, Orange,

CA, USA) and a nanohybrid-type resin composite (Premise, Kerr), followed by irradiation with an LED curing light (Demi, Kerr) for 20 seconds per increment. The restorations were finished and polished using flame-shaped extra fine diamond burs and abrasive discs (Sof-Lex, 3M ESPE, St Paul, MN, USA). An indi-

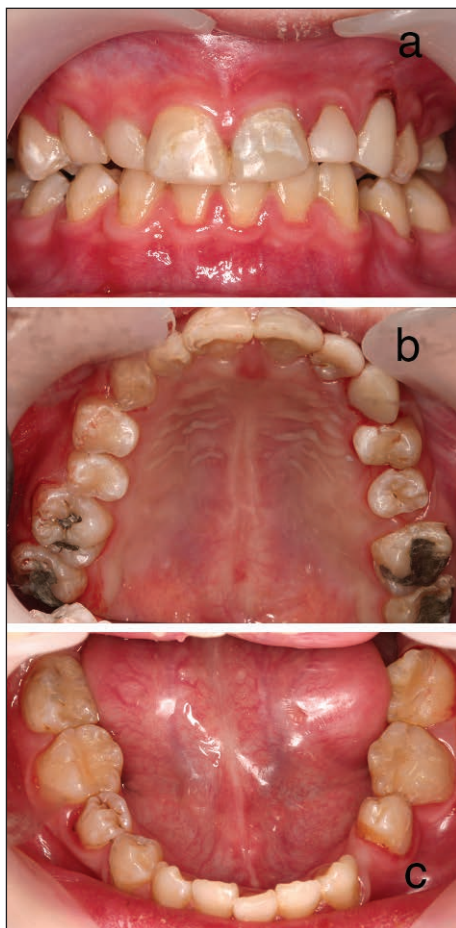


Figure 4. Full mouth views upon completion of five consecutive treatments under general anesthesia and deep sedation. All of the teeth with caries were restored using a resin composite via a direct technique, except for an indirect resin veneer of #11, occlusal amalgam restorations of #2, #14, and #15, and Class V facial restorations of #2 and #3 using RMGI. The patient's oral hygiene was greatly improved compared to her condition prior to treatment (see Figure 1).

rect resin veneer was planned for tooth #11, where the resin core was built up but fell out one week later (Figures 2C and 2D). The remaining post and chamber were cleaned with pumice. The cavity wall was ground using a #4 round carbide bur to expose the fresh bonding surface. The remaining post was re-silanated and a new resin core was prepared in the same way as the previous treatment. Veneer preparation was performed and impressions were taken using polyvinyl siloxane (Honigum, DMG, Hamburg, Germany). At the next appointment, the resin core surface was sandblasted and silanated, the remaining dentin was etched and primed and adhesive was applied to the entire bonding surface (Optibond FL). The veneer was cemented using the same dentin adhesive agent and dual-cure resin cement (Variolink, Ivoclar Vivadent), and the buccal and palatal sides were each irradiated for 60 seconds.

Other resin composite restorations were performed in the same manner (Figure 3). All of the restorative procedures were conducted with rubber dam isolation.

For the amalgam restorations, the cavities were lined with a dentin bonding system (Clearfil SE Bond, Kuraray, Tokyo, Japan) and filled with high copper amalgam (Dispersalloy, Dentsply Caulk, Milford, DE, USA). For the glass-ionomer cement restoration, the cavities were conditioned with polyacrylic acid (Dentin Conditioner, GC, Tokyo, Japan) and filled with resin-modified glass ionomer cement (RMGI) (Fuji II LC, GC), followed by irradiation with an LED-curing light (Demi, Kerr) for 20 seconds. The restorations were finished and polished using flame-shaped extra fine diamond burs and silicon points.

#### Recall and Maintenance (Phase IV)

During the main treatment under general anesthesia, the patient showed noticeably improved oral hygiene (Figure 4). The caregivers, including the patient's mother, became highly motivated after the first operation. The mother said that the patient was not completely receptive to toothbrushing with fluoride-containing toothpaste, but she was more cooperative than in the past. The mother also reported that the patient was eating better than before treatment and seemed capable of chewing less refined foods, such as nuts and vegetables. The authors of this study recommended that the patient receive an annual dental checkup and assured the family that, if additional restorations were needed, they would be performed under general anesthesia.

The patient returned to the dental office 22 months after the fifth and final operation for follow-up procedures. General anesthesia was administered as previously described. A thorough oral examination and radiography revealed periapical pathosis of #8 and secondary caries under the restoration on #7 (Figure 5). The other restorations remained in acceptable conditions in terms of secondary caries, surface texture, anatomic form, marginal integrity, marginal discoloration and color stability. New caries lesions were found on unrestored surfaces of teeth #2, #3, #15, #18, #19, #29, #30 and #31. The gingiva was generally inflamed and plaque had accumulated, but these conditions were not as severe as what was found during the first examination 26 months earlier. Endodontic treatment was performed on tooth #8, followed by placement of a post-and-resin core and direct buildup of a resin crown in the same manner as previously described (Figure 6). The caries lesion in #7 was removed during inspection of the remaining soft dentin. Marginal repair was performed using a dentin adhesive system (Optibond FL) and flowable resin (Premise Flow, Kerr Corporation) to fill the narrow space and resin composite (Premise) to restore the defect. For the posterior teeth with new



Figure 5. Full mouth views and radiographs taken at the 22-month follow-up. Secondary caries developed on #7, with the loss of the resin composite restoration. Tooth #9 reveals no marginal deficiency but shows crown discoloration possibly due to an intrapulpal hemorrhage after the previous single-visit endodontic treatment. New caries developed on the interproximal surfaces of the posterior teeth. Compare with Figures 2A and 2B.

caries, the same resin composite was used (Figure 7). Full mouth scaling and root planning were performed and a fluoride varnish was applied.

### DISCUSSION

Special-care dentistry requires substantial attention to financial concerns, coordination of medical subspecialties and management of operation time.<sup>1</sup> Under these conditions, the dentist must judiciously select procedures and compromise as needed to provide optimal care.<sup>3</sup> In the current case, the patient's family wanted to preserve the patient's damaged teeth as much as possible, while minimizing time under general anesthesia. The need for maintenance after treatment was also raised as a concern. Maintenance time and the frequency of prophylactic visits increased with the complexity of the procedure.<sup>1</sup> The patient could not tolerate daily hygienic practices or the periodic prophylactic treatments required to maintain her prostheses in an optimal condition. Except for the maxillary anterior teeth, the anatomic configuration of her dentition had suffered minimal destruction. The authors of the current study, therefore, planned to use directly-placed bonded restorations, which are conservative, cost-effective and less time-consuming than other indirect restorative protocols.<sup>7</sup> The authors worked in a day-surgery facility for a maximum operation time of five-to-six hours, excluding anesthesia induction and recovery. Given these restrictions, it was desirable to complete each tooth restoration in a same-day procedure, as the

authors were unable to ensure that the next scheduled operation would take place without complications (such as health conditions, financial obstacles, family issues, etc). Deciding which teeth to treat first was another important issue. The priorities in special care treatment are often governed not by the patients themselves, but by the caregivers, and family members and caregivers may express more concern over esthetic appeal than functional impairment. In this case, the patient's family was primarily concerned that her damaged front teeth be restored. For this reason, the authors used the first treatment period for endodontic treatment and post-endodontic restoration of the anterior teeth.

The patient's six upper anterior teeth were broken due to injury and had been left untreated for two years. Four of these damaged teeth (#6, #7, #10 and #11) had lost crown structure, and the pulp was exposed. One central incisor (#9) with a partial crown fracture displayed periapical pathosis in radiographs. The other central incisor (#8)

had separate mesioproximal and distoproximal cavities with dentin thicknesses of at least 2 mm and no apparent periradicular abnormalities. Endodontic treatment was performed on #6, #7, #9, #10 and #11, but not on #8. The definitive restoration of endodontically-treated teeth depends largely on the amount of remaining tooth structure.<sup>8</sup> Resin or porcelain veneers may be preferable to full-coverage crowns when sufficient coronal enamel remains for a bonding surface.<sup>9</sup> The insertion of a root canal post can be beneficial, particularly when coronal retention of a core is uncertain.<sup>5</sup> The authors of this study selected direct resin composite buildups, combined with a post-and-core restoration for teeth #6, #7, #10 and #11. In the access cavity of #9, for which the facial and lingual enamel walls remained, a resin core was built up without a post. Fiber-reinforced composite post, made of zircon-reinforced silica fibers embedded in resin (fiber 43%, zircon 17%, resin 40%) were selected based on the following advantages: chairside application, esthetic properties, bonding to the root dentin and core resin and favorable elastic properties.<sup>8,10</sup> The post-inserted teeth (#6, #7, #10 and #11) had been severely damaged and were covered with overgrown gingival tissue (Figure 1). It was challenging for the dental practitioner to achieve endodontic treatment, periodontal management and definitive restoration of the patient all in one appointment. To expose the restoration margins, the authors used electrosurgery in a coagulation mode. They could not completely control



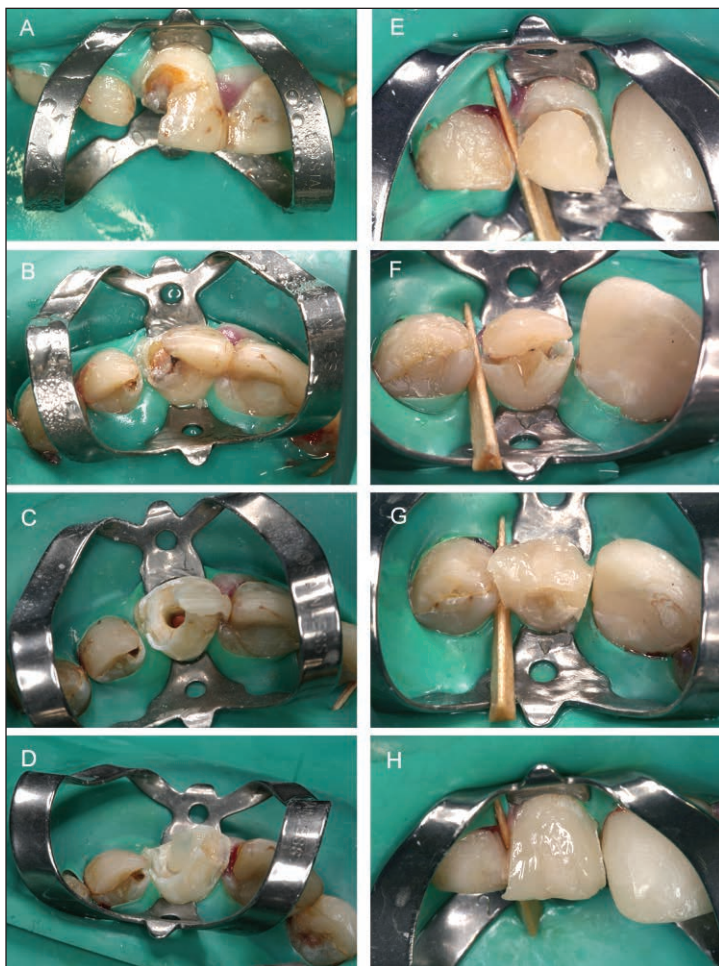


Figure 6. Clinical steps in the endodontic treatment and post-and-core placement of #8 (Figures 6A to 6E). After crown buildup was completed on #8, resin repair was performed on #7 (Figures 6E to 6H).

bleeding, which was not an optimal condition for direct resin construction. They encountered an early bonding failure in the core-dentin and core-post interfaces of #11, which may have resulted from contamination during the bonding process or from inefficient stress loading. To overcome these two adverse factors, the authors used an indirect resin veneer. To increase the bonding surface, the veneer margin was extended lingually to ensure cuspal coverage (Figures 2 and 4). Impressions were taken at the subsequent appointment, after the core build up and veneer preparation were completed. Although other restorations were completed during the primary operation, one additional operation under deep sedation was required to complete cementation of the veneer. Through these combined efforts, the veneer was well retained until the 22-month follow-up. Another bonding failure occurred 20 months later (two months prior to the follow-up) in the distal Class III resin composite restoration of #8, while the Class IV mesial restoration of the same tooth was retained without any defect. It is uncertain whether the failure occurred

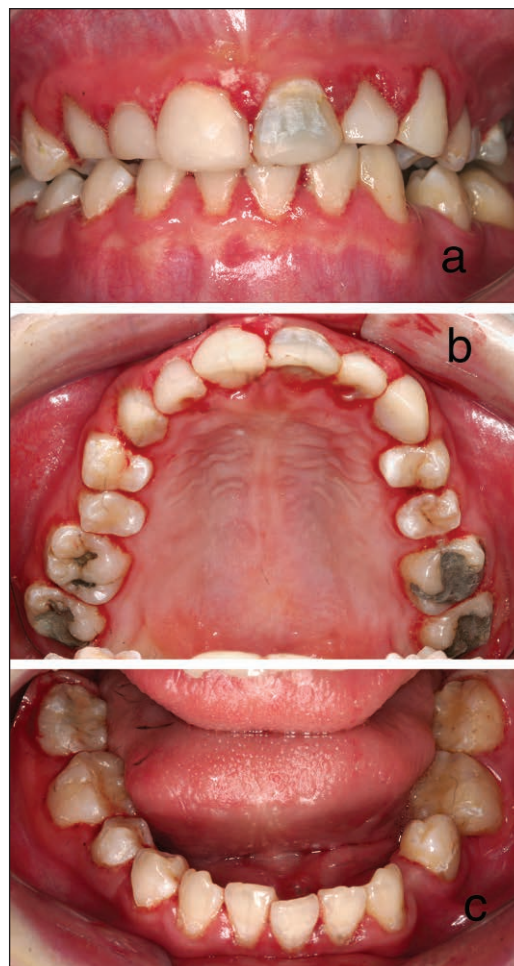


Figure 7. Full mouth views taken upon completion of the 22-month follow-up treatment. Due to time limitations, crowns were simply built-up with a single shade (A2) on #7 and #8. Proximal cavities in #2, #15, #29, #30 and #31 were restored using a resin composite.

through debonding by excessive occlusal stress or through secondary caries, which loosened the restoration. However, the authors confirmed that dentin-bonding agents behave unpredictably in an area with a limited bonding surface and high stress. It was interesting to find that all five endodontically-treated teeth showed good coronal integration of the core resin with or without a post. Although secondary caries appeared on #7, meticulous cleaning of the cavity performed by the authors assured that the post and core and the coronal tissue were retained in unison. Only the defective part of #7 needed to be repaired.

Amalgam is recommended for special-care patients with posterior restorations. The benefits include low technique-sensitivity, rapid completion, fracture resistance and other qualities.<sup>11-12</sup> However, durable amalgam placement requires an adequate mechanical design within a sound structure, and this may not be feasible in a diffuse, poorly defined lesion. For that reason, the

authors of this study restored the bucco-occlusal lesions of the lower molars (#18, #19, #21, #28, #29, #30 and #31) using a resin composite. For the upper molars, where the retention and resistance forms of cavities were available, the authors used amalgam to restore the occlusal cavities. For the buccocervical cavities, they used RMGI separately, mainly because this technique is relatively simple compared to that of a resin composite. No secondary caries was observed around the margins of any posterior restorations after 22-to-26 months. Instead, new caries had developed in the interproximal surfaces of several posterior teeth, some of which had progressed into the dentinoenamel junction (Figure 5). The rate of caries development, combined with poor oral hygiene, indicated an urgent need for restorative intervention. Because the authors were limited to one-day procedures, the teeth were prioritized for treatment according to the extent of caries development.

A variety of at-home preventive regimens, including fluoridated toothpaste, fluoride/chlorhexidine mouth rinse and Xylitol gum, may be recommended for special-needs patients susceptible to dental disease.<sup>13</sup> For these protocols to succeed, however, the patient must accept and comply with them, as the patient in the current study could not do. As a professionally administered preventive measure, in special care dentistry, fluoride varnish is preferred to acidulated phosphate fluoride gel.<sup>14</sup> The intensive regimen of varnish treatment, which includes multiple coats and three consecutive applications within a seven-day period, has proven to be more effective than the regular protocol with only a single coat applied twice yearly.<sup>15-16</sup> Based on this data, the authors of the current study followed the intensified protocol. The frequency of recall visits depended on the patient's situation; however, the authors emphasized to the patient's family the importance of regular dental checkups.

### CONCLUSIONS

Providing dental care for a mentally-challenged patient demands a rare combination of professional expertise and judgment, patience and empathy. Desirable outcomes may be achieved; however, treatment must be designed and adapted to meet the individual patient's dental needs and special circumstances. In the comprehensive restoration of an entirely caries-affected dentition, directly placed resin composites by a single-appointment procedure seemed to be advantageous, cost-efficient and esthetically enhancing. During a 22-month follow-up, the resin composite restorations remained stable, despite difficulties with maintaining the patient's oral hygiene.

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