

CLINICAL REPORT

# Management of ectodermal dysplasia with tooth-supported computer-engineered complete overdentures: A clinical report



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Ectodermal dysplasia (ED) is a congenital disorder characterized by alterations in 2 or more ectodermal structures, most commonly involving the hair, teeth, nails, or sweat glands.<sup>1</sup> Fixed, removable and implant prosthodontics have been used in the dental management of ED.<sup>2,3</sup> Because the dental manifestations of ED involve multiple missing or malformed teeth, the alveolar ridges tend to be underdeveloped, affecting the occlusal vertical dimension (OVD).<sup>4</sup>

Removable prosthodontics in the form of complete dentures, partial dentures, and overdentures have been a popular and versatile treatment option for managing these conditions.<sup>2,3</sup> An overdenture provides an excellent prosthesis when teeth are present to provide support and stability.<sup>5</sup> Studies by Rogoff and Graser<sup>6</sup> and Graser and Rogoff<sup>7</sup> have reported on overdenture treatment for congenital and acquired anomalies by using conventional prosthodontic materials, techniques, and concepts. Advances in digital dentistry have simplified the design and manufacture of dental prostheses, and in the last 5 years, computer-engineered complete denture fabrication has incorporated significant improvements in materials and technology.<sup>8-12</sup> Articles have been published on computer-engineered complete dentures for rehabilitating patients with complete edentulism, but the authors are unaware of reports of the use of this technology for a tooth-supported overdenture in an adult patient. This clinical report uses principles of conventional prosthodontics in

## ABSTRACT

Ectodermal dysplasia (ED) is a genetic disorder affecting organs derived from the embryonic ectoderm. Symptoms manifest early in life, and dental anomalies, including partial or complete edentulism, affect most of these patients. Overdentures have been a popular and conservative treatment option for patients with ED with a few natural teeth. Advancements in digital technology have improved and positively influenced dentistry, including removable prosthodontics. This clinical report describes a positive treatment outcome using computer-engineered complete overdentures to rehabilitate a patient with dental manifestations of ectodermal dysplasia. (J Prosthet Dent 2019;121:195-9)

the new age of digital dentistry to provide a high-quality yet straightforward treatment.

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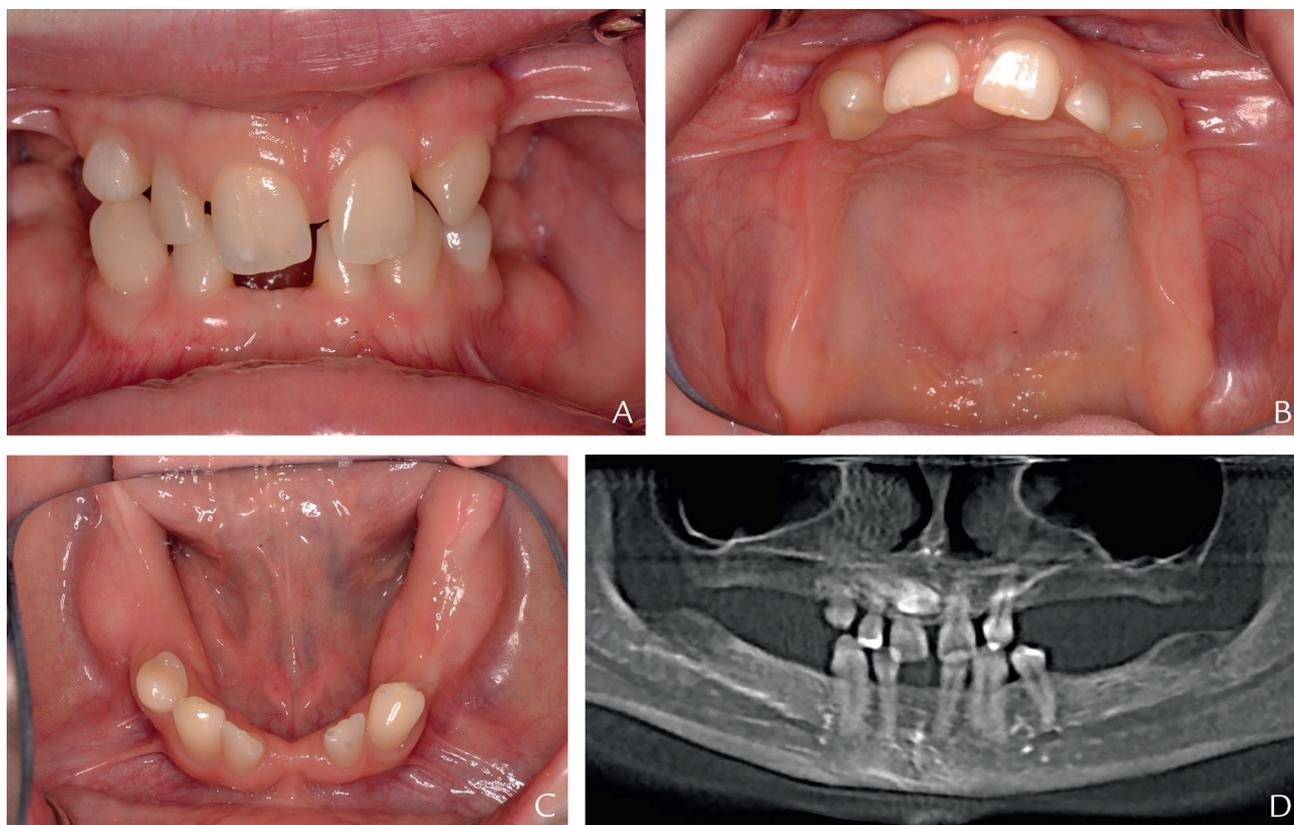
A 20-year-old woman presented to the Faculty Dental Practice at Oregon Health and Science University for an evaluation and consultation to improve her mastication



Figure 1. Initial presentation. Frontal smile view.

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**Figure 2.** Initial presentation. A, Maximal intercuspal position frontal view. B, Maxillary arch occlusal view. C, Mandibular arch occlusal view. D, Panoramic radiograph.

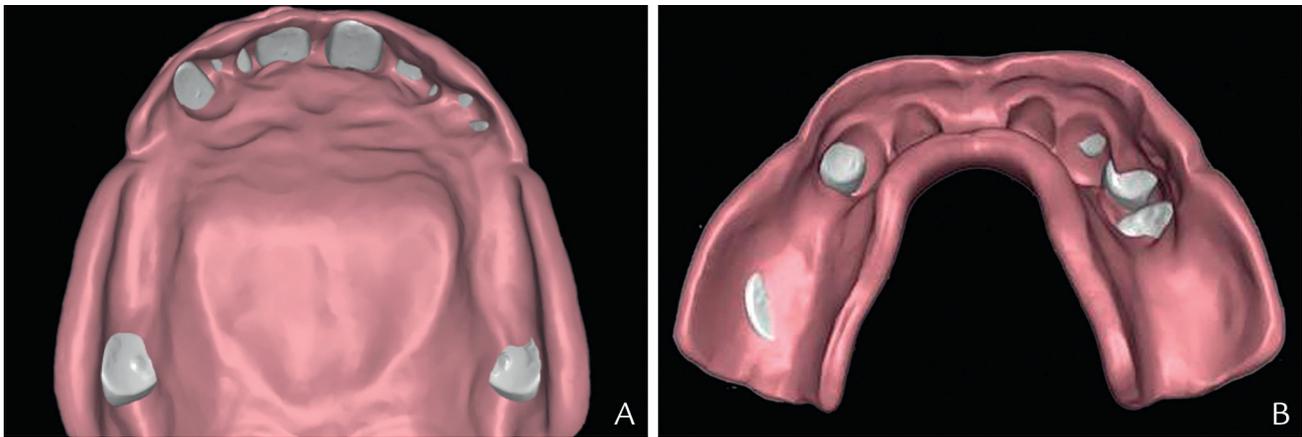
ability and appearance. Her physician had diagnosed hypohidrotic ED with the aid of genetic testing. She had a mild form of the condition as there were no abnormalities with her skin, hair, or nails. She had visited other dental practices and received treatment options from complete extraction and conventional removable complete dental prostheses to implant-supported prostheses. The patient had limited financial means and was unwilling to have her teeth extracted.

A complete prosthodontic examination was performed which revealed a short upper lip, well-defined mentolabial fold, and reduced OVD (Fig. 1). Intraorally, high maxillary labial and buccal frenal attachments were noted, and 10 teeth were present in the anterior segment of both arches, with no evidence of caries or periodontal disease. Some of the teeth were peg shaped and had rotations and spacing in the arch. The posterior teeth were missing in both arches, and the alveolar ridges were hypoplastic in the maxillary arch and hypertrophic in the mandibular arch. The hypertrophy of the alveolar bone could be explained by a compensatory mechanism in response to masticatory load. Radiological examination revealed no abnormalities other than an impacted maxillary anterior tooth. The impacted tooth was left as such because it was determined that an extraction would have resulted in loss of remaining maxillary teeth (Fig. 2).



**Figure 3.** Maxillomandibular relation record on definitive casts.

Irreversible hydrocolloid impressions (Jeltrate Alginate Fast Set; Dentsply Sirona) were made of both arches by using stock trays (COE Spacer Disposable Trays; GC America), and a maxillomandibular relationship record was made using an occlusal registration material (Aluwax; Aluwax Dental Products Company) at the intended OVD, using occlusion rims fabricated from wax (Hygenic extra tough wax; Coltène). To evaluate her esthetics, phonetics, and maxillomandibular relationships without modifying her existing natural teeth, a denture tooth



**Figure 4.** Virtual design images of intaglio surfaces. A, Maxillary overdenture. B, Mandibular overdenture.

arrangement was performed with denture teeth (Portrait IPN Denture teeth; Dentsply Sirona) selected by using her existing natural teeth as a guide. Because of financial constraints and her unwillingness to have her teeth extracted, she accepted the treatment option of removable complete maxillary and mandibular overdenture prostheses.

Impressions were made using irreversible hydrocolloid impression material (Jeltrate Alginate Fast Set; Dentsply Sirona), from which custom trays were fabricated using light-polymerizing material (Triad; Dentsply Sirona) on preliminary casts (Microstone; Whip Mix Corp). Tray adhesive (VPS Tray Adhesive; 3M ESPE) was applied on the custom tray and allowed to dry completely. Border molding was accomplished with polyvinyl siloxane (PVS) putty (Aquasil Putty; Dentsply Sirona), and definitive impressions were made using light-body PVS (Aquasil Light body; Dentsply Sirona). Definitive impressions were scanned using a desk-top scanner (inEos X5; Dentsply Sirona) to create a digital file. Definitive casts were then fabricated by using dowel pins and autopolymerizing acrylic resin (Pattern Resin; GC America) in the location of the teeth to prevent fracture during separation, and the impressions were poured in Type III gypsum (Microstone; Whip Mix Corp) (Fig 3).

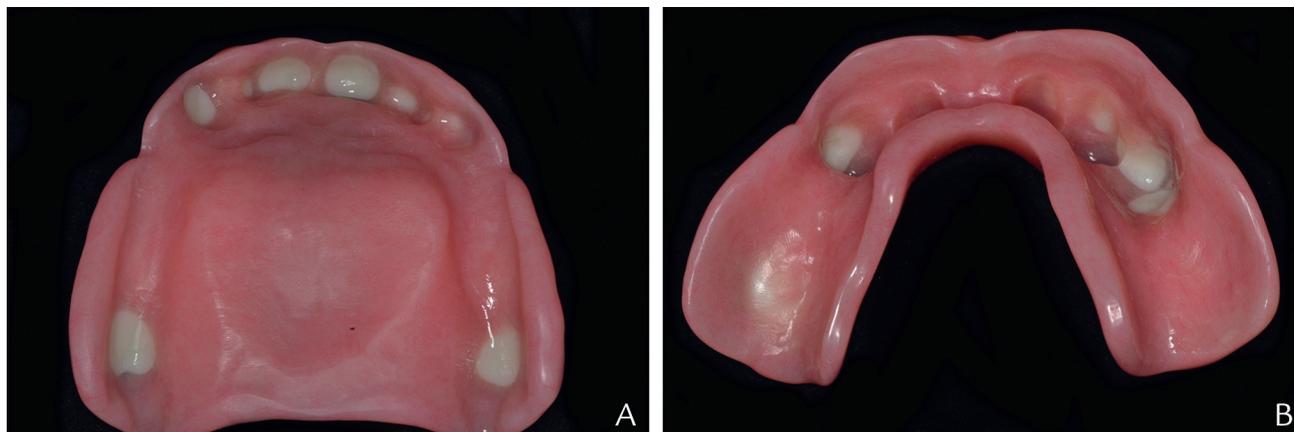
The recommended anatomic measuring device (Global Dental Science) could not be used without significant modifications because of the presence of teeth and the reduced OVD. On the definitive casts, the remaining teeth were blocked out, and occlusion rims were fabricated (Hygenic medium-soft no.3 pink wax; Coltène). The maxillary occlusion rim was adjusted for esthetics, and a facebow record was made. A centric relation (CR) record was made by using a PVS material (Futar D; Kettenbach) at the restored OVD. The mold and shade were selected for the denture teeth by using the patient's existing teeth as a reference, and the location of the posterior palatal seal was identified.



**Figure 5.** Trial dentures.

The facebow and CR records were used to mount the definitive casts on a Class III articulator (Whip Mix Model 4641 Articulator; Whip Mix Corp). The dental laboratory (Global Dental Science) scanned the CR record and created another digital file. Specific instructions were given to the laboratory to virtually block out undercuts around the teeth and soft tissues to ensure a single path of insertion. Digital files from the definitive impressions and maxillomandibular relation records were merged, and the denture was designed using proprietary denture designing software (AvaDent Denture Design Software; Global Dental Science). Anatomic teeth were selected to achieve bilateral balanced occlusion on a virtual articulator programmed with average values.

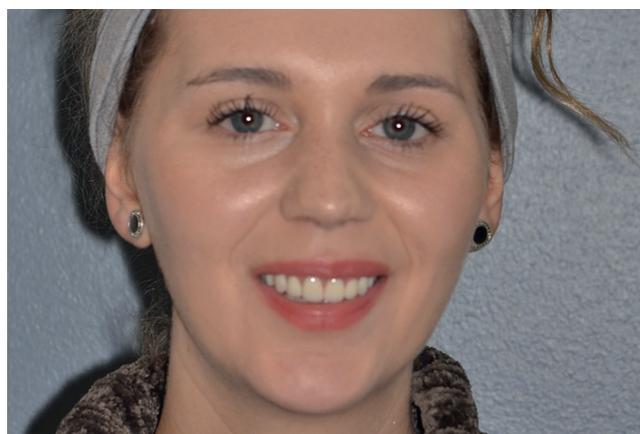
A digitally designed preview file was returned by the dental laboratory (Global Dental Science) and reviewed by the authors prior to approval (Fig 4).<sup>10</sup> Poly(methyl methacrylate) (PMMA) milled trial dentures were fabricated (Functional BTI; Global Dental Science) and returned by the dental laboratory. The trial dentures were delivered and adjustments were made for comfort, function, and esthetics (Fig 5). Reduction of the trial denture flanges was required for comfort, but because an



**Figure 6.** Intaglio surfaces. A, Maxillary overdenture. B, Mandibular overdenture.



**Figure 7.** Maxillary and mandibular overdenture prostheses in centric occlusion position.



**Figure 8.** Definitive treatment. Frontal smile view.

adequate number of natural teeth were present, retention and stability were not compromised. The patient took the trial dentures home for 2 weeks to evaluate function and comfort and obtain comments on her appearance from friends and family members.

The trial dentures were then sent back to the laboratory and scanned. The definitive monolithic dentures were made with denture teeth (Portrait IPN Denture teeth; Dentsply Sirona) and light reddish pink acrylic resin. The dentures were considered monolithic as there was a seamless transition from denture teeth to base without involving a bonding process (XCL-2; Global Dental Science) (Fig. 6). The definitive prostheses were delivered with minimal adjustments, and home care and hygiene instructions were provided (Fig. 7). Follow-up appointments were made at 1 and 3 weeks and 3 months. The patient reported being very satisfied with the outcome (Fig. 8). A high-fluoride content toothpaste (PreviDent 5000 Booster Plus; Colgate Oral Pharmaceuticals Inc) was prescribed to use twice daily for her natural teeth, and she was instructed to return for

examination every 6 months. The patient hopes to transition to an implant-supported fixed complete denture in the future.

## DISCUSSION

The diagnosis, impression production, and capture of records took the same amount of time as a conventional overdenture treatment, but the planning and communication with the laboratory and use of the trial PMMA dentures made treatment time longer than the conventional approach. The patient took a few weeks to adapt to the new prostheses. Advantages of the approach included the following:

1. Increased strength: conventional overdentures have complications such as denture base fracture and denture teeth debonding due to reduced thickness from grinding acrylic resin to accommodate space for abutments.<sup>5</sup> In this protocol, monolithic dentures milled from a single resin block that does not rely on individual denture teeth bonding to the denture base were used. The proprietary technology

uses a prepolymerized high strength, cross-linked resin with appropriately located esthetic denture teeth shade together with the pink acrylic resin for denture base areas.

2. Easy block out and reduced finishing time: The laboratory process of blocking out undercuts is performed virtually during the designing process and hollow grinding denture teeth is eliminated.
3. Better fit: the fit of the milled acrylic resin denture base is reported to be better than that of conventional heat-polymerized acrylic resins.<sup>12</sup>
4. Easy duplication: the denture design is archived and can be used for future reproduction of duplicate prostheses and for planning implant placement and implant-supported prostheses.
5. Two-week trial placement period. Unlike the conventional technique in which wax is used for trial dentures, the more durable PMMA trial dentures offered the patient an opportunity to take the trial overdentures home for 2 weeks to assess comfort, function, and esthetics.

## SUMMARY

This clinical report presents the management of ectodermal dysplasia by using a conventional treatment with a modern approach. Advantages of this approach are the virtual block out, trial dentures the patient can take home, better material properties offered by monolithic bases, and information archived for future use.

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