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# Complete Rehabilitation Of Partial Anodontia In Hereditary Ectodermal Dysplasia With Quad Zygoma Maxillary Hybrid Denture And Mandibular Overdenture - A Case Report

Ranjith Varghese, Deepa Subramanian, Shalni Chandrasekar, Sharanya Ponnusamy, Saravanakrishnan Radhakrishnan

*(Head Of the Department, Department of Prosthodontics, RVS Dental College and Hospital, Tamil Nadu, India)*
*(Professor, Department of Prosthodontics, RVS Dental College and Hospital, Tamil Nadu, India)*
*(Post Graduate Student, Department of Prosthodontics, RVS Dental College and Hospital, Tamil Nadu, India)*
*(Post Graduate Student, Department of Prosthodontics, RVS Dental College and Hospital, Tamil Nadu, India)*
*(Post Graduate Student, Department of Prosthodontics, RVS Dental College and Hospital, Tamil Nadu, India)*

***Abstract:***
***Background:*** *Hereditary ectodermal dysplasia is a rare genetic condition characterized by abnormalities of ectoderm-derived structures, frequently presenting with hypodontia or partial anodontia, leading to significant functional and esthetic challenges. The prosthetic rehabilitation of such patients is complex due to associated alveolar ridge deficiencies, particularly in the maxilla, often compounded by sinus pneumatization and reduced bone volume.*
***Case Report****: An 18-year-old male patient diagnosed with ectodermal dysplasia who presented with partial anodontia and severely atrophic maxillary and mandibular ridges. Clinical and radiographic evaluation done using cone beam computed tomography revealed an atrophic maxilla with pneumatized maxillary sinuses and a compromised mandible with the inferior alveolar nerve located near the crest of the ridge.*
***Results:*** *A multidisciplinary treatment approach was planned involving quad zygomatic implants for maxillary rehabilitation and a tooth-supported overdenture for the mandibular arch. Endodontic treatment was performed on the remaining teeth to preserve proprioception and enhance support for the overdenture. Immediate provisionalization of the maxillary arch was carried out following implant placement, followed by definitive rehabilitation with a screw-retained implant-supported hybrid prosthesis. The mandibular arch was restored using a tooth-supported overdenture with copings on the canines. The treatment resulted in marked improvement in masticatory efficiency, aesthetics, and overall patient satisfaction*
***Conclusion:*** *This case highlights the role of advanced implant techniques such as zygomatic implants in managing severely resorbed maxillae and emphasizes the importance of a multidisciplinary, prosthetically driven approach in achieving predictable outcomes in patients with ectodermal dysplasia.*
***Key Word:*** *Ectodermal dysplasia; Partial anodontia; Atrophic maxilla; Tooth supported overdenture; Zygomatic implants.*

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## I. Introduction:

Developmental abnormalities of ectodermally derived tissues, such as hair, nails, sweat glands, and teeth, are the hallmark of the diverse collection of genetic illnesses known as ectodermal dysplasia (ED). Among the most clinically relevant characteristics are dental manifestations, which frequently include conical teeth, hypodontia or anodontia, and undeveloped alveolar ridges. These conditions create severe obstacles to both functional and cosmetic rehabilitation [1]. Insufficient alveolar bone formation, especially in the maxilla, causes severe ridge resorption and sinus pneumatization, which makes prosthetic maintenance much more difficult [2].

Particularly in young people with severe atrophy, conventional removable prostheses frequently show poor retention and stability because of insufficient supporting structures. Although implant-supported rehabilitation has become a reliable therapeutic approach, conventional implant placement is often constrained by inadequate bone volume and close proximity to important anatomical structures [3]. By anchoring in the thick zygomatic bone, zygomatic implants offer a practical substitute in these situations, eliminating the need for lengthy bone grafting operations and allowing for immediate or early loading protocols [4].

Preserving existing teeth and using tooth-supported overdentures can improve load distribution, preserve alveolar bone, and increase proprioception in the mandibular arch, providing a conservative but efficient treatment

option [5]. Achieving the best results for patients with ED requires a multidisciplinary approach that incorporates surgical and prosthodontic techniques.

This case study highlights the clinical considerations and treatment results of using quad zygomatic implants for maxillary reconstruction in conjunction with a mandibular tooth-supported overdenture for the complete rehabilitation of a patient with hereditary ectodermal dysplasia.

## II. Case Report

An 18-year-old male patient reported to the Department of Prosthodontics with the chief complaint of multiple missing teeth since birth and difficulty in chewing, with a desire for a fixed prosthetic rehabilitation. The patient's medical history revealed a diagnosis of hereditary ectodermal dysplasia, presenting with characteristic features such as hypohidrosis, frontal bossing, and partial anodontia. Intraoral examination showed the presence of only a few permanent teeth (11, 12, 21, 22, 33, and 43), with generalized spacing and poorly developed alveolar ridges. The maxillary and mandibular arches exhibited significant ridge deficiency, compromising prosthetic support. Extraoral examination reveals thin and fragile hair.

Radiographic evaluation using orthopantomogram and cone beam computed tomography revealed a severely atrophic maxilla with bilateral maxillary sinus pneumatization.

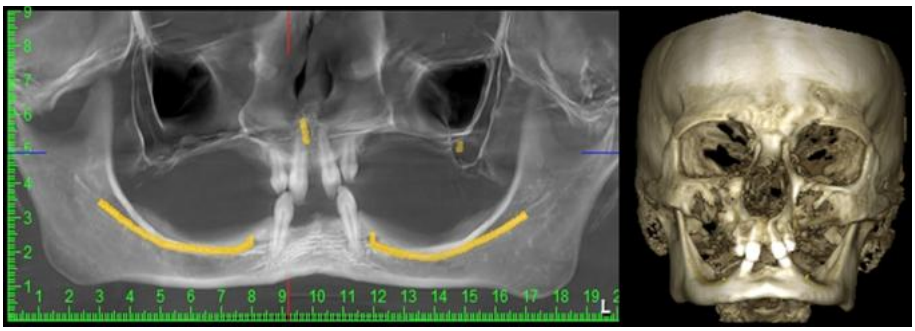

**Fig.1- OPG AND CBCT OF THE PATIENT**

The mandible also demonstrated advanced ridge resorption, with the inferior alveolar nerve located close to the crest of the residual ridge, thereby limiting the feasibility of conventional implant placement. Blood investigation revealed values within normal physiological limits.

Based on the clinical and radiographic findings, a multidisciplinary treatment plan was formulated in consultation with the oral and maxillofacial surgery team.

The treatment objectives included achieving a fixed, stable, and esthetic prosthesis in the maxillary arch and a functionally efficient and retentive prosthesis in the mandibular arch. A quad zygomatic implant-supported prosthesis was planned for the maxillary arch to overcome the limitations of insufficient bone volume, while preserving the remaining teeth for proprioception.

For the mandibular arch, a tooth-supported overdenture utilizing copings on the canines was planned to enhance retention, stability, and load distribution. Pre-prosthetic procedures, including endodontic treatment of the remaining teeth and fabrication of a provisional prosthesis for immediate loading, were incorporated into the treatment plan.

The following treatment was carried out

Diagnostic impressions of both arches were made and diagnostic casts were obtained for treatment planning and evaluation of the existing occlusal relationship and ridge morphology.

Endodontic treatment was carried out on the remaining teeth (11, 12, 21, 22, 33, and 43) to preserve them for proprioception and to serve as abutments for the planned prosthesis.

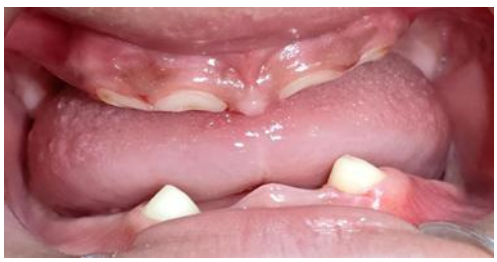

**Fig.2-TOOTH PREPARTION FOR COPINGS**

Tooth preparation was performed on the mandibular canines to receive metal copings for overdenture support, ensuring adequate reduction and proper finish lines.

Maxillomandibular relations were recorded, and a diagnostic wax try-in was performed to assess aesthetics, phonetics, and occlusal scheme.

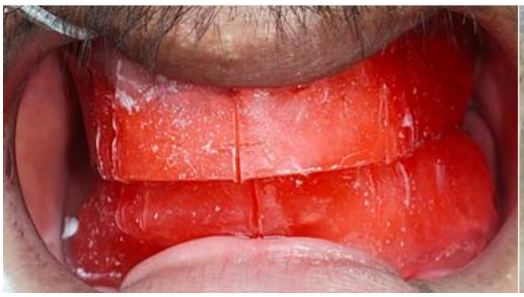

**Fig.3-JAW RELATION RECORD**

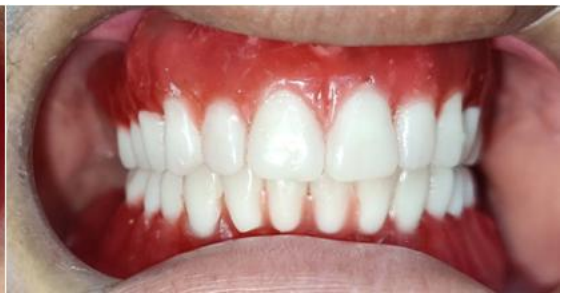

**Fig.4-WAX TRY-IN**

A provisional prosthesis for the maxillary arch was fabricated prior to surgery to enable immediate loading following implant placement.

Under nasal intubation and standard aseptic precaution, painting and draping was done, then local infiltration was given with lignocaine and adrenaline. Bilateral maxillary crestal and two vertical releasing incisions were given and subperiosteal plane of dissection was achieved and body of zygoma was exposed.

Bilateral bony window was created in maxillary sinus and Schneiderian membrane was elevated, followed by sequential drilling and Nobel BioCare brand quad zygomatic implants were placed of size 35,42.5 mm and 47.5 mm dimension.

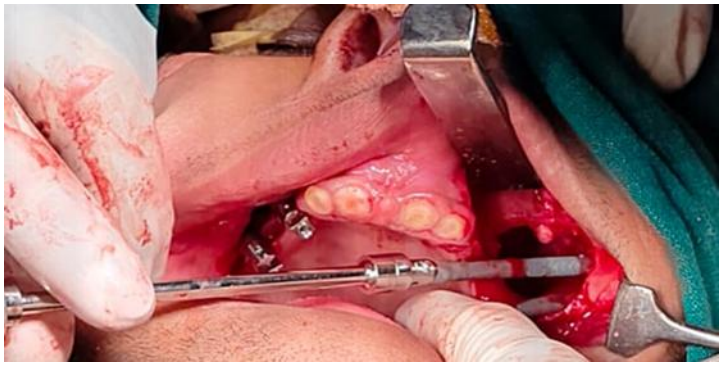

**Fig.5-QUAD ZYGOMA IMPLANT PLACEMENT**

Haemostasis was achieved and closure was done with 3-0 vicryl suture material. Multi-unit abutments and temporary cylinders were connected, and immediate provisionalization was carried out using a screw-retained provisional prosthesis.

**Fig.6-MULTIUNIT ABUTMENT AND TEMPORARY CYLINDERS PLACED**

The patient was placed on periodic follow-up, and a healing period was allowed for osseointegration of the implants.

Following healing, multi-unit impression copings were placed and splinted using pattern resin to ensure accuracy of the impression.

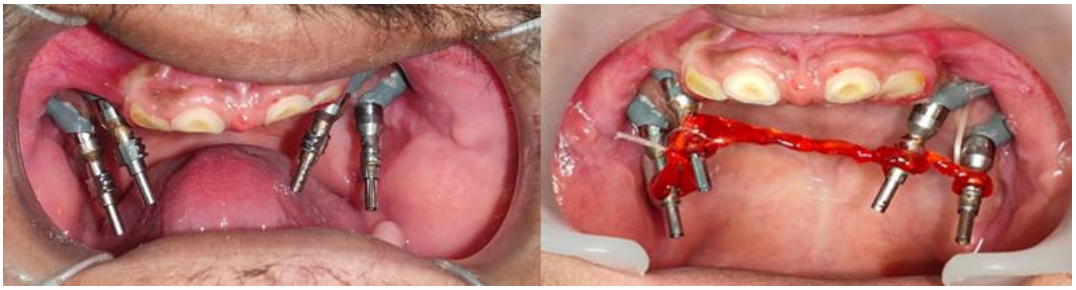

**Fig.7-MULTIUNIT IMPRESSION COPINGS PLACED**
**Fig.8- COPINGS SPLINTED USING PATTERN RESIN**

An open tray impression was made using putty and light-body elastomeric materials to obtain the definitive master cast.

**Fig.9-OPEN TRAY IMPRESSION MADE WITH PUTTY AND LIGHT BODY**

A verification jig trial was performed to confirm the accuracy of the cast and to ensure passive fit of the framework.

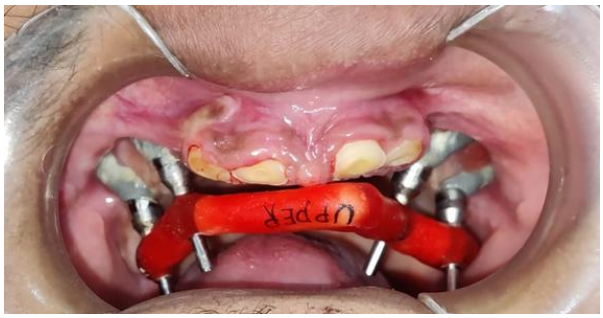


**Fig.10-MAXILLARY PROSTHESIS JIG TRIAL DONE**

Final jaw relation records were made, and a trial with a 3D-printed resin prosthesis was carried out to evaluate aesthetics, phonetics, and occlusion.

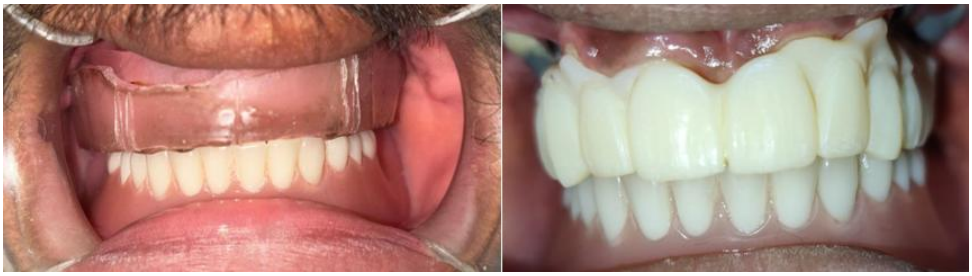

**Fig.11-JAW RELATION RECORD MADE**
**Fig.12-3D PRINTED RESIN PROSTHESIS TRIAL DONE**

A metal framework try-in was performed to verify passive fit and structural integrity prior to final prosthesis fabrication.

**Fig.13-METAL TRY IN DONE**

The definitive maxillary prosthesis, a screw-retained implant-supported hybrid prosthesis with a metal framework and porcelain-fused-to-metal superstructure, was fabricated and inserted.

The mandibular arch was rehabilitated with a tooth-supported overdenture retained by copings on the canines to improve retention, stability, and load distribution. Occlusion, aesthetics, and phonetics were evaluated and necessary adjustments were made at insertion.

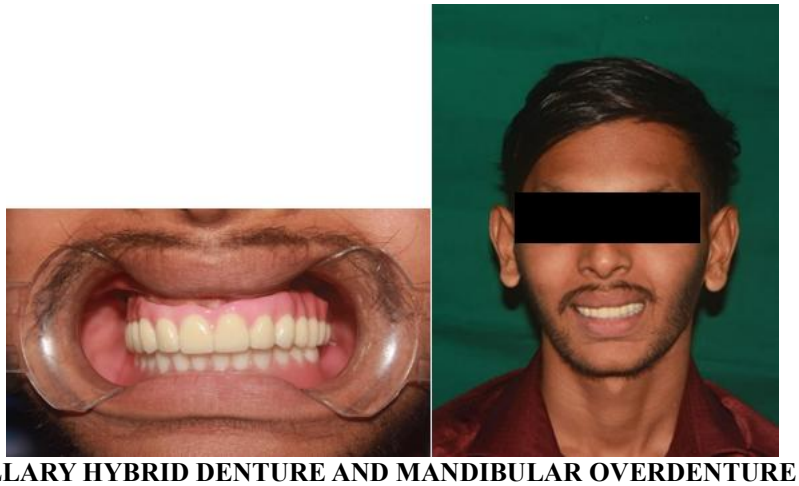

**Fig.14-MAXILLARY HYBRID DENTURE AND MANDIBULAR OVERDENTURE INSERTION**

The patient was kept under periodic follow-up, which demonstrated satisfactory function, improved masticatory efficiency, and stable peri-implant tissues.

## III. Discussion

Dental abnormalities are among the most noticeable clinical characteristics of ectodermal dysplasia (ED), a group of hereditary illnesses marked by deficiencies in ectodermally derived structures. Lack of functional stimulation to the alveolar bone caused by hypodontia or anodontia impairs ridge formation and causes progressive resorption, especially in the maxilla [6]. Maxillary sinus pneumatization exacerbates this anatomical insufficiency by reducing bone volume and creating unfavourable conditions for traditional implant implantation. These traditional conclusions were clear in this instance, requiring a different strategy for rehabilitation.

For these patients, traditional detachable prostheses have traditionally been the main treatment option, particularly during growing phases. However, because of inadequate supporting structures, these prostheses frequently lack sufficient stability and retention, which compromises masticatory efficiency and causes patient discontent [7]. Additionally, extended use of removable prosthesis may aggravate the clinical condition by accelerating remaining ridge resorption. Implant-supported prostheses, which provide better function, aesthetics, and psychological advantages, have emerged as the preferred treatment choice due to advances in implant dentistry.

Despite their benefits, inadequate bone volume and close proximity to important anatomical structures sometimes limit the insertion of conventional endosseous implants in ED patients. To get over these restrictions, a number of bone augmentation techniques, such as sinus lifts and onlay grafts, have been suggested. Nevertheless, these techniques are linked to higher surgical morbidity, increased expense, longer treatment times,

and uncertain graft material resorption [8]. These considerations become much more important in younger individuals, which is why less intrusive options are preferred.

For the rehabilitation of severely atrophic maxillae, zygomatic implants have become a dependable graftless option. These implants, which were developed by Brandmark, provide exceptional primary stability even in situations of severe maxillary resorption by engaging the dense cortical bone of the zygomatic arch [9]. By doing away with the necessity for lengthy bone grafting procedures, their use shortens the duration of treatment and lowers morbidity. According to clinical research, zygomatic implants have long-term effectiveness in full-arch rehabilitations and high survival rates that are comparable to those of conventional implants [10].

When anterior bone support is insufficient due to significant maxillary atrophy, the idea of quad zygomatic implants—two zygomatic implants placed on each side—is especially helpful. This method broadens the possibilities of implant rehabilitation for these patients by supporting a full-arch fixed prosthesis without the necessity for anterior traditional implants [11]. In this instance, the severe bone deficit was overcome by using quad zygomatic implants to successfully rehabilitate the maxillary arch with a fixed prosthesis.

Zygomatic implant immediate loading has become more common as a result of improvements in surgical techniques and implant design. Immediate provisionalization is made possible by high primary stability attained through cortical bone engagement, which not only promptly restores function and appearance but also benefits the patient psychologically [12]. Immediate loading was effectively accomplished in this instance, which improved patient satisfaction and shortened the course of treatment.

The mandibular rehabilitation of patients with ectodermal dysplasia frequently poses a different set of difficulties than the maxillary arch. The placement of conventional implants may be limited by extensive ridge resorption and the proximity of the inferior alveolar nerve, as seen in this instance, even though bone supply may be comparatively better than the maxilla [13]. A conservative strategy that preserves the remaining natural teeth and uses a tooth-supported overdenture is a clinically sound course of treatment in these circumstances.

By preserving the periodontal ligament and lowering the rate of residual ridge resorption, the maintenance of natural teeth is essential for preserving alveolar bone [14]. Furthermore, when compared to complete dentures, the periodontal ligament's proprioceptive feedback improves neuromuscular control during mastication and overall functional efficiency [15]. In young children, where long-term oral structure preservation is crucial, this is especially beneficial.

Compared to traditional complete dentures, tooth-supported overdentures have been demonstrated to greatly increase retention, stability, and support. In addition to protecting the tooth structure, the application of copings over prepared abutment teeth improves the distribution of occlusal stresses along the teeth's long axis, extending the abutments' and the prosthesis' lifespan [16]. Because of their advantageous root morphology and advantageous location within the arch, the use of mandibular canines as overdenture abutments in this instance was carefully planned.

From a prosthodontic standpoint, obtaining a passive fit of the framework and creating a stable occlusal scheme are crucial for the success of full-arch implant-supported prostheses, particularly in zygomatic implant instances. In addition to biological concerns impacting peri-implant tissues, errors in impression techniques or framework construction might result in mechanical issues including screw loosening or fracture [17]. To guarantee precision and passive fit, stepwise prosthetic trials, verification jigs, and splinted impression copings are crucial.

In these kinds of rehabilitations, occlusal concerns are equally important. To reduce excessive stresses on the implants, a mutually protected occlusion or implant-protected occlusal scheme is sometimes advised, especially when long-span prosthesis supported by zygomatic implants are included [18]. The long-term success of the prosthesis is influenced by the careful distribution of occlusal contacts and the prevention of cantilever overload.

The interdisciplinary strategy used in this instance, which involved close cooperation between oral and maxillofacial surgeons and prosthodontists, was essential to obtaining a successful and predictable result. The final restorative design serves as a reference for prosthetically driven implant placement, which guarantees ideal implant location, angulation, and load distribution [19]. In complicated instances like ectodermal dysplasia, where anatomical restrictions need sophisticated treatment options, such coordinated planning is particularly crucial.

All things considered, this case shows that combining zygomatic implant therapy with traditional prosthodontic concepts, like overdenture design and tooth preservation, can offer a reliable and efficient way to treat patients with significant anatomical defects. The method greatly enhances the patient's quality of life in addition to restoring function and appearance.

## IV. Conclusion

Patients with ectodermal dysplasia have severe tooth deficiencies and reduced alveolar bone, which make rehabilitation extremely difficult. This case shows that quad zygomatic implants offer a reliable and efficient graftless approach for the rehabilitation of severely atrophic maxillae, allowing for a fixed prosthetic restoration with instant functional and cosmetic advantages. Concurrently, the use of a tooth-supported overdenture and the

maintenance of natural teeth in the mandibular arch provide a conservative method that preserves residual alveolar bone, improves load distribution, and improves proprioception. To get the best results in such complicated circumstances, a multidisciplinary, prosthetically driven therapy approach is necessary. Patients with ectodermal dysplasia can greatly enhance their function, appearance, and general quality of life by combining cutting-edge implant methods with traditional prosthodontic principles.

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