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RESEARCH ARTICLE

COMPREHENSIVE PROSTHODONTIC AND ORTHODONTIC REHABILITATION OF FRACTURED UPPER ANTERIORS DUE TO ACCIDENTAL TRAUMA- ANINTERDISCIPLINARY APPROACH

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Abstract

In recent years, the growing emphasis on dental esthetics has prompted dentistry to adopt a more organized and systematic approach. Today, dental professionals recognize the importance of Esthetic Principles in achieving patient satisfaction. However, relying solely on formerly independent disciplines like Orthodontics, Prosthodontics, Endodontics, Periodontics, or Maxillofacial Surgery may not suffice. To deliver the highest quality dental care, a collaborative approach that integrates various dental specialties is essential. In our present case report, we highlight the use of an interdisciplinary method combining orthodontic and prosthodontic treatments to achieve optimal esthetic outcomes for our patient.

Introduction:-

Patients seeking esthetic dental treatment today aspire to enhance their appearance, leading to an improved quality of life and heightened self-esteem. Achieving an overall esthetic smile involves an interdisciplinary treatment approach that plays a pivotal role in diagnosis, treatment planning and ultimately better outcomes[(1)].

Orthodontic treatment, when used adjunct to prosthetic treatment, facilitates tooth movement to enhance the success of other necessary dental procedures. For instance, if existing tooth positions hinder the insertion of dental restorations, orthodontics becomes an integral part of the treatment plan. The interplay between orthodontics and prosthodontics often resembles symbiosis, as demonstrated in this case report. Here, both disciplines collaborated to restore the esthetics and function following a traumatic fracture of the upper central incisors[(2)].

Case Report:

An18-year-old male patient reported with a chief complaint of a broken upper front teeth due to trauma (Fig-1).Patient gives a history of root canal treatment of both upper central incisors(Fig-2) and esthetic correction of the upper right lateral incisor, whose crown structure has been lost due to trauma.

On clinical examination Ellis class 6 fracture was noted on 11, Ellis class 7 fracture on 21, Ellis class 2 fracture on 12 with a midline spacing of 4mm.After thorough clinical examination and diagnosis, it was decided torehabilitate11 and 21 with fiber post and composite core followed by individual crowns.On evaluation of diagnostic casts and mock wax-up, the space and tooth structure available to rehabilitate with fiber post and crowns was found to be inadequateas there was edge-to-edge contact of the upper anterior with lower anterior teeth. There was insufficient tooth structure on 11 for crown placement and it was decided to take an orthodontic opinion for extrusion and alignment of the upper anterior teeth followed by rehabilitation with prosthesis.

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Upon orthodontic assessment, the patient exhibited a convex soft tissue profile, Angle's Class I malocclusion and reduced overjet and overbite. Additionally, golden proportion, height-width ratio and gingival height, shape and contour were evaluated (Fig-3). On joint evaluation and thorough clinical examination between the Departments of Orthodontics and Prosthodontics, with particular attention to micro and mini esthetics, a treatment plan was devised which involved fixed mechanotherapy using an MBT 022 bracket to extrude the upper central incisors followed by prosthetic rehabilitation of the same.

Initially, crown lengthening was performed on teeth 11 and 21. This procedure establishes a healthy relationship between the restoration and the periodontium by maintaining the biologic width.Following crown lengthening, orthodontic extrusion was employed. This technique involved controlled movement of teeth to achieve specific goals.The process began by bonding brackets more gingivally on teeth 11 and 21. An upper 0.012-inch nickel-titanium (NiTi) wire was used for initial extrusion(Fig-4).Subsequently, an upper 0.016-inch NiTi wire with an accentuated curve of Spee was utilized for further extrusion (Fig-5).The goal was to achieve about 3mm of extrusion while maintaining slight proclination to avoid occlusal trauma.After extrusion, 16X 22 NiTi wires were used for leveling and aligning.Later, 19 X 25 stainless steel wires with an elastic chain (e-chain) facilitated the closure of the space (Fig-6). Light forces were applied during extrusion to prevent ankylosis and complications.The total treatment time and force applied varied across literature, but maintaining light and constant extrusive forces is crucial for simultaneous bone and soft tissue displacement.In order to achieve the intended result, this comprehensive approach included space closure, orthodontic extrusion, and crown lengthening.

Followingdebonding(Fig-7)generalized gingival enlargement was noticed as an inflammatory response to plaque accumulation and the patient was referred to the Department of Periodontics for scaling and root planing. After one week, it was noted that the inflammation had subsided, but there was localized gingival enlargement from the upper right first premolar to the upper left premolar.Considering the gingival overgrowth in the esthetic zone,Gingivectomy and Gingivoplasty weredone surgically (Fig-8).The patient was asked to report back after a week to assess for healing. The patient reported back after a week, it was noted that the healing was satisfactory. The patient was then referred to the Department of Prosthodontics for further treatment. Post-space preparation and fiber post with composite resin core build-upwas done for both upper central incisors (Fg-9). The right later incisor underwentcomposite resin build-up. The patient was presented with different types of prosthetic crown options: zirconia, PFM full coverage crowns, and PFM-facing crowns. The patient decided to go with PFM-Facing crowns as they were more affordable. Shade matching protocol was done prior to tooth preparation. Tooth preparation for uppercentral incisors and right lateral incisor for PFM-facing crowns was done.Gingival retraction was done using retraction cords(SURE-Cord® Plus; Sure Dent Corporation, Jungwon-gu, South Korea). Digital impression was made using an intraoral scanner (Dexis 3700, Dental Imaging Technologies Corporation, Hatfield, PA, USA), Followedby temporizationusing Bis-acrylic composite (Protemp, 3M ESPE, Neuss, Germany).Cementation of the crowns was done using GIC cement and post cementation instructions were given to the patient (Fig-10).The patient was recalled for follow-up after a week.

Discussion:-

The coordination of macroesthetics (the face), miniesthetics (the smile)and microesthetics (the dental esthetic component) offers a complete approach to esthetic treatment planning. Orthodontists can enhance their work by using principles of cosmetic dentistry to provide a superior esthetic outcome[(1)].

In the realm of esthetic dentistry, achieving excellent results, particularly in the anterior teethrequires clinicians to have a deep understanding of natural dental aesthetics. To enhance esthetic outcomes, mathematical principles like the "golden proportion"[(3, 4)] and the "golden percentage" [(5)] have been put forth. These concepts guide the harmonious arrangement of teeth, contributing to pleasing smiles. The golden dental proportion is a fundamental concept in esthetic dentistry, rooted in a mathematical ratio of 1.618:1. This ratio pertains to the relationship between a larger and a smaller dimension, often applied to tooth proportions.However, it's essential to recognize that while the golden proportion provides a conceptual framework for proportional design, natural variations in patients' teeth alignment and appearance limit its direct application. Achieving esthetic outcomes involves a delicate balance between measurable dimensions and artistic sensitivity. However, Lombardi stated that strict application of the golden proportion proved to be too rigid for dentistry.In addition, the tooth height, crown width/length ratios, transition line angles and other changes in tooth form are likely to influence the perception of symmetry, dominanceand proportion. Among these parameters, measurements of width/length ratios of normal clinical crowns seem to be the most stable reference[(6)].

Therefore, when treatment planning is done in the anterior dentition, it seems appropriate to start by defining the adequate incisal edge length. So, the cervicoincisal height of the upper central incisors was determined by taking canines and lateral incisors as references. The upper central incisors were extruded and gingivectomy and gingivoplasty were done to provide adequate crown structure for prosthetic rehabilitation. Fiber posts are ready to use whereas more time, extra clinic and laboratory time are required for the metal post. One of the main clinical advantages of the fiber-reinforced post is the ability to remove them easily and without trauma.

Fiber posts(45GPa)were preferred as they are more flexible than metal posts(99.3GPa), require less dentin removal and have lower susceptibility to root fracture[7, 8]. While restoring a short clinical crown, the clinician may attempt to gain length by placing a subgingival margin. When giving a subgingival margin, care should be taken not to violate the biological width[9]. Hence, taking care of the biologic width, subgingival crown preparation was done for the upper central incisors followed by cementation of PFM-facingcrowns.

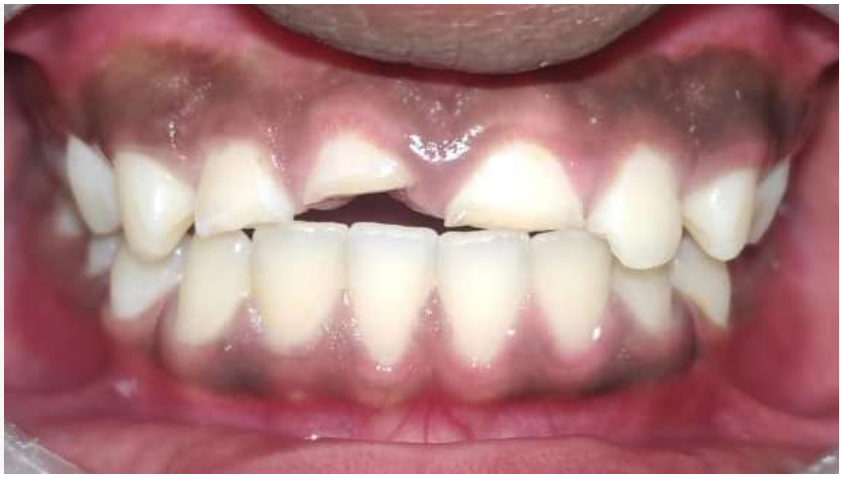

Fig1:- Pre-treatment (intra-oral).

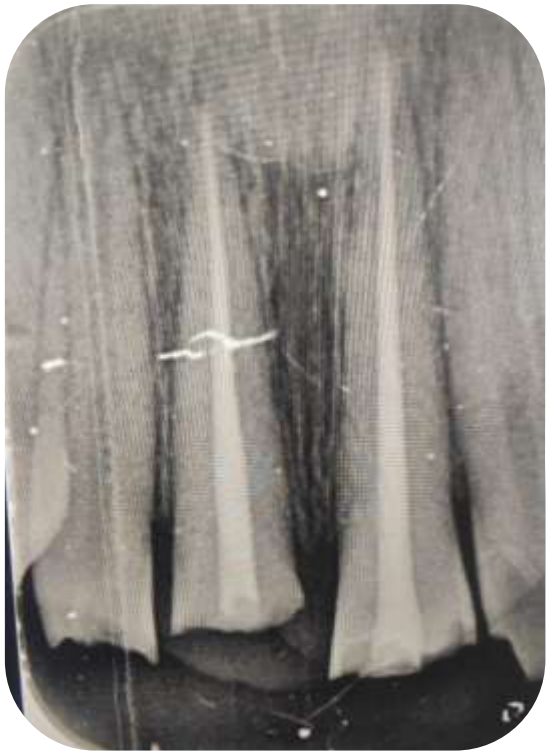

Fig 2:- Pre-treatmentIOPAR.

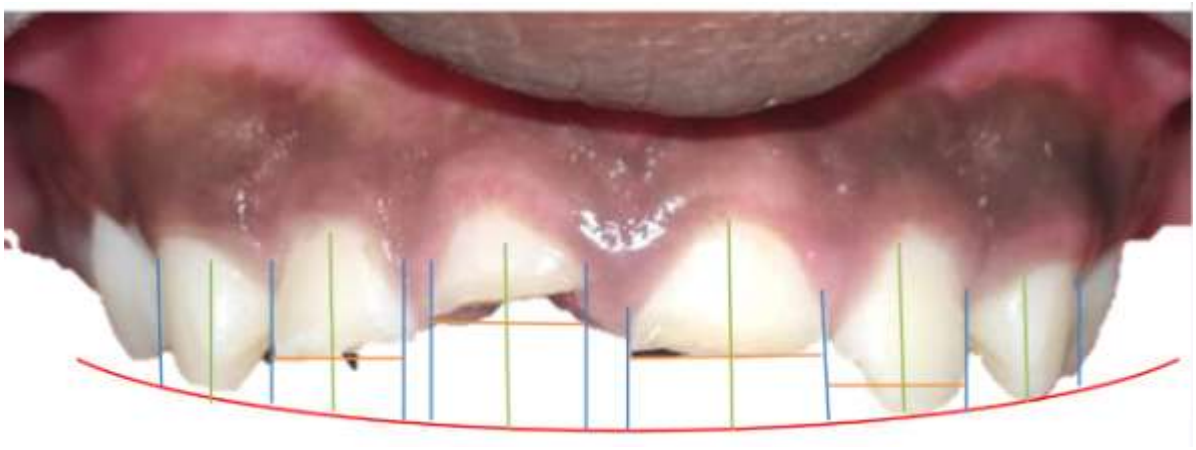

Fig3:- When clinically observed, mesiodistal width of upper lateral incisors was found to be 5mm. Hence, the mesiodistal width of central incisors was allowed to keep at 8mm.

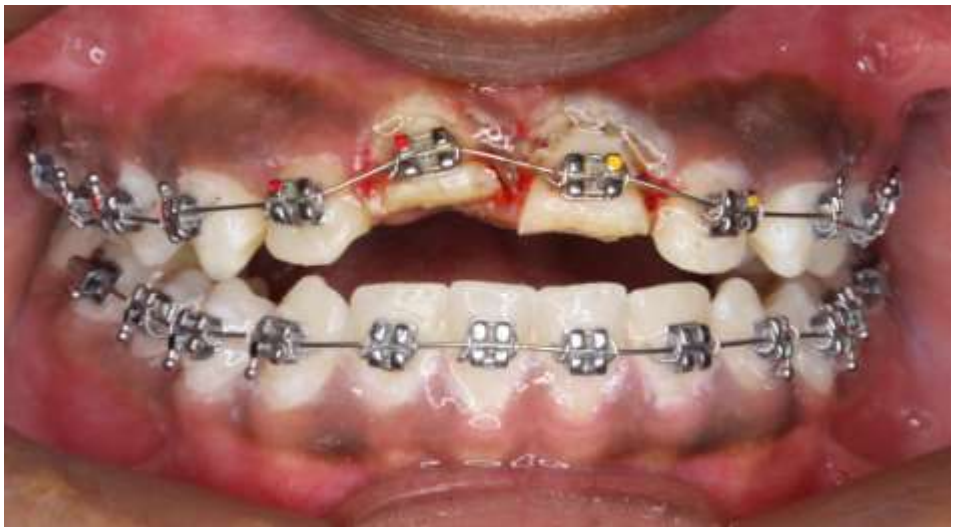

Fig. 4:-

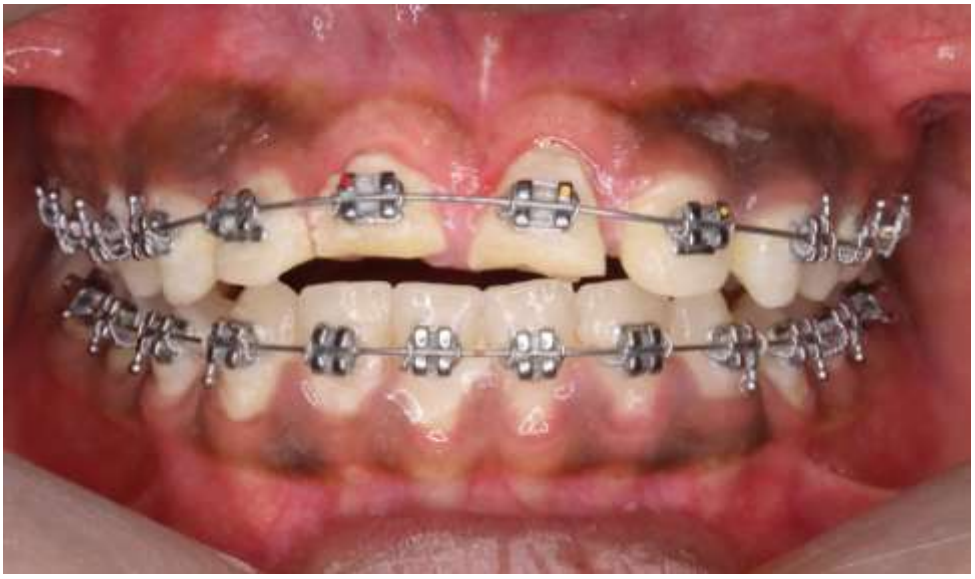

Fig. 5:-

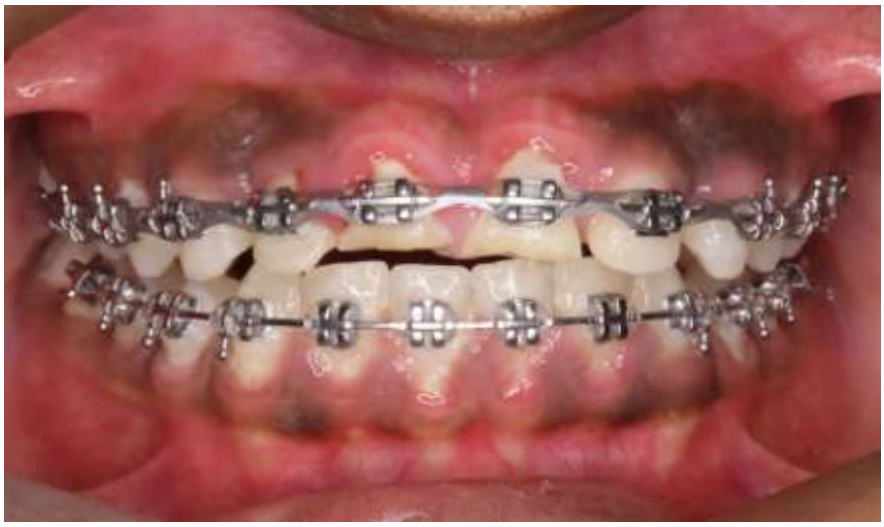

Fig. 6:-

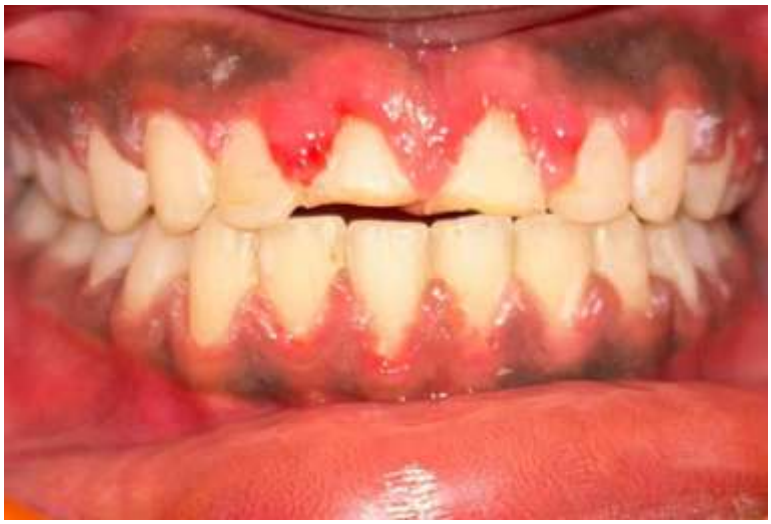

Fig. 7:- After debonding.

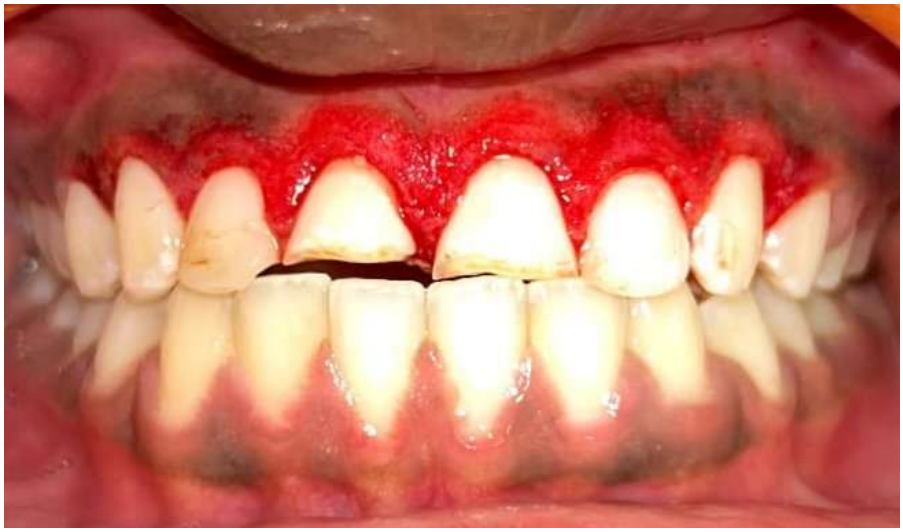

Fig. 8:- After gingivectomy and gingivoplasty.

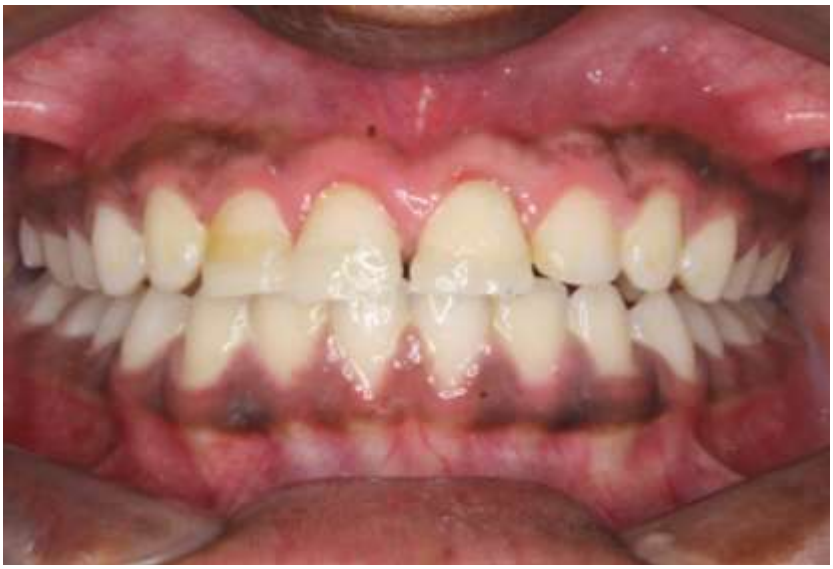

Fig. 9:- Completion of post-space preparation, fiber placement and core build-up.

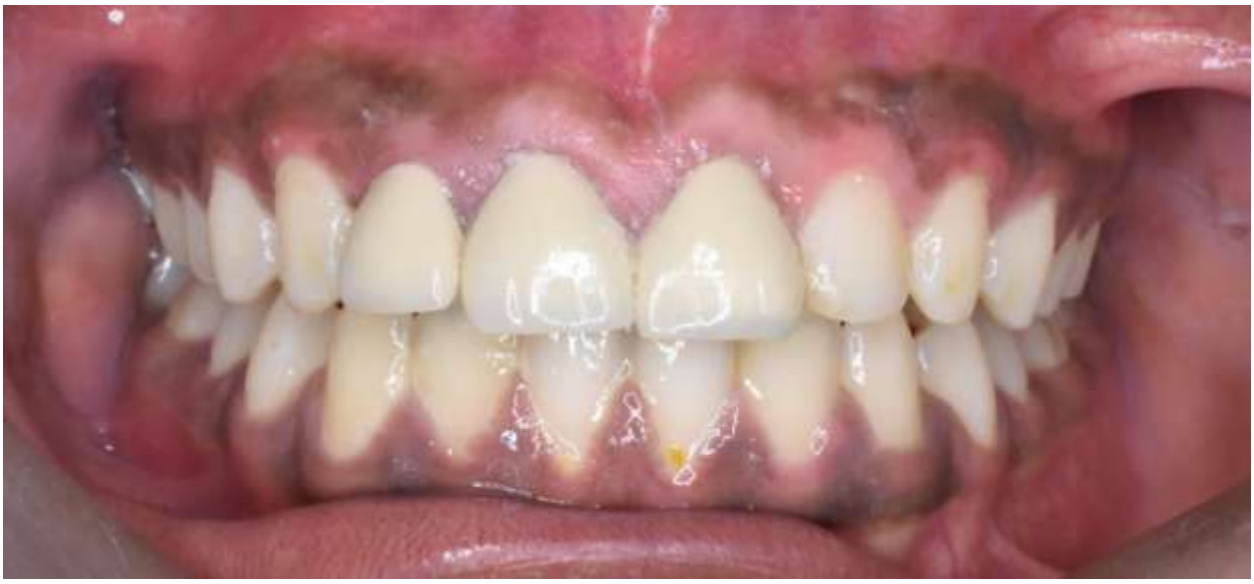

Fig. 10:- After Crown cementation.

Conclusion:-

In the realm of esthetic dentistry, the integration of orthodontic treatment as an adjunct to prosthodontic and restorative procedures can yield remarkably favorable outcomes. The case study presented here exemplifies merely one of the multifaceted treatment approaches at the dentist's disposal. To ensure patients receive the utmost care, interdisciplinary collaboration with other specialties becomes imperative.

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