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Original Research Article

An In-Vivo Comparative Evaluation and Assessment of Implant Supported Prosthesis with Different Crown Materials as Related to their Masticatory Efficacy, Designs, Function and Overall Patient Impact: A Clinical [Original Research] Study

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Abstract: ***Aim***: This study aims to evaluate and assess implant-supported prosthesis with different crown materials as related to their masticatory efficacy, designs, function and overall patient impact ***Materials and Methods***: This clinical study involved 80 patients with a missing right mandibular first molar, of whom 60 were deemed suitable for dental implants after clinical assessments. A careful incision was made, allowing the removal of the root stump while preserving surrounding tissues. An implant was placed alongside an autogenous bone graft to enhance stability. After surgery, sutures were applied, and two months later, healing abutments were placed. Final prosthetic crowns were provided three months post-surgery. Participants were divided into three groups based on crown materials: Group 1 received Monolithic Zirconia, Group 2 had lithium disilicate, and Group 3 received Porcelain Fused to Metal (PFM). Six months after implantation, a comparative evaluation assessed masticatory efficacy, functionality, and impact on quality of life, aiming to enhance understanding of material effects on implant-supported prostheses. ***Statistical Analysis and Results:*** Patients were divided into three groups based on crown material. Group 1 (20 patients) received Monolithic Zirconia crowns, known for their strength and aesthetics. Evaluation scores after six months included 5 for masticatory efficacy, 4 for design preparation and functional performance, 3 for patient impact and satisfaction, 3 for aesthetics, and 1 for reduced efficacy. Group 2 (20 patients) used lithium disilicate crowns, valued for their translucency. Scores showed 4 for masticatory efficacy, 3 for design preparation, 4 for functional performance, and 3 for both overall satisfaction and aesthetics, with a score of 3 for reduced efficacy. Group 3 (20 patients) had Porcelain Fused to Metal (PFM) crowns, known for durability. Scores were 3 for masticatory efficacy, 3 for design preparation, 4 for functional performance, 3 for overall satisfaction, 2 for aesthetics, and 5 for reduced efficacy. ***Conclusion***: The study found that monolithic zirconia offers the best strength, longevity, and aesthetics for posterior restorations, while lithium disilicate is preferred for anterior aesthetics. Porcelain-fused-to-metal (PFM) is seen as outdated and less durable.

Keywords: Implant Supported Prosthesis, Masticatory Efficacy, Crown, Dental Implant, Monolithic Zirconia, Porcelain Fused To Metal, Lithium Disilicate, Design Preparation, Aesthetics, Implant, Autogenous Bone Graft.

INTRODUCTION

An implant is a sophisticated medical device or tissue strategically placed within the body through surgical procedures to perform various functions. These implants are designed to substitute for missing anatomical structures, provide support to damaged organs, monitor physiological functions, or administer medication directly where needed. Specifically, in the field of dentistry, dental implants have emerged as a revolutionary solution for individuals who have lost one or more teeth.[1,2] Dental implants consist of titanium posts that are surgically inserted into the jawbone, serving as artificial roots for supporting prosthetic teeth. Once the implant integrates with the jawbone, a process known as osseointegration, it provides a strong and stable foundation for the replacement teeth. An implant-supported prosthesis is particularly advantageous compared to traditional dentures, offering enhanced stability that helps prevent shifting or discomfort during daily activities such as chewing and speaking. In terms of aesthetics, implants mimic the natural appearance and function of teeth, contributing to a more pleasing smile and boosting the individual's confidence.[3,4] Dental implants are versatile solutions designed to meet a variety of patient needs, particularly in cases where there has been significant bone loss. Among the most common types of implant-supported prostheses are fixed bridges, which are permanently affixed and provide a stable and durable replacement for missing teeth. Hybrid prostheses offer a unique combination of both fixed and removable features, allowing for a flexible approach to dental restoration. Lastly, removable overdentures present a practical option that can easily be removed for cleaning and maintenance, ensuring optimal oral hygiene.[5,6] The process of placing these implant-supported prostheses is a carefully orchestrated surgical procedure that involves the precise placement of titanium implants into the jawbone. The choice of titanium is deliberate, as this material is renowned for its excellent biocompatibility. It allows the implants to integrate seamlessly with the jawbone through a biological process known as osseointegration. This critical integration ensures that the implants provide a stable and robust foundation for the prosthetic teeth, mimicking the natural function and stability of real teeth.[7,8] Beyond their aesthetic appeal, implant-supported prostheses offer a host of advantages that greatly enhance the quality of life for patients. One of the most significant benefits is the remarkable improvement in chewing capability, as these implants offer a secure base that enables patients to exert greater bite force without discomfort or instability. Furthermore, these dental implants play a vital role in preserving the integrity of the facial structure, counteracting the deterioration that often results from bone loss. By maintaining the natural contours of the face, implant-supported prostheses help individuals retain their youthful appearance and confidence.[9] When it comes to fixation methods for these implants, there are primarily two options: screw-retained and cement-retained prostheses. Screw-retained prostheses are often easier to maintain and can be more readily removed for adjustment or cleaning, whereas cement-retained options provide a more aesthetic finish but may require more complex removal procedures if adjustments are needed. Although the initial cost associated with implant-supported prostheses is generally higher than that of conventional dentures, they are considered a long-term investment in oral health. This is particularly relevant for patients who are fully or partially edentulous, as these implants can significantly improve overall quality of life, chewing efficiency, and bite force, which are crucial for proper nutrition and digestion.[10,11] The design and materials utilized in these restorations play a vital role in their long-term success and the satisfaction of the patient. Increasingly, all-ceramic materials, such as monolithic zirconia, are being favoured for their superior aesthetics and durability, especially over traditional porcelain-fused-to-metal alternatives, in certain cases. These advancements in materials not only enhance the visual appeal of dental restorations but also contribute to their resilience and functionality, making them a preferred choice in modern dental practice.[12,13] This study aims to evaluate and assess implant-supported prostheses with different crown materials in relation to their masticatory efficacy, design, function, and overall patient impact.

MATERIALS AND METHODS

This clinical study began with a cohort of 80 patients who presented with the specific complaint of a missing right mandibular first molar. Each patient expressed a strong desire to have this tooth replaced due to functional and aesthetic concerns. Upon thorough clinical assessments, 60 patients were ultimately deemed suitable candidates for dental implant placement and the subsequent provision of implant-supported prostheses. The study's participant group comprised adults aged between 25 and 50 years and included both male and female individuals. Importantly, all participants had root stumps remaining in the region of the mandibular first molar, which allowed for successful implant placement. The inclusion criteria for the study required that participants be free of any acute infections, exhibit healthy soft tissue conditions, and have a documented history of atraumatic tooth extraction to ensure favourable healing conditions. Conversely, certain exclusion criteria were established: smokers, individuals with uncontrolled mental health conditions, patients with systemic diseases that could potentially hinder healing processes, and pregnant women were all excluded from participation to maintain the integrity of the study. Prior to the commencement of any procedures, informed consent was obtained from each participant, ensuring that they fully understood the study's nature, benefits, and risks involved. Following this, every patient underwent a comprehensive clinical examination, complemented by a cone-beam computed tomography (CBCT) scan. This imaging technique was crucial for evaluating the anatomic suitability of the implant placement site and for planning the surgical approach. To maintain optimal hygiene standards throughout the

procedure, each patient performed an oral rinse with chlorhexidine, an antiseptic solution known to reduce microbial load in the oral cavity. Local anaesthesia was then administered through an inferior alveolar nerve block, ensuring patient comfort and minimizing any discomfort during the surgical intervention. A meticulous incision was made using a 15-scalpel blade, which allowed the gentle elevation of a mucoperiosteal flap. This surgical technique was employed to facilitate the careful removal of the root stump while conserving surrounding soft and hard tissues, essential for future healing and implant stability. After the successful extraction of the root stump, a dental implant was carefully positioned into the cortical bone, alongside the incorporation of an autogenous bone graft harvested from the patient. This graft was utilized to promote initial stability and enhance the overall integration of the implant within the bone. Following the implant placement, the mucoperiosteal flap was repositioned, and sutures were meticulously applied to facilitate optimal healing conditions. Approximately two months post-surgery, the patients returned for a scheduled follow-up appointment. During this visit, a healing abutment was placed on the osseointegrated implant to support the maturation of the tissues and to prepare for the eventual placement of the prosthetic crown. Three months after the surgical intervention, the patients received their final prosthetic crowns, which were securely supported by the fully-integrated implants. The study included a total of 60 participants who underwent the replacement of their missing right mandibular first molar with implant-supported prostheses. These patients were stratified into three distinct groups based on the material composition of their respective crown restorations. Group 1 consisted of 20 patients who received prostheses made of Monolithic Zirconia, renowned for its strength and aesthetic qualities. Group 2 included another 20 patients whose prosthetic replacements were crafted from lithium disilicate, noted for its translucency and natural appearance. Lastly, Group 3 was made up of 20 patients whose crowns were fabricated from Porcelain Fused to Metal (PFM), a traditional material known for its durability and functional reliability. Six months following the implementation of the implant-supported prostheses, a comprehensive comparative evaluation was performed to assess the different crown materials. This analysis encompassed various factors, including masticatory efficacy, differences in design, overall functionality, and the significant impact on the participants' quality of life and satisfaction levels. The overarching goal was to thoroughly investigate how the choice of material influenced the performance, durability, and acceptance of the implant-supported prosthesis among the participants, ultimately contributing to enhanced understanding and improved clinical outcomes in dental implantology.

Statistical Analysis

In this study, we performed all statistical analyses using SPSS version 30.0, which stands for Statistical Package for the Social Sciences. It is a comprehensive and user-friendly software tool designed for data analysis in the social sciences. To assess the significance of our findings, we employed the chi-square test, which effectively examines differences in proportions across groups, allowing for a thorough comparison of categorical data and accurate insights into trends within the dataset.

RESULTS

This study encompasses a comprehensive evaluation involving a total of 60 patients who were missing their right mandibular first molar and expressed an interest in undergoing dental implant surgery, subsequently followed by the placement of an implant-supported prosthesis. The participant pool consisted of individuals aged between 25 and 50 years, ensuring a diverse representation with both male and female subjects. As illustrated in Table 1, the demographic breakdown highlights that out of the total cohort of 60 patients, 33 were male, while 27 were female, providing a balanced overview of gender distribution in this clinical context. To facilitate a structured analysis, the patients were organized into three distinct groups based on the type of crown restoration material selected for their prostheses. Group 1 included 20 patients who received implant-supported prostheses constructed from Monolithic Zirconia crowns. This material is particularly valued in dental applications due to its exceptional strength, durability, and aesthetic qualities, making it a popular choice for patients seeking both functionality and visual appeal. Group 2 comprised another set of 20 patients whose prostheses were fabricated from lithium disilicate. This material is renowned for its translucency, allowing it to closely mimic the natural appearance of teeth, which can significantly enhance the aesthetic outcomes of dental restorations. In Group 3, the remaining 20 patients received Porcelain Fused to Metal (PFM) crowns. This traditional material is favored for its long-standing reputation for durability and functional reliability, often used in various dental applications due to its proven track record. After the implantation procedure, a thorough comparative evaluation of outcomes related to the different crown materials was conducted six months later. In Table 2, the findings for Group 1 (N=20) are presented, detailing the implant-supported prostheses constructed from Monolithic Zirconia. Various parameters were evaluated during this six-month post-operative period, including masticatory efficacy, design preparation requirements, functional performance, overall patient impact and satisfaction, aesthetic considerations, and any observed reduction in efficacy. The analysis was meticulously conducted using the Pearson Chi-Square test to ascertain statistical significance, revealing scores of 5 for masticatory efficacy, 4 for design preparation requirements, 4 for functional performance, 3 for overall patient impact and satisfaction, 3 for aesthetics, and a score of 1 indicating reduced efficacy. Table 3 shines a light on Group 2 (N=20), where the participants received implant-

supported prostheses fashioned from lithium disilicate. Upon conducting the six-month post-operative evaluations, the same key parameters were assessed with the Pearson Chi-Square test. The scores noted for this group were 4 for masticatory efficacy, 3 for design preparation requirements, 4 for functional performance, and 3 for both overall patient impact and satisfaction and aesthetics. Interestingly, the group also noted a score of 3 for reduced efficacy, indicating some variability in patient experiences. In Table 4, the results for Group 3 (N=20) are detailed, showcasing the patients who received PFM crowns. Similar evaluations were conducted six months post-surgery using the Pearson Chi-Square test for statistical analysis. The findings revealed scores of 3 for masticatory efficacy, 3 for design preparation requirements, 4 for functional performance, 3 for overall patient impact and satisfaction, 2 for aesthetics, and an impressive score of 5 for reduced efficacy, highlighting the potential areas of concern and effectiveness for this material. Finally, Table 5 summarizes a comprehensive estimation across all evaluated groups by utilizing one-way ANOVA statistical methods, which allows for an in-depth analysis of the differences in outcomes associated with the three types of crown materials. This systematic approach not only deepens our understanding of the effectiveness of each type of implant-supported prosthesis but also offers valuable insights into patient satisfaction levels, ultimately guiding future clinical decisions in dental restorative practices.

Table 1: Age & gender based statistical description of contributing patients

Age Group (Yrs)	Male	Female	Total	P value
25-30	5	5	10	0.03*
31-35	6	7	13	0.40
36-40	7	6	13	0.01*
41-45	8	5	13	0.50
46-50	7	4	11	0.60
Total	33	27	60	*Significant
*p<0.05 significant				

Graph 1: Patients demographic distribution and associated details

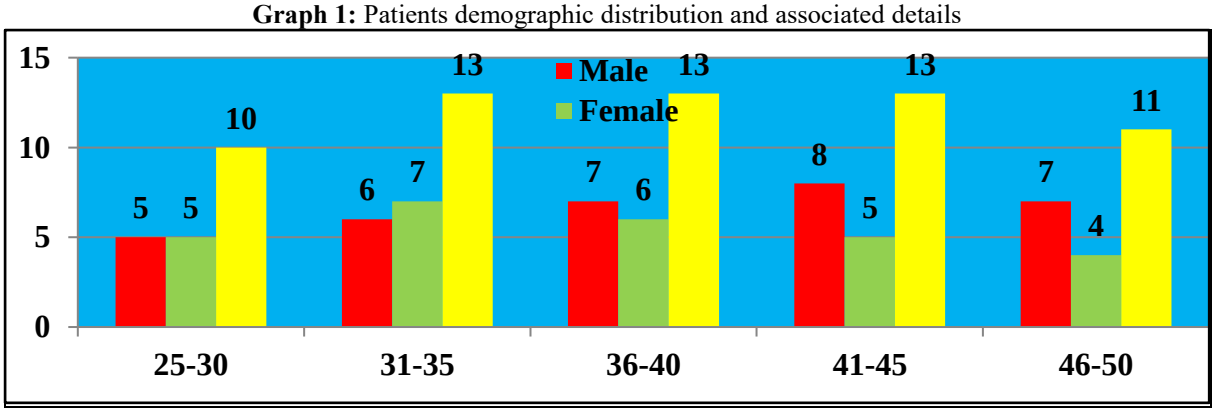

Table 2: Group 1 (N=20) Patients with a missing mandibular first molar underwent implant-supported prosthesis created from monolithic zirconia, with evaluations conducted six months post-operatively. The Pearson Chi-Square test was utilized to assess the significance of the outcomes

Variables	N	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
Masticatory Efficacy	5	1.12	1.09	1.07	1.04	1.02	1.07	0.07
Design, Preparation Requirements	4	1.09	1.06	1.05	1.02	1.02	1.01	0.06
Functional Performance	4	1.09	1.06	1.05	1.02	1.02	1.01	0.06
Overall Patient Impact, Satisfaction	3	1.06	1.03	1.04	1.02	1.01	1.01	0.02*
Esthetics	3	1.06	1.03	1.04	1.02	1.01	1.01	0.02*
Reduced Efficacy	1	1.03	1.02	1.02	1.02	1.01	1.01	0.01*
*p<0.05 significant								

Table 3: Group 2 (N=20) Patients with a missing mandibular first molar underwent implant-supported prosthesis created from Lithium Disilicate, with evaluations conducted six months post-operatively. The Pearson Chi-Square test was utilized to assess the significance of the outcomes

Variables	N	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
Masticatory Efficacy	4	1.09	1.06	1.05	1.02	1.02	1.01	0.06
Design and Preparation Requirements	3	1.06	1.03	1.04	1.02	1.01	1.01	0.02*
Functional Performance	4	1.09	1.06	1.05	1.02	1.02	1.01	0.06
Overall Patient Impact and Satisfaction	3	1.06	1.03	1.04	1.02	1.01	1.01	0.02*
Esthetics	3	1.06	1.03	1.04	1.02	1.01	1.01	0.02*
Reduced Efficacy	3	1.06	1.03	1.04	1.02	1.01	1.01	0.02*
*p<0.05 significant								

Table 4: Group 3 (N=20) Patients with a missing mandibular first molar underwent implant-supported prosthesis created from Porcelain Fused to Metal (PFM), with evaluations conducted six months post-operatively. The Pearson Chi-Square test was utilized to assess the significance of the outcomes

Variables	N	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
Masticatory efficacy	3	1.06	1.03	1.04	1.02	1.01	1.01	0.02*
Design and Preparation Requirements	3	1.06	1.03	1.04	1.02	1.01	1.01	0.02*
Functional Performance	4	1.09	1.06	1.05	1.02	1.02	1.01	0.06
Overall Patient Impact and Satisfaction	3	1.06	1.03	1.04	1.02	1.01	1.01	0.02*
Esthetics	2	1.05	1.04	1.04	1.03	1.02	1.01	0.01*
Reduced efficacy	5	1.12	1.09	1.07	1.04	1.02	1.07	0.07
*p<0.05 significant								

Table 5: Estimation amongst all studied groups using one-way ANOVA

Variables	Degree of Freedom	Sum of Squares ∑	Mean Sum of Squares m∑	F	Level of Sig. (p)
Between Groups	7	2.739	2.531	1.4	0.01*
Within Groups	24	2.298	1.842	_	
Cumulative	274.19	8.094	*p<0.05 significant		

DISCUSSION

Iyer S et al reviewed in their study that dental implants are titanium posts surgically placed into the jawbone, offering a durable solution for missing teeth. Acting as artificial roots, they provide a strong foundation for dental restorations like crowns and bridges, boasting a success rate of up to 98.5% due to osseointegration, which maintains bone density and restores chewing function.[14] Albanchez-González et al included in their study that the type of restoration chosen depends on the number of missing teeth and jawbone condition, including a single-tooth crown, which replaces one tooth without impacting adjacent teeth. Implant-Supported Bridge: Uses two or more implants to replace multiple adjacent teeth. Implant-Supported Dentures, Ideal for those missing all teeth in an arch, available as Fixed (Hybrid) Dentures, securely attached to 4–6 implants, removable only by a dental professional. Removable Overdentures: These dentures click onto implants with special attachments, allowing patients the convenience of removing them for daily cleaning. One of the standout advantages of implant-supported prostheses is their exceptional stability during activities like eating and speaking.[15,16] Dellacasa P et al showed in their study that they contribute to the preservation of bone density, boast a natural appearance and functionality, and promise long-lasting durability. Although the initial process requires a minor surgical procedure, followed by a healing period of 3 to 6 months for proper integration,

the long-term benefits, potentially a lifetime of support with adequate care, can be well worth it. However, the success of implantation is contingent upon sufficient jawbone density. In cases where density is inadequate, a bone graft may be necessary to ensure optimal conditions for the implants.[17,18] Rutkūnas V et al. reviewed in their study that implant-supported restorations, whether fixed or removable, significantly enhance masticatory efficiency and bite force compared to traditional removable dentures. Among these options, single-piece implant-supported crowns are known for their superior masticatory efficiency and faster adaptation to functional use compared to conventional three-unit fixed partial dentures (FPDs) designed to replace a single posterior tooth. The design of each restoration plays a pivotal role in its performance. For instance, Fixed Complete Dentures, particularly those employing the All-on-4 system, demonstrate marked improvements in efficiency during initial chewing cycles when contrasted with conventional dentures. Implant-retained overdentures also significantly contribute to masticatory performance, with bar-retained systems typically offering greater efficiency than ball-retained versions.[19,20] Kobatake et al included in their study that in fact, many patients report a noticeable enhancement in their masticatory function over time, especially during the initial three to twelve months following the placement of their prosthetics. The choice of materials for crowns influences their functionality as well. Zirconia, renowned for its impressive strength and durability, is particularly suited for posterior molars that endure significant chewing pressures, though it must be polished correctly to avoid excess abrasiveness to neighbouring natural teeth. Porcelain-fused-to-metal (PFM) crowns have long been regarded as a durable option due to their robust metal substructure; however, they may present aesthetic challenges, such as visible grey lines at the gum line or porcelain chipping over time.[21,22] Pjetursson et al showed in their study that lithium disilicate (EMax) crowns are celebrated for their superior translucency, making them especially desirable for anterior teeth, although they are somewhat vulnerable to damage from intense biting forces. Research indicates that all-ceramic crowns, like zirconia and lithium disilicate, reduce stress on the crown while slightly increasing stress on the abutment, without negatively impacting nearby bone. Screw-retained crowns offer easier maintenance and lower risks of excess cement, which can lead to peri-implantitis. In contrast, cement-retained crowns are preferred for aesthetics in the anterior region but carry risks from undetected cement irritations. Patient satisfaction is notably higher with implant-retained overdentures compared to conventional dentures, due to improved speech, comfort, stability, and aesthetics. Additionally, the "satisfaction-performance paradox" can arise, where patients report high satisfaction despite only moderate improvements in masticatory efficiency.[23,24]

CONCLUSION

In this study, the authors conducted a thorough examination and evaluation of implant-supported prostheses featuring various crown materials, with a specific focus on their masticatory efficacy, designs, functionality, and overall impact on patient experience. The findings revealed that, for an optimal combination of strength, longevity, and aesthetics, monolithic zirconia stands out as the preferred choice due to its exceptional performance and durability, especially in posterior restorations. Conversely, lithium disilicate emerges as the leading material for aesthetic-focused applications in the anterior region, where visual appeal is paramount. Additionally, porcelain-fused-to-metal (PFM) is increasingly regarded as an outdated and less durable alternative in the realm of dental restorations. The authors emphasise the need for further research and studies to deepen our understanding of these materials and their implications for dental practice.

REFERENCES

1. Alexander R, Liu X. Soft tissue integration around dental implants: A pressing priority. Biomaterials. 2026;324:123491.
2. Rupapara R, Ravi A, Iyer S, Thomas DC. Implant Failures: Part 1. Dent Clin North Am. 2026;70(1):173-189.
3. Spitznagel FA, Balmer M, Wiedemeier DB, Jung RE, Gierthmuehlen PC. Clinical outcomes of all-ceramic single crowns and fixed dental prostheses supported by ceramic implants: A systematic review and meta-analyses. Clin Oral Implants Res. 2022;33(1):1-20.
4. Lawand G, Vera V, Nessif R, Gonzaga L, Martin W. Artificial intelligence facilitated smile design for the rehabilitation of a fully maxillary edentulous patient with a complete arch implant-supported prosthesis: A dental technique. J Prosthodont Dent, 202622(9) 15-20.
5. Chang CC, Chang J, Osborne A, et al. Emergence angles of posterior implant-supported fixed dental prostheses and their effect on peri-implant bone loss: A retrospective clinical study. J Prosthet Dent. 2026;135(2):340.13-20.
6. Couso-Queiruga E, Ramseier CA, Chappuis V, et al. Impact of Marginal Misfit in Implant-Supported Fixed Dental Prostheses on Peri-Implant Bone Levels: A Retrospective Quantitative Analysis. Clin Oral Implants Res. 2026;37(1):69-78.
7. Kowar J, Turri A, Stenport V, Stervik C, Barkarmo S. Comparison of Materials in Implant-Supported Partial Fixed Dental Prostheses: A Randomized Controlled Trial. Clin Implant Dent Relat Res. 2026;28(1):e70129.
8. Edalati R, Aref M, Abrego I, Ahmadi F, Nejat AH. The effect of occlusal morphology of implant-supported prosthesis, support configuration, and build angulation on the number of isolated islands in a 3D printing slicing software. J Prosthodont. 2026;35(2):201-209.
9. Silva JR, Leles CR, Moura-Neto LO, Brägger U, Schimmel M, Fonseca M. Three-Unit Prosthesis

Supported by a Single Implant With Two Cantilever Extensions in the Posterior Region (T-Bridge): Case Report With a 2-Year Follow-Up. Clin Case Rep. 2025;14(1):e71777.
10. He Z, Bennani V, Aarts JM, Choi JJE, Veerasamy A. Fit accuracy of 3D printed Co-Cr multiunit implant-supported fixed dental prostheses: A systematic review of in vitro studies. J Prosthet Dent. 2026;135(1):64.e1-64.e10.
11. Farawati FA, Nakaparksin P. What is the Optimal Material for Implant Prosthesis?. Dent Clin North Am. 2019;63(3):515-530.
12. Almudarris BA, Poonia PS, Mansuri AH, et al. Assessment of Patient Satisfaction and Oral Health-Related Quality of Life Following Full Mouth Rehabilitation with Implant-Supported Prostheses. J Pharm Bioallied Sci. 2024;16(Suppl 3):S2143-S2145.
13. Beri A, Pisulkar SG, Bansod A, Rauniyar S, Jain R, Deshmukh S. Full Mouth Rehabilitation With All-on-Six Concept With Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) Milled Bar Retained Zirconia Prosthesis. Cureus. 2024;16(8):e67465.
14. Iyer S, Annamma LM, Hassaan Rasheed M, Ahmed N. Dental Implant Failures: Part 2. Dent Clin North Am. 2026;70(1):191-208.
15. Albanchez-González MI, Brinkmann JC, Peláez-Rico J, López-Suárez C, Rodríguez-Alonso V, Suárez-García MJ. Accuracy of Digital Dental Implants Impression Taking with Intraoral Scanners Compared with Conventional Impression Techniques: A Systematic Review of In Vitro Studies. Int J Environ Res Public Health. 2022;19(4):2026.
16. Monteiro DR, Goiato MC, Gennari Filho H, Pesqueira AA. Passivity in implant-supported prosthesis. J Craniofac Surg. 2010;21(6):2026-2029.
17. Dellacasa P, Schiavon L, Menini M, Pesce P, Tomasi C, Bressan E. Prosthetic Emergence Angles and Implant Outcomes: A Retrospective Study With at Least 5 Years of Follow-Up. Clin Implant Dent Relat Res. 2026;28(2):e70127.
18. Lua ESP, Tan KBC, Lee FKF, Yee SHX, Wong KM, Tan MY. Comparison of 3D Accuracy of Conventional Cast Metal to Milled Zirconia Implant-Supported Full-Arch Fixed Dental Prosthesis Frameworks. Int J Oral Maxillofac Implants. 2026;41(1):53-60.
19. Rutkūnas V, Kuleš D, Akulauskas M, Auškalnis L, Gendvilienė I. Success and survival of full-arch implant-supported monolithic zirconia fixed dental prostheses fabricated using a digital workflow: A 2-year prospective cohort study. J Dent. 2026;165:106256.
20. Schoenbaum TR, Lin GH, Brunello G, et al. 1st Global Consensus for Clinical Guidelines for the Rehabilitation of the Edentulous Maxilla: A Single-Round Survey on the Number of Implants, Timing of Implant Placement, and Loading for Fixed Restorations. Clin Oral Implants Res. 2026;37 Suppl 30:S155-S165.
21. Kobatake R, Doi K, Oue H, Izumikawa T, Wakamatsu K, Tsuga K. Passive fit evaluation of implant superstructures by analyzing the accumulated screw tightening torque. Int J Implant Dent. 2026;12(1):6.
22. Yan Y, Liang C, Geng W, Lin X. Partial and Complete-Arch Implant-Supported Fixed Dental Prostheses in Fully Digital Workflow Using Neuromuscular and Jaw Tracking Systems. Int J Prosthodont. Published online February 13, 2026.
23. Pjetursson BE, Valente NA, Strasding M, Zwahlen M, Liu S, Sailer I. A systematic review of the survival and complication rates of zirconia-ceramic and metal-ceramic single crowns. Clin Oral Implants Res. 2018;29 Suppl 16:199-214.
24. Shrivastav M. Effect of surface treatments on the retention of implant-supported cement-retained bridge with short abutments: An in vitro comparative evaluation. J Indian Prosthodont Soc. 2018;18(2):154-160.

