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IMPLANT-PROSTHETIC REHABILITATION USING THE "ALL-ON-FOUR" TREATMENT CONCEPT: A CASE REPORT

ИМПЛАНТО-ПРОТЕТСКА РЕКОНСТРУКЦИЈА НА ПАЦИЕНТ СО КОНЦЕПТОТ "ALL-ON-FOUR": ПРИКАЗ НА СЛУЧАЈ

Paneva M.[1], Pavloski C.[1], Manevski P.[2], Dashtevski B.[3], Petkov M.[3], Mijoska A.[3], Janeva N.[3], Jurukovska Shotarovska V.[3], Lazov K.[4].

[1] PHI (Private Health Institution) Dental-Craft, [2]PHI (Private Health Institution) Decestudio, [3]Faculty of Dentistry, Skopje, University "Ss. Cyril and Methodius", Department of Dental Prosthodontics, [4]Public HI Institute of Transfusion Medicine of the Republic of North Macedonia

Abstract

The "All-on-Four" treatment concept is a contemporary approach to complete implant-prosthetic rehabilitation in edentulous patients, enabling the placement of a fixed prosthetic restoration within 24 hours. Compared to conventional complete dentures, this method offers faster rehabilitation, improved function, enhanced aesthetics, and a notable increase in quality of life. This case report aims to evaluate the clinical success of the "All-on-Four" concept for the immediate restoration of completely edentulous jaws, as well as to document a four-year follow-up after placement of the definitive prosthetic restoration. A 56-year-old patient with advanced periodontitis and severely compromised oral health underwent comprehensive clinical and radiographic evaluation, including 3D imaging (CBCT). The diagnosis revealed generalized chronic periodontitis with alveolar bone resorption and inadequate support for conventional implant placement. Given the patient's good systemic health and absence of contraindications, the "All-on-Four" treatment concept with immediate loading was indicated for both the maxilla and mandible. Four titanium implants (MIS C1) were placed in each jaw, followed by the immediate installation of a provisional fixed prosthesis. Follow-up evaluations were conducted at 1, 3, and 6 months, proceeding to the fabrication and placement of a definitive metal-ceramic prosthetic construction. The results indicate that the "All-on-Four" concept is a reliable and effective alternative for patients unsuitable for traditional implant therapy, providing excellent functional and aesthetic outcomes, a favorable long-term prognosis, and substantial improvements in overall quality of life. **Keywords:** "All-on-four" treatment concept,implant-prosthetic rehabilitation, immediate loading,quality of life.

Апстракт

Концептот "all-on-four" претставува современ терапевтски пристап за целосна имплантопротетска рехабилитација кај пациенти со тотална беззабост, овозможувајќи фиксна протетска конструкција во рок од 24 часа. Овој пристап нуди брза рехабилитација, подобрување на функцијата, естетиката и квалитетот на животот во споредба со конвенционалните тотални протези. Целта на овој приказ на случај, со употреба на all-on-four" концептот, е да се евалуира успешноста на реконструкцијата на целосно беззабите вилици со фиксна протетска изработка веднаш по имплантирањето како и да се направи следење на пациентката по поставувањето на дефинитивната протетска конструкција, во временски период од 4 години. Импланто-протетска рехабилитација беше направена кај пациентка на возраст од 56 години со напреднат пародонтит и значително влошена орална состојба. По клиничкиот преглед и 3Д радиографска анализа (CBCT), беше утврдена генерализирана хронична пародонтопатија со алвеоларна ресорпција и недоволна коскена поддршка за традиционална имплантолошка терапија. Поради добрата општа здравствена состојба и отсуството на контраиндикации за имплантирање, беше индицирана терапија со all on four концептот за двете вилици со имедијатно оптеретување. Поставени беа четири титаниумски импланти во горна и долна вилица (MIS C1). Контролни прегледи беа извршени по 1, 3 и 6 месеци, по што беше изработена дефинитивна конструкција од металкерамика. Резултатите покажуваат декаовој пристап претставува одлична и сигурна алтернатива за пациенти кои не се подобни за традиционално поставување на импланти, овозможувајќи висок степен на естетско задоволство, функција, одлична прогноза и значително подобрување на квалитетот на животот. **Клучни зборови:** All on four концепт, имплантопротетска рехабилитација, имедијантно оптоварување,квалитет на живот.

Introduction

The rehabilitation of completely edentulous jaws and the restoration of the stomatognathic system remain significant challenges in modern dentistry. The most commonly employed treatment for total edentulism is conventional complete dentures, designed to restore speech, mastication, and aesthetics. However, in patients with severe alve-

olar ridge resorption-particularly those with Class V and VI mandibular resorption[1], problems with prosthesis retention, stability, and support become considerably more pronounced.

Implant-supported overdentures represent an established therapeutic option for the rehabilitation of fully edentulous patients[2]. Within this context, the use of implant-supported fixed prostheses in individuals with advanced alveolar atrophy poses a substantial clinical challenge. Prosthetic design must balance patient expectations with anatomical limitations. Notably, many edentulous patients demonstrate a strong preference for fixed restorations over removable prostheses.

One of the most widely accepted protocols for fixed prosthetic rehabilitation in edentulous jaws is the "All-on-Four" concept. Regarding the number of dental implants utilized, Brånemark and colleagues conducted a 10-year longitudinal study demonstrating higher success rates in patients treated with four implants compared to those with six[3].

Originally developed by Maló and colleagues in the early 2000s[4], the concept is based on the strategic placement of four implants-two placed axially in the anterior region and two distally tilted posterior implants. This angulation, typically around 45 degrees[5], increases the anteroposterior spread, which in turn enhances prosthetic support and occlusal stability, especially in the first molar region, while limiting cantilever length.

Tilted implants offer several biomechanical and anatomical advantages: they permit the use of longer implants (increasing surface area and primary stability), reduce or eliminate cantilevers, expand the prosthetic base, and help avoid critical anatomical structures such as the inferior alveolar nerve, the mental foramen, and the floor of the maxillary sinus. Literature supports the efficacy of this approach, reporting high success rates and a low incidence of complications[6,7].

The objective of this case report was to evaluate the clinical success of immediate fixed prosthetic restoration using the "All-on-Four" treatment concept for the reconstruction of completely edentulous jaws, with a follow-up period of four years post-implantation.

Case presentation

A 56-year-old female patient with a documented history of advanced periodontitis presented for comprehensive oral rehabilitation due to severely compromised oral health (Figure 1). The patient expressed strong desire to restore both masticatory function and facial aesthetics, emphasizing with a clear preference for a fixed prosthetic solution. The patient reported longstanding dissatisfaction with partial removable dentures, which she had been using for several years.

Intraoral examination revealed partial edentulism in both the maxilla and mandibleThe remaining teeth had a poor prognosis, marked by Grade III mobility, periodontal pockets exceeding 6 mm in depth, and generalized gingival recession. Clinical findings, corroborated by cone-beam computed tomography (CBCT), confirmed a diagnosis of generalized chronic periodontitis accompanied extensive alveolar bone resorption and insufficient bone volume for conventional implant placement.

Given the patient's satisfactory general health and absence of contraindications for surgical intervention, full-arch rehabilitation using the "All-on-Four" treatment concept with immediate loading was proposed for both arches.

Figure 1. *Initial intraoral condition*

Surgical Protocol

The procedure was performed under plexus anesthesia using articaine with epinephrine 1:100,000 (Artinibsa 4%). Antibiotic prophylaxis was initiated with a single dose of amoxicillin-clavulanic acid (Alkaloid AD Skopje), administered one hour prior to surgery and continued for six days postoperatively. Corticosteroid therapy (Prednisolone, MERCK Healthcare KGAA, Germany; P&G Health Austria GmbH & CO OG) was prescribed in a tapering dosage (15 mg to 5 mg) from the day of surgery through postoperative day four.

All remaining teeth wereextracted atracumatically to preserve the existing bone structure. Following extractions,

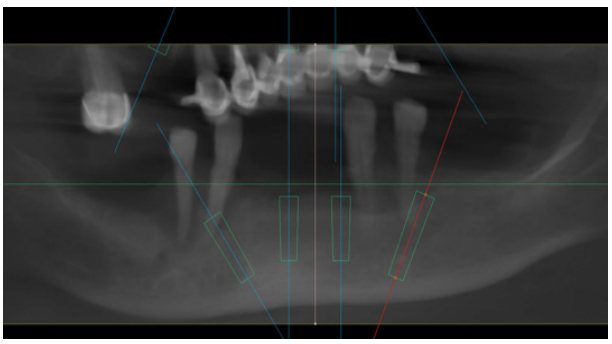

Figure 2. *Marking of four implant positions in the lower arch.*

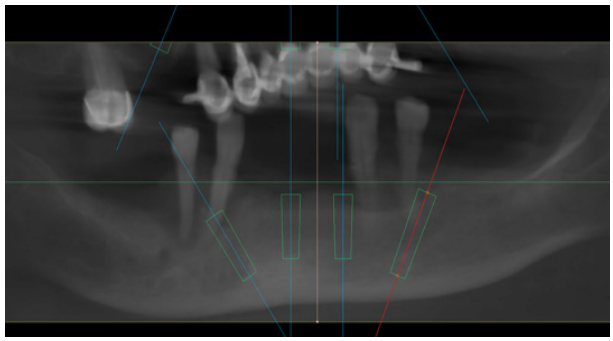

Figure 3. *Marking of four implant positions in the upper arch.*

meticulous curettage of the alveoli was performed to remove residual inflammatory tissue and establish a healthy foundation for implant placement. Full-thickness mucoperiosteal flaps were elevated to allow for osteoplasty and alveolar ridge leveling, thereby optimizing implant stability and ensuring proper prosthetic adaptation. Implant sites were then marked in both arches (Figures 2 and 3).

The anterior implants were placed axially in the lateral incisor/canine region, while the posterior implants were inserted at angulations of 30° to 45°, in the premolar foramen to avoid critical anatomic structures such as the maxillary sinuses and the mental foramen. A total of eight titanium implants (MIS C1) were placed—four in each jaw—with primary stability values exceeding 35 Ncm, thereby allowing for immediate loading.

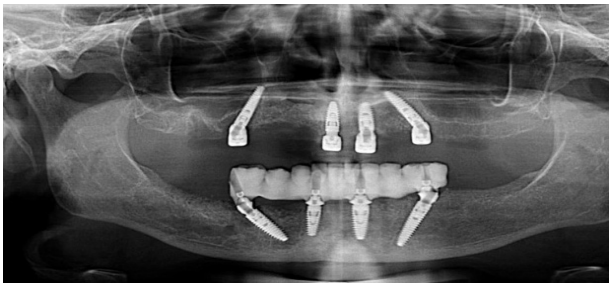

Figure 4. *Final placement of implants in the upper and lower jaw.*

Implants placed in the lower jaw: #45: C1 B+ 4.20 × 13 mm; #42: C1 B+ 3.75 × 10 mm; #31: C1 B+ 3.75 × 11.5 mm; #34: C1 B+ 3.75 × 16 mm

Implants placed in the upper jaw: #15: C1 B+ 3.75 × 16 mm; #11: C1 B+ 3.75 × 10 mm; #21: C1 B+ 3.75 × 10 mm; #24: C1 B+ 3.75 × 13 mm

Multi-unit abutments (MIS, Dentsply Sirona) were immediately connected to correct angulation and provide optimal prosthetic support. Open-tray impression copings were then secured using metal splints and self-curing acrylic resin. Final impressions of both jaws were taken

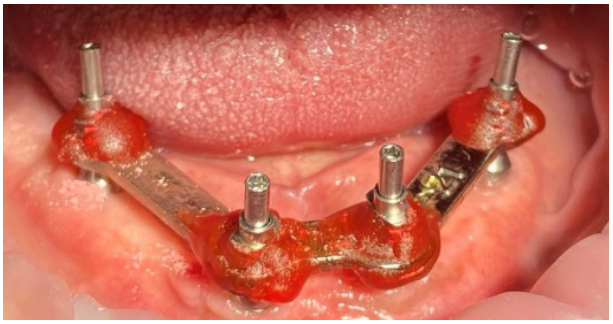

Figure 5. *Placement of transfers stabilized with metal framework and self-curing acrylic in the lower jaw. ??*

Figure 6. *Impression of the lower jaw using hydrocolloid silicone.*

(Figure 5) using hydrocolloid silicone material (Variotime, Kulzer) (Figure 6).

Prosthetic Workflow

Digital planning and design were completed using Exocad software (Figure 7). Upon approval, fabrication of the provisional restoration began.

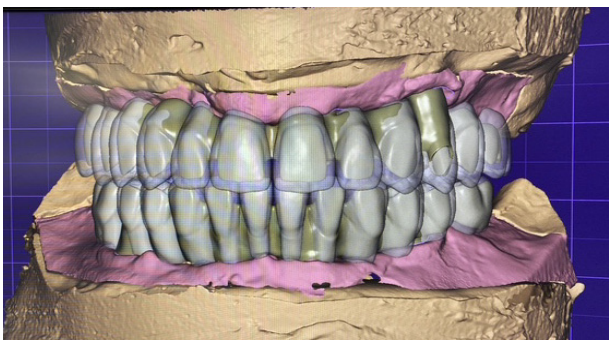

Figure 7. *Digital prosthetic design.*

The temporary restoration (Power Resins Temp, 3BFAB LLC) was 3D-printed using the DentaFab system and screw-retained on the same day, providing immediate restoration of both functional and aesthetics (Figure 8).

Figure 8. *Fabricated temporary restoration.*

Postoperative care management included the continuation of prescribed antibiotic and corticosteroid regimens, supplemented with analgesics (ibuprofen or paracetamol every 6 hours as needed). The patient was advised to perform oral rinse with 0.12% chlorhexidine and adhere to follow a soft diet for 6–8 weeks to minimize implant loading and support proper osseointegration. The initial follow-up appointment was conducted 7 days post surgery, while suture removal scheduled at 14 days. Further evaluations were conducted at 1, 3, and 6 months.

Definitive Prosthetic Rehabilitation

Six months post-implantation, final impressions were obtained, and stone casts were fabricated and scanned with a laboratory scanner. The diagnostic models of the provisional restoration served as reference to preserve established occlusal and aesthetic parameters. The definitive prosthesis was digitally redesigned in Exocad, and the framework was milled from a pre-sintered cobalt-chromium disc (KERA®-DISC, Eisenbacher Dentalwaren) (Figure 9).

Figure 9. *Milled metal framework for tht definitive prosthesis.*

A clinical try-in of the metal framework was performed to verify its passive fit on the abutments, with radiographic verification ensuring accurate adaption. The framework was subsequently veneered with ceramic (GC Initial® MC Classic Line) (Figures 10, 11, 12), achieving excellent aesthetic integration and a natural, lifelike appearance. The definite prosthesis was screw-retained, providing both long-term stability and ease of retrieval for maintenance. A follow-up panoramic radiograph was taken four years post-implantation confirmed the sustained stability of the prosthetic construction and successful osseointegration (Figure 13)

Figure 10.

Figure 11.

Figure 12.

Figure 10, 11, 12. *Definitive prosthesis in situ.*

Figure 13. *Follow-up radiograph four years post-surgery.*

Discussion

Dental implantology represents a major advancement in the treatment of partial and complete edentulism, significantly enhancing both oral health and overall quality of life[8]. In the presented case, four implants were strategically placed in each jaw, with biannual follow-up assessments conducted over a four-year . Throughout this time,no marginal bone resorption was observed, and occlusal contacts remained stable in maximum intercuspation. Implant-supported prosthetic rehabilitations have demonstrated exceptional efficacy in the management of complex edentulous cases[9]. However, such advanced treatments are often associated with increased financial costs when compared to conventional removable dentures. Furthermore, fully edentulous patients may be at risk for certain postoperative complications following implant placement[10].

The introduction of the "All-on-4" treatment concept represents a significant advancement in the prosthetic rehabilitation of edentulous patients. This approach maximizes optimizes the use of residual alveolar ridges in severely atrophied jaws, enabling immediate loading and rapid functional restoration. By minimizing the number of implants and eliminating the need for bone grafting, the "All-on-4" concept reduces surgical complexity, lowers overall treatment costs, and decreases the incidence of prosthetic complications commonly associated with full-arch restorations supported by multiple implants[11].

Compared to conventional removable prostheses, the "All-on-4" protocol delivers superior functional outcomes, enhanced aesthetics, and improved long-term predictability. Fixed implant-supported restorations notably improve patients' self-confidence and social interactions[12]. Conventional dentures often restrict masticatory function-particularly when chewing harder foods-whereas the "All-on-4" system provides complete functional rehabilitation[3].

While the initial financial investment may be higher, the long-term value of the "All-on-4" approach is significantly greater due to reduced maintenance requirements or replacement. Additionally, the elimination off bone augmentation procedures makes this treatment more accessible and cost-effective for a broader range of patients. Clinical evidence supports the use of fewer implants, which still yields highly successful outcomes[13], as confirmed in our case.

The long-term success of the "All-on-4" treatment concept relies heavily on careful patient selection, precise surgical planning, and a prosthetic design that ensures optimal occlusal load distribution[14]. In our case, strategic implant allowed for the cantilever extension to the first molars, achieving maximum occlusal contact without compromising stability-a result that remained consistent over the entire follow-up period[15].

Numerous clinical studies confirm the high success rate of this concept, which involves the placement of four implants-two anteriorly positioned axially and two posteriorly tilted implants. The posterior implants are strategically angulated to increase the anteroposterior spread, thereby enhancing prosthetic support and avoid vital anatomical structures, such as the maxillary sinus of the interior alveolar nerve[16].

Tilted implants provide several biomechanical advantages, including the ability to use of longer fixtures and reduce or eliminate cantilevers, both of which contribute significantly to prosthetic stability. Balshi et al.[17] demonstrated that angled and axially placed implants in the "All-on-4" configuration exhibit equivalent cumulative survival rates, reaching 97.3%.

Our clinical and radiological findings are consistent with these results: four years post-implantation, marginal bone levels remained within physiological limits, suggesting that tilted implants do not adversely affect peri-implant bone stress distribution[18].

Moreover, it is well documented that the longevity of implant-supported prostheses is heavily influenced by the distribution of functional load. Implant failure is often associated with inadequate occlusal design, which can result in excessive stress concentration and subsequent bone resorption. Therefore, occlusal scheme and load distribution are critical parameters for ensuring the long-term success of implant-prosthetic rehabilitation[19].

Conclusion

The presented clinical case highlights the efficacy and long-term stability of the "all-on-four" treatment concept affirming its role as a safe and predictable therapeutic option for patients with advanced periodontal disease and severe alveolar ridge resorption requiring fixed prosthetic rehabilitation. The applied protocol, which included immediate loading with a screw-retained fixed prosthesis, enabled rapid functional restoration and excellent aesthetic results within the first 24 hours of the surgical intervention.

Thanks to accurately established intermaxillary relationships and the controlled distribution of occlusal forces, the patient exhibited no signs of peri-implant inflammation throughout the follow-up period. Regular evaluations over a four-year period confirmed the long-term clinical success of the treatment, with the patient demonstrating optimalfunctional adaptation and reporting a high degree of satisfaction in both functional and aesthetic terms.

The "All-on-Four" treatment concept has thus proven to be a reliable and evidence-based alternative for patients who are not ideal candidates for traditional

implant protocols. Beyond delivering a functionally stable and aesthetically satisfactory fixed prosthetic solution, this approach significantly enhances patients' overall quality of life.

Consequently, the "All-on-Four" concept has become is increasingly regarded as a contemporary gold standard within the discipline of implant prosthodontics.

Reference

1. J. Patel, 1 RY Jablonski*1 and LA Morrow. Complete dentures: an update on clinical assessment and management: part 1. British Dental Journal.2018;1-8
2. Gaonkar SH, Aras MA, Chitre V, Mascarenhas K, Amin B, Rajagopal P. Survival rates of axial and tilted implants in the rehabilitation of edentulous jaws using the All-on-four™ concept: A systematic review. J Indian Prosthodont Soc. 2021; 21(1):3-10.
3. Grandi T, Signorini L. Rehabilitation of the Completely Edentulous Mandible by All-on-Four Treatment Concept: A Retrospective Cohort Study with Up to 10 Years Follow-Up. Medicine (Kaunas) 2021; 22:58(1)
4. Maló P, Rangert B, Nobre M. All-on-Four" immediate-function concept with Brånemark System implants for completely edentulous mandibles: a retrospective clinical study. Clin Implant Dent Relat Res. 2003;5 Suppl 1:2-9.
5. Ata-Ali J, Peñarrocha-Oltra D, Candel-Marti E, Peñarrocha-Diago M. Oral rehabilitation with tilted dental implants: a metaanalysis. Med Oral Pathol Oral Cir Bucal. 2012;17(4): e582-e587.
6. Resnik, Randolph R. Contemporary implant dentistry. Elsevier Inc. 2021
7. Bevilacqua M, Tealdo T, Menini M, Pera F, Mossolov A, Drago C, Pera P. 2011. The influence of cantilever length and implant inclination on stress distribution in maxillary implant-supported fixed dentures. J Prosthet Dent. 2011 Jan;105(1):5-13.
8. Fernández-Ruiz JA, Sánchez-Siles M, Guerrero-Sánchez Y, Pato-Mourelo J, Camacho-Alonso F. Evaluation of Quality of Life and Satisfaction in Patients with Fixed Prostheses on Zygomatic Implants Compared with the All-on-Four Concept: A Prospective Randomized Clinical Study. Int J Environ Res Public Health. 2021;18(7):3426
9. Siadat H, Rokn A, Beyabanaki E. Full Arch All-on-4 Fixed Implant-Supported Prostheses with 8.5 Years of Follow-Up: A Case Report. J Dent (Tehran). 2018; 15(4):259-265.
10. Papaspyridakos P, Chen CJ, Chuang SK, Weber HP, Gallucci GO. A systematic review of biological and technical complications with fixed implant rehabilitations for edentulous patients.Int J Oral Maxillofac Implants. 2012; 27(1):102-10.
11. Soto-Penaloza D, Zaragozí-Alonso R, Penarrocha-Diago M, Penarrocha-Diago M. The all-on-four treatment concept: Systematic review. J Clin Exp Dent. 2017; 9(3):474-488.
12. Att W, Stappert C. Implant therapy to improve quality of life. Quintessence Int. 2003; 34(8):573-81.
13. Duong HY, Roccuzzo A, Stähli A, Salvi GE, Lang NP, Sculean A. Oral health-related quality of life of patients rehabilitated with fixed and removable implant-supported dental prostheses. Periodontol 2000. 2022; 88(1):201-237.
14. Babbush CA, Kanawati A, Kotsovilis S, et al. A retrospective analysis of 800 Brånemark System implants following the All-on-Four protocol. Oral Implantol. 2014; 40(6):657-664.
15. Krekmanov L, Kahn M, Rangert B, Lindström H. Tilting of posterior mandibular and maxillary implants for improved prosthesis support. Int J Oral Maxillofac Implants. 2000;15(3):405-14
16. Kaya G, Bilmenoglu C. Accuracy of 14 intraoral scanners for the All-on-4 treatment concept: a comparative in vitro study. Adv Prosthodont. 2022; 14(6):388-398
17. Balshi TJ, Wolfinger GJ, Slauch RW, Balshi SF. A retrospective analysis of 800 Brånemark System implants following the All-on-Four™ protocol. J Prosthodont. 2014; 23(2):83-8.
18. Wang Q, Zhang ZZ, Bai SZ, Zhang SF. Biomechanical analysis of stress around the tilted implants with different cantilever lengths in all-on-4 concept. BMC Oral Health 2022; 22(1):469.
19. Bozyel D, Taşar Faruk S. Biomechanical Behavior of All-on-4 and M-4 Configurations in an Atrophic Maxilla: A 3D Finite Element Method. Med Sci Monit. 2021; 27: e929908.