ARTICLES SCIENTIFIQUES

Immediate Maxillary Full-Arch Rehabilitation Using the All-on-X FP1 Concept: Case report and Literature review

Réhabilitation maxillaire complète immédiate selon le concept All-on-X FP1 : A propos d'un cas et revue de la littérature

Sghaier Jihed [1,2], Ranym Jebali [1,3], Ommezine Moncef [1,3]

[1] *Université de Monastir, Faculté de médecine dentaire de Monastir, Service de Médecine Dentaire Hôpital Régional de Moknine*
[2] *Unité de recherche Maladies Bucco-Dentaire en Milieu Militaire, UR17DN04, Tunis, Tunisie*
[3] *Laboratoire de Recherche Santé Buccale et Réhabilitation Bucco-Faciale, LR12ES11, 5000, Monastir, Tunisie*

Abstract

Introduction: The All-on-X FP1 concept offers a minimally invasive, prosthetically driven solution for maxillary full-arch rehabilitation, aiming to preserve soft tissues while achieving natural esthetics. Digital technologies have enhanced planning accuracy and surgical predictability. **Methods:** A 55-year-old female with a hopeless maxillary dentition underwent a comprehensive digital workflow including intraoral scans, facial scans, CBCT analysis, and virtual implant planning. Six implants, four straight anterior and two posteriors tilted, were placed using a combined tooth and mucosa supported surgical guide. Immediate loading was performed with a digitally fabricated PMMA FP1 provisional prosthesis. **Results:** The immediate restoration demonstrated passive fit, excellent soft-tissue adaptation, and restored function. At three months, radiographic evaluation confirmed successful osseointegration and stable bone levels. The patient reported high esthetic and functional satisfaction with no biological or mechanical complications. **Discussion & Conclusion**: This case reinforces evidence that the All-on-X FP1 concept, when paired with digital planning and tilted implant strategies, provides predictable outcomes, high patient satisfaction, and reduced morbidity. Although technique sensitivity and patient related factors remain considerations, FP1 represents a reliable and effective modality for maxillary full-arch rehabilitation.

Key words : Full arch, guided, digital workflow, implants, immediate loading, Fp1

Résumé

Introduction : Le concept All-on-X FP1 offre une solution mini-invasive, guidée par la prothèse, pour la réhabilitation complète de l'arcade maxillaire, visant à préserver les tissus mous tout en obtenant une esthétique naturelle. Les technologies numériques ont amélioré la précision de la planification et la prévisibilité chirurgicale. **Méthodes** : Une patiente de 55 ans présentant une denture maxillaire sans pronostic favorable a bénéficié d'un flux de travail numérique complet incluant des empreintes optiques intra-orales, des scans faciaux, une analyse CBCT et une planification virtuelle des implants. Six implants, quatre droits en position antérieure et deux postérieurs inclinés, ont été posés à l'aide d'un guide chirurgical combinant un appui dentaire et muqueux. Une mise en charge immédiate a été réalisée au moyen d'une prothèse provisoire FP1 en PMMA fabriquée numériquement. **Résultats** : La mise en charge immédiate a montré une adaptation passive, une excellente intégration des tissus mous et une restauration fonctionnelle satisfaisante. À trois mois, l'évaluation radiographique a confirmé une ostéointégration réussie et des niveaux osseux stables. La patiente a rapporté un haut niveau de satisfaction esthétique et fonctionnelle, sans complications biologiques ni mécaniques. **Discussion et conclusion** : Ce cas confirme les données de la littérature selon lesquelles le concept All-on-X FP1, associé à une planification numérique et à des stratégies d'implants inclinés, permet d'obtenir des résultats prévisibles, une forte satisfaction des patients et une morbidité réduite. Malgré la sensibilité technique et les facteurs liés au patient, le FP1 représente une modalité fiable et efficace pour la réhabilitation complète de l'arcade maxillaire.

Mots clés : Réhabilitation implantaire complète, chirurgie guidée, flux numérique, implants, mise en charge immédiate, FP1

INTRODUCTION

All-on-X FP1 concept for maxillary full-arch rehabilitation is a predictable and safe treatment approach with high long-term success rates [1].

These restorations typically involve crowns or bridges supported by dental implants that only replace the crowns of the teeth and do not have any artificial gingiva [2]. These prostheses as potentially the closest restoration that can mimic the look, feel, and function of natural dentition. They are specifically designed to replace only the crowns of the teeth and promote soft tissue preservation [3].

Recent digital technological advances have allowed for any All-on-X full arch implant case to be digitally planned [4]. the workflow involves creating a "virtual patient" by combining digital records including intraoral scans, face scans, CBCT, digital tracking of the patient's own mandibular movements, and optical impression of implant positions [4]. The aim of this report is to present a therapeutic approach for full maxillary arch rehabilitation using the All-on-X FP1 concept. This report details the clinical decision-making process, treatment steps, and outcomes, providing insight into the management of similar cases.

CASE PRESENTATION

A 55-year-old female patient in good general health presented with functional and esthetic concerns related to her maxillary dentition.

She reported difficulty chewing and dissatisfaction with the appearance of her smile, expressing a desire for a fixed, immediate full-arch rehabilitation. Her medical history was non-contributory, with no systemic diseases, medications, or previous medical complications.

The pre-operative clinical examination showed several mobile maxillary teeth with extensive carious lesions and multiple retained root fragments, indicating a hopeless prognosis for the remaining dentition (Fig 1).

Figure 1 Pre-operative intraoral view

Radiographically, OPG and CBCT analysis revealed adequate anterior maxillary bone suitable for immediate implant insertion. However, the posterior maxilla exhibited significant sinus pneumatization and insufficient residual bone height, making conventional posterior implant placement impossible without advanced grafting (Fig 2, Fig 3).

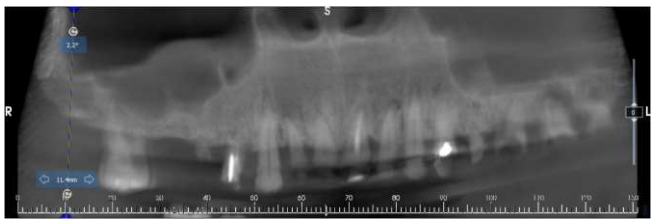

Figure 2 Panoramic radiograph (OPG) showing sufficient bone in the premaxilla and insufficient bone beneath the maxillary sinus.

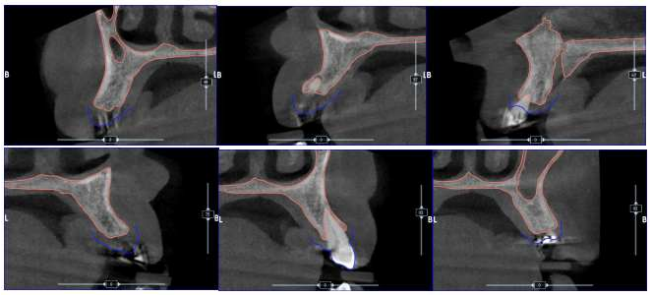

Figure 3 CBCT demonstrating favorable conditions for extractions and immediate implant placement.

These findings justified the selection of an All-on-X approach, using four straight anterior implants combined with two posterior tilted implants to avoid the sinus and achieve optimal AP spread.

A comprehensive digital workflow was implemented to plan the surgery.

The patient underwent intraoral scanning, facial scanning, digital occlusal registration, and smile design. A digital mock-up was created to preview esthetic and functional outcomes and to guide prosthetically driven implant placement (Fig 4).

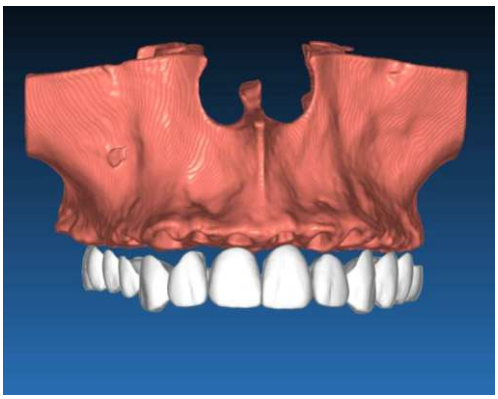

Figure 4 Digital mock-up

RealGuide® software was used for virtual implant planning, enabling precise positioning according to bone availability and prosthetic design requirements.
A combined tooth-supported and mucosa-supported surgical guide was fabricated through segmentation of the maxillary anatomy, allowing high stability during the procedure.
The preservation of selected teeth pre-operatively was intentional to enhance guide support.
On the day of surgery, the patient received premedication, followed by local infiltration anesthesia. The compromised teeth were extracted while maintaining the teeth needed for guide support (Fig 5).

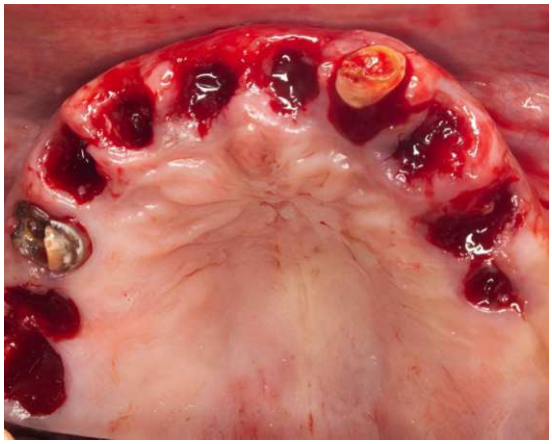

Figure 5 Post-extraction view showing removal of compromised teeth while preserving the teeth used to support the surgical guide.

The surgical guide was positioned and stabilized with fixation pins, and osteotomies were performed following the planned sequence (Fig 6).

Figure 6 Tooth- and mucosa-supported surgical guide stabilized with fixation pins

Four straight anterior implants (3.8 × 11 mm) and two tilted posterior implants placed at 17° (3.8 × 13 mm) were inserted according to the digital plan.
Multi-unit abutments were then connected to correct implant angulation and establish a suitable platform for immediate loading (Fig 7).

An immediate impression was taken using a pick-up technique, with splinted multi-unit transfers and a heavy–light silicone protocol (Fig 8).

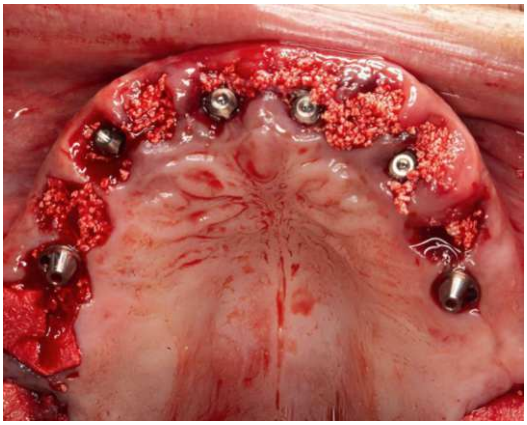

Figure 7 Implant placement and connection of multi-unit abutments.

Figure 8 Immediate impression, pick-up technique

After suturing the soft tissues and placing multi-unit protective caps (Fig 9), the impression was sent to the laboratory.

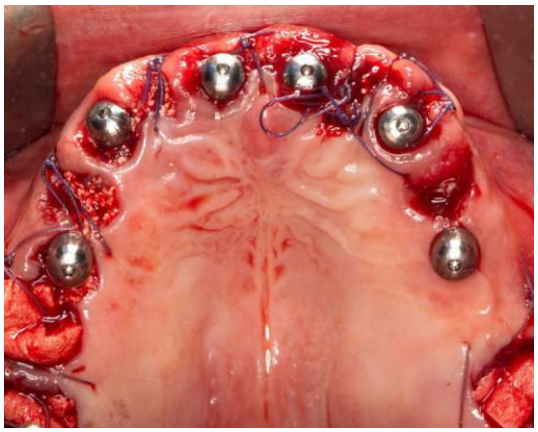

Figure 9 Multi-unit healing caps in place.

Within six hours, the laboratory delivered a screw-retained provisional FP1 prosthesis fabricated in Polymethyl methacrylate (PMMA) (Fig 10).

Figure 10 Laboratory-fabricated provisional prosthesis, milled in PMMA.

The immediate prosthesis, designed based on the validated digital mock-up, was installed on the multi-unit abutments, providing the patient with restored function and esthetics on the same day as surgery (Fig 11).

Figure 11 Provisional prosthesis in place, showing excellent papillary adaptation, proper support of the gingival contour, and passive fit.

Occlusal adjustments were performed according to the principles of balanced occlusion to minimize non-axial loading and protect the implants during the healing phase.

Post-operative instructions included a course of antibiotics, non-steroidal anti-inflammatory drugs, analgesics, and antiseptic mouth rinses.

The patient was advised to follow a strictly liquid diet and maintain meticulous oral hygiene. At the 24-hour follow-up, the patient exhibited no swelling or pain, and the provisional prosthesis showed excellent adaptation with stable and healthy soft tissues (Fig 11, fig 12) .

Figures 12, 13 Before-and-after comparison showing restored function, improved esthetics, and a satisfied patient.

The patient expressed high satisfaction with both esthetic and functional outcomes.

No complications were recorded throughout the treatment period.

An OPG follow-up at three months confirmed stable bone levels, good soft tissue health, and successful osseointegration of all implants (Fig 12).

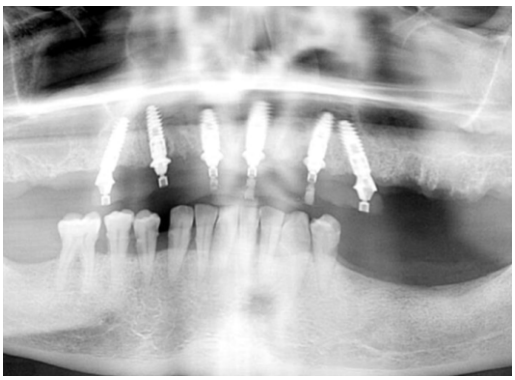

Figure 14 Panoramic radiograph at 3 months showing stable bone levels and stable implant

A definitive impression was made to begin fabrication of the final prosthesis, ensuring precise capture of the matured soft-tissue architecture and optimal prosthetic fit.

DISCUSSION

The All-on-X FP1 concept a highly effective treatment option for maxillary rehabilitation

M. Zaninovich et al., 2024 emphasizes that FP1 ceramic implant-supported fixed prostheses are designed to replace only the dental hard tissues and promote preservation and rehabilitation of gingival soft tissues. They note that "FP1" may be the closest prostheses the profession can offer edentulous patients that mimic the look, feel, and function of missing dentitions [4].

Several key differences emerge between the FP1 concept and traditional techniques for maxillary full-arch rehabilitation (FP3):

M. Zaninovich et al., 2024 explains that "FP-1 ceramic implant-supported fixed prostheses (CISFPs) are designed to replace only the dental hard tissues and to promote preservation and rehabilitation of gingival soft tissues." This contrasts with traditional approaches where prostheses often included artificial gingiva and denture base materials [4].

M. Zaninovich et al., 2024 notes that "early on in dental implant therapy, prostheses were generally made with cast metal frameworks, denture bases and denture teeth.

Prosthetic complications were widely reported." The FP1 concept utilizes advanced

CAD-CAM protocols that allow "stronger prostheses to be constructed in reduced or

small restorative volumes [4].

M. Zaninovich et al., 2024 emphasizes that FP1 designs focus on "identifying the level of papilla heights achieved with FP1 CISFPs," suggesting more natural gingival contours compared to traditional denture-like prostheses [4].

Multiple studies demonstrate robust clinical outcomes: P. Maló et al., 2019 reported a 94.7% implant survival rate with up to 13 years of follow-up, and marginal bone loss averaging just 1.18-1.67mm [5].

Stavros Pelekanos et al., 2023 recently introduced innovative approaches like translucent monolithic zirconia with titanium frameworks to enhance aesthetic and mechanical performance [6].

Stavros Pelekanos et al., 2023 highlights that the smooth, highly polished titanium surface with anatomic design can "limit food impaction, air and saliva leakage and contribute to overall biologic integration of FP1 full-arch prosthesis [6].

Tilted implants offer several significant advantages in maxillary full-arch rehabilitation:

Michael H Chan et al., 2015 explains that tilted implants allow "longer implants to be placed by tilting them posteriorly" while avoiding anatomical limitations [3]. M. Menini et al., 2012 notes that "tilting of the implants parallel to the anterior maxillary sinus wall may represent a feasible treatment option" and that long tilted implants (13 mm) placed in residual bone have been advocated to obtain high levels of initial primary stability, avoiding bone-grafting procedures [7].

P. Maló et al., 2005 describes how tilting of the posterior implants helps achieve good bone anchorage and large inter-implant distance for good prosthetic support [5].

Michael H Chan et al., 2015 identifies key biomechanical benefits including increasing in A-P spread, enhancing load distribution with cross arch stabilization, shorten cantilever [3].

M. Menini et al., 2012 explains that tilting can optimize the anterior-posterior spread of the implants to provide satisfactory molar support for a full fixed prosthesis of 12 masticatory units [7].

M. Del Fabbro et al., 2022 found in their systematic review that tilted implants demonstrate excellent survival rates, with cumulative implant survival rate of 93.91% over 3-18 years of follow-up [8]. M. Menini et al., 2012 reported no significant difference in failure rate between tilted and upright implants with failure rates of 2.19% for tilted and 1.89% for upright implants [7].

M. Menini et al., 2012 notes that tilted implant design eliminates or reduces the number of cantilever extensions generally seen with vertical implants to obtain the same number of masticatory units [7].

Immediate loading in maxillary full-arch rehabilitation is well-documented across multiple studies:

P. Maló et al., 2005 demonstrates that immediate function within 3 hours of implant placement is achievable with high success rates (97.6% survival at 1 year) [5]. D. van Steenberghe et al., 2005 reports that all patients received their final prosthetic restoration immediately after implant placement, that is, both the surgery and the prosthesis insertion were completed within approximately 1 hour [9].

S. Balshi et al., 2005 achieved a 99.0% immediately loaded implant survival rate and 100% prosthesis survival rate in their prospective study [10]. E. Agliardi et al., 2010 reported implant survival rates

of 98.36% in the maxilla and 99.73% in the mandible at 1 year with immediate loading [11].
G. Sannino et al., 2017 found that all participants were functionally and esthetically satisfied with their definitive restorations after 2 years functioning, with average VAS scores of 99.7 for masticatory function, 99.5 for phonetic function, and 99.2 for esthetics [12]. P. Maló et al., 2012 concludes that the immediate-function concept for completely edentulous maxillae using the present protocol is viable in the medium- and long-term outcomes with 93% patient-level and 98% implant-level survival at 5 years [5].
These studies consistently show that immediate loading provides patients with immediate function, high satisfaction, and predictable long-term outcomes while reducing overall treatment time and complexity.

Digital guidance plays a crucial role in modern maxillary rehabilitation, offering enhanced precision, predictability, and streamlined workflows:
D. van Steenberghe et al., 2005 pioneered the use of CBCT customized surgical templates and fixed prosthesis for flapless surgery and immediate loading, achieving 100% implant and prosthetic stability in their multicenter study [9]. Armando Lopes et al., 2017 demonstrated that computer-guided protocols using NobelGuide achieved a 94.5% implant survival rate at 7 years with precise implant positioning [13].
A. Pozzi et al., 2021 investigated advanced dynamic navigation guided surgery that integrates implant placement, soft and bone tissue sculpturing, and immediate delivery of navigation-guided complete-arch prostheses. This approach achieved 98.3% implant success and 100% prosthetic success rates, demonstrating that dynamic navigation was effective to deliver in the planned coordinates both implants and prosthesis [14].
C. Monaco et al., 2017 developed a fully digital technique for full-arch implant support rehabilitation using intraoral scanners to transfer provisional restoration parameters to definitive restorations. This workflow captured 3D implants positions, soft tissue architectures, occlusal relationships, correct occlusal vertical dimension and aesthetic features [15].
Michael Klein et al., 2023 reported on a novel digital system (NEXUS IOS) that achieved 100% implant survival and minimal complications at one year, demonstrating that digital workflows represent a viable solution for the restoration of completely edentulous patients [16].
Stavros Pelekanos et al., 2023 utilized digital workflows to design and mill precise prosthetic components, achieving "a rigid and passive joint with supporting implants through computer-guided planning [6].

Several limitations and potential challenges exist with the All-on-X FP1 concept for maxillary rehabilitation:
Patient-Related Risk Factors: P. Maló et al., 2019 identified significant risk factors including male gender (HR = 1.73), smoking (HR = 1.94), and age, which were significantly associated with implant failure and increased marginal bone loss [5]. Armando Lopes et al., 2017 found that "bruxing and smoking habits had a negative impact on implant failure, mechanical, and biological complications [13].
Mechanical Complications: P. Maló et al., 2019 reported a 58.8% incidence of mechanical complications for provisional prostheses, though this decreased to 7.3% for definitive prostheses [5]. Armando Lopes et al., 2017 found that 91 patients experienced complications in provisional prostheses, with issues ranging from prosthetic fracture to screw loosening, particularly in bruxers [13].
Material Limitations: Stavros Pelekanos et al., 2023 notes that "translucent zirconia for full-arch implant prostheses" has "reduced flexural strength and fracture toughness compared with high-strength opaque zirconia [6]. C. Larsson et al., 2010 reported superficial chip-off fractures in 34% of ceramic units at 3-year follow-up [17].
Evidence Quality Limitations: S. Patzelt et al., 2014 concluded that current evidence is limited by the quality of available studies and the paucity of data on long-term clinical outcomes of 5 years or greater [18]. Ana Messias et al., 2021 noted that "poor description of technical complications, adjustments, and maintenance and corresponding costs precluded a cost-effectiveness analysis [19].
Anatomical Constraints: M. Zaninovich et al., 2024 mentions that restorative space can have a major impact on prosthesis design and longevity" and that "aesthetic outcomes of FP-1 CISFPs are variable and depend on a multitude of factors [4].
Biological Complications: Armando Lopes et al., 2017 reported that 25 patients (22%) developed peri-implant pathology, highlighting ongoing

maintenance challenges [13].

These limitations emphasize the need for careful patient selection, meticulous technique, and long-term maintenance protocols.

CONCLUSION

The All-on-X FP1 concept has emerged as a highly successful, predictable, and evidence-based treatment approach for maxillary full-arch rehabilitation with compelling long-term outcomes. This concept represents a mature, evidence-based treatment paradigm that successfully combines immediate function, excellent aesthetics, high patient satisfaction, and predictable long-term outcomes. It has fundamentally transformed maxillary rehabilitation by providing a minimally invasive, highly effective alternative to traditional approaches, establishing itself as a gold standard for edentulous maxillary treatment.

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