



All-on-4 Implant Rehabilitation in Smokers vs Non-Smokers: A Narrative Review

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Abstract

The All-on-4 implant concept has become a widely accepted treatment modality for the rehabilitation of edentulous patients requiring full-arch fixed prostheses. This treatment approach utilizes four strategically positioned implants to support an immediate-loading prosthesis while minimizing the need for extensive bone grafting procedures. Smoking has long been recognized as a major risk factor affecting implant survival and peri-implant health. The purpose of this narrative review is to evaluate the current literature regarding clinical outcomes of All-on-4 implant rehabilitation in smokers compared with non-smokers. A PubMed-based literature review was conducted focusing on implant survival rates, marginal bone loss, peri-implant disease, prosthetic complications, and long-term prognosis. The available evidence suggests that smokers may experience increased biological complications and greater marginal bone loss compared with non-smokers. However, acceptable implant survival rates can still be achieved when proper treatment planning, maintenance protocols, and smoking cessation counseling are implemented. Despite the increased risks associated with tobacco use, the All-on-4 concept remains a viable option for full-arch rehabilitation in carefully selected smoking patients.

Keywords: All-on-4, smokers, dental implants, implant survival, peri-implantitis, full-arch rehabilitation, osseointegration.

Category

Narrative Review

I. Introduction

Edentulism significantly affects oral function, facial esthetics, speech, and quality of life. Conventional removable dentures have historically been used to restore edentulous arches; however, many patients experience dissatisfaction due to poor retention, instability, and reduced chewing efficiency. Implant-supported prosthetic rehabilitation has revolutionized the management of edentulous patients by providing improved stability, comfort, and patient satisfaction.

The All-on-4 concept, introduced by Paulo Malo and colleagues, consists of placing four implants to support a complete fixed prosthesis. Two anterior implants are positioned axially while two posterior implants are tilted distally to maximize bone support and avoid critical anatomical structures. This approach allows immediate loading and often eliminates the need for extensive bone grafting procedures.



Smoking is considered one of the most important systemic risk factors associated with implant complications and failure. Tobacco smoke contains harmful substances such as nicotine and carbon monoxide, which impair vascularization, reduce oxygen delivery, alter immune response, and negatively affect bone metabolism. These biological

effects may compromise osseointegration and increase the risk of peri-implant disease.

As the popularity of All-on-4 rehabilitation continues to increase, understanding the influence of smoking on implant outcomes is essential for clinicians and patients. This narrative review aims to summarize the current evidence regarding All-on-4



implant rehabilitation in smokers versus non-smokers, focusing on implant survival, marginal bone loss, biological complications, and prosthetic outcomes.

II. Methods and Materials

A literature review was conducted using the PubMed to identify studies related to All-on-4 implant rehabilitation and smoking.

The search strategy included combinations of the following keywords:

- “All-on-Four”
- “dental implants”
- “smoking”
- “smokers”
- “implant survival”
- “peri-implantitis”
- “full-arch rehabilitation”
- “marginal bone loss”

English-language articles published in peer-reviewed journals were included. Selected studies consisted of prospective clinical studies, retrospective analyses, systematic reviews, and meta-analyses evaluating implant outcomes in smokers and non-smokers.

Articles discussing implant survival rates, peri-implant disease, marginal bone loss, prosthetic complications, and long-term follow-up outcomes were analyzed descriptively.

III. Discussion

-Biological Effects of Smoking on Osseointegration

Successful osseointegration is fundamental for implant stability and long-term survival. Smoking negatively affects healing through vasoconstriction, impaired fibroblast activity, reduced collagen production, and compromised immune response.

Nicotine reduces blood circulation to oral tissues, limiting oxygen and nutrient delivery necessary for bone healing. Tobacco products also increase oxidative stress and inflammatory mediators, which may interfere with bone remodeling around implants.

These biological changes can compromise the integration of implants placed under immediate-loading protocols such as the All-on-4 concept.

-Implant Survival Rates

Several studies report high overall survival rates for All-on-4 rehabilitations in both smokers and non-smokers. However, smokers consistently demonstrate slightly lower survival rates and increased complications.

Research suggests that smokers are more likely to experience early implant failure during the healing

phase due to impaired osseointegration. Long-term implant survival may also be negatively affected by chronic inflammation and peri-implant bone loss. Despite these risks, many clinical studies still report survival rates greater than 90% among smokers treated with the All-on-4 concept, particularly when strict maintenance protocols are followed.



-Marginal Bone Loss

Marginal bone loss is a critical indicator of implant success. Numerous investigations have shown greater crestal bone loss around implants in smokers compared with non-smokers.

Smoking contributes to increased inflammatory response and altered bone metabolism, resulting in accelerated bone resorption. In All-on-4 rehabilitations, tilted posterior implants may experience additional biomechanical stress, potentially increasing susceptibility to marginal bone remodeling in smoking patients.



Regular radiographic monitoring is essential to detect early bone changes and maintain implant health.

-Peri-Implantitis

Peri-implantitis is characterized by inflammation and progressive bone loss around dental implants. Smoking has been identified as a major risk factor for peri-implant disease.



Smokers frequently demonstrate:

- Increased plaque accumulation
- Deeper probing depths
- Increased bleeding on probing
- Higher rates of soft tissue inflammation

The failure of a single implant in an All-on-4 prosthesis may compromise the stability and function of the entire restoration, emphasizing the importance of preventive maintenance in smokers.

-Prosthetic Complications

In addition to biological complications, smokers may experience mechanical and prosthetic complications such as:

- Acrylic tooth fracture
- Screw loosening
- Prosthetic fracture



- Occlusal wear

Although smoking may not directly cause prosthetic failure, the associated inflammatory changes and compromised supporting tissues can negatively affect long-term prosthetic stability.

-Smoking Cessation and Maintenance

Smoking cessation should be strongly encouraged before implant therapy. Studies suggest that reducing tobacco consumption before and after surgery may improve healing outcomes and decrease complication rates.

Important clinical recommendations include:

- Detailed informed consent
- Smoking cessation counseling
- Strict oral hygiene protocols
- Regular supportive periodontal therapy
- Long-term radiographic follow-up

Careful patient selection and maintenance are essential to improve long-term success rates in smokers undergoing All-on-4 rehabilitation.

IV. Conclusions

The All-on-4 implant concept represents a predictable and effective treatment modality for full-arch rehabilitation in edentulous patients. Although smokers demonstrate increased risks of peri-implantitis, marginal bone loss, and implant-related complications, acceptable long-term outcomes can still be achieved with appropriate treatment planning and maintenance.

Current evidence suggests that smoking negatively influences implant survival and peri-implant tissue health compared with non-smokers. Nevertheless, smoking should not necessarily be considered an absolute contraindication for All-on-4 rehabilitation.

Smoking cessation counseling, patient education, meticulous surgical protocols, and long-term follow-up remain critical factors in improving treatment success.

Further long-term prospective clinical studies are necessary to better understand the relationship between smoking and All-on-4 implant rehabilitation outcomes.

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