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FAILURE OF ALL-ON-4 FULL-ARCH REHABILITATION AND  
IMMEDIATE CORRECTIVE MANAGEMENT USING THE  
TECHNOLOGY OF THE STRATEGIC IMPLANT®:  
A FOUR-CASE SERIES

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## Failure of All-on-4 Full-Arch Rehabilitation and Immediate Corrective Management Using the Technology of the Strategic Implant®: A Four-Case Series

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## Abstract

**Background:** The All-on-4 / All-on-6 / All-on-x concept is widely used for fixed full-arch rehabilitation in edentulous or almost edentulous patients. Although it is often presented as a predictable immediate loading solution, the concept shows severe flaws in the clinical reality: Its biomechanical stability depends on only four / six supporting implants, and nevertheless, the implants are used in immediate functional loading. This limited number of support units represents one critical weakness among several: if one implant is incorrectly positioned, loses stability, or receives unfavorable occlusal loading, the entire prosthetic framework may become compromised, and a surgical corrective intervention will be necessary. This always raises the question who will bear the costs for this. Similar to any structure supported by only four main pillars, failure or overload of one support may affect the stability of the whole system. To make things worse, in the All-on-4 concept, the implants are pre-dominantly positioned in the anterior jaw, while the large amount of masticatory forces (90%) are seen in the distal jaw!



*Drawing 1: If we compare the All-on-4 concept to the construction of chairs (or cars), we see at one glance that this design will create mechanic problems (due to the unstable design), and biologic problems (due to the development of extreme stresses both in the bone and in the structure of the BIPS®).*

In full-arch implant rehabilitation, excessive anterior loading, off-axis forces, or poor load distribution may lead, after several months or years, to prosthetic fracture, implant instability, screw loosening, or peri-implant bone loss.

Peri-implant bone loss will occur in the All-on-4 concept just as often as it occurs always when traditional 2-stage implants are used. This case series presents four female patients with failed All-on-4/6 rehabilitations and their immediate correction using the technology of the Strategic Implant®.

**Case presentation:** Four patients, aged 50 to 76 years old, reported to the clinic for All-on-4 full-arch rehabilitation failure due to either the upper jaw or lower jaw. The failure of the restorations occurred within three months to one year post restoration placement. Complications included severe ridge resorption, failure of implant stability, biological implant site failure, soft tissue complications, aesthetic concerns, presence of a dark shadow visible through the soft tissue, and unfavorable biomechanical considerations.

**Case 1:** The case involved a female patient aged 56 years, who experienced failure in maxillary rehabilitation using All-on-4 technique, within nine months after reconstruction. Prior to that, an attempt was made for rehabilitation of both jaws, but the mandibular implants started failing progressively, one after another. At the follow-up examination, the

mandibular implants had already been removed, and the maxillary implants could not be used for prosthesis anymore, owing to excessive bone loss around implants and ridge atrophy. The maxillary implants and the sole destabilized mandibular implant were removed, followed by immediate reconstruction of both jaws using Strategic Implant®. The follow-up period was up to two years.

**Case 2:** In this case, the patient is a 76-year-old female who has had full-arch mandibular rehabilitation in the past using the All-on-6 technique. While she had a successful maxillary rehabilitation performed by the same dentist, her mandibular implants did not integrate well. In the post-operative period, she suffered from chronic pain especially in the left lower arch. Clinical examinations showed increasing mobility of the implants. Most of her mandibular implants were lost while only two remained at the time of intervention. These failing implants were removed and she underwent another immediate mandibular rehabilitation using eight Strategic Implant®. She received her fixed prosthesis after 72 hours. She felt satisfied with the results and her current follow-up period is 1.5 years.

**Case 3:** This case was an example of failure of mandibular implants in a 55-year-old female. The patient was rehabilitated by using implants nine months after surgery, but only nine months after prosthodontic placement, she started to suffer from excessive bone resorption, inflammation, and gingival recession, resulting in loss of implants. The patient experienced psychological distress owing to unanticipated bone resorption and treatment failure. One of the implants could not be removed apart from the prosthetic bridge during its removal, which indicated severe resorption of bone tissues due to loss of osseointegration. After removing the failed implants, ten Strategic Implant® were put into use. It has been one year since the treatment.

**Case 4:** In the fourth case, the patient was a 50-year-old man, former boxer with a history of failure of a maxillary All-on-4 rehabilitation after one year of wearing a rehabilitation device. In this case, the upper jaw showed severe atrophy with weak, poorly developed bone structures. All-on-4 therapy in this patient was performed using two pieces of straight implants rather than tilting the rear part of the teeth. As a result, the patient began

to lose all his implants, and all implants in the right half of the jaw were completely lost. On the other hand, there were only two implants retained on the left side. These implants were kept due to lack of alternatives since they had sufficient bone structure. These two implants survived mainly thanks to engaging the second cortical bone. Before this treatment, the patient wore removable dentures and then decided to use All-on-4 method for fixing his teeth. Strategic Implant® technology was applied during the treatment followed by a prosthesis of fixed titanium structures. Pseudo-class III malocclusion was detected. Follow-up period was two years.

In each of the above cases, the objective of the correction was to deal with the biomechanical inadequacy inherent in the previously used implant system design by providing additional anchorage sites for better distribution of loads. This was achieved by providing eight to ten implants depending on case requirements to achieve better load distribution and avoid overload of the remaining implants while avoiding dependency on compromised crestal bone.

**Conclusion:** These four cases prove the possibility of All-on-4 treatment failure if there are conditions of severe ridge resorption, two-piece implant design disadvantages, biological complications, loss of implant stability, and insufficient biomechanical load distribution. One of the key limitations of the All-on-4 technique is that only four implants serve as a support base; thus, if one implant becomes problematic for either biological or mechanical reasons, it will influence the whole rehabilitation process. Immediate revision treatment with the help of the new Strategic Implant® technology allowed overcoming all difficulties by involving cortical and basal bone regions and increasing the number of support elements. Clinical stability within 1.5 to 2 years after revision was noted in all cases. It can be concluded that successful implementation of an All-on-4 technique for full-arch restoration depends on many factors including proper diagnosis, support load distribution, correct implant selection, and biomechanics considerations.

**Keywords:** All-on-4 failure; full-arch reconstruction; Strategic Implant®; severe ridge atrophy; immediate loading;

cortical anchorage; load distribution; implant complications; case series.

## Introduction

Implant rehabilitation of the full arch has allowed achieving better results in treating the completely edentulous patients, offering fixed and aesthetically pleasing alternatives. Due to simplicity, All-on-4 concept was widely implemented in dentistry since it implies creating the full prosthesis with just four implants.

Nevertheless, decreasing the quantity of implants does not mean a reduction in biological or mechanical risks. In case of full-arch rehabilitation, all the components act as one construction, thus making it essential to consider bone quality, distribution of the implants, occlusal loads, and prosthetic construction.

A failure occurs due to various reasons, such as severe atrophy, inappropriate implant placement, poor prosthesis fit, uneven load distribution, and destruction of peri-implant tissues. Thus, the treatment should be aimed not only at repositioning implants but also at correcting the biomechanical concept altogether. The purpose of this case series is to demonstrate four failed rehabilitation cases

based on the All-on-4 technique and discuss possible corrective measures by means of the Strategic Implant® technology application.

## Case Presentation

### Case 1

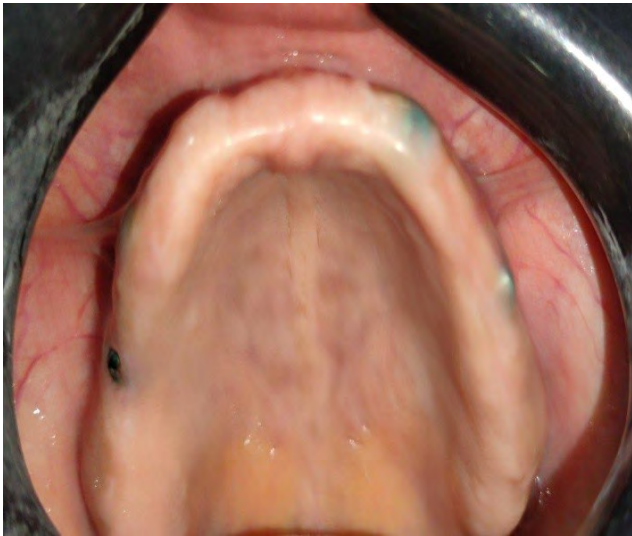
**Patient's information:** In this case, the patient is a 56-year-old female with failure of All-on-4 implantation treatment. In particular, this failure took place nine months after the surgery.

**Previous treatment:** In the initial course of action, the All-on-4 concept was used to provide complete-arch prosthetic rehabilitation of the maxilla. Four implants were placed to retain the maxillary prosthesis. However, attempts at rehabilitating the mandibular arch were not successful, as the mandibular implants failed progressively. When the patient presented herself again to the clinic, after nine months of the implant placement procedure, it was observed that the mandibular implants had already been lost. The maxillary implants were not appropriate any more to hold a fixed prosthetic restoration, due to significant bone loss around the implants.

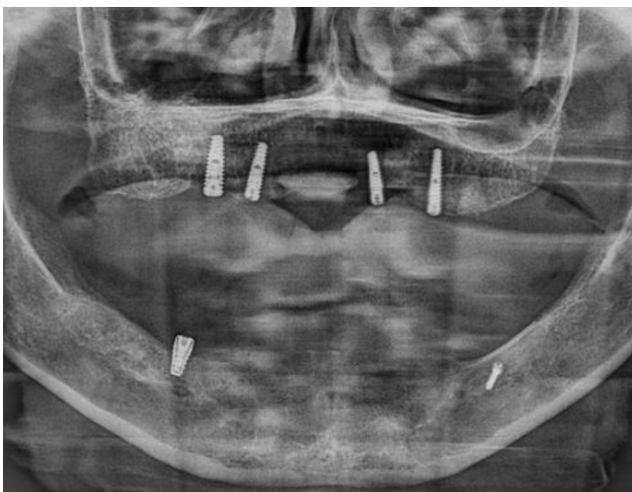
**Diagnosis based on clinical and radiological examination:** Examination was carried out on a clinical and radiographic level, which demonstrated that bone absorption had significantly progressed in both arches but was more severe in relation to the maxillary implants. At the time of the nine-month check-up, it was noted that all mandibular implants had been steadily failing, while the maxillary implants demonstrated poor stability.



*Fig. 1a: Preoperative view showing severe maxillary ridge resorption, reduced soft-tissue, and dark shadowing. The jawbone is extremely asymmetric.*

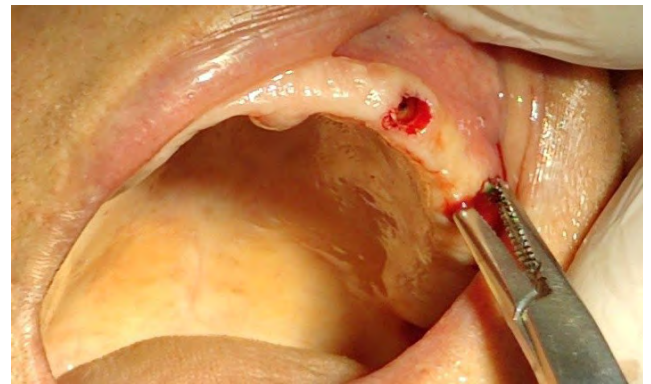


**Fig. 1b:** Preoperative maxillary view showing four All-on-4 implants with severe ridge resorption, soft-tissue compromise, and dark discoloration.



**Fig. 2:** Preoperative panoramic radiograph showing four maxillary All-on-4 implants in a severely horizontally resorbed ridge, with compromised implant distribution and reduced bone support before our corrective intervention.

**Complications:** Complications included instability of the implants, biological failure of the implant sites, soft tissue inflammation, impaired aesthetics, and lower predictability in the prosthesis construction process. The complications not only led to lost valuable treatment time but were also responsible for higher levels of patient anxiety due to unpredictable outcomes, mistrust towards the previous practitioner, economic pressures, and conflicts with the management at the previous institution.



**Fig. 3:** Intraoperative view showing removal of a failed maxillary All-on-4 implant from the severely resorbed ridge, with bleeding soft tissue indicating the compromised implant site.



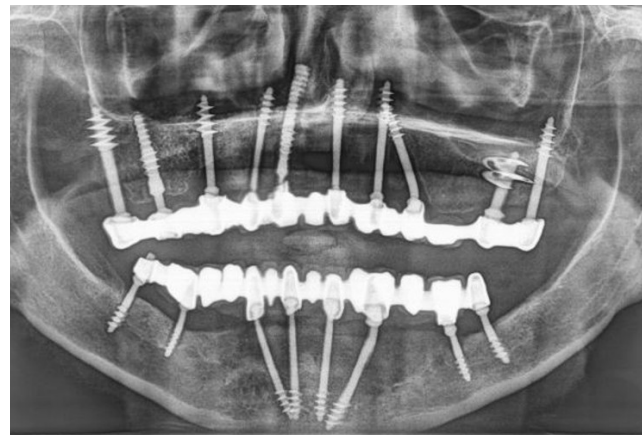
*Fig. 4: Post-removal intraoral view of the maxillary arch showing severe ridge resorption and soft-tissue healing after removal of the failed All-on-4 implants.*



*Fig. 5: Removed failed All-on-4 implant components showing biological contamination and loss of stability after explantation from the maxillary arch.*

**Intervention:** The maxillary All-on-4 restoration system and its related prosthetics were successfully removed. One compromised implant from the mandibular dentition was also surgically removed. An urgent rehabilitation plan was put in place using Strategic Implant® methodology in both the maxilla and mandible, targeting stable cortical and basal bone while bypassing crestal bone complications. A porcelain-fused-to-metal fixed prosthesis was fabricated and delivered.

**Result and follow-up:** Two years of follow-up since rehabilitation has seen that the patient's condition remains stable and functional.



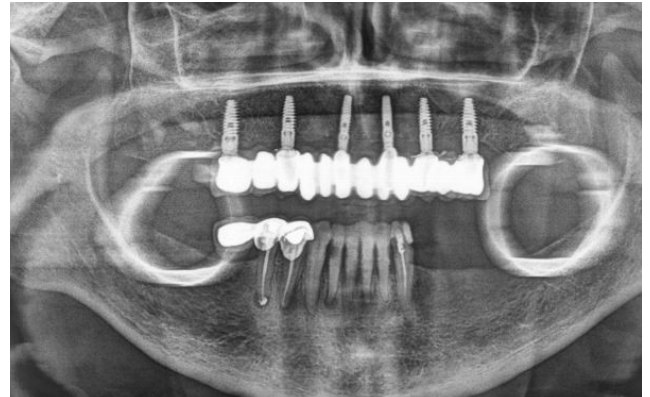
*Fig. 6: Postoperative panoramic radiograph showing immediate corrective full-arch rehabilitation of both jaws using the technology of the Strategic Implant®, with multiple cortical anchorage points and improved support distribution.*

## Case 2

**Patient's information:** Elderly female, 76 years old, seeking rehabilitation treatment due to the failure of All-on-4 implants in the mandible.

**Previous treatments:** The patient was treated for full-arch mandible rehabilitation using All-on-4 therapy. Even though maxillary rehabilitation was done successfully using the same dentist, mandibular rehabilitation did not succeed in obtaining stable osseointegration. In the six months following the procedure, the patient complained of experiencing constant pain on the lower jaw, especially the lower left region. Repeated checks revealed that there was increasing mobility of implants until eventually, most of the implants were lost naturally, with only two implants remaining in the right-side region.

**Diagnosis based on clinical and radiological examination:** Clinical examination has shown a failure of rehabilitation due to All-on-4 implants, which includes ridge resorption, unstable implants, biological complications, and insufficient prosthesis support in the mandible.



*Fig. 7: Preoperative panoramic radiograph of case 2 showing failed mandibular full-arch rehabilitation with six implants, before progressive implant loss and corrective intervention.*



*Fig. 8: Panoramic radiograph of case 2 showing failed mandibular All-on-4 rehabilitation before removal, with compromised implant support and inadequate distribution of load-bearing units.*



*Fig. 9: Panoramic radiograph of case 2 showing progressive mandibular implant failure, with most implants lost and only two remaining implants before immediate corrective rehabilitation.*

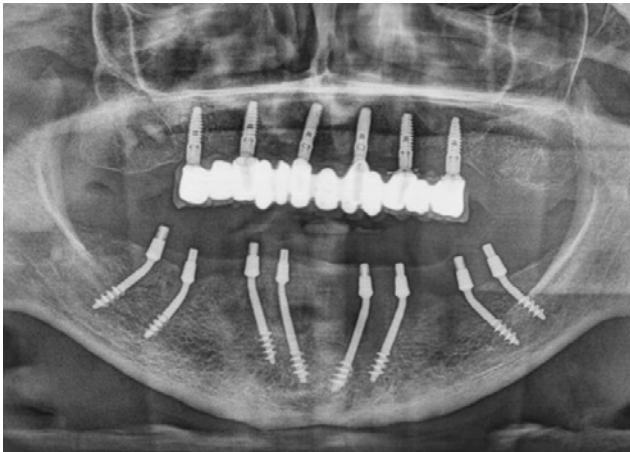


*Fig. 10: Intraoperative view of case 2 showing exposure and removal of a failed mandibular All-on-4 implant, with bleeding peri-implant soft tissue and compromised implant stability.*

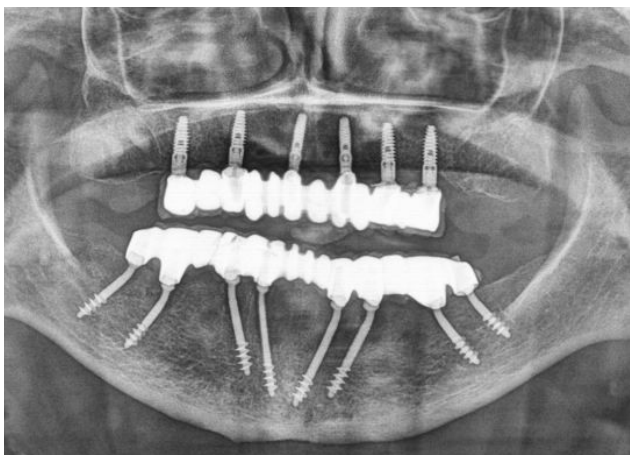
**Complications:** The complications were similar to those reported in Case 1 and consisted of biological failures of the implants, loss of stability of the implants, soft tissue problems affecting both aesthetics and function, as well as reduction in the dependability of the full arch prosthesis.

**Intervention:** Extraction of the mandibular All-on-4 implants that were not working properly was required. Management of the problem involved placing eight implants using the Strategic Implant® technique. This would ensure a greater number of supports, more cortical bone engagement, and distribution of biting force in the mandibular arch, followed by a porcelain-fused-to-metal fixed prosthesis that was fabricated and delivered within 72 hours. The patient was satisfied and comfortable after correction.

**Result and follow-up:** The present follow-up time is one and a half years. The rehabilitation of the mandible after correction has remained stable since then.



*Fig. 11: Postoperative panoramic radiograph of case 2 showing immediate mandibular rehabilitation with eight Strategic Implant®, providing wider cortical support and improved load distribution after removal of the failed All-on-4 system.*



*Fig. 12: Postoperative panoramic radiograph of case 2 showing immediate mandibular rehabilitation with eight Strategic Implant® and fixed prosthetic reconstruction after removal of the failed mandibular implant system.*

## Case 3

**Patient's information:** A 55-year-old female patient was referred with failed mandibular All-on-4 total-arch rehabilitation. The prosthetic restoration had been working properly for about nine months.

**Previous treatment:** This patient had mandibular full arch rehabilitation using the All-on-4 approach. The implants were done first, and the bridge was inserted following around nine months. Less than nine months from the insertion of the bridge, the patient had suffered massive bone resorption, bone collapse, inflammation, and implant instability, especially on the left side of the mandible where massive bone compression and collapse were noted. The patient had been emotionally stressed due to the ongoing bone loss that led to failure of the treatment. In the process of removing the bridge, one of the implants was loosened along with the bridge.

**Clinical and radiographic examination:** It showed failure of mandibular implant-supported rehabilitation due to severe ridge resorption, instability of implants, biological issues, and poor biomechanics.



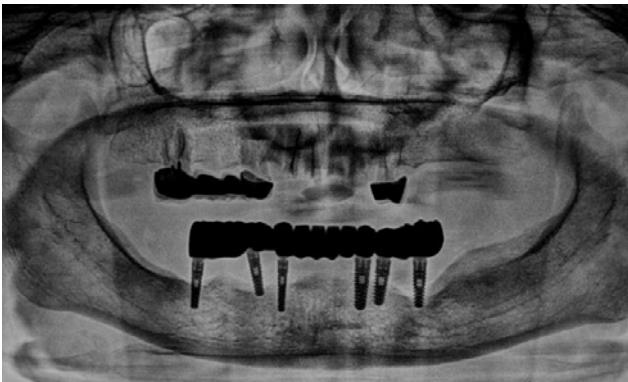
*Fig. 13: Clinical view of case 3 showing failed mandibular All-on-4 rehabilitation with exposed implant / abutment sites, soft-tissue inflammation, prosthetic instability, and peri-implant tissue compromise before corrective intervention.*



*Fig. 14: Close-up clinical view of case 3 showing peri-implant soft-tissue breakdown, exposed failing mandibular implant components, and prosthetic instability before corrective treatment.*



**Fig. 15:** Clinical view of case 3 showing multiple exposed failing mandibular implant components, peri-implant soft-tissue inflammation, and bleeding during removal of the failed All-on-4 system.



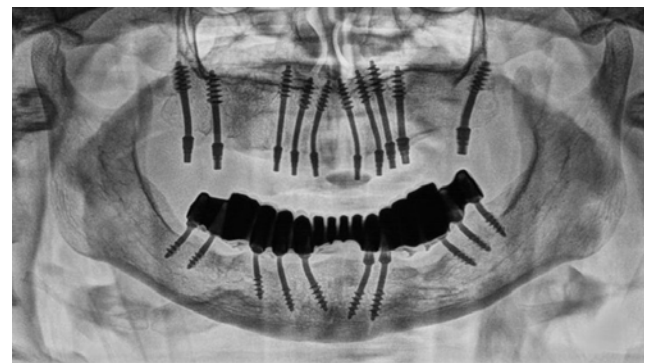
**Fig. 16:** Panoramic radiograph of case 3 showing failed mandibular All-on-4 rehabilitation with compromised implant support before removal and corrective intervention.

**Complications:** The identified complications involved biological failures, instability of implants, damage to peri-implant structures, limitations in function, and poor predictability of the prosthesis.

As was noted in previous instances, the limited use of only four implants could no longer ensure system stability.

**Intervention:** The existing four mandibular implants were removed, and ten new Strategic Implant® were installed. A greater number of implants allowed for the more even distribution of occlusal force and biomechanical stability for full arch reconstruction. A porcelain-fused-to-metal fixed prosthesis was fabricated and delivered.

**Result and follow-up:** So far, the patient has undergone one year of observation after the correction. The outcome of the procedure is clinically stable and ensures satisfactory function.



**Fig. 17:** Postoperative panoramic radiograph of case 3 showing immediate corrective rehabilitation with multiple Strategic Implant®, providing broader cortical anchorage and improved load distribution after failure of the mandibular All-on-4 system.

## Case 4

**Patient's information:** A 50-year-old male, a former boxer, presented with failure of a maxillary All-on-4 implant-supported restoration after one year of use.

**Previous treatment:** This patient had already received rehabilitation in the upper jaw on four implants All-on-4. The patient had been a professional boxer and the maxilla had suffered from very intensive reabsorption. The bone became very thin and weak. The previous rehabilitation was done with the help of two-part implants that were straight rather than modern tilted ones. Later, implants became more and more mobile until all implants placed in the right jaw had gone while in the left one two remained. The latter implants were saved due to lack of other bone to place implants. The stability of the implants seemed to be assured by the second cortical bone alone. The patient wore a removable prosthesis during the previous rehabilitation period before he got the fixed one.

## **Clinical and radiographic examinations:**

Failure of the maxillary implant-supported restoration was found along with alveolar ridge atrophy, absence of implant stability, biological complications, and deficient implant-supported structures.

**Complications:** The significant problems involved extensive resorption of the maxillary ridges, very thin and frail residual bone, increased mobility of the straight two-piece implants, as well as the failure of the right side implants. The two remaining implants on the left side were relatively stable but seemed to be dependent mostly on second cortical anchorage. The rehabilitation problem also led to lack of support, poor esthetic appearance, pseudo-Class III relationship as a result of maxillary collapse, as well as removable prostheses before rehabilitation.

**Interventions:** The failed rehabilitation of the maxilla through All-on-4 was radiologically and clinically reevaluated. The non-functional mobile implants were extracted if necessary, but the two remaining implants on the left side were retained due to a lack of adequate supporting bone and their interaction with the second cortical bone.

The correction treatment was done by applying the Strategic Implant® technology. Titanium prosthesis was constructed and applied in order to address the severe maxillary atrophy and instability in the pseudo-Class III.



**Fig. 18:** Preoperative panoramic radiograph of case 4 showing failed maxillary All-on-4 rehabilitation with severe ridge resorption and reduced implant support before corrective intervention.

**Result and follow-up:** The improvement of fixed prosthetic stabilization and function was accomplished through the use of corrective rehabilitation technology with the Strategic Implant® and placement of acrylic- fused-to-titanium frame prosthesis. This allowed the patient to gain improved function and stabilization even with the presence of severe collapse in the upper jaw region.

Clinically, the prosthesis retained its stability during the follow-up of two period, with no loss of support from the corrective implant.



**Fig. 19:** Postoperative panoramic radiograph of case 4 showing immediate maxillary corrective rehabilitation using the technology of the Strategic Implant®, with broad cortical anchorage and improved distribution of support after removal of the failed All-on-4 system.



**Fig. 20:** Corrective maxillary prosthetic bridge supported by eight Strategic Implant®, showing the final prosthetic framework after replacement of the failed All-on-4 system.



**Fig. 21:** Clinical view of case 4 showing the corrected maxillary prosthetic rehabilitation after replacement of the failed All-on-4 system with an implant-supported prosthesis on eight Strategic Implant®.

Case 1	Case 2	Case 3	Case 4
56 / Female	76 / Female	55 / Female	50 / Male
Maxilla	Mandible	Mandible	Maxilla
Maxillary All-on-4 rehabilitation	Mandibular All-on-4 rehabilitation	Mandibular All-on-4 rehabilitation	Maxillary All-on-4 rehabilitation
Failure of maxillary All-on-4 with one additional failing mandibular implant	Failure of mandibular All-on-4	Failure of mandibular All-on-4	Failure of maxillary All-on-4
Severe ridge resorption, loss of implant stability, biological complications, soft-tissue compromise, aesthetic dark shadowing	Severe ridge resorption, lack of implant stability, biological complications, compromised prosthetic support	Severe ridge resorption, loss of implant stability, biological complications, soft-tissue breakdown, prosthetic instability	Severe ridge resorption, lack of implant stability, biological complications, compromised maxillary support
Biological, aesthetic, functional, psychological, and financial complications	Biological and biomechanical complications	Biological, soft-tissue, and prosthetic complications	Biological, aesthetic, and biomechanical complications
Removal of failed maxillary All-on-4 system and one mandibular implant; immediate rehabilitation of both jaws using the technology of the Strategic Implant®	Removal of failed mandibular All-on-4 implants; immediate placement of eight Strategic Implant®	Removal of failed mandibular implants; immediate placement of ten Strategic Implant®	Removal of failed maxillary implants; immediate placement of eight Strategic Implant®
Engagement of stable cortical and basal bone with broader support distribution	Increased mandibular support units and improved load distribution	Increased mandibular support units with wider cortical anchorage	Increased maxillary support units with improved biomechanical distribution
2 years	1.5 years	1 year	2 years
Clinically stable after correction	Clinically stable after correction	Clinically stable after correction	Clinically stable after correction

**Table 1: Comparative Summary Table.** Based on this comparison, it is evident that the four mentioned failures occurred over a relatively short functional period ranging from three months to one year and mostly occurred due to extreme ridge resorption, instability of implants, biological problems, and inadequate biomechanical support. In each case, timely intervention using Strategic Implant® technology provided better anchorage of bone and efficient load distribution.

For all four cases, the period of time during which the failure occurred was relatively short; it ranged from three to twelve months. This short period shows that osseointegration has not happened, before the osteolysis started. According to Derks et al<sup>11</sup>, "osseointegration" is the pre-requisite for the development of peri-implantitis, i.e. implants which fail so early have never been osseointegrated. Peri-implantitis occurs two to three years after placement. Fast track periimplantitis occurs if five or more traditional implants are placed into one jaw and used in an immediate functional loading protocol<sup>12</sup>. This limitation does not apply for Corticobasal® implants (or the Strategic Implant®) even is used in immediate functional loading where Periimplantitis is known to never occur<sup>13-17</sup>.

The method used for correction of All-on-4/6 cases included a re-analysis of the failed biomechanics, removal of any malfunctioning parts, installation of the Strategic Implant®, and redistribution of occlusal forces using extended anchorage bases.

## Discussion

From the presented case series, it follows that observed failures might be due to several factors: ridge resorption, poor implant stability, improper positioning of implants, biological complications, and incorrect distribution of loads resulting in overloaded bone. As the prosthesis is supported by just four to six implants (often placed in unfavorable positions) because bone for this type of implants (old fashioned, osseointegrated implants) gets overloaded, which leads to instability and failure of the case as such.

Biological factors consisted of soft tissue inflammation, problems associated with peri-implant tissues, crestal bone loss, lack of osseointegration, and implant mobility. Mechanical issues included unfavorable load transfer, instability of prosthesis, screw loosening, and overload affecting a limited number of supporting implants. As a result, tremendous amounts of jawbone get melted away.

As a rule, application of two-part systems in the severely resorbed bone shows low reliability. Under immediate loading and off-axis loading, the connection between the implant and abutment may cause movement, bacterial infection,

and mechanical instability. Immediate correction of the case series was possible since the new treatment strategy did not depend on resorbed crestal bone. The implementation of Strategic Implant® allows for utilizing areas of stable cortical and basal bone. By adding additional units, occlusal loads are distributed evenly between a larger number of implants. The main lesson that one learns from the discussed case series is the fact that planning of full-arch implantation needs to take into account the bone condition, implantation pattern, design of the prosthesis, and occlusal loads rather than popularity of specific treatment protocols. Removal of unstable elements and biomechanical correction will prevent the situation from aggravating further.

## Conclusion

Failure of the All-on-4 procedure may be caused by several reasons: poor prognosis due to insufficient ridge volume, unstable implants, unfavorable positions of implants, inadequate design of prosthetic restoration, biological complications, or unequal load distribution. Biological, mechanical, aesthetic, psychological, and financial consequences may be

associated with treatment failure. The main biomechanical disadvantage of All-on-4 involves four-point fixation, which means that this method of rehabilitation relies on a potential “single point of failure.” Once a particular implant becomes unstable or subjected to excessive load, all the other components may become dysfunctional. Similar to a building standing on four main pillars, a failure at a certain point can affect the entire construction. Unfavorable distribution of occlusal loads, especially in case of a nonparallel axis or the anterior region, may result in prosthetic fractures, screw loosening, unstable position of implants, and gradual peri-implant bone loss. The use of additional supports and implants, such as eight or ten implants where needed, will help distribute the loads more evenly and reduce excessive pressure on the implants. Immediate correction of the problem using Strategic Implant® technique may prove to be a feasible way out in the selected cases by involving both cortical and basal bone structures. Full-arch rehabilitation must be based on thorough diagnosis, proper implant selection, appropriate force distribution, and efficient handling of any failures.

## Patient Perspective

The patients complained about various forms of dysfunction, appearance problems, psychological issues, and cost-effectiveness issues following the unsuccessful All-on-4 treatments in the past. The significant issues included difficulty in eating, unsatisfactory appearance, anxiety, wasted time, costs, and lack of trust in the previous procedure. After the problem was solved using the Strategic Implant® system, they appreciated better comfort, superior functionality, higher stability, and better self-confidence.

## Informed Consent

Written informed consent was obtained from all subjects in relation to the presentation of their clinical data, radiographs, intraoral images, and treatment results. Personal identifiers were deleted to ensure confidentiality and privacy.

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