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The All-on-Four Treatment Concept in Implantology- A Review

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Abstract

Generally, a complete edentulous arch requires 5-7 implants. This is not possible always because of biologic or economic factors. Such scenario pivots the need for treatment by All-on-4 concept. Though, biological, and mechanical complications can arise due to reduce implant support, but the success rates are quite satisfactory. This article describes the All-on-4 concept in general. This concept is mainly indicated to maximize the use of available alveolar bone and to allow for immediate function. It greatly increases patient's satisfaction.

Keywords: Implants; Full mouth rehabilitation; Prosthesis

Introduction

The "All on four" treatment concept is used for full mouth rehabilitation in complete edentulous arch with either a denture or bridge supported by four implants [1]. In the early concept by Branemark, it was stated that use six implants in a mandible with sufficient ridge and 4 implants in severely deficient alveolar ridge [2]. The two anterior implants are placed axially and remaining two posteriors are angled and placed distally to minimize cantilever and aid in mastication. In addition, the posterior angulation also prevents implant's interference with mandibular nerve in lower arch and maxillary sinus in upper arch [3]. Nobel Biocare was amongst the first company to identify the evolution of All-on-four technique for full mouth rehabilitation.

Procedure

Enhance primary stability

During immediate rehabilitation, specific procedure was followed to enhance primary stability of implants. First, there should be under-preparation of bone during site preparation which depends on the quality of bone seen during initial drill. This prevents the placement of implant into cortical bone. Second, the final torque should be between 30-50 Ncm. Optimum Torque is necessary for Osseo-integration. Third, the minimum height of 8 mm and width of 5mm is recommended. This allow placement of standard implant which is necessary to support the prosthesis [3].

Initial preparation

To relieve the flap, a distal vertical incision is recommended along with crestal incision [4]. A computer-designed prosthetic splint was also used sometimes while performing a guided surgical approach in a flapless technique [5]. Some authors even suggested to make a window to locate mesial maxillary sinus wall and to reach

mental foramen as a safety measure in the maxillary and mandibular jaw respectively [6].

Distal implant angulation

Many authors suggested to angle implant by 30 degrees in the posterior region. And sometimes even by 45 degrees to safeguard anatomic structures [7]. This also reduces cantilever and prevents dislodgement of the prosthesis.

Torque

The insertion torque suggested is between 25 to 50 Ncm. Majority of studies suggested torque between 32 to 37 Ncm [8]. If the tightening torque is not achieved, then it is recommended that one provides a conventional healing phase of 3-6 months for Osseo-integration.

Length and Width

The average length is 10 mm with shortest of 7 mm (95.4% survival rate) and longest of 18mm is reported [9]. The average diameter suggested is 4 mm with smallest of 3.3.mm and widest of 5 mm is reported [10]. Standard recommendations for optimum length and height should be followed.

Surgical technique

A conventional or a guided surgery can be performed. In the conventional procedure, a flap is raised, and implants are placed with the help of a standard All-on-4 guide. Whereas, in the guided technique a flapless approach is used. Treatment is planned mainly by 3D diagnostics. A surgical template is custom fabricated to correctly drill and place implants [11]. It is more accurate but requires more time to plan the procedure. The advantage is that it reduces the chance of morbidity.

Prosthetic consideration

Zirconia crowns and acrylic resin prosthesis with a titanium framework are acceptable. For prosthetic abutment, straight and 17 degree angulated multiunit abutments were constructed for anterior implants to compensate lack of parallelism. On the other hand, 30-degree angulation was preferred for distal implants [12]. The interferences in excursive dynamic movements were treated by creating centric and lateral contacts within the inter-canine region. Thus, securing mutually protected occlusion.

Discussion

The ill-fitting complete denture can result in soreness and atrophy of the jaws which is a discomfort to the patients [13]. The all-on-four concept offers comfortable solution for patients with atrophic jaws. The immediate implant-support restoration provides patient greater satisfaction. The outcome is better quality of patient's life [14]. In the study of Lopes et al., difficulty in doing surgery was classified based on a score- low (residual ridge of > 5mm), moderate (irregular residual ridge of 4-5mm) and high (irregular residual ridge of < 4mm) [15]. The under drilling of implant site does enhance the insertion torque by preventing counter sinking to maximize stability of the implant. Biologically, this approach is justified because mechanical stimulation around a newly placed implant modulates the release of bone mediators [16]. Indiscriminately and immediately loading of dental implants is not always favourable because of unfavourable stress distribution and non-favourable cellular response during initial healing phase in un-splinted implants like in over dentures or partial fixed dental prosthesis [17]. Furthermore, high torque during insertion of implant at an under drilled site which is commonly used for immediate loading can reduce crestal bone-to-implant contact during initial healing phase [18]. To reduce the chance of patient's morbidity, flapless surgery with the use of prefabricated customized guides are used. This makes the surgery more accurate and avoids interference with anatomical structures [19]. Primary stability is extremely important for osseointegration which can be achieved by greater insertion torque. For this splinting is recommended during a full arch restoration with immediate loading [20]. On contrary, extra high insertion torque can lead to wearing on the implant surface and cause a foreign body reaction because of titanium debris and ions that are emitted from the implant surface [21].

Complications

Mechanical complications

The fracture of acrylic prosthesis is the most frequent complication. Fracture is most often seen when opposing arch has natural dentition. This is due to greater force by patients during mastication as well as abrasive nature of enamel or ceramic crown or bridge in the arch. In addition,

full arch implant supported prosthesis has higher chance of fracture due to lack of proprioception [22].

Biological complication

Peri-implantitis is a frequent complication which is commonly seen because of poor of oral hygiene maintenance by the patients [23].

Conclusion

The all-on-four treatment concept had overall great success rate of more than 98% at 24 months follow up. The window technique to locate anatomic structures allows adequate implant insertion and safeguards sinus and nerve. To attain primary stability and to prevent countersinking of implant in cortical bone the implant bed was under-prepared. It is recommended to use guided surgery to ensure proper positioning and inclination of distal implants. Acrylic fracture and peri-implantitis are the complication of all-in-four implant treatment. Furthermore, there is a need for more follow-up studies to determine the effectiveness of all-on-4 implant concept.

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