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Minimally invasive Approach dental implant

In recent decades, Most oral health-related therapies have shifted to minimally invasive treatments in recent decades.

The tendency to perform standard yet minimally invasive therapies in implantology is increasing day by day.

In the past, implantation with a large diameter and long length was considered the best treatment, but today choosing the dimensions of the implant and their position based on the anatomical condition of the jaw is a more appropriate solution, especially in severely deformed jaws (1).

Suppose we want to define minimally invasive treatments in implantology.

In that case, it is better to say:

Any therapy that extends from preventing bone grafts and preventing morbidities such as pain, swelling, bleeding, or surgery time is better considered a minimally invasive approach to implant treatment.

In addition to implant surgery, this view is also used in implant prosthetics, which mentions immediate loading, which reduces the patient's waiting time.

There are several ways to achieve the goals of minimally invasive treatments, which we will address in this article:

One of the features of this view is the patient-related outcome and focus on **patient satisfaction** and **preference**.

- 1) **Narrow implants**
- 2) **Short implants**
- 3) **Osseodensification**
- 4) **Minimally invasive perspective in maxillofacial reconstruction treatments.**
- 5) **Flapless implantation.**
- 6) **Usage of magnifications in implant treatments.**

Narrow Implants

Today, the use of narrow implants in the world of Implantology is increasing.

Narrow implants have 3 main categories:

1) diameter less than 2.5 mm, which are mostly used in areas of single teeth that have no pressure on them and are also used in some cases to support temporary prostheses.

2) Implants with a diameter of 2.5 to 3.3, which like the previous group, are used in single teeth and non-load bearing areas and can also be used to support permanent dentures.

3) Implants with a diameter of 3.3 to 3.5 that can be used in areas with medium pressure (2).

Patients' satisfaction with the use of narrow implants is about 87%, and their survival rate in clinical studies has been reported to be about 90-100% (3).



Narrow implants can be helpful in cases where the mesiodistal width of the edentulous area is small, as well as in cases where the buccolingual width of the bone is reduced due to bone resorption and require advanced and complex bone reconstruction.

In cases where the implants are designed as a one-piece, the **micro-gap** is removed, and the problems of the microbial pump at the implant connection are eliminated.

In contrast to the advantages of using this type of implant, some considerations should be considered, including them, in the design of one-piece implants, it is usually not possible to design an ideal prosthesis, which causes problems in terms of maintenance of implant in a long time.

From a mechanical point of view, the narrow diameter of implants **increases the risk of failure** of implants and parts, and their use in the reconstruction of the entire jaw must be splinted.

From a clinical point of view, the correct three-dimensional placement is essential due to the **limitation of prosthetic parts** in these implants.

In these cases, the use of **surgical guides** can help to position them correctly.

To reduce the forces on the implants, we can use **taller implants** and implants with reinforced surfaces (**micro design**).

The use of these implants is not recommended in patients with parafunctional and malocclusion habits.



Short Implants

The emergence of short implants in the world of implants began when studies of the finite element by Mr. Himmlova et al. (4) showed that the maximum distribution of stress forces is about 5 mm at the beginning of the implant length and the implant diameter factor is more critical in withstanding the forces than its length.

Thus, implants with a length of fewer than **eight millimeters** were introduced to the world of implants which paved the way for implant treatments in areas with anatomical limitations (maxillary sinus and inferior alveolar nerve) (5).

Initially, short implants, due to the reduced surface area of the bone to implant contact (BIC) and the possibility of marginal bone resorption, raised concerns that scientists overcame by changing the diameter and redesign of these implants, and the following important parameter was the crown/implant ratio that was insufficient (6).

When this ratio is between 0.9 and 2.2, it can not hurt the success of the implant.

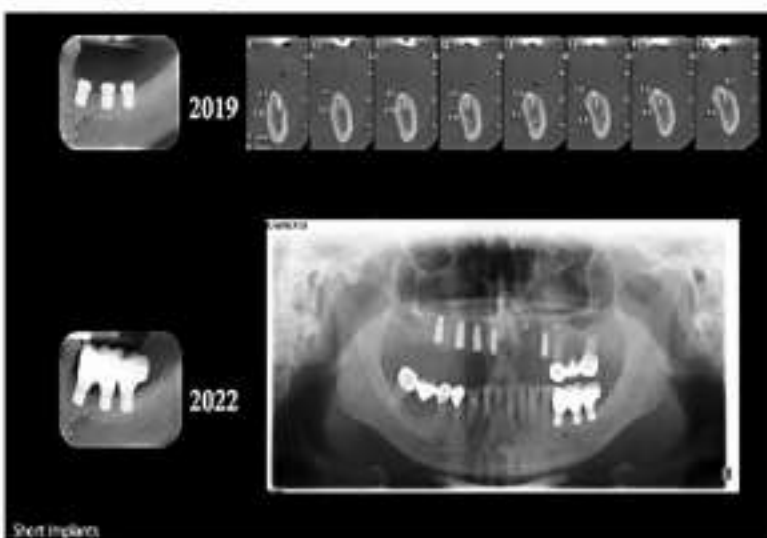
The use of implants of 6 mm and less (extra-short) in severely atrophic areas behind the mandible can be an acceptable alternative to Vertical bone regeneration treatments.

Compared to vertical reconstruction, it will have fewer biological problems (paresthesia, infection degeneration, etc.).

It also will reduce the patient's waiting time and suffering.

Short implants may be a good treatment choice in posterior maxillary atrophic areas where the maxillary sinus prevents standard-length implants. Depending on the amount of bone left, open or closed sinus lift treatments sometimes have more biological and morbidity problems than using short implants. Also, other issues such as less cost and less time are the benefits of using short implants(7).

However, in patients with parafunctional habits and poor bone quality with bone height less than **seven mm**, **sinus lift treatments** are preferable to the use of short implants (8). When using extra-short implants, the implants should be splinted to distribute the occlusal forces better. It also reduces the accumulation of stress at the junction of implants and abutments and, **of course, maintains the stability of implants** (9).



Osseodensification

One of the most popular techniques today is the use of special drills (Densah burs) for bone osseodensification. One of the advantages of these drills is that, unlike standard drills that remove the bone, this method moves the bone and this preserves the bone. Typical uses of this technique are in ridge splitting and crestal sinus lift graft. In both cases, it is minimally invasive for patients (10).

Clinical Considerations:

In cases where **Densa burs** are used for ridge splitting, the morphology of the edentulous ridge is essential, which must have special conditions. **Among these conditions** the presence of more than two millimeters of trabecular bone in the area and the shape of the edentulous ridge must be triangular, and the ratio of trabecular to cortical bone is more than one. **Productivity of bone hyperplastic** properties can improve the primary stability of the implant in addition to bone expansion.

These drills are minimally invasive use for sinus lift and nasal floor elevation during implant surgery. In classical methods, osteotomes and hammers were used to perform sinus lifts, which in some cases caused positional vertigo for patients, which has been eliminated in this technique.

In studies, the rate of vertical reconstruction in the sinus transplant areas has been reported to be 3 to 12 mm, and of course, the rate of sinus rupture is between 8 to 12%. (11)

It is technically straightforward, but at the same time, it is susceptible.

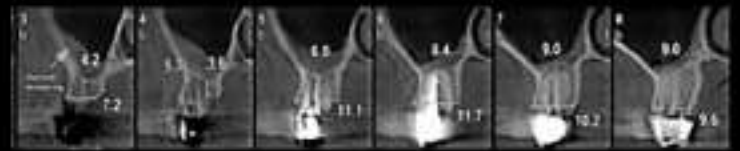
The condition for success in this technique is a high experience in performing sinus lift surgeries and a high tactile sense.



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Osseodensification-Crestal Sinus Lifts by Densah Drill

Osseodensification-Nasal Floor Elevation by Densah Drill



Crestal Sinus Lift by Densah Drill

Open Sinus Lift



Minimally invasive perspective on whole jaw reconstruction

Reconstruction of the entire jaw with fixed implant-based prostheses is challenging especially in severe soft and hard tissue loss patients. Usually, gingival and bone grafts are required for success in these patients although sometimes the results of bone grafts are unpredictable and require a long wait and multiple surgeries.

thus, facilities and treatment plans that allow us to place implants and prostheses with minimal trauma, minimal bone grafting and reduced waiting time to restore the patient's function are examples of minimally invasive treatments. With the advancement of **technology and the emergence of surgical guides** in recent years, guided therapies have entered the field of implant dentistry.

Advantages of guided surgery include high accuracy in three-dimensional (3D) placement of implants, which in turn reduces problems in the placement stage of the prosthesis (implant crown) (12) as well as in cases where there are anatomical limitations in the mandible and maxilla.

Guided surgeries can prevent postoperative problems by accurately diagnosing these areas and finding solutions to bypass these obstacles in the planning stage.

In some cases, tilted implants or zygomatic implants are used to reconstruct the entire mouth and prevent advanced bone grafts (13) and in these cases, the use of guides due to accurate 3D evaluation by software can help perform these sensitive surgeries accurately. Patient satisfaction for using tilted implants is about 94% and for zygomatic implants is 83% (2).



In cases where the aesthetic zone, in addition to **ceramic veneer treatments**, requires the replacement of teeth with implants, many clinical points should be considered.

The symmetry of the gums, the exact depth and position of the implant, the time sequence of the treatments, and the proper guidance of the soft tissue around the implant are some of the things that the surgeon should pay special attention to, that these are by using the surgical guide, in all stages like implant placement, crown lengthening and teeth preparation time, can be minimally invasive treatments. (Photo by Melika)





Digital - Guided Esthetic Crown Lengthening



Post-op 2 Months



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Post-op 2 Weeks



Digital - Guided Implant Surgery with Immediate Restoration



Digital - Guided Implant Surgery with Immediate Restoration



Digital - Guided Implant Surgery with Immediate Restoration



CERAMIC VENEERS

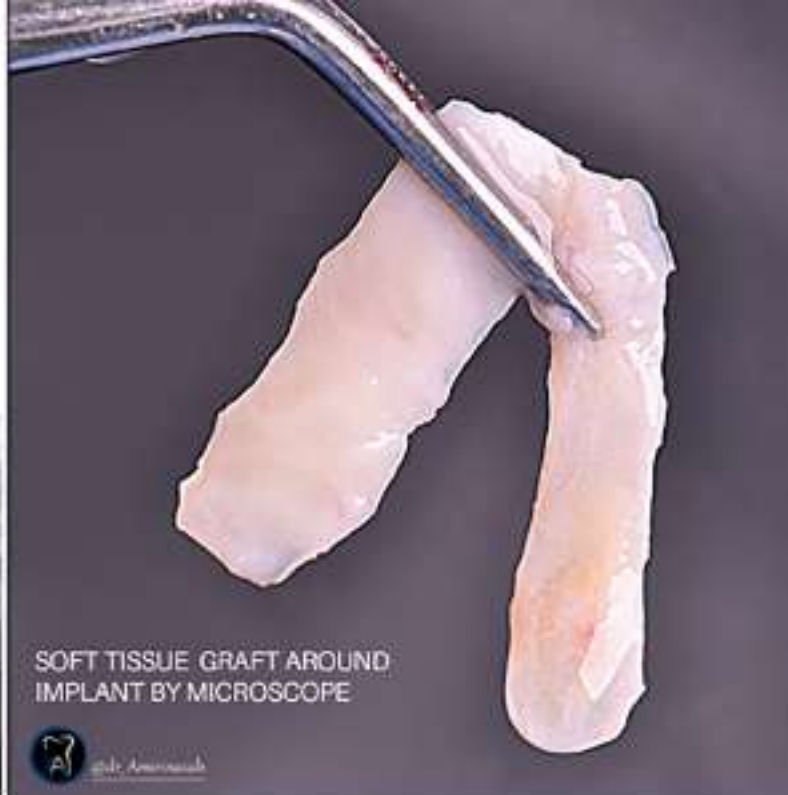
Flap vs. flapless treatments

Flapless implant placement has advantages and disadvantages that the surgeon should be aware of. Therefore, in this method, due to the lack of incisions and sutures and the short time of surgery, the patient usually returns to daily life and routine oral hygiene as soon as possible, creating comfort and a positive feeling towards surgery in the patient.

Of course, we should know that due to insufficient visibility of anatomical landmarks and the possibility of increasing bone temperature due to inadequate washing it will cause problems, which due to low visibility in the area of probability, incorrect angle, and depth of the implant are among its other disadvantages. Numerous articles have shown that the flapless technique can in some cases preserve the gingival papilla, reduce postoperative pain and reduce the depth of the envelope around the implant, which is superior to the flap method.

Similar results in keratinized gingival width and crystal bone loss around the implant have been reported.

However, it should be noted that the reduction in pain in this method is only related to the first day after surgery, and on the third day, there is no difference between the two groups (14). This technique is used in implant surgery cases in which the edentulous ridge, in terms of bone and soft tissue, must have ideal conditions so that we can have similar success with other methods.



Implant treatments under magnification

Today, with the advancement of microscopes and loops, implant and peri-implant treatments have taken on a new shape.

Magnification is one of the main pillars of the microsurgical triad. These tools are used in all stages of implants, including implant placement and peri-implantitis treatments.

They can also increase the accuracy and quality of sinus lift treatments and mucogingival treatments around the implant (15).

Another advantage of these tools is ergonomics which is suitable for the surgeon and can increase the working life of the dentist. Disadvantages of these tools include the limited field of view, reduced depth of field of view, high skill, and high cost of special tools and instruments.

The benefits of using microscopes in peri-implant treatments are widely accepted and have become popular with clinicians and patients making them the standard of care in the dental world soon (16).



Conclusion

In minimally invasive surgical techniques clinicians use different methods with less trauma, pain, and patient complications. Nowadays, the methods used in implant treatments are patient-centered, and the choice of technique is based on criteria such as evidence-based with the ability to predict high success and minimal trauma for the patient.

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THANK YOU .

