

Short Implants: An Alternative to Conventional Implants

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Abstract- Dental implants have become quite successful, prompting more research aimed at making surgeries easier and boosting how well implants hold up over time. Thanks to technological advancements, we're now seeing more implants being used even in complicated cases. But there's a challenge—after a tooth is extracted, the loss of bone often complicates the placement of implants. In these situations, traditional implants might not work, which is where short implants come into play as a viable alternative.

Short implants are designed specifically for use in areas of the jaw that have lost a lot of bone. They can be an effective treatment option for patients with resorbed ridges. By relying on shorter fixtures, dentists can often avoid the need for complex bone grafting procedures. This not only makes surgery simpler but also shortens the overall treatment time, leading to better comfort and quicker recovery for patients.

This review is set to look into whether short dental implants can act as a reliable substitute for longer implants in cases where there's limited bone volume. We'll also examine how well they perform biomechanically

I.INTRODUCTION

Today, dental implants are seen as a trustworthy solution for restoring both oral function and aesthetics. However, challenges can arise, especially when there isn't enough bone height or volume, or when anatomical features like the maxillary sinus or inferior alveolar nerve interfere with implant placement—these issues are often found in the back regions of the jaw. Bone loss after tooth extraction can further reduce available bone height and volume, complicating the use of standard implants.

To tackle these hurdles and steer clear of complicated surgeries, short dental implants have been introduced as a practical option for patients with limited bone height. Current research shows that if the right clinical protocols are followed, their long-term results can be comparable to those of standard-length implants. Improvements in implant surface technology and

macro-design have also boosted their stability and success rates. Consequently, short implants are now being increasingly recommended for prosthetic rehabilitation in patients with low bone height, offering a less invasive and simpler treatment option. They provide significant benefits, such as reducing the number of surgical procedures and minimizing trauma, which means patients deal with less discomfort and heal faster, all while experiencing fewer complications. That said, short implants do come with their own set of challenges; the higher crown-to-implant ratio and greater risk of peri-implantitis can lead to complications that need careful management.

Advantages of Short Implants:

1. No need for bone grafting: Short implants often eliminate the need for extra grafting techniques to restore bone height, providing a less invasive path to functional rehabilitation.
2. Reduced cost, pain, and treatment time: By avoiding additional surgical steps, patients might enjoy lower treatment costs, less discomfort, and a quicker overall treatment process.
3. Fewer surgical complications: Complicated procedures can introduce risks like bleeding, nerve injury, infection, and graft exposure. Using short implants can help prevent many of these issues both during and after surgery.
4. Simplified osteotomy preparation: The shallower osteotomy for short implants makes the surgical setup easier and improves irrigation during drilling, which helps avoid thermal damage to the bone.
5. Easier implant placement: The process of inserting short implants is generally simpler due to their shorter length.
6. Improved implant angulation: Smaller osteotomy sites allow for better alignment with functional loads,

especially when the basal bone under the alveolar ridge doesn't line up with the tooth's long axis.

II. BIOMECHANICAL CONSIDERATIONS

1. Diagnostic Considerations for Short Implants

a) Implant Diameter

The diameter of the implant plays a bigger role than its length in how stress is distributed. Most stress during loading is concentrated near the crestal bone, with little reaching the apical region. So, while increasing the length mainly improves primary stability, a wider implant not only boosts stability at the time of placement—it also increases the functional surface area at the crestal level. This helps spread out occlusal forces more evenly and reduces the chance of bone loss around the implant neck.

b) Crown-to-Implant Ratio

A higher crown-to-implant ratio can act similarly to a vertical cantilever, applying excess stress to the crestal bone and potentially causing bone loss or implant failure. But thanks to advancements in implant surface technology and improved designs, it's possible to achieve good outcomes even with higher crown-to-implant ratios, as long as the distribution of loads is well managed.

c) Bone Quality

The density of the surrounding bone significantly affects implant stability. In softer or more porous bone types, achieving primary fixation can be tough, which can hinder osseointegration, even with the best surface modifications. The combination of a short implant length with weak bone quality can diminish stability during placement and lower the likelihood of successful integration during healing.

d) Absence of Cantilevers

In implant-supported prosthetics, cantilevers refer to parts of the prosthesis that extend beyond the last implant. These extensions can create unfavorable biomechanical stresses on both the implant and the surrounding bone. With short implants having limited bone support to begin with, cantilevers can raise bending forces and stress concentration, leading to issues like loosening screws, micro-movement, fractures, or bone loss. Eliminating cantilevers allows occlusal forces to be transmitted more axially, improving stress distribution and enhancing the implant's long-term stability. Careful prosthetic planning—like placing enough implants and aligning

them correctly—helps to prevent cantilevers, making short implant restorations more predictable and durable.

e) Number of Implants

Using multiple implants increases the total functional surface area that can bear occlusal forces. This helps distribute the load better and strengthens the mechanical stability of the restoration.

f) Implant Design

Certain design elements can really enhance the performance of short implants:

- Thread Number: More threads per length increase the contact area between bone and implant.

- Thread Depth: Deeper threads create a larger surface area for bone attachment, boosting stability.

- Thread Shape: Square threads have a higher bone-implant contact percentage than V-shaped threads, improving load distribution.

- Implant Surface: A rough surface with micro-topography can encourage better bone integration compared to smooth surfaces. These enhancements not only promote bone contact but also speed up osseointegration, helping to counteract the usually less favorable crown-to-implant ratio linked with short implants.

1) Surgical Considerations

a) TWO-STEP SURGICAL PROTOCOL

For short implants, a two-stage surgical method is often recommended to ensure greater primary stability during healing. This way, the implant can securely integrate with the bone before it faces functional loading. The healing period usually lasts from 4 to 6 months in the maxilla and 2 to 4 months in the mandible, depending on the bone's density and quality.

b) MODIFIED SURGICAL PROTOCOL

Getting optimal initial stability is key for the success of short implants. This can be improved by tweaking the usual surgical technique—like skipping the countersink drill or the last drill in the standard sequence—to keep more bone around the implant site. In areas with poor bone quality, a soft bone drilling process is suggested. The final osteotomy should ideally be done with slightly narrower drills than usual, ensuring a snug fit and better primary stability for the short implant.

2) Prosthetic Considerations

a) Implant–Abutment Connection

The implant–abutment connection design plays a big role in how stress is distributed and how well the bone is preserved.

- Morse taper connections are preferred for short implants because they minimize micro-movement at the junction, reduce bone loss, and promote bone growth over the implant shoulder.

- Internal hex connections distribute occlusal forces more evenly compared to external hex designs, improving biomechanical stability.

- Using the platform-switching method, where the abutment diameter is purposely smaller than the implant platform, can help maintain marginal bone levels around the implant shoulder and enhance overall peri-implant stability over time.

b) Occlusal Table

reducing the occlusal table size minimizes offset loading on the implant. A smaller occlusal surface

lowers lateral forces and ensures a better spread of occlusal loads, protecting the implant and surrounding bone from excessive stress.

c) Incisal Guidance

Implant-supported restorations should mimic how natural teeth function, especially in managing higher bite forces in the back teeth. Proper incisal guidance in the front teeth helps eliminate lateral forces on the back implants during jaw movements, reducing stress and prolonging the restoration's lifespan.

d) Splinting

When implants are positioned in softer bone, splinting several implants together can deliver greater functional stability. This method increases the total surface area available for load distribution and lowers the forces acting on the prosthesis, cement layer, abutment screws, and implant–bone connection. Consequently, splinting improves biomechanical performance while minimizing the risk of complications.

Clinical Guidelines for Placing Short Implants

Ridge height	Bone type	History of periodontitis, smokers, patient’s age	Treatment
<5mm	Type I, II, III	No	Sinus lift
	Type IV	Yes	Sinus lift
5-6mm	Type I, II, III	No	Short implants
	Type IV	Yes	Sinus lift
≥6mm	Type I, II, III	No	Short implants
	Type IV	Yes	Short implants

In line with the clinical recommendations from Nisand and Renouard (2014), selecting short implants should depend on factors like the patient’s remaining bone height, density, and risk factors such as age, smoking

history, or previous periodontal issues. These guidelines apply in cases where the remaining alveolar ridges are wide enough to accommodate at least a 5mm diameter implant.

a) Resorbed maxilla:

Ridge height	Bone type	Treatment
<8mm	Type I, II, III, IV	Advanced surgical procedure
≥8mm	Type I, II, III, IV	Short implants

b) Resorbed mandible

Indications for Short Implants:

Short dental implants can be effectively used in various clinical situations, whether for fixed or removable prosthetic restorations. Their flexibility

makes them a good choice when bone height is limited or when complex grafting procedures are best avoided.

Common uses include:

1. Replacing single or multiple teeth in the back:

Short implants are especially helpful for supporting single crowns or multi-unit fixed prostheses in the back jaws, where bone height is frequently less due to anatomical constraints.

2. Severely resorbed edentulous mandible:

In cases of advanced resorption, four short implants can support an overdenture, offering stability and retention. Alternatively, six short implants could be placed for a fixed prosthesis for better function and comfort.

3. Edentulous maxilla:

In the maxilla, strategically placing short implants can bolster support for prosthetic rehabilitation. For example, two short implants positioned toward the back, combined with longer implants in the front, can effectively support either a maxillary overdenture or a fixed prosthesis.

III. CONCLUSION

Short dental implants provide a valuable option for patients who aren't suitable candidates for extensive surgical procedures due to medical issues, anatomical limitations, or cost concerns. By reducing the need for invasive surgeries, these implants help lessen patient suffering, cut overall treatment costs, and speed up recovery times. When placed according to the right clinical protocols, short implants can be a safe and reliable solution for restoring function in atrophic maxillary and mandibular ridges.

That said, even with their increasing success, we still need more long-term clinical data on how short implants perform. Further research is essential to gain a deeper understanding of their survival rates and biomechanical behavior, particularly with regard to how they handle occlusal loading, crown-to-implant ratios, and performance in areas with poor bone quality.

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