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SHORT DENTAL IMPLANTS: A NEW BENCHMARK TO RESTORE ATROPHIC JAWS

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ABSTRACT

Rehabilitation of severely atrophic jaws with dental implants always remains a subject of challenge for the clinicians.The present treatment modalities which are adopted currently for management of such compromised sites lead to employment and popularization of various extensive surgical procedures, which ultimately leads to increased patient morbidity, prolonged treatment duration and also proven to be expensive. As an alternative shorter dental implants (>8.5mm) gained immense popularity as they impart results those are equivalent to that of conventional implants when used in augmented bone.The present article reviews thoroughly the current literatures on the use of short implants as an alternative to conventional ones when placed in anatomically challenging, atrophic bone sites and discusses the bio-mechanical considerations involved behind it.

INTRODUCTION

Osseointegrated implants have proven to be a quantum leap in the field of orofacial prosthetic rehabilitation. Success of endo-osseous implants in maxillary and mandibular atrophic sites are subjected to anatomical limitations. The goals to overcome these shortcomings lead to the discovery to surgical techniques such as alveolar ridge augmentation, sinus lift procedures, osseo-distraction and nerve repositioning with a purpose of creating adequate bone volume for the placement of standard size implants[1]. However, the use of short dental implants provide a good argument against the conventional methods and yields results comparable in a much better way to that of traditional techniques. The primary goal following implant placement is to achieve osseointegration, a solid anchorage of endoosseous portion with the bony envelope[2]. Therefore, the aim of this narrative review is to evaluate the data available on the survival rates of shorter implants in the anatomically challenging areas of the maxilla and mandible.

Rationale behind adoption of short implants

Selection of implant length is basically dependent on the amount of bone availability. This is based on the principle that longer implants provide much better primary stability and a favourable distribution of masticatory load due to an increased total surface area. Two type of implant surface area are taken into consideration, which is the total surface area and the functional surface area. Total surface area (TSA) represents the overall surface area of implant, while the functional surface area (FSA) refers to area which transfers the compressive and tensile loads to the surrounding bone[3].

Another is the biomechanical rationale, according to which the crestal portion of the implant body mostly involved in load bearing, whereas very least amount of stress is transferred to the apical portion.

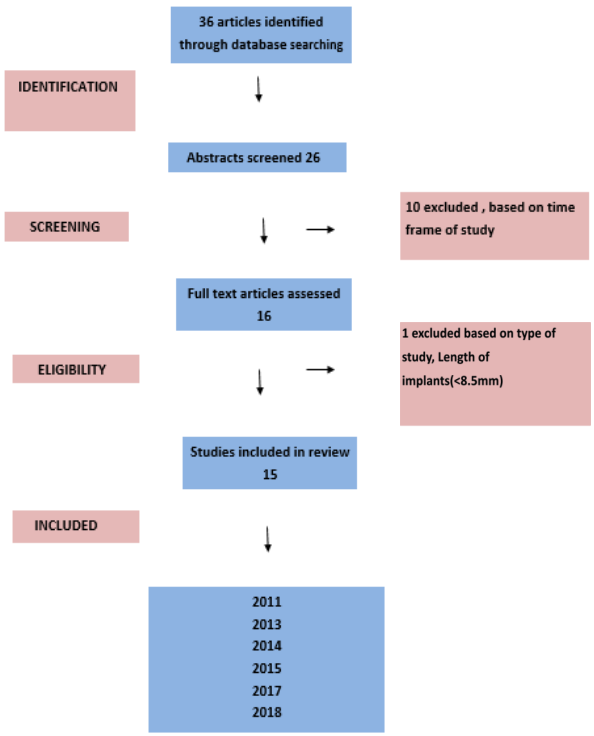
Additional to this, other basic mechanical principle states that when two materials of different moduli are placed in contact and one is loaded, a stress concentration can be observed where the two materials first come in contact. Based on this, any increase in the implant length would simply contribute to its primary stability only. On other hand, a wider diameter implant increases not only primary stability but also the functional surface area at crestal level.

METHODOLOGY

The search strategy of this comprehensive review includes database search done at various platforms. A thorough search of literature includes finding of 36 pertinent articles from Pubmed central database screening and also by hand search.

After critically evaluating, preliminary exclusion of articles were done on the basis of time frame, time period in which of study was conducted and length of the implants which did not match the criteria. (Fig 1)

Figure 1- Flowchart illustrating steps followed during database search



RESULT

A thorough and comprehensive study of literature pointed out the benefits of shorter dental implants and their success in atrophic bone sites while synchronously overcoming the shortcomings of conventional surgical procedures, hence reducing the plausibility of increased patient morbidity as well as the treatment duration.(Table 1)

Table 1 : illustrates the success outcome of shorter implants in resorbed area

Author	Year	No of patients included	Control implant size	Survival Rate	Causes of failure
Lopez Torres et al (1)	2017	76	>8.5mm	90%	Perimplantitis
Hingsammer et al(4)	2017	110	6.0 mm	97%	Loosening of implants
Veronika Pohl(5)	2017	101	6.0mm	100%	----
Bechara S.(6)	2016	53	6.0 mm	100%	Perimplantitis
Al Hashedi(7)	2015	20	6.0 mm - 8.0 mm	100%	----
Gulje et al (8)	2014	37	6.0 mm	100%	----
Pietro Felice et al(9)	2014	60	6.6 mm	95.2%	Patient did not report back. Rest developed perimplantitis
Daniel de Santis(10)	2013	46	6.5 mm	98%	Loading errors
Mijiritsky et al(11)	2013	787	6.0mm-8.5mm	97%	Perimplantitis
Esposito et al (12)	2011	60	<6.5 mm	99%	Perimplantitis

DISCUSSION

Lopez Torres[1] et al, in 2017 suggested in his study that the design of implant does not seem to have much influence on the osseointegration behaviour of peri implant at crestal region.

Himmlova et al[13], conducted a finite element analysis to study stress distribution at the bone-implant interface. In his studies he concluded that, maximum amount of stress concentration occured near the crest portion of the implant surface i.e. at the initial *5-6 mm* of the implant and there was no considerable difference in the area affected by varying length of the implant.

Pietro Felice[9] et al, concluded when the residual bone height over the mandibular canal is between 7 mm to 8 mm. When shorter implants of 6.6 mm used they yield, good and similar results over longer implants when placed in vertically augmented bone. However, the former one is preferred because it leads to treatment which is faster, cheaper and associated with less morbidity than vertical augmentation.

Anitua et al[14],in 2013 proposed that no remarkable relation was found between crown/implant ratio and mean bone level. Implant diameter plays an effective role in stress distribution when compared to that of implant length and its geometry .

Scarano[15] et al, in his study compared the marginal bone loss around the conventional and shorter implants and concluded that, no such pronounced differencs observed between both the systems. Instead ,the survival rate (SRR) for the shorter implants was found to be 98.5%.

Sohueil Bechara[6],who conducted a comparative study between short implants (6.0 mm) and longer implants (>10 mm), concluded that the shorter implants gives results that are equivalent to that of conventional implants when placed in grafted bone, hence they provide results much faster and less expensive that lead to increase in patient compliance.

CONCLUSION

Shorter dental implants has proved to be a milestone in the era of modern dentistry, when compared to conventional implants, which not only demands sufficient bone height but, also extensive surgical procedures leading to associated comorbidities of donor sites, prolonged healing period, considerably more challenging in compromised patients and also less economical. They also show acceptable levels of survival and success rates. Hence, they have been proved currently in various studies to be a more reliable modality over many advanced and cumbersome procedures which demands more expertise skills of operator also.

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