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REVIEW ARTICLE

Smooth Surface Screw Implants: Rational use in Basal and Cortical Implantology

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Abstract

The majority of implant systems available in the market are philosophically based on the supply of size and shape of alveolar bone and are known as 'crestal implants'. The deficiency of alveolar bone, if any, is corrected by time consuming procedures utilizing expensive graft materials and barrier membranes. The results of such operations are not always predicta- ble. The patients do not want these adjuvant surgical procedures with additional expenses. They even want to have fixed teeth as early as possible, even immediately. The need for some alternative implant philosophy was always on. The 'Strategic Implantology' offers ba- sal and cortical implants which can fulfil such desires of the patients, even with diabetes and with a habit of smoking. (2019, Vol. 03; Issue 01: Page 1 - 6)

Key words: Implant, Strategic Implants, Alveolar bone, Cortical implant, Diabetes, Smoking.

Introduction

Smooth surface screw implants are a group of specially designed implants which belong to basal and cortical implant system (Fig 1). These are extensively used in basal and cortical implant therapy for achieving anchorage in extra-territorial cortical bones of maxillofacial interest. The varying sizes of threads at the tip of the implant shaft are the main features of this type of implants which are made en- gaged into either basal bone or cortical bones for anchorage (1, 2, 3).

Fig 1: Smooth surface implants of various diameters

Historical perspective

In 2005 German dentist Dr. Stefan Ihde developed this shape in an attempt to modify the shape of disk implants which were introduced by a French dentist Gerard Scortecci in mid-1980s. Dr. Ihde rightly felt the cumbersome surgical pro- tocol of the lateral placement of Scortecci's disc implant into the alveolar ridge. The masticatory force is passed through the shaft to reach to the plates and ultimately the load transmission is executed through these single or multiple horizontal plates directly to the underlying bone (basal or cortical), but with the advent of new type of implants (transformation of plates/disc into blades by Ihde) the traditional disk implants are not now used widely and the practice of basal and cortical implantology has now become much easier and gradu- ally getting popular amongst the dental practitioners (1, 3-6).

Form and design

This is a single piece straight implant. The surface is mandatorily smooth and highly polished with a flexible solid abutment (Fig 2). These threads create tremendous vertical compression which leads to per- manent and long standing stability (Fig 3). The diameter of aggressive threads at the apical end ranges from 3.5 mm to 12 mm and meant for anchoring at the 2nd and 3rd cortical bones (1, 2). The larger the di- ameter is, the more forcefully the anchor- age we get from the implant. It is denomi- nated as per the diameter of thread: for ex- ample, 3.5 mm. screw or 12 mm screw. The length of the smooth shaft ranges from 10 mm to 38 mm and for zygomatic insertion the range could be up to 50 mm. In all lengths of the implant the height of the sharp cutting and aggressive threads is fixed to 5.5 mm (1). After it is being in- serted into bone vertical movement is not desirable. If exists, some underlying cause may be suspected and the implant might then be removed. For zygomatic insertion the shaft becomes longer than the usual one and the fixation is achieved through threads at the tip into the 3rd. cortical zy- gomatic bone; also the long shaft is useful in reaching 3rd cortical pterygoid plates of sphenoid bone.

Bendability

The screws are made up of titanium alloys (Ti6Al4V ELI) which is as per ASTM F 136- 13 and ISO 5832-3. At the neck region the implant can be bent 15-25° after being an- chored into the 2nd or 3rd cortical (Fig 4). The amount of bending depends on the need of the degree of alignment in the jaw. This bending should be unidirectional and under no circumstances the bending can be corrected by reversing on opposite di- rection. This is very special characteristics to the alloy with which it is made. This al- loy also yields a special property of elastic- ity into implants (7).

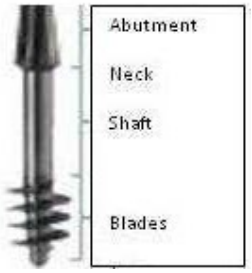

Fig 2: Different parts of smooth surface screw implant

Fig 3: Spiral threads at the tip of the shaft to get engaged into the cortical bones

Indications or uses

The typical thread profile at the end of the shaft denotes its ability to cut the bone sharply (incising bone) for engagement. The greater diameter of thread size is meant for nearer location of 2nd cortical bone (cortical of opposite side of the same bone); ideally this is very good for engaging the sinus floor if the floor is nearer to the alveolar ridge top (1st cortical) and virtu- ally in no bone situation (Fig 4). Otherwise sinus lifting followed by vertical alveolar bone augmentation remains the only op- tion for implant placement.

The variable length of the shaft helps to find out remotely placed 2nd or 3rd corti- cal. The need for length is mainly aimed to engage the 3rd cortical of pterygoid plate of sphenoid bone from tuberosity of max- illary bone area. This approach is known as tubero-pterygoid implant placement (Fig 5). There can be more than one im- plant to be inserted parallel to each other in the same area which is known as "Dou- ble pterygoid". This gives a very strong an- chorage. After one or two tubero-pterygoid implants are inserted into the corticals, the appropriate bending is done for de- sired alignment. The tubero-pterygoid im- plants are never loaded directly with the masticatory frame work – it is used as only anchorage of the whole prosthesis since the tip of the implants are engaged far away from 1st cortical bone of tuberosity area; it expands the span of supporting polygon and thereby helps the stability of maxillary full prosthesis (8, 9).

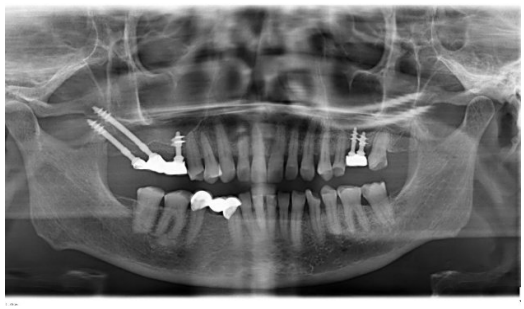

Fig 4: Smooth surface implants are en- gaged in 2nd.cortical (maxillary sinus floor) and 3rd (pterygoid plates of sphe- noid bone of right side) cortical bones

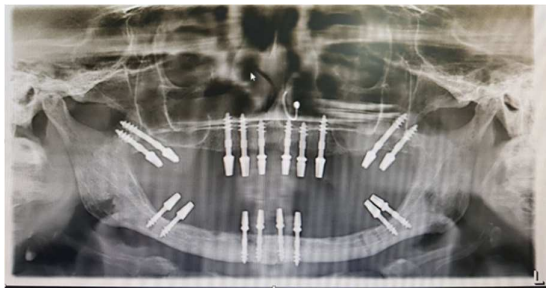

Fig 5: Atrophied jaws of a female aged 68 years (otherwise contraindicated for tra- ditional approaches) treated with Smooth Surface implants. Note the alveolar ridge at maxillary sinus areas ('no bone situa- tion') and inferior dental canals nearly on the top of both sides of mandible.

Passing through the sinus (trans-sinus passage)

These implants may be inserted into the 3rd cortical while passing through the maxillary sinus (antrum of Highmore). Generally, this happens in case of insert- ing implant for engagement in zygomatic bone and pterygoid plates. It may pass through (a) under the sinus membrane (Schneiderian membrane) within the can- cellous bone, (b) through and through the

sinus cavity and a part of the shaft per- sists (cavernous part) into the air sinus. Marked atrophy of maxillary alveolar bone together with increased pneumatisation of sinus cavity may demand the implant pas- sage through sinus cavity in order to reach 3rd cortical for pterygoid plates (6).

Peri-implantitis

The passage of dental implant is made first through soft tissue gingiva and then through bone. This invariably creates two different types of interfaces of which gin- giva-implant interface is of prime im- portance (10). The nature of association between soft tissue and the surface of im- plant body never gives the guarantee of impermeability of bacteria and its prod- ucts into the underlying structures (11). The display of various histological entities at implant-gingival junction in contrast to dento-gingival junction, clearly shows the equal degree of possibility or even more of such bacterial assault (12, 13). The mu- cosa is first affected which is known as "periimplant mucositis" followed by the af- fliction into bone. Thus periimplantitis is always preceded by periimplant mucositis. The recent classification of peri-implant diseases gives us a new outlook in this re- gard (14).

The transmucosal part of the implant shaft is exposed to oral microflora. It is generally seen that bacteria accumulate at this site on the metal body and develops biofilm. 6% to 58% of conventional im- plants develop periimplantitis. The bone loss due to periimplantitis is seen only up to the alveolar bone (crestal bone); no re- sorption is generally seen to be associated with basal bone (highly mineralised) or cortical bone (osteonal bone) (1, 2, 7). Im- plant shaft is highly polished and diame- ter is very narrow. Bacterial plaque is not observed clinically to cause any pe- riimplantitis around the implant neck. In osseointegrated conventional crestal im- plants, once the resorption of marginal bone takes place (so called demineralisa- tion) around implant due to periimplanti- tis, it is difficult to regrow bone in the same region. This is specially seen in rough surface (SLA, HA-coated, etched, TPS). The occurrence of this disease is usually not seen with the use of strategic implants (2).

Diabetes and Smoking

It is a well-known fact that micro-circula- tion in both soft and hard tissues are af- fected in diabetes and smoking. The peri- odontal tissues are not an exception to this rule. The micro-circulation of crestal alveolar bone gets affected normally with the loss of teeth due largely to the loss of arterial supply to the cribiform plate and the bone surrounding the alveolar bone proper. In addition to this diabetes and smoking cause further disturbance/poor blood supply. The summation of these two entities cause lack of blood supply which does not allow to form osseointegration of an implant to its surrounding spongy bone. Even if the implant is osseointe- grated, the degree of mineralization into the formed bone around the implant re- mains in question. This has not been a subject of research or discussion as to how the new bone which surrounds the implant, gains the strength by gradual mineralization. The physical and chemical property of such bone has not been re- vealed so far.

In contrast to this, the engagements of smooth surface screw implants are always

done either in dense and highly mineral- ized cancellous basal bone or into the cor- tical bones. The cortical bones are rela- tively inert and blood circulation is mini- mal unlike alveolar bone. In case of imme- diate loading, question of formation of os- seointegration in the cortical bone does not arise. Therefore, diabetes and smoking are not affecting in any way the critical vi- tality of cortical bone for implants to de- velop osseointegration; rather it depends on the osseofixation (purely mechanical way) for immediate loading (1, 2, 5).

General acceptance

University study curriculum and course syllabus are focussing on the traditional implant systems and it is a matter of sur- prise that this unconventional systems are not taught at any level of dentistry. It is a fact that tremendous amount of scientific data were generated on the Branemark's research and it was well documented through various modes of 'evidence based dentistry'. It is true that in the same tune it has not been possible for cortical and basal implants. There is no reason why this has not been done. One reason could be the unbelievable and enormous patron- age and/or the financial support from var- ious manufactures /companies that Branemark got, was fabulous and he had the academic platform at Goteborg Univer- sity, Sweden, where he did his research meticulously with a band of scholars (15). Most of the initial work done by the work- ers (Graffelman, Linkow, Scortecci, Ihde) of cortical implantology were on clinical parameter, not as strongly documented as Branemark. But the reality shows that the cortical and basal implantology has a promising future to meet all the demands of almost all patients irrespective of the amount of alveolar bone resorption, suf- fering from diabetes, habit of smoking. It does not require the necessity of alveolar ridge augmentation or sinus lifting. The greatest desire of patients is to have fixed teeth immediately which this system can successfully offer. It is a matter of pleas- ure that for the first time, a cortical and basal implant system named Mo- noimplant™ (Switzerland) has been per- mitted to be used in India by the Central Drugs Standard Control Organization, Di- rector General of Health Services, Ministry of Health & Family Welfare, Govt. of India (vide No. HQ/MD/2018/000223, dt. Sept 24, 2018) (16).

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