Cranio-maxillofacial

Implant Directions®

Vol. 8 N° 1 March 2013 English Edition

THE USAGE OF THE DISTAL MAXILLARY BONE AND THE SPHENOID BONE FOR DENTAL IMPLANT ANCHORAGE»

Shah S., Ihde A., Ihde S., Gaur V., Konstantinovic V.S.K

ISSN 1864-1199 / e-ISSN 1864-1237

OFFPRINT

Published by IF Publishing, Germany

Editorial board

Single Issue Price
Euro 30
Annual Subscription
Euro 120

Contact
publishing@implantfoundation.org

CMF.Impl.dir.
ISSN 1864-1199
e-ISSN 1864-1237

The usage of the distal maxillary bone and the sphenoid bone for dental implant anchorage.

Authors:
Prof. Dr. Siddharth Shah
Professor - Department of Prosthodontics
Off No.29, Prestige Point Bldg, 1st floor
283,Shukrawar Peth
Pune-411002
Maharashtra
India
Phone: +91 93711 11275
Email: drsidom7@yahoo.com

Dr. Antonina Ihde
MNE-85315 Vrba/Tudorovici
Montenegro
Phone: +382 69 615399
Email: ihde@ihde.com

Prof. Dr. Stefan Ihde
MNE-85315 Vrba/Tudorovici
Montenegro
Phone: +41 79 821 90 45
Email: ihde@ihde.com

Dr Vivek Gaur,
India
Email: drvivekgaur@yahoo.co.in
Phone: +91 9837 035 972

Prof. Dr. V.S.K. Konstantinovic
Clinic of Maxillofacial Surgery,
School of Dentistry,
University of Belgrade, Serbia;
Phone: +381 63 263 887
Email: v.konstantinovic@stom.bg.ac.rs

Keywords: basal implants, cortical support, tilted dental implants, cross-arch stabilisation.

1. Abstract

The posterior maxilla until today presents a challenging site for implant placement. Treatment with conventional techniques is often impossible.The area of poor bone quality is typically combined with reduced bone height. Nevertheless 90 % of the masticatory forces are to be met in the distal maxilla. Both tubero-pterygoid and bi-cortical maxillary implants are a good option to provide rigid support. The insertion of these devices offer resistance both against intrusive (Angle Class 1, Angle Class 2) and extrusive (Angle Class 3) forces. The placements of long and cortically anchored implants in distal maxilla have made dental implant protocols even in the atrophied maxilla predictable and easy. The purpose of this article is to describe and evaluate closely, the justification of implants in this area with regards to, anatomy, surgical technique, prosthodontic rehabilitation and potential complication.

Key Words:
Dental implants, pterygoid plate, maxillary tuberosity, sphenoid bone anchorage, immediate functional loading.

2. Introduction

Intraoral implantology is widely considered the most effective therapy to rehabilitate partial or total edentulism. Nowadays the rate of positive outcome for such treatment range from 75 % to 98 %, depending on the arch treated (it is higher when operating the

mandible than in case of operations in the maxilla) and the available bone supply (i.e. quality and quantity). There are certain aspects about implant dentistry that still need to be discussed. The first aspect concerns the desire – common to both professionals and patients – for a significant simplification of the procedures and the shortening of treatment time. The second aspect concerns the costs of implant therapy, too expensive according to the majority and often unaffordable for a large number of patients. In compliance with such demand the research community affiliated to the International Implant Foundation (www.implantfoundation.org, www.implant-directions.info) has been working effectively in search for solutions and so far remarkable achievements have been made. It must be noted, that the efforts of this group was self-organized, it became a multi-national movement which took place outside of the premises of traditional universities. Scientifically oriented practitioners under the roof of the IF (implant foundation) paved ground for a new era of dental implantology.

Up to the last decade, the average timing for implant rehabilitation was still sticking to the old principles of "osseo-integration" stated by Branemark in 1977: a implant set in the mandible was to be kept in a state of {mechanical rest' - i.e. in a sub-gingival covered position - for at least 3 months before reaching the capability to sustain the prosthesis and to be loaded. In the maxillary bone, conditions were considered even worse, and the required time to wait for the integration of the implant was postulated to be 6 months or more. Dr. Per-Ingvar Branemark was the first to experimentally elaborate a series of procedure, protocols with an aim to meet implant success. In this respect he defined implant success by equating it with the status of „implant osseointegration", and he postulated that it takes the mentioned amount of time, to achieve this state. Thereby he was severely misleading our profession. His rules - like many others in its kind - would later on turn out to be exceedingly binding and inhibiting the research community and especially many universities. While orthopedic surgeons discovered stable cortical anchorage already 4 decades ago, dental implantologists are until today holding on to the believe, that the implant`s integration will be achieved over time by some kind of "active and promotable bone growth" towards miraculous implant surfaces.

The fact that definite and stable "osseo-integration" can be achieved instantly and simply by placing the dental implant in stable and direct contact with cortical bone was first described and proven for basal dental implants . Thereby immediate load is possible, provided that proper conditions are given. This concept differs from the teaching of Branemark, because it considers osseo-integration to be a status which can be achieved in a right away by a precise surgical intervention, rather than by the "healing" of bone over time. Hence, for this concept, specific "bone-friendly" surfaces of implants are not required, as long as the implant material is compatible with bone tissue.

Nevertheless and for other reasons many patients are until today considered unsuitable for dental implant restorations. Patients who

lack the bone necessary for conventional crestal implants are excluded from the treatment, if their general health conditions are forbidding for adjuvant bone augmentations, bone transplants, etc.. Many patients suitable for these interventions still refuse to undergo it due to the risks and the additional costs as well as the additional waiting time they require.

Patients today are aware of the fact, that dental implantology becomes unpredictable, as soon as bone augmentations are part of the treatment plan.

There has been a long-standing fealing among clinicians that the distal maxilla is unsuitable for implants because of the large fatty marrow spaces, limited trabecular (endosseous) bone, and the rare presence of cortical bone. However, subsequent clinical trials showed that titanium fixtures could successfully osseo-integrated in this area 1,2,5. In fact, the density of some of the structures in this region may provide stability which exceeds the one offered by the anchorage in any other part of the maxilla3. Reiser`s anatomic investigations using cadaver dissection have shown that the specific structures that may support implants are the tuberosity of the maxillary bone, the pyramidal process of the palatine, and the pterygoid process of the sphenoid bone[4].

3. Justification

The corticals in the distal maxilla and the sphenoid bone (just as any other corticals) are just as stable to resorption as the mandibular anterior and basal segment. The reason for this stability is the outstanding muscular stimulus provided by both the lateral and medial pterygoid muscles. It is known from the orthopedic field of medicine, that even very thin spines of cortical bone can cope with enormous amount of forces. In nature spongious bone is never used for mechanical anchorage purposes. It has been proposed, that dormant trajectories in distal maxillae can be stimulated to undergo remodeling by inserting tuberopterygoid implants and functional loading of maxillae5. It should be investigated deeper however, if in all cases the placement of implants into the tubero-pterygoid bone will have an impact on those bone structures and If the muscular activity originating from mastication is in the predominant region of functional forces (rather than implant-mediated forces inside the bone), the presence of the implant body may not alter the morphology and the internal structure of the bone at all.

4. Applied anatomy of posterior maxilla

The “tuberosity” is the posterior convexity of maxillary alveolar ridge. Its medial and posterior boundary is the pyramidal process .The pyramidal process of the palatine bone and the anterior surfaces of the pterygoid process of the sphenoid bone are located behind and slightly medial to the tuberosity. This process binds to the anterior surfaces of the pterygoid plates of the sphenoid bone and is interposed between the inferior end of the pterygoid plates and maxillary tuberosity (Fig. 1). The palatal artery is located between the maxillary and the palatal bone. A large anatomic variation is found in the palatal bones. During the growth of the skull the distance between both processi pterygoidei increases, however the growth

of the maxilla, which is associated to the development of teeth (and especially the 2nd and 3rd molars) lasts longer. Therefore the maxilla expands to the lateral, while the processi pterygoidei remain in a more central position. This must be respected, when determining the direction of insertion of the tubero-pterygoid screw implant.

Fig. 1a.: Topographic relationships at maxillary tuberosity

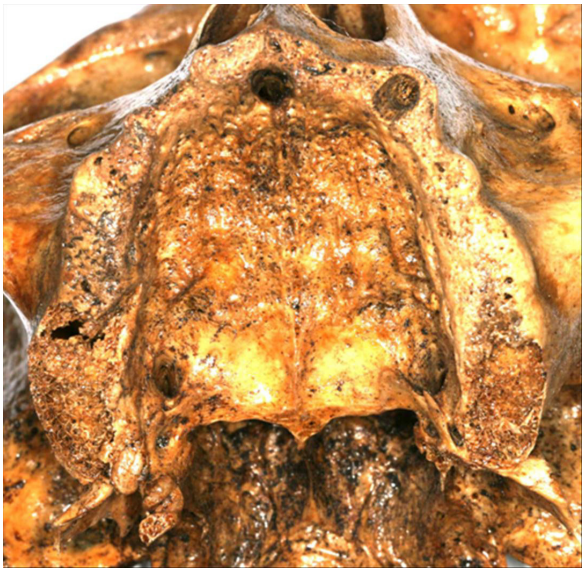

Fig. 1b.: View on a edentulous maxilla and a pterygoid plate with a rather untypical anatomy.

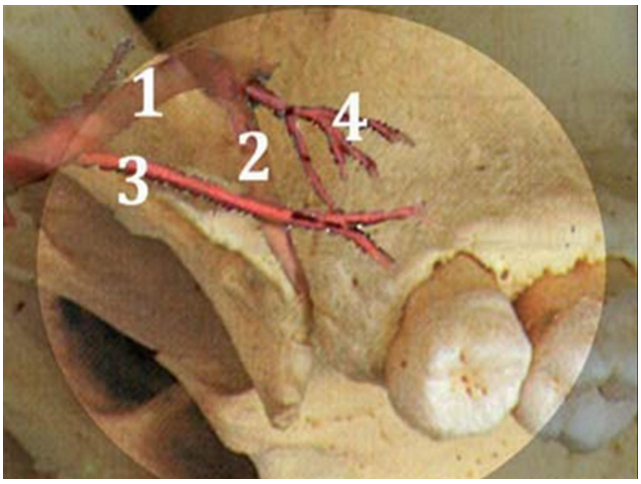

Fig. 2: Regional artery branches in the distal maxilla.

Topographic relationships between maxillary tuberosity and local artery branches.

1. Maxillary Artery running into the pterygo-palatine fossa.
2. Descending palatine artery
3. Buccal artery
4. Rr. superioris posteriors, nourishing the teeth and the periodontal tissues in the posterior maxilla.

The required implant inclination is meso-version and vestibule-version. In the Fig. 2 the major palatine duct containing the descending palatine artery is colored in yellow. One can easily notice the close proximity of the vessels and the implant insertion site. Note however, that the vertical distance between the alveolar crest of the maxilla and the pterygoid fossa is in all cases- even in cases of severe maxillary atrophy - more than 3 cm. The implant is set with multi-cortical support, which may consist of the following structures: distal sinus border wall; the front face of the lateral lamina belonging to the sphenoid pterygoid process; cortical borders of the major palatine duct; distal maxillary cortical border, crestal cortical of the maxillary bone. In case of implant placement immediately after an extraction, the cribrose cortical (lamina) around the roots in addition provides cortical anchorage.

Depending on the angle of placement and length of the posterior implant, four apical anatomic bone engagements are possible and can be classified as follows Reiser[4]:
1. The tuberosity
2. The tuberosity/pterygoid process
3. The tuberosity/pyramidal process
4. The tuberosity/pyramidal/pterygoid

This classification is in fact confusing and the determination of the final position of the implant is difficult.

Ihde[5] showed in addition, that also the lateral cortical wall of the nose is a suitable end-point for basal implant anchorage (Fig. 3).

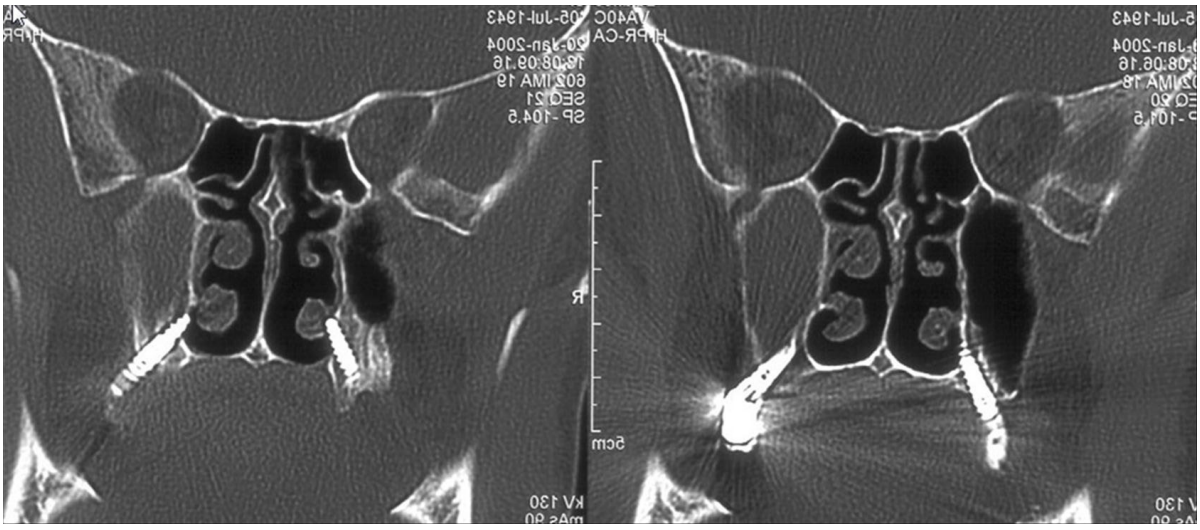

Fig. 3: TPG-implants are engaged in the lateral wall of the nose. The risk of this positioning is, that a retrograde infection stemming from the nose can lead to a infection-related failure of osseo-integration

5. Diagnostics by radiography and Computed tomography

Panoramic radiographs are supplying a sectional imaging (i.e. one focused plane) of both the maxilla and the mandible at the same time. They will reveal the structures located in the focused plane and typically the focus is in the center of the teeth. In edentulous patients the discrepancies between both bones become tremendous, as the maxilla resorbs centripetally, while the mandible resorbs centrifugally. Panoramic radiographs are therefore often difficult to evaluate. If bone is visible on the panoramic picture, the bone is definitely there. The opposite cannot be concluded however. Even in the dentulous maxillae, the pterygoid plates are out of focus of a panoramic picture and so is the bone which can be found palatal to the roots of the 2nd and 3rd molars. (Fig. 4a). Data from CT scans may be computed in such a way, that the plane of vision runs through the pterygoid plate (Fig. 4b).

Today even 3d-models of the jaw bone structures are individually manufactured on the base of a CT scan. These models help to gain orientation, especially because they allow to inspect the maxillary sinuses, and the walls of the nose from a cranial view. On those models reliable drill templates may be prepared.

While CT scans allow the visualization of all available bones, their clinical interpretation and their use for the placement of tubero-pterygoid implants is difficult: typically the axial slices obtained out of a CT are strictly vertical, while the direction of the insertion of tubero-pterygoid screws is oblique both in medial and distal direction.

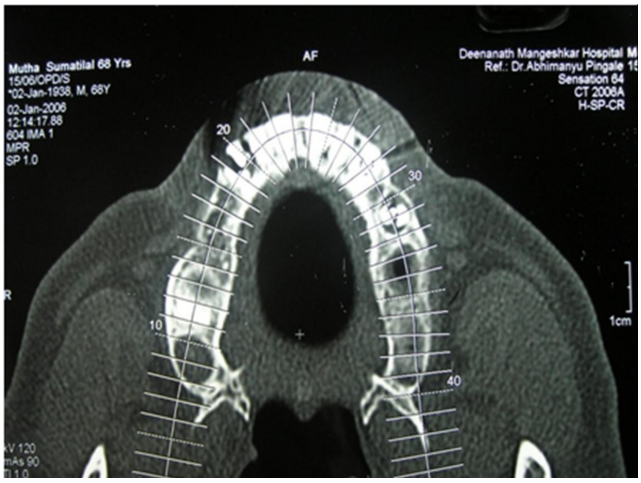

Fig. 4a.: The pterygoid plates and the bone of the distal maxilla are out of focal plane of a panoramic picture.

Note that in this clinical case the pterygoid plates consist of two corticals and spongious bone within. In such cases the implants are anchored in four corticals: the crestal cortical of the maxillary bone, the distal wall of the maxillary bone, and the anterior and distal cortical of the pterygoid plate. On the way upwards, many implants will be in contact with the cortical wall of the paltine canal. All this provides an enormous stability and allows to subject the implants to massive masticatory loads which we find in the distal jaws.

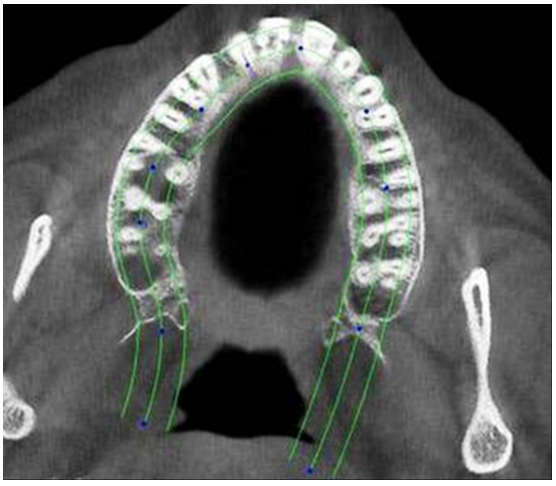

Fig. 4b.: The focal plane is here adjusted to visualize the pterygoid plates. Also in the case shown here, the pterygoid plate provides two separate corticals

6. Diagnostics by palpation

The most caudal region of the hamuli can be palpated behind the alveolar process of the maxilla. Usually the medial hamulus is longer than the lateral. The medial hamulus is used for orientation, when it comes to determine the direction of the tubero-pterygoid screw implant

7. Treatment planning

Several factors should be weighed by the treatment team when considering the use of implants in the tuberosity or pterygomaxillary region. It is vitally important to remove all functional and nonfunctional upper and lower third molars. After the extraction of upper molars the socket in the tuberosity often fills with bone, and at the same time the lamina cribrosa of the extracted 3rd molar serves as a provisional cortical. The extraction of lower third molars gives more vertical space for the restoration and space during the placement of the pterygoid implant. The extraction of lower 3rd molars avoids their gradual extrusion and posterior early contacts associated with this. At the same time, the direction of the osteonal systems is no longer inhibited by their roots, the mandible reaches after their extraction quickly a more functional and stable morphology, and the osteonal systems come to a rest. This kind of rest is needed for safe integration of dental implants. By mentioning all this we would like to point out, that there is a rationale behind our recommendation to extract 3rd molars. In addition the removal of upper 3rd molars is necessary in order to create access to the maxillary tuberosity and the pterygoid plate.

Due to the oblique direction of insertion, the usage of hand instruments is the preferred method both for the preparation of the cavity and the insertion of the implant. Even if accurate radiographic analysis of the available bone by computerized tomography is available, the direction of the insertion has to be determined clinically. The problem of CT`s in our field is, that the radial sectional planes through the alveolar bone are strictly vertical, whereas the implant is inserted oblique both in distal and medial direction. The implant hence crosses several sectional planes and this make a CT planning difficult.

While using hand instruments, the back side of a Bein-elevator is used as hammering instruments, while the tip of the handgrip is equiped with a thin and pointed drill (BCD1 or BCDX1, “The pathfinder”). The beauty of this technique is that the surgeon can evaluate the bone quality by the sound of the hammering: as soon as the opposing cortical is reached, the sound becomes more metallic. There is a small disadvantage, that the patient will also hear the hammering quite well.

Clinical results have shown that given adequate surgical expertise, the success rate for implants in the pterygomaxillary regions compares favorably with the results of previous studies of implants placed in the maxillary arch. In 1999, Balshi[6] reported on the results of placing 356 pterygomaxillary implants in edentulous arches and found a cumulative survival rate of 88.2 percent after an average functional period of 4.68 years. This is a great for a two stage implant, but of course much worse compared to any single-piece implant procedu-

re with immediate splinting. Five other studies of pterygomaxillary implants also have revealed cumulative survival rates that were consistently above 86.0 percent Balshi et al [7,8,9,10,11]. If BCS implants are used in combination with a correctly executed and planned immediate load protocol a success rate of almost 100 % can be acchieved13. As these implants are immediately loaded, their clinical success after a correct placement depends on an acceptable masticatory loading more than on anything else.

8. Technique

Scortecci[12] advices that for an accurate placement of tuberoterygoid implants exposure of this site is required, i.e. an open surgery. The full-thickness flap incision for exposure of the pterygoid bone should be confined to crest of the ridge or made 1mm palataly. It should be parallel to course of major palatine artery, but away from it. Vestibular angulated transverse releasing incisions are recommended distal to the pathway of the tuberosity vessel. Palatal transverse release incision should be avoided in tuberosity area. Scortecci`s recommendations are based on his experience with "Structure" and "Fractal" implants, which have a considerable diameter and a two-stage design. In a number of cases these implants are simply too thick, their insertion is complicated and they require a lot of bone.

Ihde & Ihde[13] recommend to first use a closed approach with single-piece bi-cortical screws (BCS), and to open the flap only, if the residual ridge is missed. This happens, if this ridge is smaller than approximately 2 mm. Thus in over 90 % of the cases a closed approach is possible.

At times it is possible to place an implant completely within and avoid angling the implant apex more distally, depending on the tuberosity's dimensions and quality (Fig. 5). If the height, length, and/or width of the tuberosity are not adequate, however, the implant can be angled and the apex made to engage either the pterygoid process, the pyramidal plate of the palatine bone, or both.

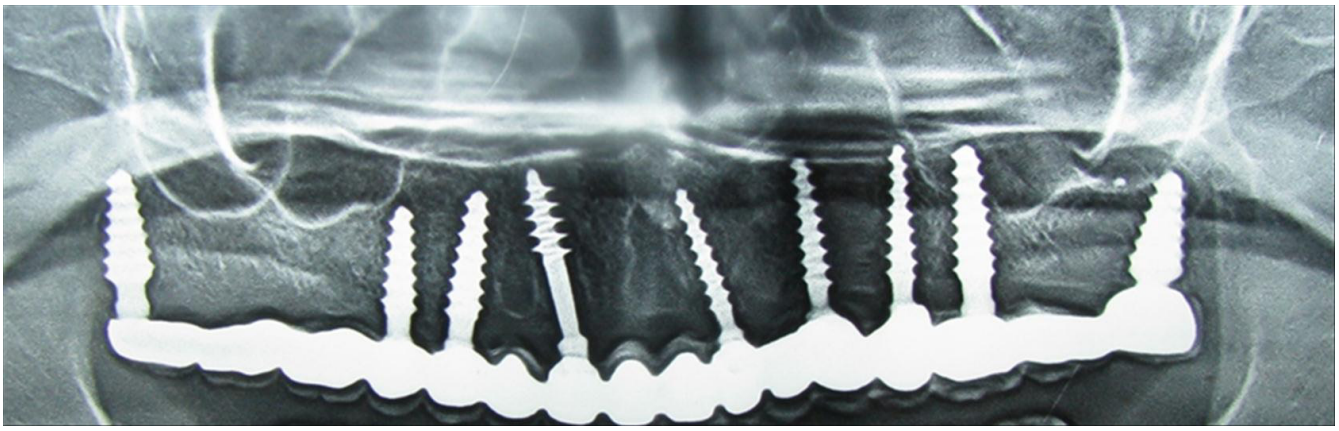

Fig. 5: Large diameter compression screw implants have been placed in the maxillary tuberosity.

Implant insertion sites for maxillary sinus bypass

Even if the maxillary tuberosity does not offer any spongious bone content, it still can serve as a support for implant anchorage due to the fact, that it provides two corticals. The quality of the spongious bone is usually low (D4, even D5). If spongious bone is present, its mineral content can be improved by using implant which compress this bone. Both KOS implants and large diameter BCS lead to a strong vertical and lateral compression.

. The implant is angularly inserted in mesio-version (i.e., with the stump leaning forward from the body) (Figs. 6, 7, 8, 9) so as to go up the bone thickness distally to the sinus cavity. The implant is inserted at an angle of approximately 20-45 degrees from the lateral and from the anterior in a distal medial direction Ihde[5] .Since this area features practically no cortical bone- to the detriment of the implant stability - implants have to be deeply inserted, so far as they reach the osseous cortical of the front face of the lateral lamina related to the pterygoid process of the sphenoid bone. Such cortical structure is extremely tough and strong, capable of supporting the apex of long implants. (Fig.10).

Fig. 6: Angulations for right pterygoid implant. The implant is inserted using the long insertion tool and a ratchet (RAT 2).

Fig. 7: Angulations for left pterygoid implant.

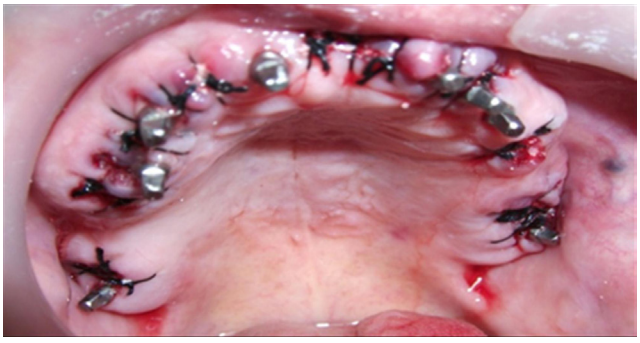

Fig. 8: Upper arch with two pterygoid implants

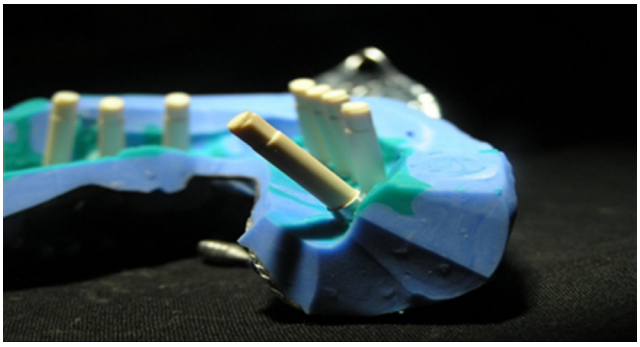

Fig. 9: Upper arch impression with analogs in place, showing the angulation of the distal implant.

9. Implant design for tubero-pterygoid implants

For implants in tuberosity area larger diameter implants are preferred which will condense alveolar bone here (Fig. 5). For the maxillary tuberosity most suitable implants should have following characteristics:

A. A thin body, so as to remove as little bone as possible while preparing the alveolus

B. Large threads (at least mm 5 or 6) to completely use the width of the tuberosity

C. Thin and sharp threads to guarantee the best self-threading effect and the best bone preservation

D. The size of the alveolus prepared is smaller than the implant size (the so called {"Press-Fit" technique)

E. Thread diameter narrowing towards the apex, thus forming a conic shape capable of perfectly copy and fill the available bone volume

F. A thin and pointed apex capable of reaching the pterygoid cortical and finding stability in there.

The implants meeting such requirements in the better way are screws for basal anchorage with an aggressive thread. (Fig.10). The alveolus preparation has to be drilled very slightly, because such implant morphologies are strongly self-threading and can easily progress into spongious bone without need of perforation. In addition this procedure allows minimizing the risks of pterygoid cortical perforation, thus also the risk of damaging structures, like the descending palatine artery and further above the maxillary artery (Fig. 2). During implant threading it is possible to notice the different consistency of the various osseous layers: firstly the spongious layer - easy to penetrate -; then the cortical bone, with its strong impact. On reaching the cortical bone implant threading has to engage plates and should not stop. This would cause the total loss of anchorage and stability (Fig. 11). Axial pressure has to be exerted to make sure that the implant achieves the necessary engagement. A problem which may occur (but not so often in the tuberosity region), is that the drill-hole is not in the center of the implant, i.e. if the axis of the implant is deviated by cortical structures.

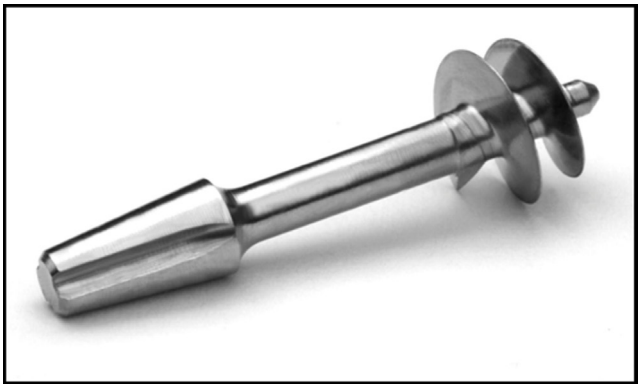

Fig. 10: Large threaded BCS® implants for safe basal anchorage.

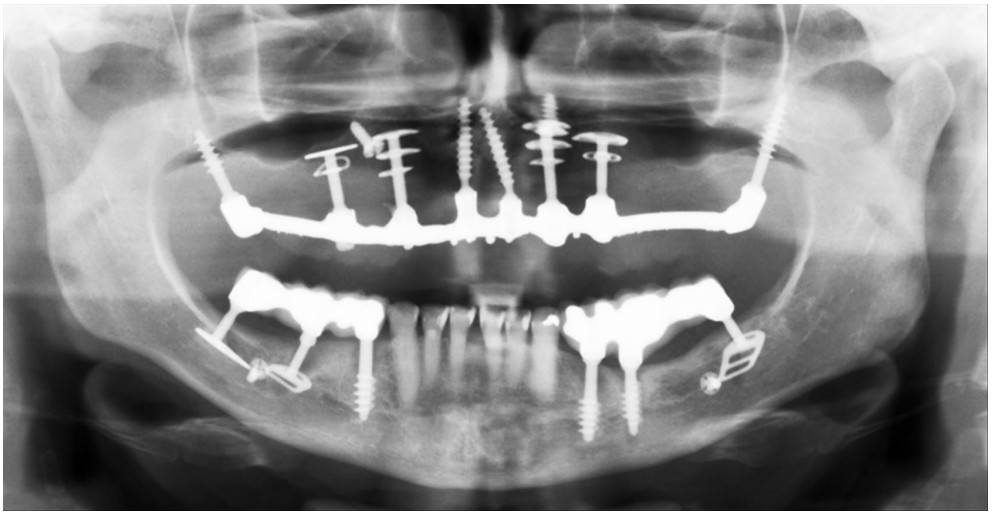

Fig. 11: Upper arch with two bicortical tuberosity implants, anterior KOS-implants, and four lateral basal implant (BOI).

10. Prosthodontic consideration

For implant patients with full arch splinted restoration pterygoid implants offer rigid support during anterior guidance or anterior function, especially so with class-3 occlusion cases where anterior load is high, because these implants are anchored at angulations to anterior dislodging forces. Immediate loading with preferred cross arch stabilization is advised (Fig.11) so that trajectories in tuberosity are rearranged in accordance to function, thereby increasing bone density specially so in nonfunctional maxillae. There should not be any direct occlusal loading on these implants. To counteract extreme angulations of these implants for restoration, angled abutments, lateral open access [for screw retained prosthesis] (Fig.12), precision attachments or telescopic crowns can be used. Sometimes sectioning and laser welding of full arch casting might be required.

Fig. 12: Lateral open access for a partially screw retained prosthesis. The technical abutment is nicely polished.

11. Complications

If the major palatine artery is touched slightly during manual osteotomy (and not from cutting during flap elevation) the placement of implant body will stop the haemorrhage because the bleeding occurs inside the bone. Then the flap can be sutured safely. If the major palatine artery is accidently opened inside the soft tissue of the palate, suturing and administering some pressure is necessary. The vessel may also be ligated and thereby closed. If the palatal artery retracts into bony channel, the hemorrhage can be stopped by filling the bony foramen with resorbable bone wax, however there is a chance of bleeding into the pterygo-palatine fossa. In any cases the flaps should be closed and sutured tightly. If the patient has denture he should maintain pressure with it for 20 minutes .Patient is advised to keep denture in mouth for 24 hours, be on liquid diet, and then return for check up next day[12].

In the case when the implant is inserted too much into the lateral direction, it will not reach the pterygoid plate, but it may end up in the medial pterygoid muscle. The patient will then note pain during the opening and the closing of the mouth. As this pain does not heal", the implant will be removed and inserted in a different (more medal) direction.

Sometimes it is difficult to place implants in pterygoid plates wherein one has to think of alternate restorative techniques like-transsinus BOI implants,sinus grafts,zygomatic implants, shortened dental arch with implants in canine pillar region. In the case shown in Fig. 13a the patients right pterygoid plates were not engaged. The implant in the distal maxilla was lost and subsequently removed. The four BBBS implants in the canine pillar area (Fig. 13b) and left pterygoid provided adequate support and restoration is in service for more than 3 years now. Note that occlusion is till second molar only on both sides though the cantilever looks long on right upper side.

Fig. 13a: Full mouth rehabilitation, only one pterygoid implant. This surgical solution requires meticulous balancing of prosthetics, and a reduced width and length of the functional of the occlusal table.

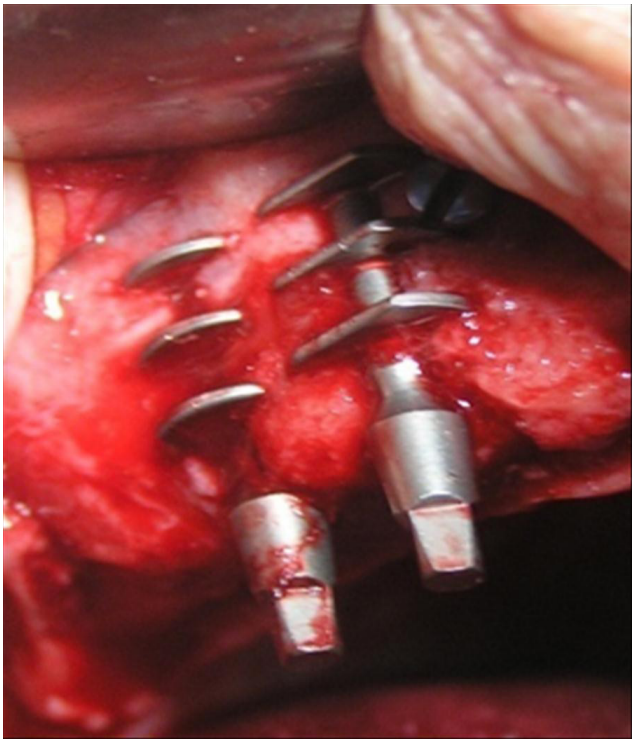

Fig. 13 b: Intraoral view of the two triple-BOI implants in extremely thin ridges. Multicortical support on the palatal and vestibular side. The anterior implant is additinonaly secured through a SSF-bone-screw. As an alternative palatal insertion of 4T-implants is recommended in such thin ridges.

12. Conclusion

Most of the edentulous implant patients are elderly people, generally more exposed to health risks and no longer in the position to endure pain or invasive surgical techniques (SINUS GRAFTS). Furthermore especially in elderly people their limited life-span is a risk: long lasting treatment plans should be avoided, or else a number of patients may not be alive by the time the treatment is terminated.

Surgeons are ethically and professionally bound to safeguard the patient's health, by opting - when required - for alternative and equally reliable therapies with a view to guarantee satisfactory masticatory and aesthetic functions. Unfortunately the „ideal "implant has not yet reached the mainstream of practitioners. This is mainly due to the strong influence of industrial sale-force on the thinking within our profession, combined with a lack of independent thinking within this group. With the traditional techniques the posterior maxilla presents many challenges for the implant practitioner. And many patients suffer without ever reaching a usable result of the dentists efforts. Basal osseo-integration, which has brought forward both lateral and basal dental implants are closing the gap between the needs and possibilities of dental implantology and orthopedic surgery or traumatology respectively. Their design finally allows us to utilize the advantage of the "immediate loading", which is for a long time already state of the art in the hands of our orthopedic colleagues.

As soon as the special technique of the placement of tubero-pterygoid implants has been introduced, all fear of losing the stability in the rather soft maxillary bone has vanished. Today we can realize a strong support even in strongly atrophied maxillae. This way grafting procedures, including sinus lift grafts, have become obsolete. The usage of hand instruments both for creating the cavity and for insertion the implants is the recommended technique.

It must be noted here, that the quite powerful lobby of "bone grafters" and their protagonists in the industry will continue in their efforts to convince both the mainstreamers as well as the patients,that their technique is necessary and alternatives do not work or provide less success.

It is our duty to provide a real informed consent to the patient and show him ways to safe and effective alternative treatment as described in this article.

References

1. Balshi TJ. Single, tuberosity-osseintegrated implant support for a tissue-integrated prosthesis. Int J Periodont Rest Dent 1992;12:345-357.
2. Hure G. Scanner superimposed technique for the tuberositypterygoid implant positioning. Presented at the Advanced Osseointegration Course, Courchevel, France, February 1991.
3. Tulasne JF. Osseointegrated fixtures in the pterygoid region. In:Worthington P, Brånemark P-I (eds.) Advanced Osseointegration
4. Reiser GM. Implant use in the tuberosity, pterygoid, and palatine region: anatomic and surgical considerations. In: Nevins M, Mellonig JT (Eds.) Implant Therapy: Clinical Approaches and Evidence of Success, vol. 2. Chicago:Quintessence, 1998:197-207.
5. Ihde S. (Edt.): Principles of BOI, Springer, Heidelberg, NewYork, 2005;
6. Balshi TJ, Wolfinger GJ, Balshi SF. Analysis of 356 pterygomaxillary implants in edentulous arches for fixed prosthesis anchorage. Int J Oral Maxillofac Implants 1999;14:398-406.
7. Balshi TJ, Lee HY, Hernandez R. The use of pterygomaxillary implants in the partially edentulous patient: a preliminary report. Int J Oral Maxillofac Implants 1995;10:89-98.
8. Bahat O. Osseointegrated implants in the maxillary tuberosity: report of 45 consecutive patients. Int J Oral Maxillofac Implants 1992;7:459-467.
9. Tulasne JF. Implant treatment of missing posterior dentition. In:Albrektsson T, Zarb GA (eds). The Brånemark Osseointegrated
Implant. Chicago: Quintessence, 1989.
10 . Khayat P, Nader N. The use of osseointegrated implants in the maxillary tuberosity. Pract Periodontics Aesthet Dent 1994; 6: 53-61.
11. Graves S. The pterygoid plate implant: a solution for restoring the posterior maxilla. Int J Periodontics Restorative Dent 1994;14:513-523.
12. Gerard M Scortecci: Implants and Restorative Therapy ,Martin Dunitz 2003:274-275
13. Ihde S., Ihde A. (Edts.): Immediate Loading, The International Implant Foundation Publishing, Munich/Germany 2011

Educational Video Series

Maxillary Implant Placement

1 Crestal & Basal Implants
Order Nr. 6667

2 And Replacing Replace®
Order Nr. 6669

Each DVD contains approx. 20 minutes of oral surgery. With explanations in english and german language.

j 35,00

Please send your order via e-mail to:
publishing@implantfoundation.org
www.implantfoundation.org

or via regular postage mail to:
International Implant Foundation
Leopoldstr. 116, DE-80802 München

Guide for Authors

ID publishes articles, which contain information, that will improve the quality of life, the treatment outcome, and the affordability of treatments.
The following types of papers are published in the journal:
Full length articles (maximum length abstract 250 words, total 2000 words, references 25, no limit on tables and figures). Short communications including all case reports (maximum length abstract 150 words, total 600 words, references 10, figures or tables 3) Technical notes (no abstract, no introduction or discussion, 500 words, references 5, figures or tables 3). Interesting cases/lessons learned (2 figures or tables, legend 100 words, maximum 2 references).

Literature Research and Review articles are usually commissioned.
Critical appraisals on existing literature are welcome.

Direct submissions to:
publishing@implantfoundation.org.
The text body (headline, abstract, keywords, article, conclusion), tables and figures should be submitted as separate documents. Each submission has to be accompanied by a cover letter. The cover letter must mention the names, addresses, e-mails of all authors and explain, why and how the content of the article will contribute to the improvement of the quality of life of patients.