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Disclaimer

Typical contents in ID

- **Evidence Reports** summarize the latest «Hot Topics» from relevant journals putting similar studies «side-by-side». This unique presentation of studies allows you to compare and contrast the patient populations, the treatment interventions, and the quality of the scientific methods. The «evidence-based bottom line» is presented with an overall summary statement at the beginning. Clinical notes by implantologists with special expertise on the topic complete the Evidence Report by providing their expert clinical opinion. **ID** is an implantology publication that provides attention to detail in balancing science with clinical opinion in such a clear, concise, and visually-friendly presentation.

- **Literature Analyses** provide you with an in-depth look at the research on a given topic. A «Literature Analysis» is a critical review of the literature on the epidemiology, treatment methods, and prognosis for implant-related topics or conditions. Literature Analyses are broader than «Evidence Reports» and are written to serve as a reference tool for implantologists to help them make decisions regarding how to manage patients, to assist them in evaluating needs for future research, and to use the material for future presentations.

- **Critical Appraisals** summarize the findings from important papers used for clinical decision making or marketing by implant companies. In addition to the summary, the study's methods and clinical conclusions are critically reviewed in an effort to challenge the implantology community into not accepting everything that is published, while fostering alternative explanations and ideas.

- **Case reports** give implantologists the opportunity to publish on unique patients using innovative or alternative methods for treating challenging patient conditions.

- **Research in Context** is a helpful «what is» section to consult if you've ever read a study and asked «what is a p-value» or any other research method question. It assists clinicians with the critical evaluation of the literature by briefly describing relevant aspects of research methods and statistical analysis that may bias results and lead to erroneous conclusions.

Implant Directions Critical Appraisal

Reference:

Bornstein MM, Chappuis V, von Arx T, Buser D. Performance of dental implants after staged sinus floor elevation procedures: 5-year results of a prospective study in partially edentulous patients. Clin Oral Implants Res. 2008 Oct;19(10):1034-43.

Performing Clinic:

Department of Oral Surgery and Stomatology, School of Dental Medicine, University of Bern, Bern, Switzerland.

ARTICLE SUMMARY

Authors' Summary:

Study Objectives:

The aim of this prospective study was to evaluate the 5-year performance and success rate of titanium screw-type implants with the titanium plasma spray (TPS) or the sand-blasted, large grit, acid-etched (SLA) surface inserted in a two-stage sinus floor elevation (SFE) procedure in the posterior maxilla.

Study Design:

- Prospective case series
- All partially edentulous patients scheduled for two-stage SFE between January 1997 and December 2001 were consecutively enrolled in the study, including those with local bone defects requiring local bone augmentation. All patients had a remaining alveolar bone height of <4mm.
- Exclusion criteria included severe systemic problems and smoking.
- 22 men and 34 women (61% female) with a mean age of 53.86 years (range 19-74 years) were enrolled.

Surgical Methods:

- A total of 59 delayed SFEs were performed in 56 patients using a composite graft with autogenous bone chips combined with deproteinized bovine bone mineral (DBBM) or synthetic porous beta-tricalcium phosphate (beta-TCP).
- After a healing period averaging 7.75 months, n=111 dental implants were inserted.
- After an additional 8-14-week healing period, all implants were functionally loaded with cemented crowns or fixed partial dentures.

Outcomes measured:

- Modified plaque index (mPLI) at four aspects around the implants
- Modified sulcus bleeding index (mSBI) at four aspects around the implants
- Probing depth (PD in mm)
- Distance between implant shoulder and mucosal margin (DIM)
- Clinical attachment level (AL)
- Mobility using Periotest values (PTV)
- All biological complications were also recorded throughout the follow-up period
- Clinical success = absence of persistent subjective complaints, absence of peri-implant infection with suppuration, absence of mobil-

ity, and absence of continuous radiolucency around the implant

Follow-up:

- The patients were recalled at 12 and 60 months for clinical and radiographic examination.
- Follow-up rate = 91% (11 implants were lost to follow-up)

Results:

- One patient developed an acute infection in the right maxillary sinus after SFE and did not undergo implant therapy.
- Two of the 111 inserted implants had to be removed because of a developing atypical facial pain. Clinical and radiographic findings for the remaining 98 implants are reported in table.
- 5-year success rate = 98%*
- o TPS implants = 89%
- o SLA implants = 100%

*authors state that any comparisons between implant types should be made with caution as the study was not designed from the beginning as a randomized comparative study and the SLA-type implant is overrepresented

Table. Reproduction of table reporting gingival parameters and periotest values.

Follow-up	mPLI	mSBI	PD (mm)	DIM (mm)	AL (mm)	PTV
1 year (n=103)	0.34 ± 0.03	0.35 ± 0.04	4.43 ± 0.11	-1.35 ± 0.11	3.04 ± 0.06	-2.71 ± 0.31
5 years (n=98)	0.27 ± 0.03	0.29 ± 0.04	4.14 ± 0.11	-1.22 ± 0.11	2.89 ± 0.08	-3.00 ± 0.28

Conclusions provided by authors:

This prospective study assessing the performance of dental implants inserted after SFE demonstrated that titanium implants can achieve and maintain successful tissue integration with high predictability for at least 5 years of follow-up in carefully selected patients.

Reviewer's Evaluation

Methodological Principle	
Randomized design	NO
Independent or blind assessment	NO
Adequate sample size	NO
Appropriate analysis	YES
Appropriate measures	
Radiological analysis	YES
Clinical measures	YES
Patient report quality of life	NO

1. What were the study's methodological strengths?

- Clearly defined objective.
- Clearly defined inclusion and exclusion criteria.
- The authors report a relatively high follow-up rate over a 5-year period.

2. What were the study's methodological limitations?

- Case series provide only descriptive and safety related data. No conclusions can be made on the efficacy of this method or implants versus other implant methods.
- Smokers were not included making these findings non generalizeable to this population.
- The authors attempted to evaluate risk factors for failure (eg, age, gender, time period, grafting material, etc.), however, did not report these findings descriptively or through a stratified analysis so the reader could evaluate their possible effect. With such a small sample size, the p-value can be misleading and not necessarily capture possible differences in outcome based on these factors.
- No qualified patient related quality of life measures were collected. Studies evaluating clinical and radiographic outcomes have been performed for decades with similar results. Studies evaluating the patient's perspective on their implants with respect to various domains including satisfaction, pain, functional ability, timing of implant use, cost, and other factors should be included. The patients are reported to have had "moderate discomfort", however there was neither a measurement on a reproducible scale nor were the patients questioned about discomfort or pain during abutment placement or bridge/crown cementation (i.e. during treatment steps, which could have been avoided, if only alternative treatment concepts had been applied).

3. How might the findings from this Critical Appraisal be applied to patient care?

- Interestingly the rupture of the sinus membrane is a frequent complication (30.5 % of the cases). This information is found not often in the literature regarding dental implants. Even more interesting is the fact that this complication did not have any influence on the treatment outcome.
-
- The study was carried out with implants providing a 2.8 mm machined neck. This type of implant is not used any more at the time then the article was published. The reason for this is, that "long necks" lead to bad aes-

thetics and visible metal areas. This is shown in Fig. 2 clearly: after 5 years, almost all of the necks were visible above the mucosal line.

- As far as the discussion reports on reduced success rates in smokers, the aulthors fail to mention, that this is true only for crestal designs of implants ("screws") and not for basal implants. Donsimoni et all have shown in a long term study, that failure rates in smokers are even lower in smokers compared to non-smokers, however without being able to explain why this is so (Donsimoni JM., Dohan D.: Les implants maxillo-faciaux à plateaux d'assise Concepts et technologies orthopédiques, réhabilitations maxillo-mandibulaires, reconstructions maxillo-faciales, réhabilitations dentaires partielles, techniques de réintervention, méta-analyse. 1ère partie : concepts et technologies orthopédiques. Implantodontie 13, n°.1, 13-30, 2004). The discussion does not reflect the present and available body of literature.

EVIDENCE REPORT

Title: Prevalence of peri-implant disease in individuals with intraoral dental implants

Evidence Report Purpose

The inflammatory lesions that develop in the tissues around implants are collectively recognized as peri-implant diseases. Peri-implant disease includes two entities: peri-implant mucositis and peri-implantitis. Peri-implant mucositis is a reversible inflammatory reaction in the soft tissues surrounding a functioning implant with no signs of loss of supporting bone, and peri-implantitis is described as inflammatory reactions associated with loss of supporting bone around an implant in function. The clinical presence of peri-implant disease requires periodontal probing to identify bleeding and/or suppuration, while radiographs are needed to detect the presence (peri-implantitis) or absence (peri-implant mucositis) of marginal bone loss.

Objective

To critically summarize the recently published literature examining the prevalence of peri-implant disease in individuals with intraoral dental implants.

Summary

Very few studies appropriately assessed peri-implant disease using both clinical and radiographic criteria, both of which are needed to make an appropriate diagnosis of this condition. One study found the prevalence of peri-implant mucositis to be 56.4% of subjects and 47.8% of implants. The prevalence of peri-implantitis ranged from 14.7-27.8% of subjects and from 6.7-13.4% of implants. Additional methodologically rigorous comparative studies are needed to better evaluate the prevalence of peri-implant disease associated with dental implants.

Sampling

A MEDLINE search was performed to identify recent studies published between January 2000 and April 2009 evaluating the prevalence of peri-implant disease in individuals with intraoral dental implants. Only studies which reported both clinical and radiographic diagnostic criteria with a follow-up of at least 5 years were evaluated. From a list of 12 articles, 3 included peri-implant disease diagnostic criteria that met our criteria and are included in this report, Table 1.

Table 1. Medline Search Summary

Terms	Hits	Reviewed
Search **dental implants OR dental implantation, endosseous [MeSH]**	16.600	
Search **(dental implants OR dental implantation, endosseous [MeSH]) AND [diabetes OR diabetes mellitus]), Limits ENGLISH, Human, Literature containing Abstracts**	295	2
Search **(dental implants OR dental implantation, endosseous [MeSH]) AND [diabetes OR diabetes mellitus] AND comparative studies), Limits ENGLISH, Human, Literature containing Abstracts**	89	1
Total Reviewed	**3**	

Common Outcome Measures

- Peri-implant mucositis
- Peri-implant bone resorption
- Peri-implantitis

Interventions

Dental implants were placed in subjects described as follows:

Roos-Jansåker (2006)

- In a longitudinal study, 218 patients were provided with Brånemark System (Nobelpharma, Gothenburg, Sweden) implant-supported fixed or removable restorations. Clinical and radiographic examination was performed 9 to 14 years after suprastructure placement. Mucositis was defined as probing depth ≥ 4mm and bleeding on probing (BOP) with < 3 threads of bone loss, while peri-implantitis was defined as bone loss ≥ 3 threads with BOP and/or pus.

Fransson (2005)

- In a longitudinal study, 662 patients who had received Brånemark System (Nobel BioCare, Gothenburg, Sweden) implants were followed for at least 5 years after implantation (Fransson 2005). Peri-implantitis was defined as BOP with bone loss ≥ 3 threads occurring between the 1 year follow-up and the ≥ 5 year examination.

Bragger (2005)

- In a longitudinal study, 89 individuals received ITI Dental Implant System (Institute Straumann, Waldenburg, Switzerland) implants. Complete peri-implant clinical and radiographic assessments were performed 10 years after implant placement. Peri-implantitis was defined as a probing pocket depth of ≥ 5mm and bleeding on probing or pus secretion as well as radiographic signs of bone loss.

Table 1. Comparative studies evaluating dental implant outcomes in patients with and without diabetes mellitus.

Author (year)	Study Design	Population	Diagnostic Characteristics	Peri-implant disease		Follow-up (%)	LoE†
				Peri-implant mucositis	Peri-implantitis		
Roos-Jansåker (2006)	Prospective cohort	female: NR age: NR	Indication for dental implant placement	N = 218 Ni = 998	N = 218 Ni = 987	9-14 years: 74.5%	Moderate
Fransson (2005)	Retrospective cohort	female: 60% mean age: 65 (range 20-92) yrs	Indication for dental implant placement		N = 662 Ni = 3413	5-9 years: 48.5%	Moderate
Bragger (2005)	Retrospective cohort	female: 62% mean age: 58.9 (22-88) yrs	Indication for dental implant placement		N = 89 Ni = 179	8-12 years: 70%	Moderate

N = Number; Ni = Number of implants; NR = Not Reported

†Level of Evidence (LoE) is based on study design and methods (Very high, High, Moderate, and Poor)

Table 2. Evaluation of articles e the prevalence of peri-implant disease

Study design and methods	Tawil (2008)	Morris (2000)	Accursi (2000)
1. What type of study design?	Prospective Cohort	Retrospective Cohort	Retrospective Cohort
2. Statement of concealed allocation?*	N/A	N/A	N/A
3. Intention to treat?*	N/A	N/A	N/A
4. Followed long enough for outcomes to occur?	YES	YES	YES
5. Complete follow-up of >85%?	NO	NO	NO
6. Adequate sample size?	YES	YES	YES
7. Controlling for possible confounding?	YES	NO	NO
LEVEL OF EVIDENCE	Moderate	Moderate	Moderate

* Applies to randomized controlled trials only
NR = not reported

Results

Peri-implant mucositis (Figure 1)

- In a longitudinal study in which individuals were followed for 9 to 14 years, peri-implant mucositis (bleeding on probing with no radiographic bone loss) was present in 56.4% (n=123) subjects and 47.8% (n=477) implants. [Roos-Jansåker]

Peri-implantitis (Figure 2)

- In a longitudinal study in which individuals were followed for 9 to 14 years, peri-implantitis (bleeding on probing and ≥ 3 threads of radiographic bone loss) was present in 14.7% (n=32) of subjects and 6.7% (n=66) of implants. [Roos-Jansåker]
- In a longitudinal study in which individuals were followed for 5 to 9 years, peri-implantitis (bleeding on probing and ≥ 3 threads of radiographic bone loss) was present in 27.8% (n=184) of subjects. [Fransson]
- In a longitudinal study in which individuals were followed for 8 to 12 years, peri-implantitis (probing pocket depth of ≥ 5mm and bleeding on probing or pus secretion as well as radiographic signs of bone loss) was present in 13.4% (n=24) of implants. [Bragger]

Methodological considerations

- All studies reviewed were cohort studies with a rating of moderate (low quality cohort) level of evidence. No very high quality randomized controlled trials or high quality cohort studies were identified in the literature.
- Since multiple implants in the same subject are not statistically independent, either one implant should be chosen per patient or statistical analysis should account for multiple implants per patient. Two of the studies reviewed [Roos-Jansåker, Fransson] accounted for multiple implants in the same subject, but only for complication rates.
- None of the studies reported an adequate follow-up rate. A follow-up rate of ≥85% is necessary to ensure valid study results.

References

Studies

Study 1

Roos-Jansaker A-M, Renvert H, Lindahl C, Renvert S (2006)

Nine- to fourteen-year follow-up of implant tratment. Part III: factors associated with peri-implant lesions

J Clin Periodontol 33:296-301.

Study 2

Fransson C, Lekholm U, Jemt T, Berglundh T (2005)

Prevalence of subjects with progressive bone loss at implants.

Clin Oral Impl Res 2005;16:440-6.

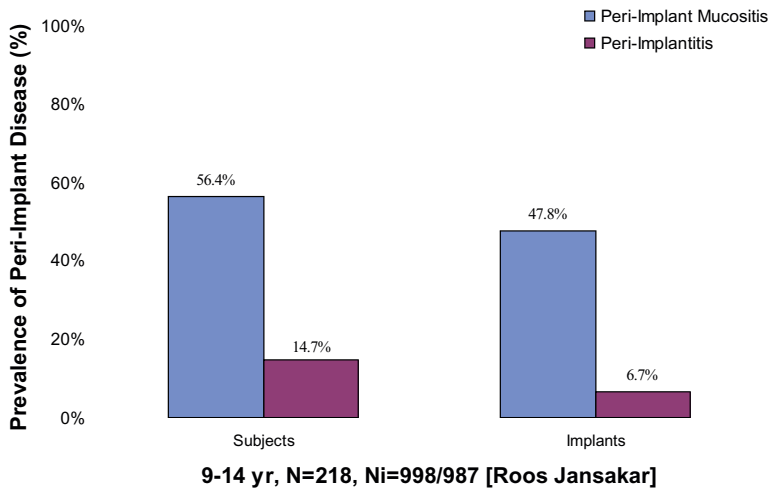
Study 3

Bragger U, Karoussis I, Persson R, Pjetursson B, Salvi G, Lang NP (2005)

Technical and biological complications/failures with single crowns and fixed partial dentures on implants: a 10-year prospective cohort study.

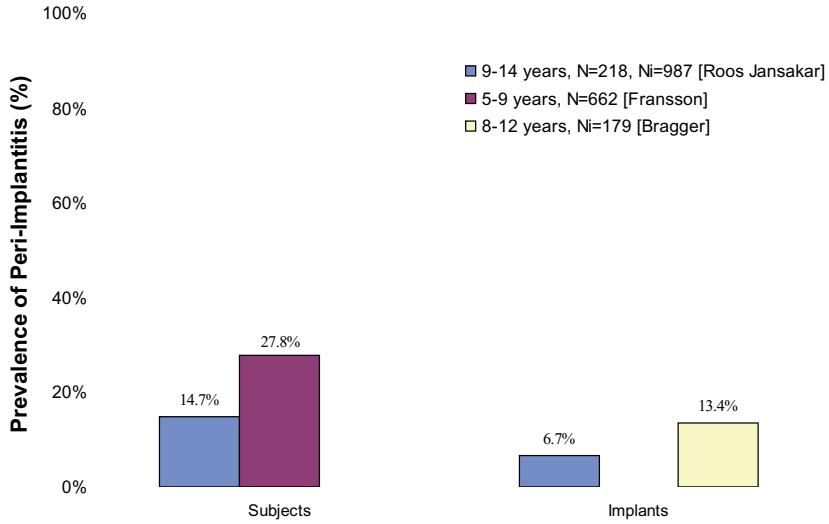
Clin Oral Impl Res 2005;16:326–334

Figure 1. Prevalence of peri-implant disease associated with dental implants



Ni = 998 for peri-implant mucositis, 987 for peri-implantitis

Figure 2. Prevalence of peri-implantitis associated with dental implants



Editorial by Editor Dr. Sigmar Kopp

Prevalence – a matter of threshold limit definitions?

It is well known that statistics are exploited to lend serious support to political views and objectives. Statistics and statistical analysis do not care whether it is about the struggle against poverty, about cholesterol or about the success rate of specific implantological therapies. The only thing that counts are the threshold limits the statistics are based on. It is possible to support just about any claim statistically, simply by defining "appropriate" threshold limits.

The threshold below which a single person is considered to be at risk for poverty is currently €856 per month (www.kinder-armut.de). If we base a historical comparison on this limit, practically all Germans were poor until a few years ago. And if we think out of the box and take a cross-sectional rather than a longitudinal position, the threshold limits we see will be very different:

The UN has defined absolute poverty as the equivalent of $2 a day or less to live on. In 2002, this affected 43% of the world population. $2 has to cover the basics, i.e. food, shelter, and water – medicines, new clothes, or schoolbooks do not even appear on the agenda. When almost an entire population lives on this little, it is not surprising that undernourishment is high, education level low, and life expectancy short. In both Nigeria and Mali, nine of ten people survive on less than $2 a day.

South America has a relatively small poor population, yet 39 million people live on less than $2 a day in Brazil (www.worldmapper.org).

Territory size shows the proportion of all people living on US$2 or less a day in purchasing power parity

Note that on a global level, we are talking about $2 purchasing power equivalent, not about "guaranteed human rights" such as access to media delivered to your own flat-screen TV. Without getting ourselves into political discussions at this point, the fact remains that threshold limits determine what statistics look like and what they purport to tell us.

If we take these two threshold limit values and compare them, we get €856 (poverty line for a German single-person household), which would correspond to roughly $1,200 at the current exchange rate. Divided by 30 days, we get $40 a day, which is 20 times (!) the global poverty level of $2 a day that is dire reality for 43% of all people in the world. We promised not to get into any political discussions, but complaining at the German level (the times-20 level) might very well be interpreted as an insult to the poorer half of mankind.

While we can turn away from these dubious statistics, we cannot do the same with statistical claims that are related to our core competencies – here we are called upon to examine and comment on statistical claims in our role as experts.

Looking at our current evidence report with the scant facts available on the prevalence of peri-implant disease in individuals with oral implants, we cannot leave the overly simplistic statistical evaluation entirely uncommented.

If, of 300 articles found, only 3 present statements that statisticians consider to be relevant,

that certainly affects the value of these articles in clinical practice, not least because the definitions of threshold limits bear witness to, let us call it a certain inventiveness.

For example, the authors of the three studies have their own individual definitions for mucositis and peri-implantitis:

Roos-Jansåker

Mucositis – probing depth of 4 mm of more and bleeding on probing (BOP) with less than 3 threads of bone loss

Peri-implantitis – bone loss of 3 threads or more with BOP and/or pus

Fransson

No mucositis

Peri-implantitis – BOP with bone loss of 3 threads or more

Bragger

Peri-implantitis – probing pocket depth of 5 mm or more and bleeding on probing or pus secretion as well as radiographic signs of bone loss

But if we base our observations on the definitions generally applied in dentistry, gingivitis stops being gingivitis at the probing depths of 3.5 mm, giving rise to profound marginal periodontitis, which is accepted by German statutory health funds as requiring therapy and, consequently, treated by open curettage by inventive or particularly meticulous dentists, with the support of German healthcare regulations. In oral implantology, only the authors of the first article believe that this finding deserves mention, as mucositis, while the authors two other studies do not even acknowledge findings of up to 5 mm in pocket depth. This means that the cases of mucositis proper are not included at all and that findings between 3.5 mm and 4/5 mm are not included in the published statistics.

When it comes to the actual concern of the articles, namely peri-implantitis, it should be noted that the BOP (bleeding on probing) ought to be mentioned as a prerequisite, independent of the amount of bone loss. No bleeding – no peri-implantitis.

Moreover, all three authors require at least three "threads" of bone loss for an implant to be assigned to the peri-implantitis group. And because we are not talking about micro-threaded implants, this would imply that these authors would never even talk about peri-implantitis until a considerable amount of bone is lost. For the shortest implants used, this bone loss might amount to approximately half of the total implant height! It is also interesting to note that even if the amount of bone loss is tantamount to the entire thickness of the cortical bone layer, these authors do not perceive this as worthy of mention.

By creatively defining threshold limits, most cases of peri-implantitis that would be considered as requiring treatment in general dentistry, given as approximately 50% in the first study, are reclassified as cases of simple mucositis, lowering the incidence of peri-implantitis to a "scientifically accepted" level of between 7% and 30%.

Remembering how cholesterol threshold limits were increased to stimulate the market for lipid reducers, a nagging suspicion arises that the figures are being bent in order to make the market leaders in implants (Nobel Biocare and

Straumann) look good and to support their numeric – rather than qualitative – dominance.

Unfortunately, these glossy publications usually lack the important detailed data that would allow us to arrive at our own conclusions and to make our own comparisons. All we can do is to apply the normal distribution curve and to suspect that most of the iceberg is below water level.

Standard definitions and a uniform nomenclature would shed light on the issue. It remains to be seen whether this light is wanted or whether authors and manufacturers believe in a better life in self-inflicted darkness.

Radiographic revelation of subantral membrane elevator in presence of septum-based maxillary sinus: case report.

Dr. Wissam M. Nasr, BDS
December 12, 2008

Abstract: Patients suffering from edentulous posterior maxilla compromised by markedly reduced subantral bone height can now undergo an endosseous implant therapy thanks to sinus floor augmentation. Various techniques of sinus floor elevation have been reported, among which lateral window osteotomy is the most common. However, the presence of anatomical structures such as septum, sinus floor convolutions, sharp bony ledges or even thin bony projections, may lead to complications mostly reflected in membrane perforation. In order to overcome these obstacles, the use of CT scan prior to surgery helps determine the anatomical variations of maxillary sinus and relevant structures that enable surgeons to alter their intervention approach.

As such, some of these structures like the thin bony projections that cannot be detectable even on CTscan, remain a challenge for surgeons undertaking sinus elevation procedure.

The purpose of this report lies behind evaluating the feasibility of subantral membrane elevator in presence of septum and other structures as well as highlighting these findings on X-ray. As a result, this procedure can be an alternative to the currently adopted technique by decreasing pre- and post-op complications, morbidity and cost.

Key words: Sinus floor augmentation, subantral membrane elevator, septum, thin bony projections

Since Tatum's introduction of sinus floor augmentation technique in mid-1970s (lateral window technique), implant placement in a minimal alveolar height in the posterior maxilla due to sinus expansion, has been finally overcome.

Sinus floor augmentation is considered a safe treatment modality with minimum complications.1

However, complications occurring throughout a sinus grafting process, such as perforation of the Schneiderian membrane, are reported in the attached literature 2.3

This complication is generally associated to the presence of maxillary septa, also called Underwood septa.

These anatomical structures that divide the maxillary sinus into several compartments complicate the elevation of the membrane. Therefore, the identification of anatomical structures in maxillary sinus prior to the surgery is crucial for surgeons in order to modify their approach, either by cutting out the maxillary sinus septa5 or by simply aborting the whole surgery.

Furthermore, the use of CTscan appears to be more reliable and accurate than the ordinary radiograph in terms of detecting incidence, morphology and location of septa, in order to prevent membrane perforation during surgery.6,7 Thus, some undetectable irregularities in the maxillary sinus, even on CTscans, may hinder sinus membrane elevation and cause perforation. These uneventful irregularities or thin bony projections,

that are approximate to the septum, present an unexpected element- even for competent surgeon- during sinus membrane elevation.

In that context, the present case report projects the application of a minimally invasive sinus augmentation technique called Subantral membrane elevator, where a lateral approach was evidently adopted. As illustrated below, the X-ray taken during this simplified procedure will reveal unexpected anatomical findings and will turn out to be a safe and feasible technique, even in complex situations.

Case study

In June 2006, a 48-year-old woman visited my private office, requesting implant-supported prostheses for her distal edentulous arch in the right maxilla.

For several years, she has been treated with a cantilever fixed dental prosthesis with retainers on teeth 16 and 13, and pontics at sites 14, 15.

Recently, her GP extracted tooth 16 due to excess mobility and pain while chewing and kept in place crown 13, 14 (in distal extension) for esthetic reasons.

In general, the patient was healthy and was not under any medication. Yet, she was a heavy smoker.

Ten years ago, she underwent a sinusitis surgery and since then, no clinical signs were observed.

At the buccal aspect, clinical examination showed soft and hard tissue deficit. Along the same line, the patient's periodontal biotype was considered thin and highly scalloped (Fig.1).

On the panoramic x-ray, an important sinus pneumatization was clearly visible due to early loss of maxillary teeth (Fig.2).

The presence of bone septum makes sinus graft procedure more complicated which entails a modification in the surgical procedure.

Detailed explanatory discussion on the treatment to be adopted, took place with the patient. A joint decision was made so as to performing the minimal invasive technique for sinus grafting and placing two implants according to a stage protocol at sites 14 and 16 (FDI): A crestal approach with Subantral membrane elevator technique was adopted.

Surgical procedure

Treatment is carried out under local anesthesia. Patient was instructed to take 2.0g of amoxicillin and 100mg of Ketoprofen, one hour prior to surgery. A crestal incision was made with a full thickness flap reflection (Fig.3). Summer's technique was carried out.

A 3.5mm ostetome was inserted in bed preparation at 1mm below the sinus floor (Fig.4). By gently taping on the osteotome, the compacta was fractured (Fig.5). As such, the membrane integrity was checked with a negative nose-blow test. Subsequently, a subantral membrane elevator (mini balloon) was inserted into the cavity (Fig.6). The inflation of the balloon was slowly carried out with a radio-opaque solution (Barium sulfate), which ultimately elevated the membrane. In general, no resistance should occur. However, when 2.5 cc was injected, a great re-

sistance was felt and the patient perceived pressure. Consequently, an x-ray was taken in presence of the balloon with a view to evaluating the sequence of the procedure and determining the cause of resistance and pressure.

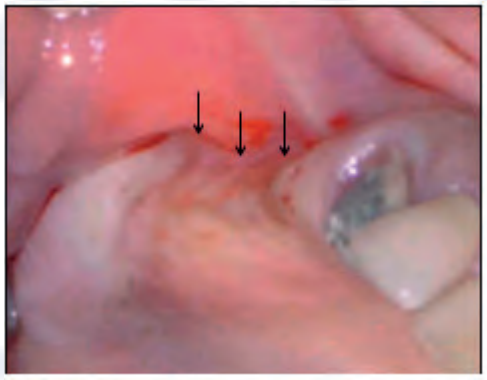


Fig. 1 Preoperative view of edentulous maxillary quadrant. Note the deficit of hard and soft tissues at the buccal aspect.

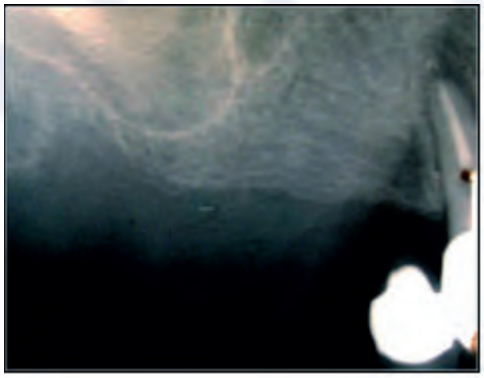


Fig. 2 Radiograph of the posterior right maxilla reveals a lack of vertical height at sites 15-16-17.Maxillary septum is clearly visible.

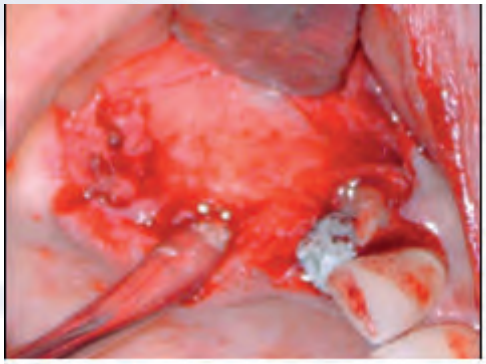


Fig. 3 Status following a midcrestal incision and elevation of a full- thickness flap.

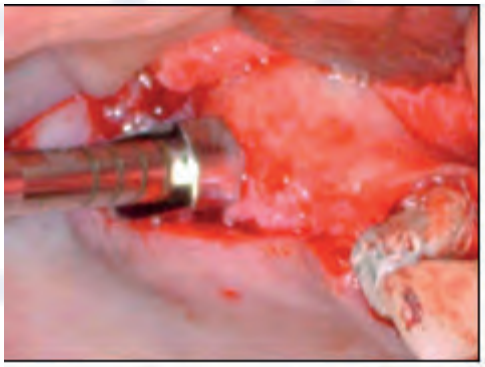


Fig. 4 A 3.5mm osteotome inserted in the preshaped canal the stopper located at 3 mm.

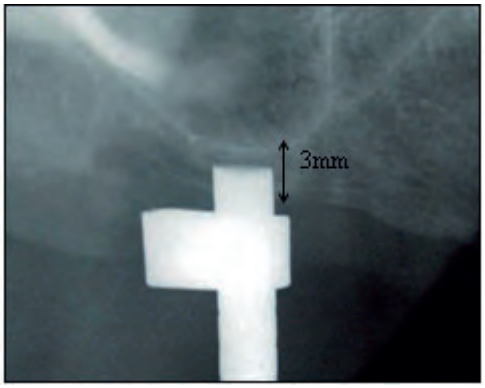


Fig. 5 Periapical radiograph shows the location of osetotome at 1mm of the sinus floor.

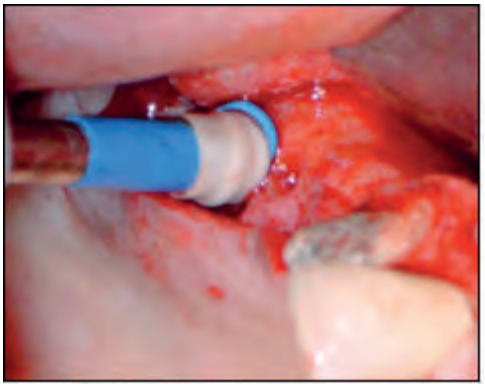


Fig. 6 The introduction of the balloon into the Osteotomy site.

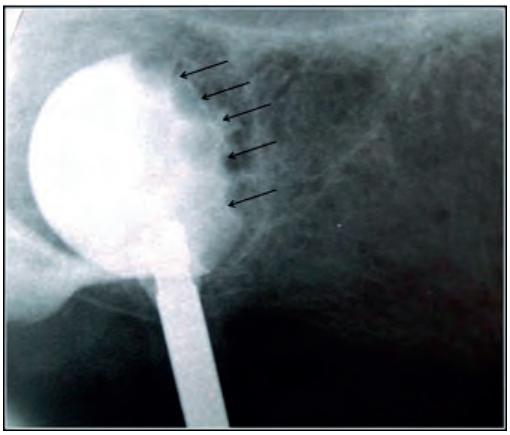


Fig. 7 Radiographic revelation of the subantral membrane elevator in presence of septum in maxillary sinus. Note the remarkable balloon registration of thin bony projections.

Fig. 8 Post-operative x- ray: cavity filled with Bio-oss particles. Due to its higher mineral density, Bio-oss appears lighter on the radiograph than the local bone.

Concurrently, the periapical radiograph showed interesting findings, namely remarquable thin

bony projections close to the maxillary septum have been detected during the inflation of the balloon (Fig.7).

The mini balloon was deflated and removed out of the sinus, and the product was checked out to ensure its integrity and function. No damage was reported. The patient was requested to undergo Valsava test in order to check the membrane integrity. A xenograft bone substitute material (Bio-oss) was introduced into the sinus cavity and filled into the new created space (Fig.8).

Subsequently, a lateral ridge augmentation procedure was performed with Bio-oss and Bio-guide, with a chief aim of correcting hard tissue deficit. The patient was instructed to take anti-biotics and anti-inflammatory drugs for five ad-ditional days. Chlorexidine solution was also pre-scribed three times per day for 2 weeks. Twelve days later, the sutures were duly removed

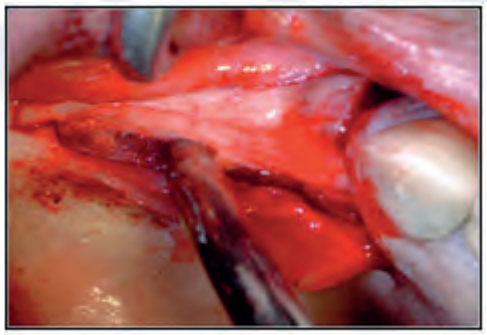


Fig. 9 A modified palatal roll flap technique is applied simultaneously with implant placement, in order to re-establish soft tissue contour.

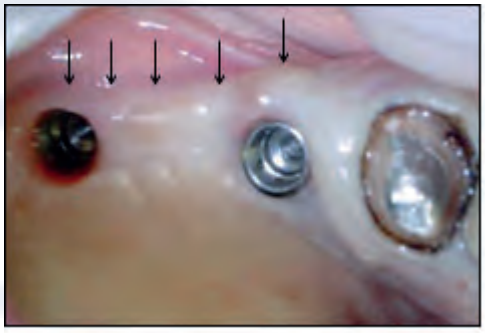


Fig.10 Noted a complete healed peri-implant soft tissue and enhancement of alveolar con-tour.

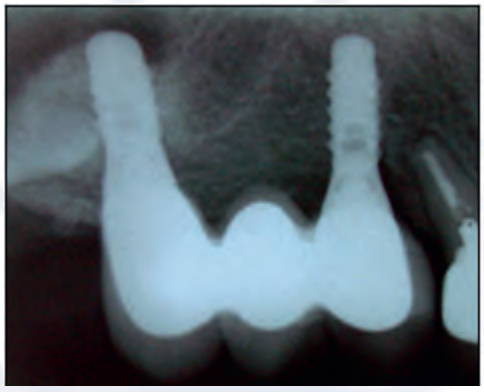


Fig.3 Peri-apical radiograph taken after crowns installation confirms normal bone integration and regeneration around the distal implant.

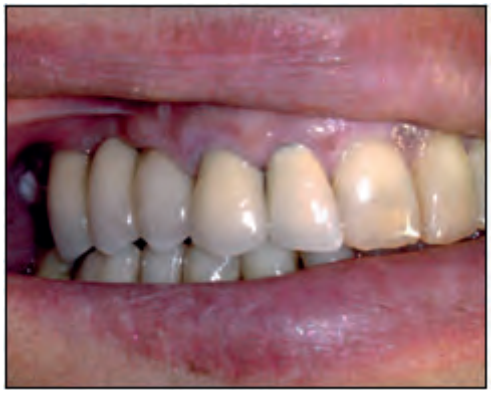


Fig. 4 Buccal view of the final ceramo-metal prosthesis with good esthetic result.

The patient only returned to my clinic in October 2007.

The second stage surgery (implants insertion) was scheduled: A modified palatal roll flap technique was simultaneously performed with two nonsubmerged implants placement at sites 14 and 16, with a view to reconstructing soft tissue defects (Fig.9).

Two months later, solid abutments were inserted, impression was taken and implant borne ceramo-metal prosthesis was cemented (Fig.10, 11, 12).

Conclusion

The main focus of implant dentistry is placed on improving the survival rate, simplifying the treatment, improving the esthetic outcome and reducing treatment time and cost.

Having said that, the success of the above-captioned treatment lies behind the appropriate research-based choice of the adopted procedure.

However, in complex situation where complications are more relevant, the application of a more simplified and safe approach may clinically provide recognizable outcomes to the patient by avoiding the disadvantages of conventional and categorical technique such as the Lateral window's.

In sum, the Subantral membrane elevator system in addition to the Summers technique have proved in all past and pre-clinical and clinical studies to be a simple, easy and safe measure.8,9,10

The anatomical structures in the sinus cavity, such as septa, sharp bony projections and convolutions do not hamper the possibility of having ruptures of the Schneiderian membrane.

Similar to many clinical cases, the decision to proceed with any chosen treatment option shall depend on the surgeon's ability to perform such a complex procedure and on his/her clinical experience; while some surgeons may consider such an approach a contraindication, others would perceive it as a successful case study.

References:

1. Barone A, Ssantini S, Sdordona L, Crespi R, Covani U. A clinical study of the outcomes and complications associated with maxillary sinus augmentation. Int J Oral Maxillofac Implants 2006; 21: 81-85.

2. Beaumont C, Zafiropolos GG, Rohmann K, Tatakis DN. Prevalence of maxillary sinus diseases and abnormalities in patients scheduled for sinus lift procedures. J Periodontol. 2005;76:461-467.

3. Ueda M, Kaneda T. Maxillary sinusitis caused by dental implants: report of two cases. J. Oral Maxillofac Surg. 1992;50:285-287.

4. Ulm CW, Solar P,Krenmair G, Matejka M, Watzek G. Incidence and suggested surgical management in sinus-lift precedures. Int J Oral Maxillofac Implants.1995;10:462-465.

5. Betts NJ. Modification of the sinus lift procedure for septa in maxillary antrum. J Oral Maxillofac surg. 1994;52:332-333.

6. Santana HG, Diego MP, Carbo JG, Broker MS. A study of septa in the maxillary sinuses and the subantral alveolar processes in 30 patients. J Oral Implantol. 2007; 33: 340-343.

7. Kim M, Jung U, Kim C, Kim K, Choi S, Cho K. Maxillary sinus septa: Prevalence, height, location and morphology: A reformatted computed tomography scan analysis. J Periodontol 2006; 77: 903-908.

8. Kfir E, Kfir V, Eliav E, Kaluski E. Minimally invasive antral membrane balloon technique: report of 36 procedures.J Periodontol.2007;78(10):232-5.

9. Soltan M, Smiler DG. Antral membrane balloon elevation. J Oral Implantol. 2005;31(2);85-90.

10. Yamada JM, Park HJ. Internal sinus manipulation (ISM) procedure: a technical report. Clin Implant Dent Relat Res. 2007;9(3): 128-35.

No more sinuslifts

Application of concepts stemming from orthopaedic surgery for effective dental implant procedures in the upper distal jaw

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Abstract

Traditional concepts in oral implantology advocate in case of maxillary jaw bone atrophy different kinds of bone buildup procedures as prerequisite for the later installation of implants. For the lateral segments of the maxilla, this involves often (open) "sinuslifts", a procedure which was introduced in 1986 and has been spread and tought widely. In some cases open sinuslifts may be avoided by a less invasive, internal technique described by Summers . Differences between both techniques have been described by Woo & Lee . Since "sinuslifts" usually are carried out in a separate surgical step, this procedure increases the number of necessary treatment steps on the way to the implantological treatment result and they affect the predictability of the treatment outcome negatively. They also they increase both costs and treatment time. Sinuslifts are accepted by the patients, as long as they are told that there is no way around it. None of our patients would ever choose voluntarily to undergo this procedure. In fact, as our 11-year-experience sows, sinuslifts are,- as a rule-, avoidable.

The technique of basal (or lateral) implantology is based on stable, cortical engagement of endossous implants. The implants are chosen to reach maximum cortical engagement in resorption free zones: basal screw implants are inserted vertically or in an angle of up to 30 degree off the vertical. Angulation adapters provide the possibility to connect cemented bridges to the implants, even ifthe endosseous implant parts are divergent. Basal screw implants utilize opposing corticals and resorption fee bone areals, preferably bone near muscle attachment regions; lateral basal implants utilize the horizontal bone supply, they are inserted from the lateral aspect of the jaw bone. At the same time they may pass through and even utilize spongious bone areas, but their success does not depend at all on bone being available between the corticals or osseous integration in areas other than the cortical bone. This leads to completely changed therapeutic option in the lateral maxilla: sinuslifts have become avoidable because all patients have enough horizontal bone, even if vertical bone is missing. This article reviews the available literature on basal implants and lines out a treatment concept without bone augmentation for the upper jaw.

Keywords: Basal implants, BOI, sinuslift, augmentation, immediate loading

Introduction

Partially or completely edentulous patients show a demand for teeth and their first intention is to get fixed teeth. With dentures becoming less accepted today, practitioners need little effort to convince patients to receive dental

implants and undergo the sufferings connected to their installment. According to traditional concepts pre-implantological steps of treatment often requires bone augmentations, bone transplants or a combination of both in the upper jaw. Sinuslifts have been introduced at a time, when the dental implant industry produced types of implants, which often- in up to 80% of the cases providing atrophy - did not fit into the bone morphology provided by the patients.

A typical example for the verbal confusion created by industry is the introduction of a product sold under the misleading brand name "Bonefit ®" [iv] , a large, bullet type of implant. Only in very rare cases this implant really fitted the bone, but only few practitioners realized the contradiction buried lying within this brand name. Instead of using implants which really fitted the bone and the patients needs, it became accepted that the patients jaw bone were multi-operated towards a size and shape which actually fitted the implants. This is a unique development in surgery on alive humans. To even increase the confusion, many practitioners fail to make clear distinctions between indications: "aesthetical indications" for augmentations were mixed or called wrongly "no-bone-indications" and vice versa. This way many patients were put on a doubtful road to success, - too often this road turned out to be under severe reconstruction, and so were patients. In the turmoil dental implantology became expensive, lengthy and unpredictable and all this became accepted, it even became the "Gold standard".

As so often in life, when the vast majority of thinkers and workers in a profession reach the same opinion, it is time to ask questions. These question where brought up by a small group of basal implantologists two decades ago. This group simply felt sorry for their patients, they wanted to keep the work within their own offices (instead of referring to the maxillofacial tribe) and they openly searched for and found a different solutions. This way the basal approach was developed (Julliet ,Scortecci, Donsimoni, Spahn, Ihde, Kopp).

Material and Methods

The term "basal implant[1]" refers to the principle to utilize infection and resorption free, basal bone areals, which is one principle of this technology. Another principle is the utilization of cortical bone areas. The rationale behind this principle stems from orthopaedic surgery and from the experience that cortical areas are structurally needed and therefore quite resistant against resorption. At the same time load bearing capacities of cortical bone are a multiple of that of spongious bone. In basal implants, vertical implant parts do not participate primarily in load transmission tasks, and this is why they are provided thin and polished. "Lateral, basal implants" 2 providing a disk-diameter of 7 mm and more, are inserted through a T-shaped slot into the jaw. bones. Screwable basal implants have been developed with the maximum diameter of threads being 5.5 mm.

1 German standard: DIN 13902-1 Terminologie dentaler Implantatsysteme

Fig. 1 A typical basal implant for lateral insertion (BOI implant) with a stable base plate, reduced vertical implant portions, two integrated bending areas, and reduced & polished mucosal penetration diameter.

Fig. 2 A typical basal compression screw (BCS brand) with large and polished threads, for cortical engagement and easy insertion.

These simple devices,- none of them even equipped with any kind of miraculous surface for the "enhancement of bone regeneration"-, turn out today to solve all principle problems of our profession at the same time:

- Through utilizing horizontal and vertical and oblique bone supply, these devices may be implanted under all anatomical conditions. No bone buildup is required and this makes the implantologist free from performing all augmentations including "sinuslifts".
- When planed and carried out properly with enough implants, the devices allow treatment concepts under immediate load even in cases providing severe jaw bone atrophy.
- Both properties meet the requirements of our patients

Simple treatment plans are set up, to avoid sinuslifts and typical plans are explained here. It is a question of the anatomy and surgical experience whether the most distal implant in the maxilla should be a screwed basal implant or a disk-type design. The importance of a really stable distal support for prosthetics, - especially under immediate load conditions-, should never be discussed however.

1. Full arch reconstructions

a. Implant installations anterior to the maxillary sinuses

Whenever an adequate number of implants can be placed anterior to the maxillary sinus a sinuslift can be avoided anyway. Typical examples for this kind of treatment are shown in Figs 1 a nd b as well as in Fig. 2.

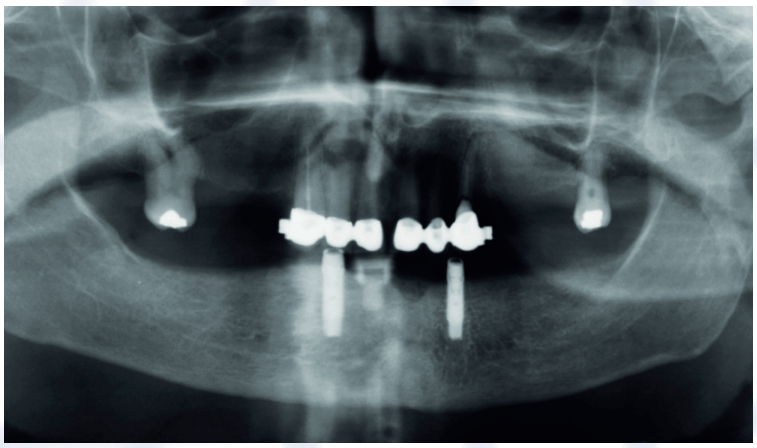

Fig. 3a Preoperative panoramic view of a maxilla needing implants to replace missing and ailing teeth as well as a removable denture.

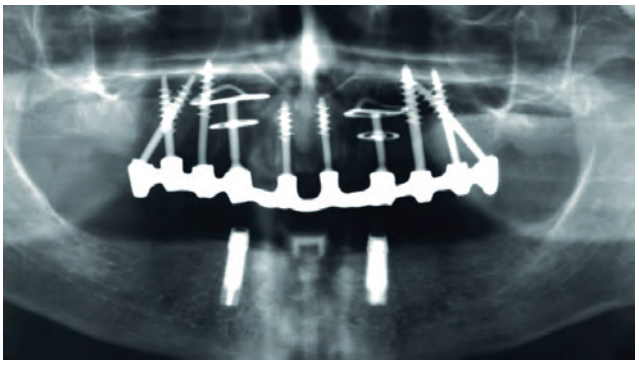

Fig. 3b Postoperative panoramic view of the same patient 6 weeks after implant placement and subsequent loading. Cortical anchoring of the implants is a basic principle of the therapy.

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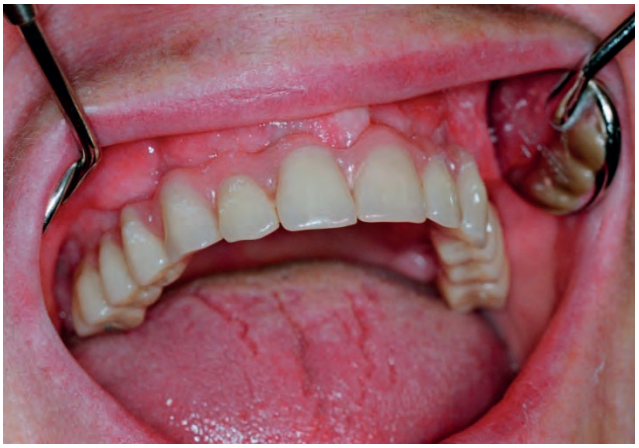


Fig. 3c Intraoral view 6 weeks postoperatively with a metal to plastic bridge installed.

b. Implant installation on both sides of the maxillary sinuses.

When enough bone is left distally to the maxillary sinus, we use a screwable implant as tubero-pterygoid-implant. Typical designs are "BCS", "STC" or TPG"-screws.

The one-piece BCS implants are easier to use and more suitable, because they avoid a screw connection between the bridge and the implant. A uniform direction of insertion can be acchieved easily through angulation adapters or bending. Before those adapters were available, differences in the direction of insertion had to be approximated by screwing the prosthetical construction on the most distal implant.

The number of necessary basal implants for a full maxillary reconstruction lies between 4 and 12, with four implants requiring meticulous masticatory control, enough and good bone in the strategic implant positions, as well as a perfect patient compliance. The more implants are placed in the maxilla, the more safe treatment gets. With implants becoming more and more affordable and suitable (due to changes in design), and because we have learned from a large number of operations,how to utilize the available bone better, we were able to increase the number of implants placeable in the maxilla. Due to the larger initial softness of the maxillary bone, it is recommend never to underequip this jaw with implants, especially when loading immediately.

Immediate loading requires an even distribution of masticatory forces between all implants involved. This distribution is done through the bridge, which is a perfect splitting device. Be-

cause the metal used to enforce the bridge tends to be elastic, the dimensions of the metal frame must be chosen adequately: it is not enough to design the dimensions of the metal frame in a fracture-proof manner. The thickness of the metal structure has to guarantee stiffness and stability and a force distribution between all implants involved, which means that it should not allow elastic deformation of the metal frame while being loaded by typical masticatory forces. This applies also to metal cores of segment-bridges described later on. Typical dimensions providing enough stiffness are 2.5 mm width x 3mm height. Keep in mind that an adequate height influences the stiffness on vertical forces more than the width.

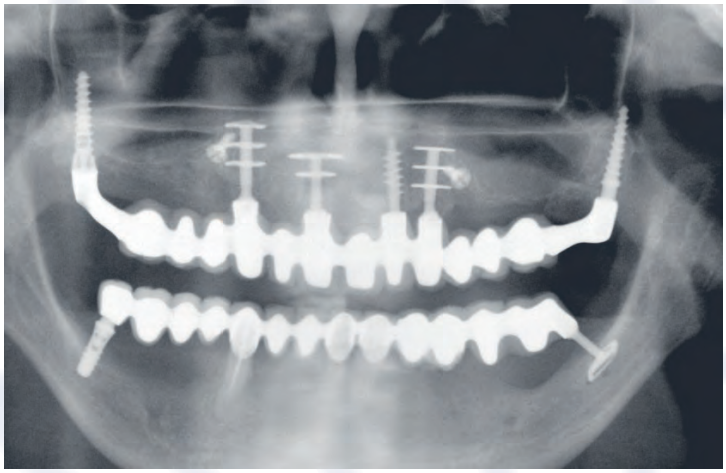


Fig. 4: Screws with internal thread (18) or one-piece implants (28) are equally suitable for equipping the tubero-pterygoid region. Today we tend to use machined, thin implants without surface enlargening and an aggressive thread-design. Cleaning in the distal maxilla is often difficult and therefore we put our emphasis in designing the bridges on allowing self-cleaning by the tongue and allowing suppuration away from the mucosal penetration are of the implants.

2. Segments in the lateral maxilla

a.Segments including posterior tooth support

Often stable 2nd molars are available and the implantologist may want to include them into the treatment concept, while leaving the anterior teeth disconnected from the bridge. This approach saves us from increasing the bone volume in the area of the 1st molar. Single base plate implants may be placed underneath the sinus in as little as 3 mm vertical bone supply, utilizing stable cortical anchoring. In the area of the premolars double- or triple base plate implants are suitable. Basal screws may be used as an alternative in the premolar area. While basal (lateral) implants are utilizing the lateral and medial walls of the maxillary bone, basal screw implants utilize the cortical in the floor of the nose and the maxiallary sinus for stable anchoring.

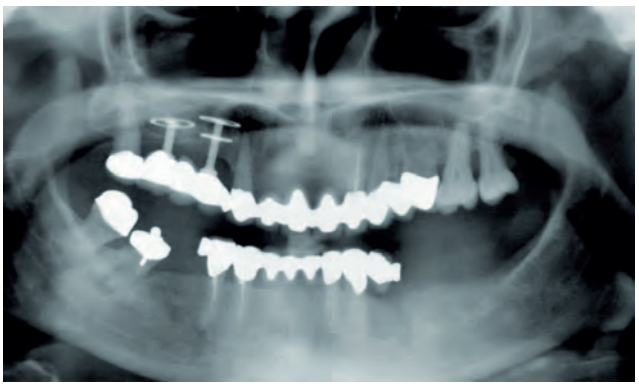


Fig. 5: Two basal implants are inserted in the upper right maxillary bone and immediately connected to the 2nd molar. 12 years postoperative panoramic view. The vertical bone loss is about 1.5 mm . It does not affect the load transmitting base plates of the implants at all.

b. Segments including implants on both sides of the sinus

For an immediately loaded bridge three or more implants are splinted by the bridge. Wherever possible a tubero-pterygoid screw is placed as the most distal implant. The engagement of this implant may be in the sphenoid bone, in the palatal bone or in the distal wall of the maxillary sinus (Fig. 6, Figs. 7)

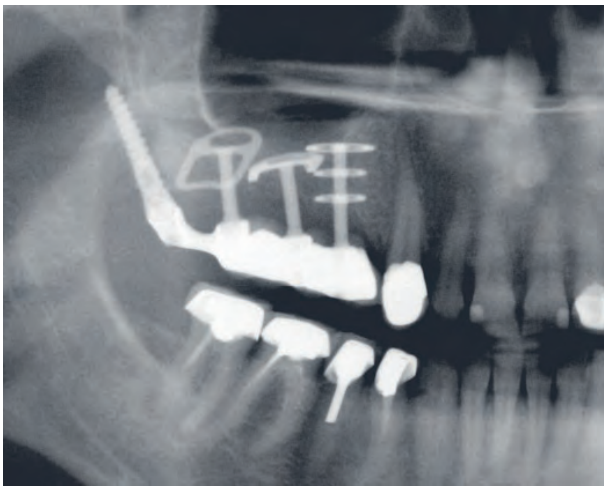
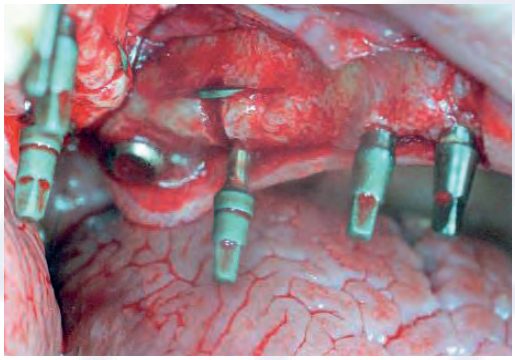


Fig. 6: Immediately after the extraction of teeth in the lateral maxilla, one tubero-pterygoid (SCT-type) screw and three lateral implants were inserted. The bridge is cemented on the three anterior implants and screwed to the distal implant.



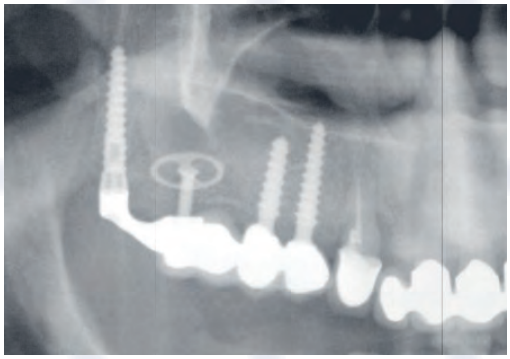


Fig 7 and b: The lateral maxilla is equipped with three compression screw implants and one lateral implant in an immediate load procedure.

c. Segments including anterior tooth support

Whenever possible a lateral implant is placed directly in front of this screw. A third implant is placed in the area of the 2nd premolar. If the 1st premolar is missing or can be extracted, another implant is placed there. Whether a screwable implant or a lateral implant is used, depends on the bones morphology: if wide alveolar are given, lateral implants are a good choice. Keep in mind however, that larger disk diameters automatically move the mucosal penetration area away from the next tooth, which may cause an unwanted cantilever (see also Fig. 5).

d. Segments and full bridges including implants below the maxillary sinus

If the anatomical situation does not permit the placement of a tubero-pterygoid screw implant, more basal implants have to be considered and those implants must be secured against lateral forces. 4D-types of basal implants as well as BAC-types provide holes for screw engagement. All other implants must be fixated by bone screws in the area of the disk ring.

Fig. 8 a

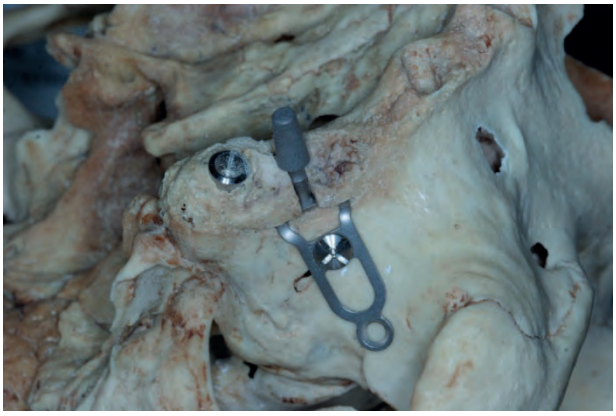


Fig. 8: a and b: BAC implant for externa scre fixation in the palatinal and the vestibular side of the maxilla. The longer (right) strut of the base plate engages nicely in the resorption stable bone of the zygomatic processus of the maxilla. Screws with a thread diameter of 2.4 mm are used.

Fig. 9: 4DS implant for –cortical screw fixation with 1.8 mm screws.

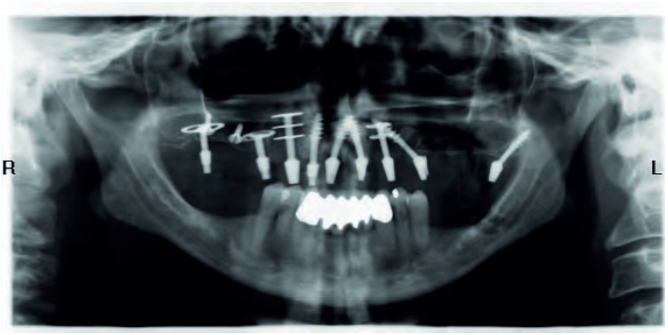


Fig. 10 While on the left side (of the patient) the placement of a tuber-pterygoid screw was possible, no stability could be reached for a screw implant on the right side. Therefore a basal implant was used for supporting the bridge. Both lateral implants were secured by SSF-bone screws.

e. Transsinusal implant placement

Transsinusal implant placement has been described for basal implants and there are pros and cons for this procedure. First of all it should be mentioned, that sinuslifts in combination with immediately loaded basal implants are possible and have been described. The technique is described in short: an approximately 5 x 5 mm large hole is created in the area of the canine fossa. With small instruments the Schneiderian membrane is then elevated. With the membrane elevated a trans-sinusal cut is made for basal implants, the implants are placed and the sinus is augmented. Suitable materials according to our experience are non resorbable HA granules (Pro Osteon 200). Experience has shown, that a number of materials are suitable as space-keeper (scaffold) in the augmented maxilla and that no preferences for any type of material

are detectable out of the literature . Even only blood-derived fibrin cloth, gained through the procedure of PRF-preparation, is a good filler for treatments with basal implants, because load transmission inside the sinus is not required anyway. The fibrin cloth is placed underneath the lifted membrane. Some practitioners prefer to perform this small lifting procedure as a separate surgical step. The technique requires access to the Schneiderian membrane through two small lateral holes.

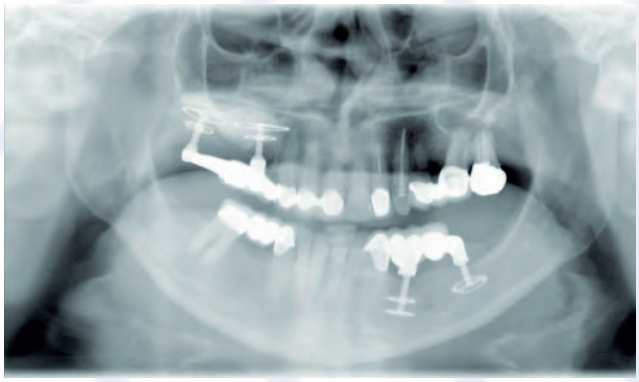


Fig. 11: Simultaneous sinuslift and basal implant placement in the upper right jaw; 12 yrs postoperative panoramic view

3. Discussion

The technique of sinus lifts has to be evaluated under different aspects, such as the cost-effectiveness, the invasiveness and the risks, the outcome of the procedure itself, the outcome of implants placed in such augmented jaw area, and finally, the difference in quality of life for the patients under treatment.

a.) Without any question, any treatment which avoids sinus lifts and leads to the same result must be cheaper, because the surgical effort and the chair time are reduced and the costs for augmentation material are avoided. This approach increases the acceptance of the treatment and for the first time it seems reasonable to predicts, that with the help of a non-sinus-lifting technique treatment, everyone requiring treatment may be treated.

b.) The evaluations regarding the invasiveness and risks is similarly clear: the placement of lateral implants require a lateral approach and therefore the preparation of an enlargened full thickness flap, the same flap would have been necessary to gain access to the sinus region for lifting the membrane. However there a points in fovour of a non-lifting technique: Since a non-sinus-lifting technique avoids the risks of infection of the graft, it should be considered the technique if first choice. With the advent of the non-lifting technique, a reversal of the burden of the proof has happened: implantologists who want to continue with a combination of sinus elevations and dental implants in a 3 stage protocol, must give proof , that their approach is more safer and more effective compared to a non-sinus-lifting technique and that it is for the patient well worth accepting the risks of this protocol.

c.) Outcome of the sinus elevation procedure and the implant treatment

In clinical studies, implant survival rates ranging from 81% to 100% have been reported for treatments after staged sinus elevations (Tidwell et al 1992[vii] ; van den Bergh et al 1998[viii] ; Kassolis et al 2000[ix] ; Pinholt 2003[x] ; Hallman & Nordin

2004[xi] ; Hallmann & Zetterqvist 2004[xii] ; Itturriaga & Ruiz 2004[xiii] ; Zijdervelt et al 2005[xiv]).

Comparison of these studies is difficult, because grafting materials were different and so were the implants. Evaluation and comparison of cases is especially difficult, because the amount of residual bone (even if measured on panoramic pictures) is difficult to measure in all three dimensions. This amount is considered critical for the outcome of the treatment.

d.) Outcome of implant treatment in cases without augmentation

A number of references is available on basal implant treatments. Donsimoni et all reported on a 97% survival rate and a 100% clinical success rate . Similar results have been reported by Scortecci , Kopp , Ihde & Mutter as well as by Ihde . If the amount of literature in crestal Implantology is compared to basal Implantology, it becomes clear, that only few specialists undertake the burden of scientific work and publishing. Since only a few universities are involved in this research, and because industry-derived money supply for enlargening the body of literature is for this technique is missing, an impacting number of publication can not be expected. Nevertheless enough evidence for the basal approach can be found easily and the quality of the articles and the research is at least identical compared to the crestal implants body of literature. Finding this literature is not easy, because most of it is published in French and German language.

e.) Differences in QOL

Implant survival or success is the "gold standard" for measuring the efficacy of dental implants, yet these definitions vary widely from study to study. Several different definitions have been proposed [1-3], but no clear consensus has been reached. In some studies, success is defined as survival of the prosthesis. In others, it is survival of the implant. When the prosthesis is considered, implants not subjected to loading due to improper angulation may be scored as successful provided the prosthesis doesn't fail because it is supported by other implants[4]. Some studies account for all implants placed and report all removals as failures, while others report failures that occur following loading. Early trials of Brånemark implants reported by Adell et al.[6,7]excluded all implants loaded less than 1 year. Walton[8] has demonstrated a wide variation in success rates when replacement, repair, and modification of prostheses are taken into account. These studies make it clear that we do not have a clear definition of failure and when to start counting failures. With the emergence and popularity of immediate load protocols, it is imperative that failures are counted as soon as implants are placed. It is reasonable to differentiate between "early" and "late" failure in delayed loading protocols; however, to be able to compare delayed loading implant systems to immediate load systems, failures must be counted immediately.

How early is too early? What about those who are turned away in the dentist office because they are not "good candidates" for implants. This is not discussed or quantified in the literature. It is not uncommon for patients with poor bone conditions to be told that implants are not an option. Or if there are, the options are expensive, timely, and invasive bone augmentation procedures. These patients are often left without an

option for implants. Is that a failure? In an era where nearly all edentulous patients would prefer fixed teeth rather than removable dentures, perhaps we need to start counting failures as soon as the patient is turned away.

4. Conclusion

Sinuslifts are avoidable procedures today. Basal implants (basal-lateral implants and basal screw implants) may be used in immediate load treatment protocols both to base lateral segments or full upper jaw reconstructions successfully. The risks and burdens of bone augmentations should not be imposed on patients today, because,- in our experience-, every patient has enough native cortical bone left, which will allow implant installation and in most cases immediate loading.

References

1. Albrektsson T, Zarb G, Worthington P and Eriksson AR: The long-term efficacy of currently used dental implants: a review and proposed criteria of success. Int J Oral Maxillofac Implants. 1: 11-25, 1986.

2. Smith DE and Zarb GA: Criteria for success of osseointegrated endosseous implants. J Prosthet Dent. 62: 567-72, 1989.

3. Schnitman PA and Shulman LB: Recommendations of the consensus development conference on dental implants. J Am Dent Assoc. 98: 373-7, 1979.

4. Morris HF and Ochi S: Influence of two different approaches to reporting implant survival outcomes for five different prosthodontic applications. Ann Periodontol. 5: 90-100, 2000.

5. ten Bruggenkate CM, van der Kwast WA and Oosterbeek HS: Success criteria in oral implantology. A review of the literature. Int J Oral Implantol. 7: 45-51, 1990.

6. Adell R, Lekholm U, Rockler B and Branemark PI: A 15-year study of osseointegrated implants in the treatment of the edentulous jaw. Int J Oral Surg. 10: 387-416, 1981.

7. Adell R: Clinical results of osseointegrated implants supporting fixed prostheses in edentulous jaws. J Prosthet Dent. 50: 251-4, 1983.

8. Walton TR: The outcome of implant-supported fixed prostheses from the prosthodontic perspective: proposal for a classification protocol. Int J Prosthodont. 11: 595-601, 1998.

9. Skaret E. A. and Åstrøm N: Oral Health-Related Quality of Life (OHRQoL) - Review of existing instruments and suggestions for use in oral health outcome research in Europe. Health Surveillance in Europe - Europena Global Oral Health Indicators Development Project - 2003 Report Proceedings. : Quintessence International. Paris, D. M. Bourggeois and J. C. Llodra, 2004, pp 99-110.

[i]Tatum H Jr.: Maxillary ans sinus implant reconstructions Clin North Am. 1986 Apr;30(2):207-29.

[ii]Summers, R.B. (1994b) The osteotome technique (Part 2) The ridge expansion osteotomy (REO) procedure. Compendium of Continuing Education in Dentistry 15: 422–436.

[iii]Woo I, Le Bt. Maxillary Sinus floor elevation: review of anatomy and two techniques. Implant Dent 2004, Mar; 13 (1): 28-32

[iv]Bonefit®: A trademark of Institute Straumann, Switzerland

[v]Julliet JM (1975): United States Patent 3,925,892.

[vi]Bornstein M., Chappuis V., Arx v. T., Buser D. : Performance of dental implants after staged sinus floor elevation procedures : 5-year results of a prospective study in partially edentulous patients. Clin Oral Impl. Res. 19 (2008) 1034 – 1043

[vii]Tidwell, J.K. Blijdorp P.A., Stoelinga P.J., Brouns J.B.,& hindericks F. (1992) Composite grafting of the maxillary sinus for placement of endosteal implants. A preliminary report of48 implants; Int. J Oral Maxillofac Impl.ants 21: 204 - 209

[viii]Van den Bergh J.P.A., ten Bruggenkate C.M., Krekeler G., & Tuinzing D.B. (1998) Sinus floor elevation and grafting with autogenous iliac crest bone. Clinical Oral Implant Research 9: 429 - 435

[x]Kassolis J.D., Rosen P.S., & Reynolds M.A. (2000) Alveolar ridge and sinus augmentation utilizing platelet-rich plasma in combination with freeze-dreid bon e allograft: case series. Journal of Periodontology 71: 1654-1161

[ix]Pinholt E.M. (2003) Branemark and ITI dental implants in the human bone-grafted maxilla: a comparative evaluation. Clinical Oral Implant Research 14: 584 – 592

[xi]Hallman M. & Nordin T (2004) Sinus floor augmentation with bovine hydroxylapatite mixed with fibrin glue and later placement of nonsubmerged implants: a retrospective study in 50 patients. International Journal of Oral & Maxillofacial Implants 19: 222-227

[xii]Hallman M. & Zetterqvist L. (2004) A 5-year prospective follow up study of impant supported fixed prostheses in patients subjected to maxillary sinus floor augmentation with an 80: 20 mixture of bovine hydroxylapatite and autogenous bone. Clinical Impant Dentistry and Related Research 6: 82-89

[xiii]Itturiaga M.T.M. & Ruiz C.C. (2004) Maxillary sinus reconstructions with calvarium grafts and endosseous implants. International Journal of Oral & Maxillofacial Surgery 62: 344 – 347.

[xiv]Zijdervelt S.A. Zerbo I.R., van den Bergh J.P.A., Schulten E.A.J.M. & ten Bruggenkate C.M. (2005) Maxillary sinus floor augmentation using a beta-tricalcium (Cerasorb) alone compared to autogenouos bone grafts. International Journal of Oral & Maxillofacial Implants 20: 432 - 440

[xv]Donsimoni J.-M., Gabrieleff, P. Bernot, D. Dohan: Les implants maxillofaciaux à plateaux d`assise; Concepts et technologies orthopediques, rehabilitations maxillomandibulaires, reconstructions maxillo-faciales, rehabilitations dentaires partielles, techniques de reintervention, meta-analyse. 6e partie: une meta-analyse? Implantodontie 13 (2004) 217-228

[xvi]Scortecci G.: Mise en fonction immédiate dans le traitement imptantaire de l'édenté total maxillaire et/ou mandibulaire. Implantodontie 1999, nc 34:29-38

[xvii]Ihde S.: Mutter L Versorgung von Freieindsituationen mit basal osseointegrierten Implantaten (BOI) bei reduziertem vertikalen Knochenangebot. Deutsch Zahnärztl. Zeitschr. 58 (2003) , 94-102

[xviii]Ihde S.: Principles of BOI, Springer Verlag, Heidelberg, 2005

Research in Context

Title: How to use analytical statistics

In the last two editions of Implant Directions, we gave an overview of checking for appropriate analyses when critically reviewing a paper and considering the authors conclusions. For example, were there appropriate analyses that included descriptive statistics, analytic statistics using the primary outcome, ample sample size, and adjustment of potential confounding variables? This edition will present some practical ways to present analytical statistics for outcomes such as implant failure.

When considering the size of the effect of a treatment, the relative risk reduction, the risk difference and the number needed to treat are helpful measures to look for.

Suppose one is reading an article comparing the results of a new implant with BOI in edentulous patients with poor bone. The authors report that the proportion of implant failure among the NEW implant group is 20% and among the BOI group 10%.

- The relative risk (RR) is simply the proportion of patients with the outcome in one treatment group divided by the proportion of patients with the outcome in another treatment group. In this case, 0.10/0.20 = 0.50

- The relative risk reduction (RRR) is |1-RR| x 100, or in our case, (1-0.5) x 100 = 50%. A relative risk reduction of 50% means that the BOI group reduced the risk of implant failure by 50% compared with the NEW implant. If the treatment increases the risk of a bad event, we call that relative risk increase (RRI). Furthermore, when a treatment increases the probability of a good event, the term we use is relative benefit increase (RBI).

The relationship among relative and absolute risk reduction, risk increase and benefit increase.

	Relative 1-|T/C|	Absolute |T-C|
Treatment reduces the risk of bad event vs. control	Relative risk reduction (RRR)	Absolute risk reduction (ARR)
Treatment increases the risk of bad event vs. control	Relative risk increase (RRI)	Absolute risk increase (ARI)
Treatment increases the probability of a good event vs. control	Relative benefit increase (RBI)	Absolute benefit increase (ABI)

- The **Risk Difference (RD)** is the absolute difference between the proportions, 0.20-0.10 = 0.10 or 10%.

- The NNT represents the number of patients one would need to treat in order to prevent a negative outcome (or allow a positive outcome, depending on which outcome is being evaluated). The formula is 1/RD. In our example, 1/.10 = 10; therefore, for every 10 patients treated with BOI, one implant failure can be prevented compared with the NEW implant.

The following table is a summary of the ways to report implant failure for fictional data comparing a NEW implant with BOI implants.

BOI (B) (n=30)	NEW Implant (N) (n=30)	RR	RRR	RD	NNT
No. failed (%)	No. failed (%)	B/N	1-(B/N)	N-B	1/(N-B)
3 (10)	6 (20)	0.50	.50	.10	10

REFERENCES

1. Scortecci G: Immediate function of cortically anchored disk-design implants without bone augmentation in moderately to severely resorbed completely edentulous maxillae. J Oral Implantol 1999;25:70

2. Kopp S: Basal implants: a safe and effective treatment option in dental implantology. CMF Impl. Dir 2007;2:110

3. Kopp S, Kopp W: Comparison of immediate vs. delayed basal implants. J Maxillofac Oral Surg 2008;7:116

4. Ihde S: Principles of BOI. Springer-Verlag 2005

5. Ihde S, Konstantinvic, V., S.: Comparison and definition of pathological peri-implant symptoms and possible therapeutic measures with basal and crestal implants. Dent Implantol 2005;9:122

6. Ihde S, Eber M: Case report: restoration of edentulous mandible with 4 BOI implants in an immediate load procedure. Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub 2004;148:195

7. Donsimoni J, M., Navarro, G., Gaultier, F., Dohan, D., : Les implants maxillo-faciaux à plateaux d`assise ; Concepts et technologies orthopédiques, réhabilitations, maxillomandibulaires, reconstructions maxillo-faciales, réhabilitation dentaires partielles, techniques de réintervention, méta-analyse 4ème partie : réhabilitations dentaires partielles. Implantodontie 2004;13:139

8. Ihde S: Principles of BOI. (ed. 1). Heidelberg: Springer, 2005

9. Kopp S: Implant based crowns in aesthetic challenging regions Arab Dental 2008;22:20

10. Ihde S: Restoration of the atrophied mandible using basal osseointegrated implants and fixed prosthetic superstructures. Implant Dent 2001;10:41

11. Ihde S: Sanierung mit basal osseointegrierten Implantaten. Colleg Magazin 1998;5:138

12. Ihde S, Mutter, E. : Versorgung von Freiendsituationen mit basalosseointegrierten Implantaten (BOI) bei reduziertem vertikalem Knochenangebot. Dtsch Zahnarztl Z 2003;58:94

13. Kopp S: „all on four" - basal implants as solid base for circular bridges in high periodontal risk patients. CMF Impl. Dir 2007;2:105

14. Ihde SK: Fixed prosthodontics in skeletal Class III patients with partially edentulous jaws and age-related prognathism: the basal osseointegration procedure. Implant Dent 1999;8:241

15. Ihde S, Kopp S, Gundlach K, Konstantinovic VS: Effects of radiation therapy on craniofacial and dental implants: a review of the literature. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008

16. Kopp S: Radiological particularities in basal dental implants. Arab Dental 2008;20:24

17. Kopp S: Implantological treatment in a patient with hypodontia. CMF Impl. Dir 2007;2:147

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