Christian-Albrechts-Universität zu Kiel
Medizinische Fakultät

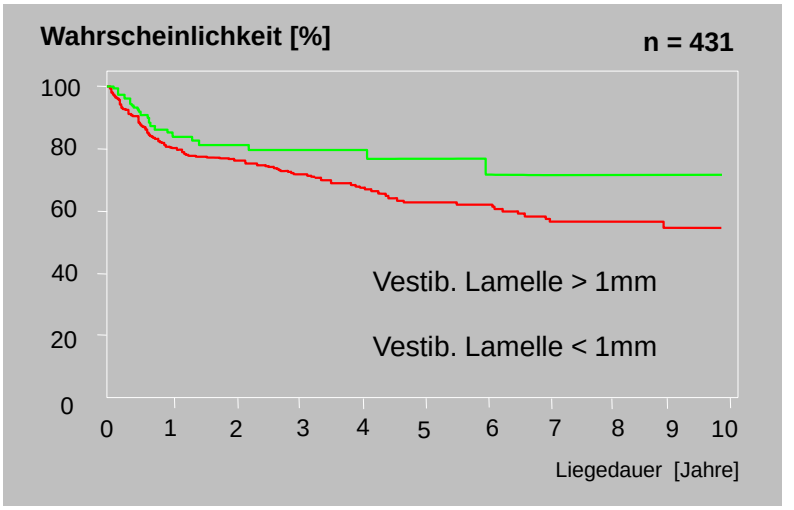
Präimplantologische Augmentation der Alveolarfortsätze: Was ist evidenzbasiert?

Prof. Dr. Dr. J. Wiltfang
Klinik für MKG-Chirurgie
Universitätsklinikum Schleswig-Holstein, Campus Kiel

Wunsch nach natürlicher Ästhetik

Buser D, Martin W, Belser UC (2004) Optimizing the esthetics for implant restorations in the anterior maxilla. Int J Oral Maxillofac Implants 19: 43.61

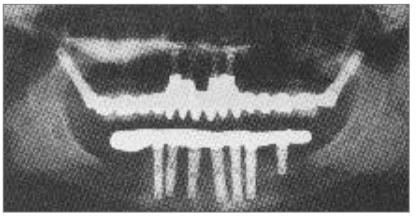
Prognose: Dicke der vestibulären Lamelle

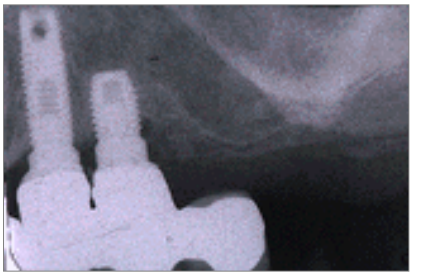


Wiethoff et al. 1994

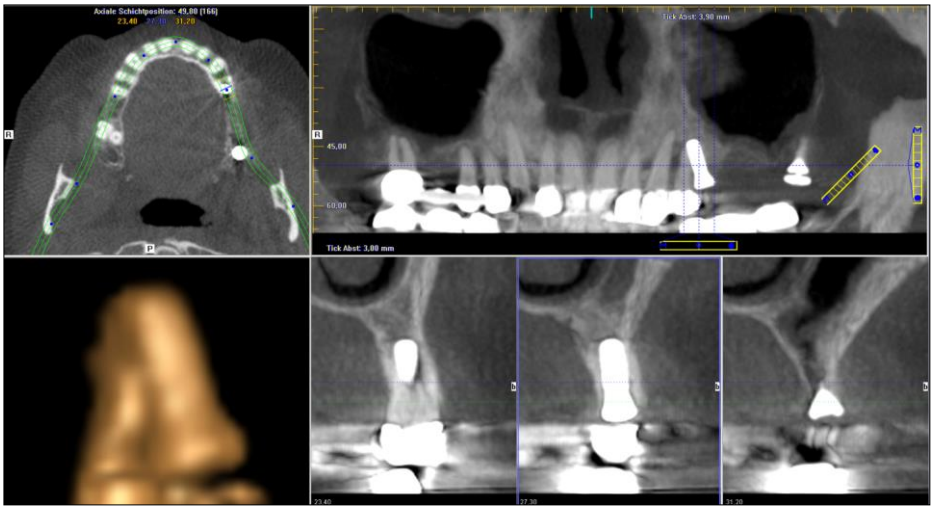
Funktion

Alte Strategien = Kompromisse





Begleitverletzung - Nachbarzähne

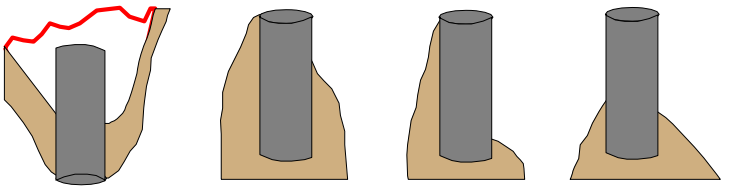


Prinzipien

⇒ **exakte präoperative Planung:**
Ästhetik, Prognose, Funktion

⇒ **korrekte Implantatpositionierung: vertikal u. horizontal**
(restoration-driven implant placement)

⇒ **langfristiges Erhalten von stabilen, ästhetischen Strukturen**



I II III IV

Operationstechniken

I Einlagerung (Sinus lift, Alveolenfüllung)
II Anlagerung (Kammverbreiterung, horizontale Augmentation)
III „mit zweizeitiger Implantatinsertion“
IV Auflagerung (Kammerhöhung, komb. vertikale Augmentation)

Sinusaugmentationen PUBMED Review

Autor	Zahl der Patienten	Zahl der Lokal.	Zahl der Implantate	Implant-ation	Zeit	vertikale Augmentation	Überlebensrate Implantate
Blomqvist	50	97	201	sec	50	?	84,2%
Block	16	27	73	sim	72	?	95,9%
Fugazzotto	150	167	167	sec	36	?	97,8%
Khoury	216	216	467	sim	49	?	94,0%
Kübler	23	39	67	sim/ sec	24-48	14mm	94,1%
Lekholm	47	47	181	sim	36	?	76,0%
Lorenzetti	13	?	?	sec	?	?	?
Olson	29	45	120	sim/ sec	38,2	?	97,5%
Peleg (a)	63	63	160	sim	24-48	?	100,0%
Peleg (b)	21	24	57	sim	8-10	?	100,0%
Peleg	20	20	55	sim	26,4	?	100,0%
Raghoebar	52	98	204	sec	32	?	93,3%
Raghoebar	99	182	392	sec	12-124	?	91,8%
Smedberg	39	75	207	sim	36	?	100,0%
v. d. Bergh	42	60	161	?	12-72	?	100,0%
Wannfors	20	?	76	sim	12	?	79,0%
Wannfors	20	?	74	sec	12	?	89,0%
Watzek	7	14	53	sec	70	?	95,4%
Wiltfang	53	63	132	sim	24	?	95,0%
Zitzmann	30	30	79	sim/ sec	30	10-12,7mm	95%-100%
Total	**994**	**1240**	**2853**	**sim: 1629 sec: 1224**			**93,59 %**

Sinusaugmentationen PUBMED Review

Autor	Zahl der Patienten	Zahl der Lokal.	Zahl der Implantate	Implant-ation	Zeit	vertikale Augmentation	Überlebensrate Implantate
Blomqvist Block Fugazzotto Khoury Kübler Lekholm Lorenzetti Olson Peleg (a) Peleg (b) Peleg Raghoebar Raghoebar Smedberg v. d. Bergh Wannfors Wannfors Watzek Wiltfang Zitzmann	**Effectiveness of sinus lift procedures for dental implant rehabilitation: a Cochrane systematic review** **„It is still unclear when sinus lift procedures are needed.“** **Esposito M, Grusovin MG, Rees J, Karasoulos D, Felice P, Alissa R, Worthington H, Coulthard P (2010)** **Eur J Oral Implantol 3 (1): 7-26**						
Total	**994**	**1240**	**2853**	**sim: 1629** **sec: 1224**			**93,59 %**

Kurze Implantate?

⇒ **short implants may be a suitable, cheaper and faster alternative**

Treatment of atropic edentulous maxilla: short implants versus bone augmentation for placing longer implants. 5 months post-loading results of a randomised controlled trial

Felice P, Soardi E, Pelegrino G, Pistilli R, Marchetti C, Gessaroli M, Esposito M (2011)
Eur J Oral Implantol 4 (3): 191-202

Kurze Implantate?

- **short implants (5-8.5 mm) vs. 11.5 mm long implants + sinuslift (iliac crest), 15/13 edentulous patients 5-9 mm residual bone height, at least 5 mm thick, follow up: 5 months after loading, cross arch fixed dental prothesis**

Treatment of atropic edentulous maxilla: short implants versus bone augmentation for placing longer implants. 5 months post-loading results of a randomised controlled trial

Felice P, Soardi E, Pelegrino G, Pistilli R, Marchetti C, Gessaroli M, Esposito M (2011)
Eur J Oral Implantol 4 (3): 191-202

Kurze Implantate?

⇨ **5 mm short implants achieve simular, if not better results than longer implants placed in augmented bone. Short implants might be a preferable choice.**

Rehabilitation of posterior atrophic edentulous jaws: prothesis supported by 5 mm short implants or ba longer implants in augmented bone? One year results from a randomised controlled trial

Esposito M, Pelegrino G,, Pistilli R, Felice P (2011)
Eur J Oral Implantol 4 (1): 21-30

Kurze Implantate?

- **short implants (5 mm) vs. >10 mm long implants + augmentation (anorganic bovine bone) in posterior atrophic jaws, 15 patients**
  4-7 mm residual bone height, at least 8 mm thick,
  follow up: 12 months after loading,
  1 vs. 1.2 peri-implant bone loss

Rehabilitation of posterior atrophic edentulous jaws: prothesis supported by 5 mm short implants or ba longer implants in augmented bone? One year results from a randomised controlled trial

Esposito M, Pelegrino G,, Pistilli R, Felice P (2011)
Eur J Oral Implantol 4 (1): 21-30

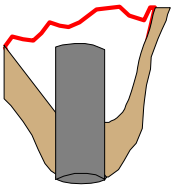
6th ITI Consensuskonferenz , Amsterdam, April 2018

Group 1 ITI Consensus Report: The influence of implant length and design and medications on clinical and patient-reported outcomes.
Jung, RE[1], et al. 2018 Oral Implants Res, 2018 Oct;29 Suppl 16:69-77. doi: 10.1111/clr.13342.
Short implants (≤6 mm) revealed a survival rate ranging from 86.7% to 100%, whereas standard implant survival rate ranged from 95% to 100% with a follow-up from 1 to 5 years. Short implants demonstrated a higher variability and a higher Risk Ratio [RR: 1.24 (95% CI: 0.63, 2.44, p = 0.54)] for failure compared to standard implants.

CONCLUSIONS:
It is concluded that short implants (≤6 mm) are a valid option in situations of reduced bone height to avoid possible morbidity associated with augmentation procedures; however**, they reveal a higher variability and lower predictability in survival rates.**

Meta-analyse

Which hard tissue augmentation techniques are the most successful in furnishing bony support for implant placement?



maxillary sinus grafting (90 articles, 5.128 implants placed)

⇨ **implant survival**

92% for autogenous and autogenous/composite grafts

93.3% for allogeneic (another individual) /non autog. composite grafts

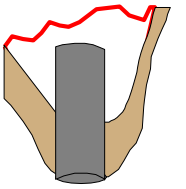
81% for alloplast (synthetic) or alloplast/xenograft materials

95.6% for xenograft materials alone (another species)

Aghaloo TL, Moy PK Int J Oral Maxilloc Implants 2007

Meta-analyse

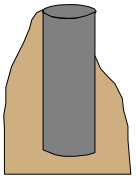
The effiacy of various bone augmentation procedures for dental implants: a Cochrane systematic review of randomized controlled clinical trials.



13 RCTs, 332 patients: outcome of implant therapy

Bone substitutes may replace autogenous bone for sinus lift procedures

Esposito M Int J Oral Maxilloc Implants 2006



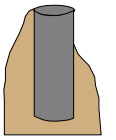
II

Operationstechniken

II Anlagerung (Kammverbreiterung, horizontale Augmentation)

Meta-analyse

Bone augmentation procedures in localized defects in the alveolar ridge: clinical results with different bone grafts and bone-substitute materials. A review



Dehiscence-type and fenestration type defects

20 studies, 627 patients, 987 implants

1. Non resorbable membrane alone:

exposure (13.8%), mean defect fill (79.4%), implant survival (93%)

2. Autogenous bone chips with or without membrane:

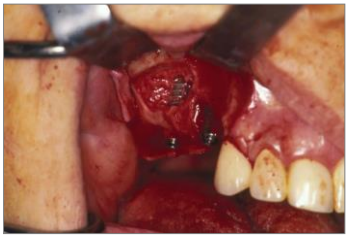
exposure (15.5%), mean defect fill (83.8 vs 68.8%), implant survival (94%)

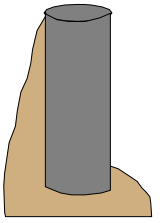
3. DBBM with or without a membrane:

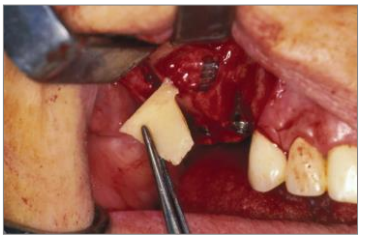
exposure (12%), mean defect fill (87 vs. 75.5%), implant survival (93%)

Jensen SS, Terheyden H Int J Oral Maxillofac Implants 2009, 24: 218-236

Benutzung des J Grafts

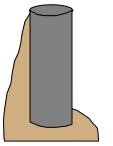






Meta-analyse

Bone augmentation procedures in localied defects in the alveolar ridge: clinical results with different bone grafts and bone-substitute materials. A review



Horizontal ridge augmentation

20 studies, 593 patients, 1,034 implants

Autogenous (intraoral donor site) block:

average gain in ridge width: 3.6mm, complication rate: 12.2%, additional grafting needed: 11.1%, implant survival: 97%

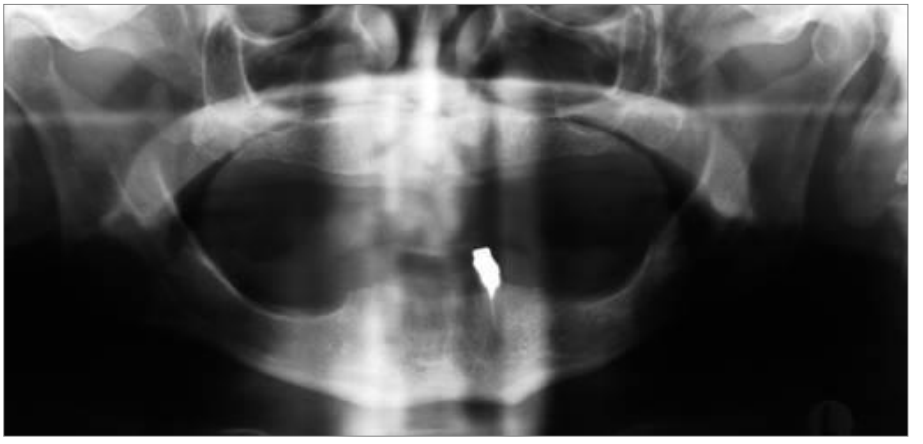
1. Non resorbable membrane: complication rate: 23.6%

2. Resorbable membrane: 18.9%

3. No membrane: 9.4%

Jensen SS, Terheyden H Int J Oral Maxillofac Implants 2009, 24: 218-236

OK und UK-Atrophie: Augmentation?



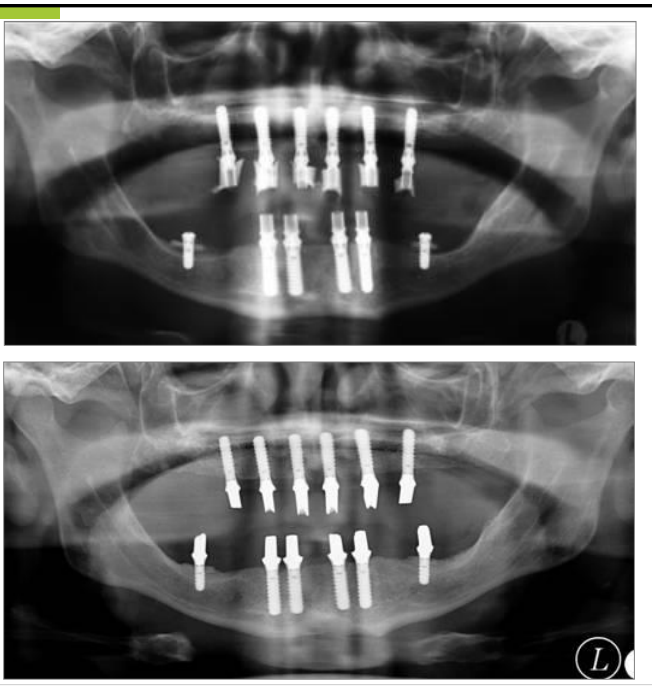
Implantatlängen: Unterkiefer

- **7-8.5 mm implants (Branemark), fixed prothesis, 96.2 – 97.1% cumulative success rates**

Malo P et al.: Short implants placed one-stage in maxillae and mandibles: a retrospective clinical study with 1 to 9 years follow up. Clin Implant Dent Relat Res 9, 15, 2007

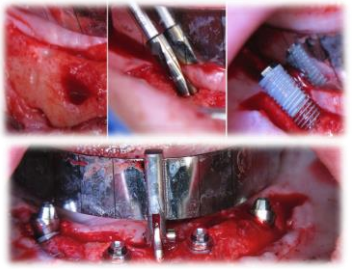
- **Total failure rate: 4.8%, implants 3.75x10mm failed at a rate of 8.7%**
  „short implants should be considered as an alternative to advanced bone augmentation surgeries“

Domingues das Neves F et al. Short implants – an analysis of longitudial studies. Int J Oral Maxillofac implants 21, 86, 2006



Prothetik: Prof. Kern

All-on-4® Konzept (Unterkiefer)



nur 4 Implantate maxilläre oder mandibuläre Rehabilitation

45° abgewinkelte distale Implantate

erhöhte Primärstabilität mittels Design des Implantatsystems, Unterdimensierung der Knochenkavität

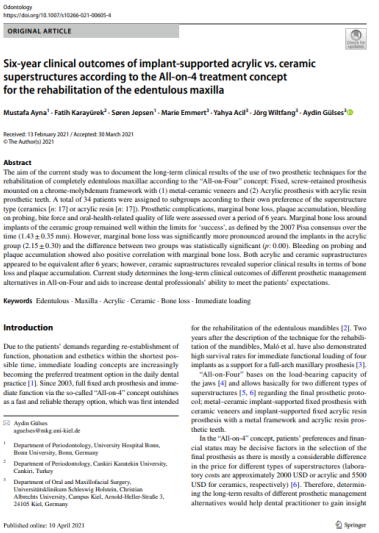
und ggf. kortikale Verankerung der Implantate

Sofortbelastung

Maló P, Rangert B, Nobre M. "All-on-Four" immediate-function concept with Brånemark System implants for completely edentulous mandibles:
a retrospective clinical study. Clin Implant Dent Relat Res. 2003;5 Suppl 1:2-9.

All-on-4 (Oberkiefer)

- 6 Jahre Ergebnisse
- 34 Patienten (Acryl vs Keramik)
- Knochenverlust
- Plaque Akkumulation
- PPD
- OHIP
- Okklusale Kaukräfte



Odontology
https://doi.org/10.1007/s10266-021-00605-4

ORIGINAL ARTICLE

Six-year clinical outcomes of implant-supported acrylic vs. ceramic superstructures according to the All-on-4 treatment concept for the rehabilitation of the edentulous maxilla

Mustafa Ayna[1] · Fatih Karayürek[2] · Søren Jepsen[1] · Marie Emmert[3] · Yahya Acil[3] · Jörg Wiltfang[3] · Aydin Gülses[3]

Received: 13 February 2021 / Accepted: 30 March 2021
© The Author(s) 2021

Abstract
The aim of the current study was to document the long-term clinical results of the use of two prosthetic techniques for the rehabilitation of completely edentulous maxillae according to the "All-on-Four" concept: Fixed, screw-retained prosthesis mounted on a chrome-molybdenum framework with (1) metal-ceramic veneers and (2) Acrylic prosthesis with acrylic resin prosthetic teeth. A total of 34 patients were assigned to subgroups according to their own preference of the superstructure type (ceramics [n: 17] or acrylic resin [n: 17]). Prosthetic complications, marginal bone loss, plaque accumulation, bleeding on probing, bite force and oral-health-related quality of life were assessed over a period of 6 years. Marginal bone loss around implants of the ceramic group remained well within the limits for 'success', as defined by the 2007 Pisa consensus over the time (1.43 ± 0.35 mm). However, marginal bone loss was significantly more pronounced around the implants in the acrylic group (2.15 ± 0.30) and the difference between two groups was statistically significant (p: 0.00). Bleeding on probing and plaque accumulation showed also positive correlation with marginal bone loss. Both acrylic and ceramic suprastructures appeared to be equivalent after 6 years; however, ceramic suprastructures revealed superior clinical results in terms of bone loss and plaque accumulation. Current study determines the long-term clinical outcomes of different prosthetic management alternatives in All-on-Four and aids to increase dental professionals' ability to meet the patients' expectations.

Keywords Edentulous · Maxilla · Acrylic · Ceramic · Bone loss · Immediate loading

Introduction

Due to the patients' demands regarding re-establishment of function, phonation and esthetics within the shortest possible time, immediate loading concepts are increasingly becoming the preferred treatment option in the daily dental practice [1]. Since 2003, full fixed arch prosthesis and immediate function via the so-called 'All-on-4" concept outshines as a fast and reliable therapy option, which was first intended for the rehabilitation of the edentulous mandibles [2]. Two years after the description of the technique for the rehabilitation of the mandibles, Maló et al. have also demonstrated high survival rates for immediate functional loading of four implants as a support for a full-arch maxillary prosthesis [3].

"All-on-Four" bases on the load-bearing capacity of the jaws [4] and allows basically for two different types of superstructures [5, 6] regarding the final prosthetic protocol: metal–ceramic implant-supported fixed prosthesis with ceramic veneers and implant-supported fixed acrylic resin prosthesis with a metal framework and acrylic resin prosthetic teeth.

In the "All-on-4" concept, patients' preferences and financial status may be decisive factors in the selection of the final prosthesis as there is mostly a considerable difference in the price for different types of superstructures (laboratory costs are approximately 2000 USD or acrylic and 5500 USD for ceramics, respectively) [6]. Therefore, determining the long-term results of different prosthetic management alternatives would help dental practitioner to gain insight

✉ Aydin Gülses
agoelses@mkg.uni-kiel.de

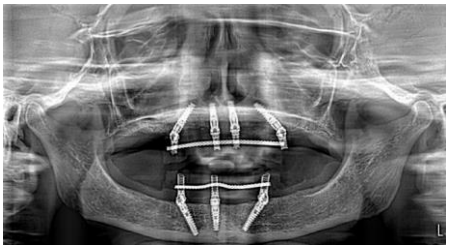
[1] Department of Periodontology, University Hospital Bonn, Bonn University, Bonn, Germany
[2] Department of Periodontology, Cankiri Karatekin University, Cankiri, Turkey
[3] Department of Oral and Maxillofacial Surgery, Universitätsklinikum Schleswig Holstein, Christian Albrechts University, Campus Kiel, Arnold-Heller-Straße 3, 24105 Kiel, Germany

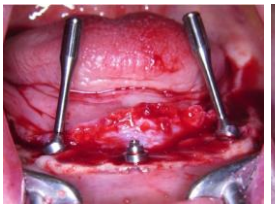
Published online: 10 April 2021

Springer

All-on-3

- Interforaminärer Distanz von < 40 mm
- 2 abgewinkelte Implantate
- ein gerades Implantat
- Primärstabilität





Ayna M, Sagheb K, Gutwald R, Wieker H, Flörke C, Açil Y, Wiltfang J, Gülses A. A clinical study on the 6-year outcomes of immediately loaded three implants for completely edentulous mandibles: "the all-on-3 concept„.Odontology. 2019 Jul 5. doi: 10.1007/s10266-019-00440-8.

All-on-3

- 6 Jahre Ergebnisse
- 29 Patienten
- Knochenverlust
- Plaque Akkumulation
- PPD
- OHIP
- Okklusale Kaukräfte

biomechanischer Vorteil für eine sofortige Funktion mittels erhöhter Primärstabilität

Odontology
https://doi.org/10.1007/s10266-019-00440-8

ORIGINAL ARTICLE

A clinical study on the 6-year outcomes of immediately loaded three implants for completely edentulous mandibles: "the all-on-3 concept"

Mustafa Ayna[1] · Keyvan Sagheb[2] · Ralf Gutwald[3] · Henning Wieker[4] · Christian Flörke[4] · Yahya Açil[4] · Jörg Wiltfang[4] · Aydin Gülses[4,5]

Received: 27 August 2018 / Accepted: 4 June 2019
© The Society of The Nippon Dental University 2019

Abstract
The objective of the current study was to demonstrate the 6-year clinical and radiological treatment outcomes of the technique performed by immediately loading of three implants (single straight in the mid-line and two tilted distal implants) for the management of total edentulous mandibles and introduce a simple decision matrix for selection of the most appropriate protocol in cases with insufficient length of the interforaminal area. Re-assessments were performed over a total observation period of 6 years after surgery via measurement of bone resorption around implants, bleeding on probing, plaque accumulation, periodontal probing depth, bite force measurements and oral health impact profile. A total of 29 patients (45% women and 55% men) with a mean age of 65 ± 6 years enrolled in the study. 14 patients received an acryl-based bridge as definitive prosthetic restoration and 15 patients received a ceramic-based restoration. Both during the immediate loading phase and during the 6-year follow-up, there was no implantation loss. Regardless of the implant position, all implants showed continuous bone loss over the observation time. The bone loss around dental implants during observation period was only maximum 1.0 ± 1 mm and it remained well within the limits for 'success' according to the 2007 Pisa consensus (< 2 mm). The plaque index showed no significant fluctuations between the implant positions and the individual examination times. The approach described herein might help the surgeon by avoiding unnecessary loss of bone strength, selecting implant sites, and establishing the biomechanical advantage of increased A–P spread for immediate function.

Keywords Mandible · Immediate loading · Implant · Tilted

Introduction
Among multitude of surgical and prosthodontic concepts employing different implant numbers, inclinations and suprastructures, no ideal treatment option exists in the management of completely edentulous jaws. Therefore, patient-oriented therapy, which depends on the patient's needs and preferences, plays a key role in meeting patients' expectations. Due to the increased patients' demands, made on re-establishment of accurate function and esthetics within the shortest possible time, immediate loading of the implant-supported prosthesis for the rehabilitation of the edentulous jaws outshine as a fast and reliable therapy option in the daily dental practice.
A relatively recent technique developed for the rehabilitation of edentulous jaws with immediate loading is the so called 'All-on-4™' concept, which was originally introduced by Maló and coworkers in 2003 [1]. The technique is based on immediate loading of bilaterally placed two tilted distal implants in the premolar and two straight implants in the lateral incisor area. The main advantage of the technique is avoiding the transitional period of implant systems with delayed loading. Moreover, in the cases where a lack of sufficient bone volume at the posterior region exists, the need for inlay and/or onlay bones grafting of the posterior implant

Aydin Gülses
agaclses@mkg.uni-kiel.de

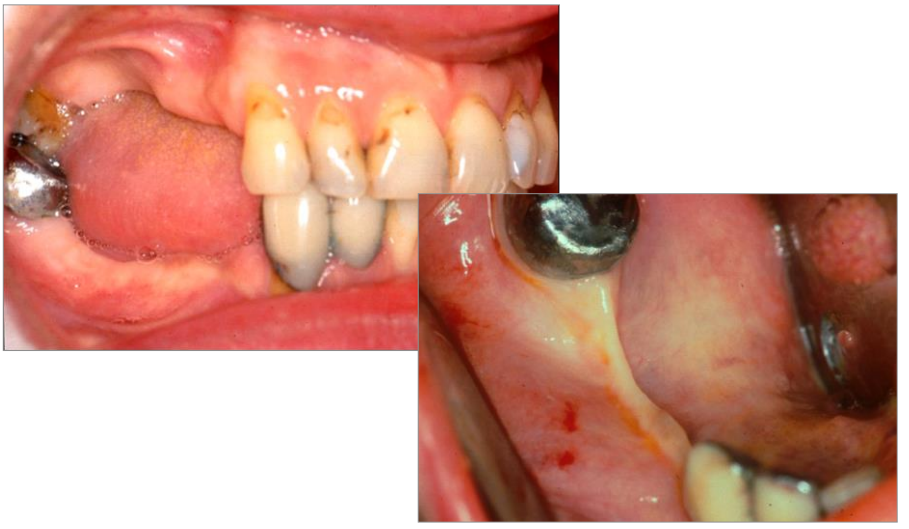
1 Center for Dental Implantology, Duisburg, Germany
2 Department of Oral and Maxillofacial Surgery, University of Mainz, Mainz, Germany
3 Department of Oral and Maxillofacial Surgery, Danube Private University, Danube, Austria
4 Department of Oral and Maxillofacial Surgery, Christian Albrechts University, UKSH, Campus Kiel, Arnold-Heller-Straße 3, 24105 Kiel, Germany
5 Department of Oral and Maxillofacial Surgery, Christian Albrechts University, UKSH, Campus Kiel, Arnold-Heller-Straße 3, 24105 Kiel, Germany

Published online: 05 July 2019

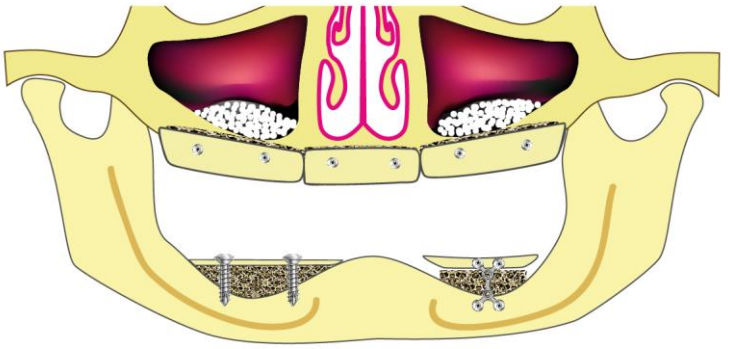
Springer

Ayna M, Sagheb K, Gutwald R, Wieker H, Flörke C, Açil Y, Wiltfang J, Gülses A. A clinical study on the 6-year outcomes of immediately loaded three implants for completely edentulous mandibles: "the all-on-3 concept". Odontology. 2020 Jan;108(1):133-142

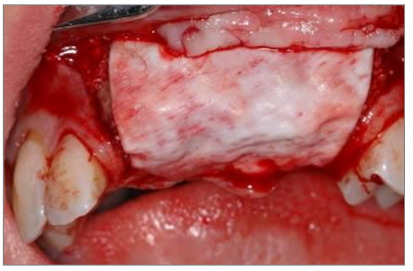
Komplexe Defekte (> 4mm)

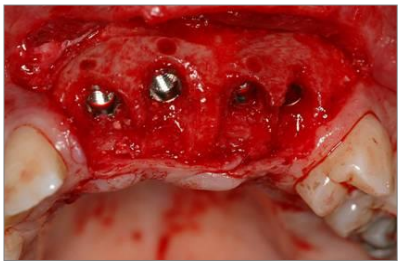


Komplexe Defekte (> 4mm)



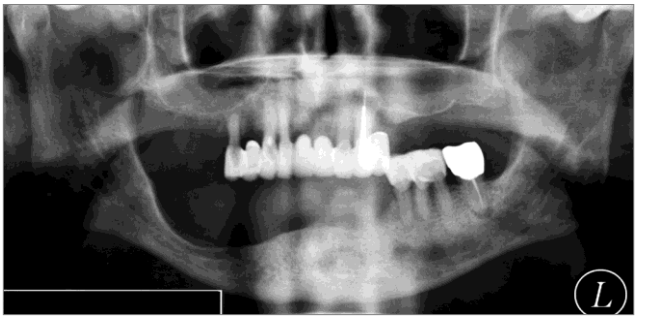
Augmentation (Rekonstruktion)



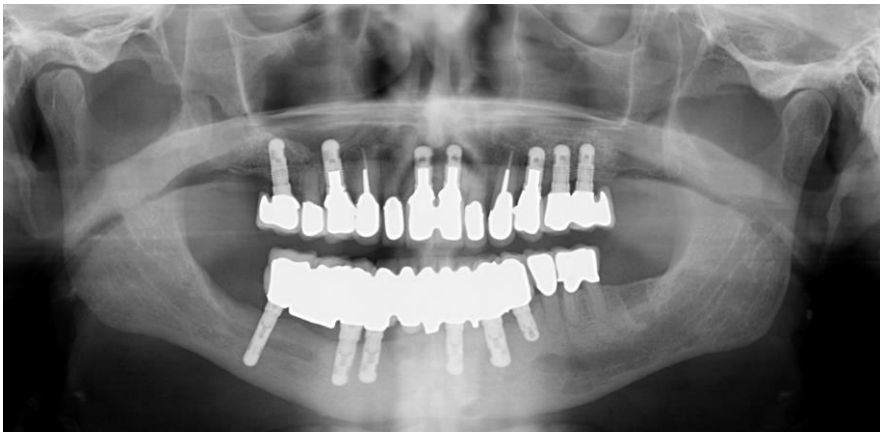


Prothetik: Prof. Dr. S. Wolfart

Komplexe Defekte

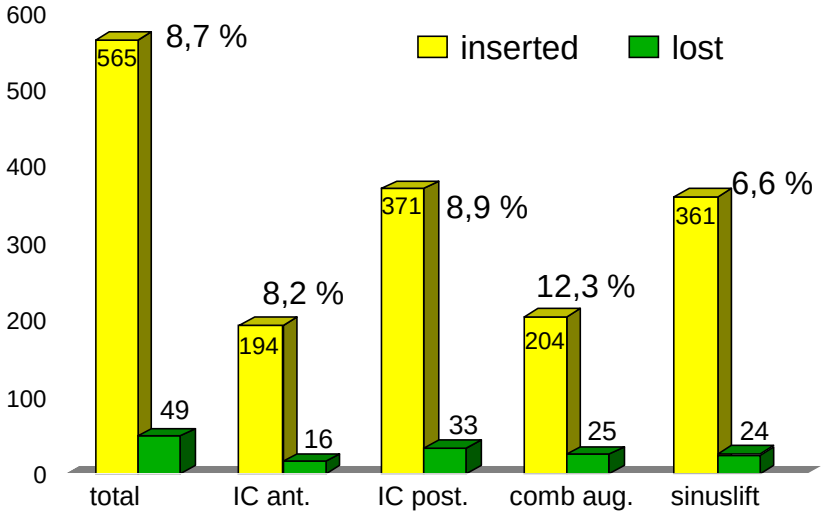


Komplexe Defekte



Clinical results after augmentations of the jaw using iliac crest –

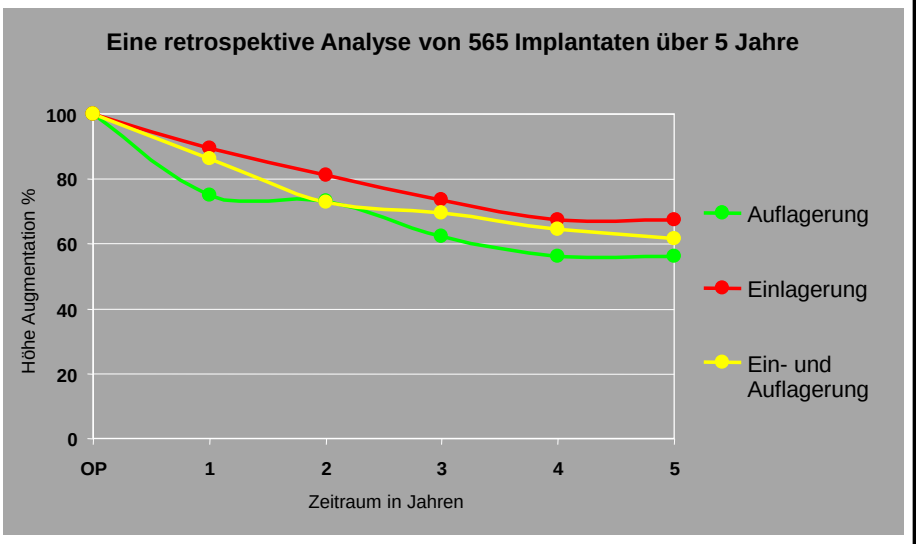
a retrospective analysis of 565 implants over a 5 years period
Wiltfang J , Neukam FW. et al. Int J Oral Maxillofac Surg 2005



- 279 Patienten, 456 autologe Augmentationsverfahren
- Autologe Knochentransplantate sind nach wie vor der "Goldstandard" bei der Alveolarkamm-Augmentation vor der oralen Implantation.

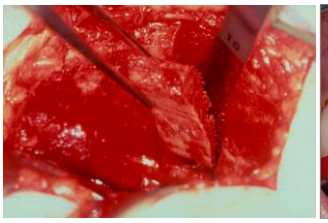
Sakkas A et al. Autogenous bone grafts in oral implantology-is it still a "gold standard"? A consecutive review of 279 patients with 456 clinical procedures.
Int J Implant Dent. 2017 Dec;3(1):23.

Postoperative Entwicklung: Augmentation



Wiltfang et al. Onlay augmentation. A five year follow uo study.
Int J Oral Maxillofac Surg 2005

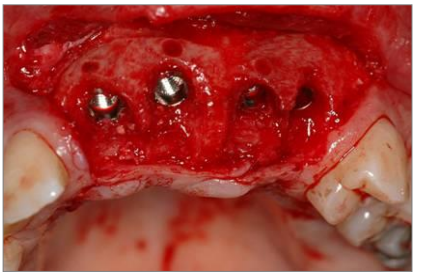
Reduktion der Resorption möglich?


Adeyemo et al. Int J Oral Maxillofac Surg 2008

Augmentation (Rekonstruktion)



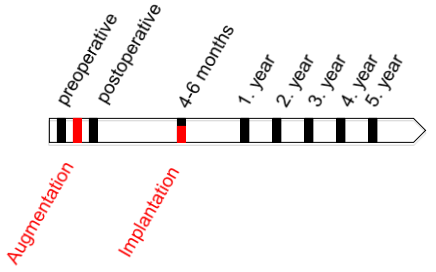
Patienten und Methode

40 Patienten, BKE, BioOss®
w=21, m=19

40 Patienten BKE
w=22, m=18

Patienten und Methode

Beobachtungszeitraum



Parameter:

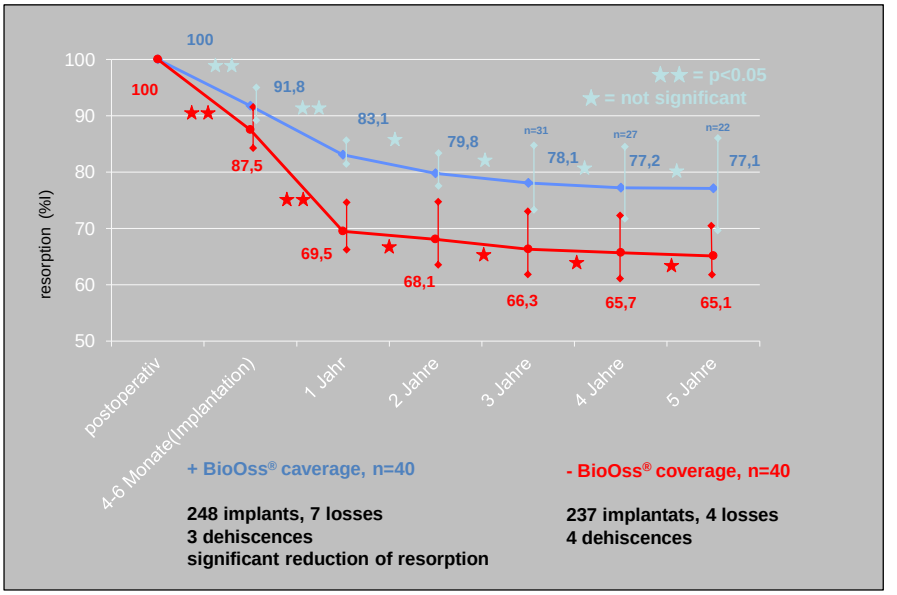
1. **Komplikationen**
2. **Resorption des Augmentates im %**

Statistik:

1. **Kolmogorov-Smirnov, Shapiro-Wilk**
2. **T-Test,Konfidenz Interval 95%**
3. **Varianz-Analyse (ANOVA)**

$p \leq 0.05$

Ergebnisse

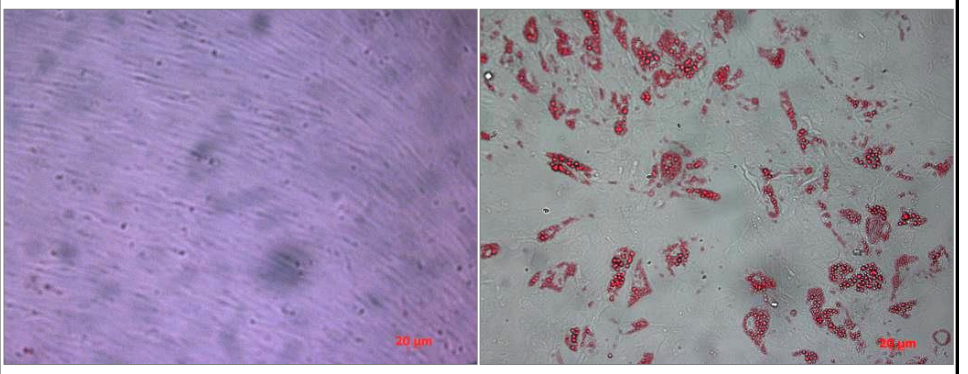


Zusammenfassung

1. BioOss Überschichtung vermindert die Resorptionsrate signifikant
2. Insbesondere im Zeitraum: 6 Mo. – 1 Jahr
3. stabile Ergebnisse > 4 Jahre

Perspektive?

MSC

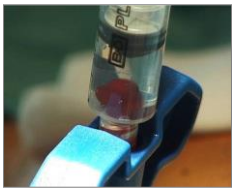


Kontrolle **adipogenetisches Medium**

adipogenetische Differenzierung ist erwiesen

Hermann, PC. et al. Concentration of Bone Marrow Total Nucleated Cells by a Point-of-care Device Provides a High Yield and Preserves their Functional Activity.
Cell Transplantation 2008, 16: 1059-69

Patienten und Methoden



30 Patienten mit ausgedehnten Augmentationen (Klasse 3 u. 4)

Knochenmarkaspiration aus dem anterioren Beckenkamm

Probenentnahme vor und nach Konzentration

Identifizierung mittels FACS-Analyse,

Oberflächenmarker + für CD-105,-29,-90,-73 and
- für CD-45,-14,-34,-19, 7-AAD und HLA-DR

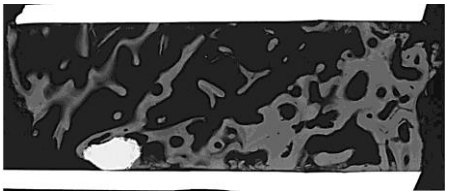
Ergebnisse

concentration of hMSC after ICS-CS and ICS-OSBS vs. concentration of MNCs in Bone Marrow Aspirate [cells/ml].

aspirate MNCs	concentrate hMSC
$1{,}2\ 10^5$ CS	$3{,}5\ 10^5$
$3{,}5\ 10^5$ OSBS	$1{,}3\ 10^6$
$2{,}0\ 10^5$ CS	$2{,}0\ 10^6$
$5{,}7\ 10^5$ OSBS	$1{,}9\ 10^6$
$2{,}1\ 10^5$ CS	$3{,}0\ 10^6$
$4{,}5\ 10^5$ OSBS	$4{,}5\ 10^6$

cell concentration techniques allow a higher density of mesenchymal cells than mononuclear cells in bone marrow aspirate in the range of factor 2 to 10

Kontrollproben



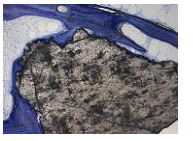
Mikroradiographie

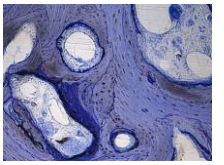
Toluidin blau

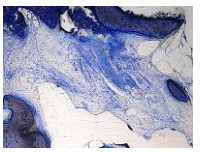
Fläche: **25,3 mm²**

Neugebildeter Knochen: **37,3%**

KEM Anteil: **2,1%**

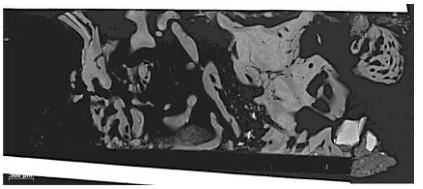


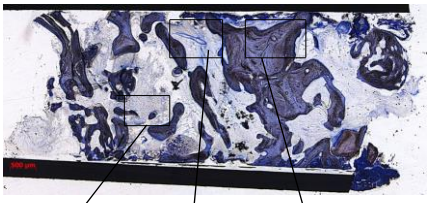




detail: 30 x

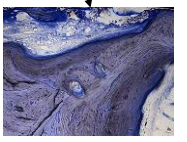
ICS CS





Mikroradiographie

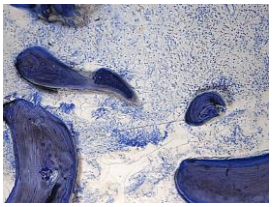
Toluidin blau

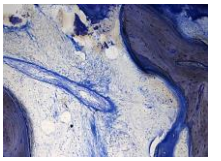


Fläche: **23,0 mm²**

Neugebildeter Knochen: **47,4%**

KEM Anteil: **0,7%**



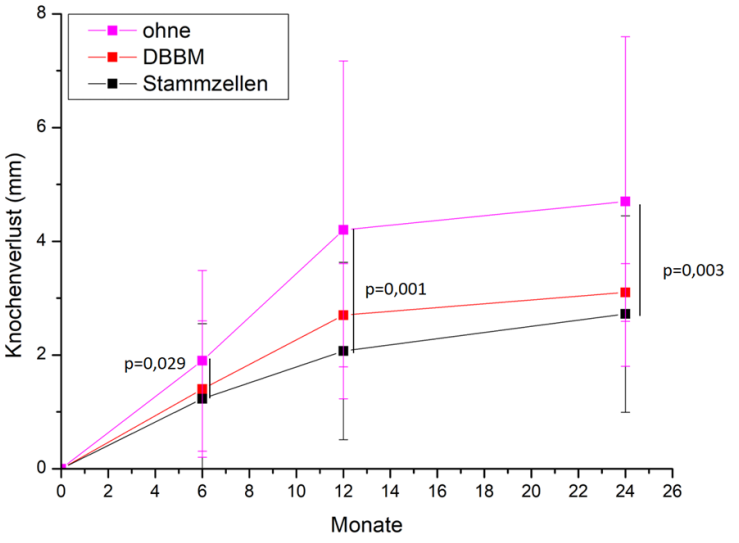


detail: 30 x

Verlust der Augmentationshöhe durch Resorption

Gruppe	# Patienten	Durchschnittsalter	Altersgruppe	Unterkiefer	Oberkiefer	Ober- Unterkiefer	# Implantate gesamt
Stammzellen	33	60	31-83	6	24	3	188
DBBM	40	64	22-80	8	26	6	248
Ohne	40	58	27-77	6	30	4	237

Zeitlicher Verlauf der Knochenresorption nach 6, 12 und 24 Mon



Ausblick: individuelle Implantate

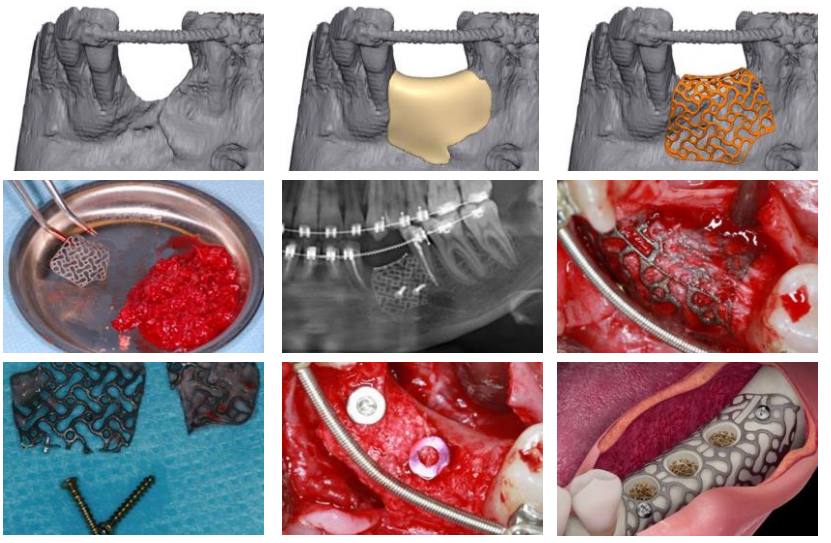
- Implantate an den Kiefer anpassen – nicht Kiefer an die Implantate
- Ausdehnung der implantologischen Grenzbereiche
- Neuentdeckung einer alten Technik:
  - *Experimental subperiosteal dental implants, Bodine 1953 (!)*
- Echte Osseointegration nur bei enossalen Implantaten

Replicate, Natural Dental Implants AG, Berlin

OMX Solutions, Melbourne, Australia

patientenspezifische GBR-Augmentation

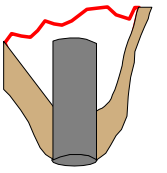
- Yxoss CBR®, Geistlich Pharma AG



Yxoss CBR®, Backward

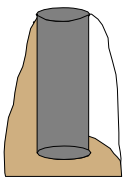
Zusammenfassung

Sinuslift: **< 6mm Restknochenhöhe offenes Verfahren,**
> 6 mm Kondensationstechnik
KEM, ggf. als Gemisch, Membran?

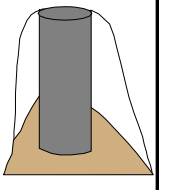


Dehiszenz: **KEM, ggf. Gemisch, Membran**

Fenestration: **intraorales Blocktransplantat**



Anlagerung: **< 4 mm io Blocktransplantat, Membran?**
> 4 mm eo Blocktransplantat, Membran



Kombinierte Defeke: BKE, KEM, Membran, ggf. Stammzellen

⇨ **Überlebensraten mit und ohne Augmentation vergleichbar**

Hämmerle CHF, Jung RE, Feloutzis A J Clin Periodontol 2002, 29: 226-231

Vielen Dank für Ihre Aufmerksamkeit!