EuCC presents recommendations for short, angulated and reduced-diameter implants

A reliable treatment option

In January and February, the 18th European Consensus Conference (EuCC) under the auspices of BDIZ EDI updated its 2016 Guideline on short, angulated and reduced-diameter implants. The 2023 Guideline provides recommendations for practitioners and reflects data from controlled clinical trials while also incorporating data from routine clinical practice.

Prof. Jörg Neugebauer, BDIZ EDI Secretary General and host of the EuCC, explains why this revised version has been prepared: "Discussions on this topic do not take place in a closed forum. We are not aiming for a purely academic environment. Rather, our recommendations should provide practical guidance for practising dentists, while also incorporating expertise from across Europe."

Short implants

This second update has left the definition of "short" unchanged. As before, they have a designed intrabony length of ≤ 8 mm with a diameter of ≥ 3.75 mm. They are used, among other things, to avoid bone grafting in the posterior jaw segments of partially edentulous patients, but also to support removable overdentures and as single or multiple tooth replacements in the anterior jaw. The EuCC has found that there is no longer any difference in success rates compared with standard implants with augmentation procedures. A new indication is that for immediate loading. There are now studies that support the use of short implants with special treatment concepts in immediate-loading situations.

Angulated implants

There have also been new developments regarding angulated implants, which are becoming routine in splinted reconstructions of edentulous jaws. The EuCC agreed that they increase primary stability for immediate loading procedures

Bibliographical note

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"Update on short, angulated and reduced-diameter implants"
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11 A4 pages + cover, with extensive references

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are significantly lower, but patients will still benefit in terms of oral health-related quality of life. Mini implants also show favourable results when used to increase the number of restorative abutments for removable partial dentures. According to the EuCC, short mini implants should still be avoided.

Recommendation

The use of short, angulated or reduced-diameter implants in sites with reduced bone volume can be a reliable, faster and less risky therapeutic option in terms of specific treatment parameters, compared with the risks associated with the use of standard-dimension implants in combination with augmentation procedures.

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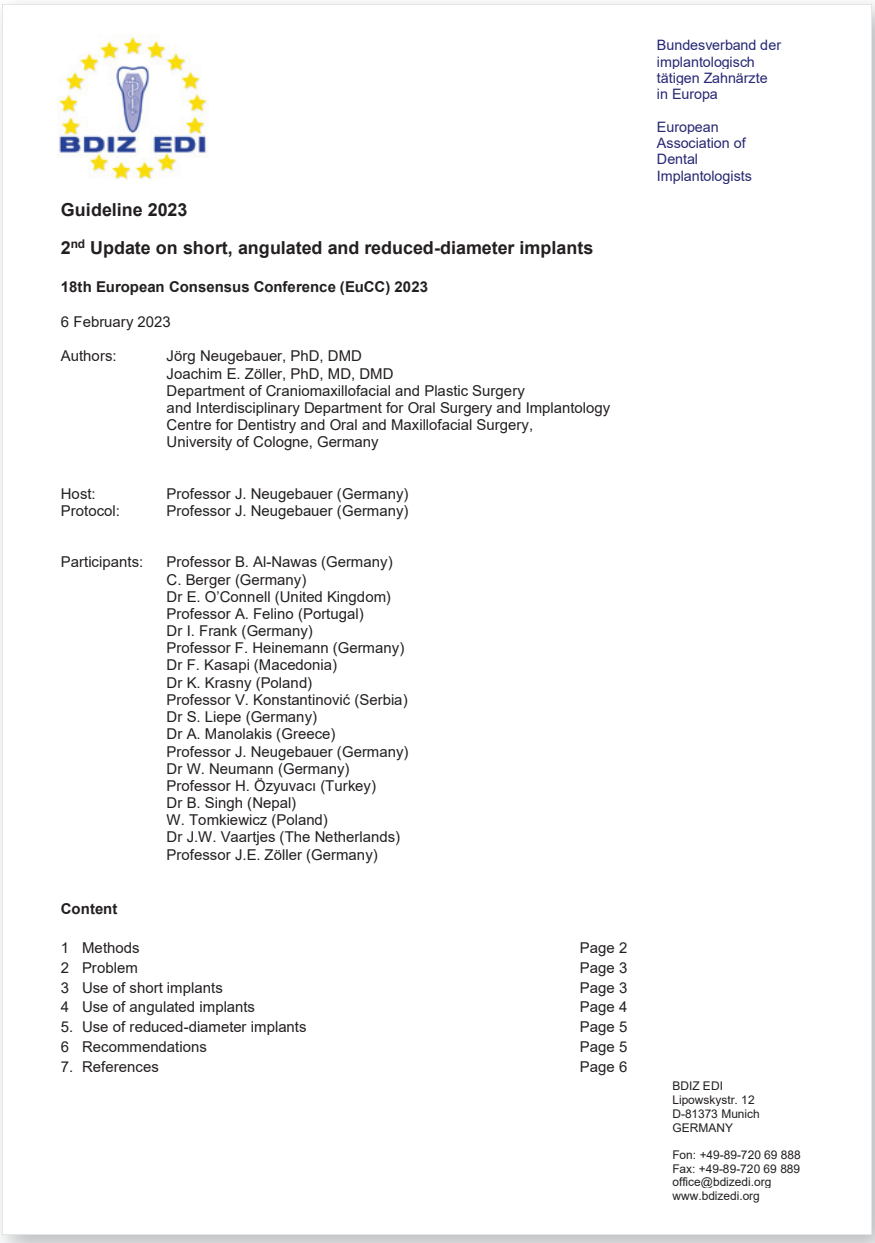
with longer implants, avoiding bone grafting. These treatment concepts require 4 implants in the mandible and 4 to 6 implants in the maxilla. However, current observations have also revealed limitations. "Despite the positive clinical results, the scientific debate on the clinical relevance of the development of marginal bone levels around angulated implants is still ongoing", as Neugebauer summarised the consensus finding.

Reduced-diameter implants

The EuCC distinguishes between two general settings. Reduced-diameter implants—those with intraosseous diameters of < 3.5 mm—are indicated for use in jaws with reduced widths. EuCC refers to implants with diameters of < 2.7 mm as mini implants. There is no change from to the previous 2016 Guideline. New meta-analyses support the statements made at that time.

Reduced-diameter implants have high survival rates (> 90%) with careful patient selection, bone density assessment, clinical approach, and user experience. They can also be used in the posterior region with high success rates.

There are differences in the success rates of mini implants in the maxilla and mandible. While mini implants in the mandible that are restored with an overdenture have excellent short- to medium-term survival rates, survival rates in the maxilla



BDIZ EDI

Bundesverband der implantologisch tätigen Zahnärzte in Europa

European Association of Dental Implantologists

Guideline 2023

2nd Update on short, angulated and reduced-diameter implants

18th European Consensus Conference (EuCC) 2023

6 February 2023

Authors: Jörg Neugebauer, PhD, DMD
Joachim E. Zöller, PhD, MD, DMD
Department of Craniomaxillofacial and Plastic Surgery
and Interdisciplinary Department for Oral Surgery and Implantology
Centre for Dentistry and Oral and Maxillofacial Surgery,
University of Cologne, Germany

Host: Professor J. Neugebauer (Germany)
Protocol: Professor J. Neugebauer (Germany)

Participants: Professor B. Al-Nawas (Germany)
C. Berger (Germany)
Dr E. O'Connell (United Kingdom)
Professor A. Felino (Portugal)
Dr I. Frank (Germany)
Professor F. Heinemann (Germany)
Dr F. Kasapi (Macedonia)
Dr K. Krasny (Poland)
Professor V. Konstantinović (Serbia)
Dr S. Liepe (Germany)
Dr A. Manolakis (Greece)
Professor J. Neugebauer (Germany)
Dr W. Neumann (Germany)
Professor H. Özyuvacı (Turkey)
Dr B. Singh (Nepal)
W. Tomkiewicz (Poland)
Dr J.W. Vaartjes (The Netherlands)
Professor J.E. Zöller (Germany)

Content

BDIZ EDI
Lipowskystr. 12
D-81373 Munich
GERMANY

Fon: +49-89-720 69 888
Fax: +49-89-720 69 889
office@bdizedi.org
www.bdizedi.org

1 Methods

1.1 Objective

The purpose of this guideline is to provide clinicians involved in implant dentistry with recommendations to enable them to correctly assess the potential indications (and any limitations) for short, angulated or reduced-diameter implants. This guideline reflects data from controlled clinical trials and takes into account clinical data from routine treatment in the private-practice setting.

1.2 Introduction

This consensus paper is concerned only with titanium implants, typically placed according to the indications recommended by the European Consensus Conference Implantology (EuCC, Germany, 6 February 2023).

All consensus recommendations in this paper should be considered as guidelines only. The specific situation of the patient is always an important consideration and may justify a deviation from the recommendations of this consensus paper.

1.3 Background

Avoiding bone augmentation with reduced-dimension implants and making optimal use of the available bone volume are often recommended as minimally invasive treatment options **[50]**. in addition to the number of implants, dimension and insertion type must be considered to ensure an acceptable treatment outcome.

1.4 Literature search

The Cochrane Library, EMBASE, DIMDI and Medline literature databases were used to conduct a systematic search for recently published data on the use of short, angled and reduced-diameter implants. Selective search criteria were used, including terms such as short implants, angulated implants, angled implants, tilted implants and implant failure, narrow and reduced diameter. The publications identified by the search were screened by reading their abstracts, and those irrelevant to the topic were identified and excluded. Those articles identified as potentially relevant were obtained in full text. Several meta-analysis reviews and randomized controlled trials (RCTs) and other prospective or retrospective systematic clinical trials were available on the topic.

1.5 Development of this guideline/consensus paper

A preliminary version, on which the EuCC based its deliberations, was prepared and reviewed by Professor J. Neugebauer of the Interdisciplinary Policlinic for Oral Surgery and Implantology and the Department of Oral and Maxillofacial Plastic Surgery at the University of Cologne, Germany. The preliminary report was then reviewed and discussed by the members of the committee in the following five steps:

- Review of the preliminary draft
- Collecting alternative suggestions
- Voting on recommendations and levels of recommendation
- Discussion of non-consensual issues
- Final vote

BDIZ EDI
Lipowskystr. 12
D-81373 Munich
GERMANY

Fon: +49-89-720 69 888
Fax: +49-89-720 69 889
office@bdizedi.org
www.bdizedi.org

2 Problem

The use of standard implants in patients with alveolar ridge atrophy or extensive pneumatization of the maxillary sinus cavity often requires the use of hard-tissue augmentation procedures [18, 19]. These procedures are well established, and widely used with success. However, depending on the operator's level of training and the patient-specific risk factors complications may occur, or the postoperative quality of life may be compromised [2, 10, 17-19, 34].

3 Use of short implants

3.1 Introduction

Short implants are increasingly being discussed as a treatment alternative in situations characterized by limited vertical bone height [5].
Compared to the use of standard implants due to biomechanical considerations (e.g., crown-to-implant ratio, C/R) with short implants may result in unfavourable loading conditions and complications, including excessive bone loss and implant failure [20]. Improvements in implant design and surface, together with the use of modified implant insertion techniques, are all aimed at minimizing these risks [15].

3.2 Definition of short implants

Implants are commonly referred to as short if their designed intrabony length measures ≤ 8 mm with diameters ≥ 3.75 mm. Standard implants are those with a length > 8 mm with diameters ≥ 3.75 mm [47, 52]. Ultra-short implants are those with lengths < 6 mm [16].

3.3 Indications for short implants

Short implants are primarily used to avoid bone augmentation procedures in the maxillary and mandibular posterior segments of partially edentulous patients. They are used when vertical bone volume is limited by anatomical structures (maxillary sinus, mandibular canal), but there is sufficient alveolar ridge width to allow successful use of implant diameters ≥ 3.75 mm. They are also used for support of removable overdentures as single or multiple tooth replacements in the anterior jaw **[25, 52]**.

3.4 Current observations

Various meta-analyses indicate that there is no difference between the use of short implants in comparison to standard implants with grafting procedures for the marginal bone level development or success rates [8, 9, 24, 25, 37, 39, 56, 62, 66].

Whether there is an advantage to splinting the implants remains unclear [1, 36] [54].

In a limited number of studies, immediate loading has been performed [26, 33, 65]. For immediate loading short implants may be used, but care must be taken to follow specific treatment concepts.

However, the literature shows , that short implants with reduced diameter have a failure rate of up to 10% after 3–5 years **[13]**.

BDIZ EDI
Lipowskystr. 12
D-81373 Munich
GERMANY

Fon: +49-89-720 69 888
Fax: +49-89-720 69 889
office@bdizedi.org
www.bdizedi.org

3.5 Preventing complications

Some authors have made recommendations on how to avoid complications that are mainly biomechanical in nature. These recommendations include:

- Machined-surfaced, short implants should not be used **[42]**.
- Short implants should only be used when bone quality is favourable **[13]**.
- Restoration with single crowns **[3, 27, 43, 58]**.
- Single short implants with cantilevers should not be used **[57]**.
- Guiding surfaces for lateral movement should be avoided **[11]**.
- Regular occlusal checks are recommended**[59]**
- Placement at or below bone level with tapered abutment design **[29, 38]**.
  - The implant surgeon and restorative dentist must have appropriate training **[58]**.

4 Use of angulated implants

4.1 Introduction

Angulated standard implant designs or non-angulated ones placed in off-axis (tilted) positions are becoming routine in splinted reconstructions of edentulous jaws as an alternative treatment option to avoid hard-tissue augmentation procedures, but also to increase primary stability for immediate loading procedures with longer implants [11]. These concepts require 4 implants in the mandible and 4 to 6 implants in the maxilla.

The aim of placing implants in a tilted position is to utilize as much bone as possible, while still avoiding vital adjacent structures (e.g., the mental foramen in the mandible or the maxillary sinus in the maxilla). They also increase the surface area for restorative support (through divergent implant axes) [6]. Restorations can be inserted on these implants using angulated abutments.

Modifications of this concept are also used in partially edentulous patients or with a reduced number of implants. The specific treatment protocol varies and individual recommendations should be followed.

4.2 Current observations

Based on 24 included articles, 2,637 patients which were rehabilitated with 2,735 full prostheses (1,464 maxilliary, 1,271 mandibular), supported by 5,594 and 5,611 tilted and axial implants, respectively. The cumulative implant survival rate between the observation of 3 up-to 18 years was 93.91% and 99.31% for implants and prostheses, respectively **[14]**.

Despite the positive clinical results, the scientific discussion on the clinical relevance of marginal bone level development around angled implants is still ongoing **[12, 14, 41, 48]**.

4.3 Restorative experience

The use of a cantilevered, shortened dental arch with a lack of posterior support has not shown an increased prevalence of oromandibular malfunctions **[51]**.

BDIZ EDI
Lipowskystr. 12
D-81373 Munich
GERMANY

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Fax: +49-89-720 69 889
office@bdizedi.org
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4.4 Preventing complications

- The use of angulated implants splinted with fixed dental prostheses and subjected to immediate loading should achieve adequate primary stability **[41, 49]**.
- Preoperative 3D computer-assisted diagnosis is recommended for anatomically and prosthetically correct angled implant placement **[30]**.
- The implant surgeon and restorative dentist must have adequate training **[60]**.

5 Use of reduced-diameter implants

5.1 Definition

Reduced-diameter implants can be defined as those with intraosseous diameters < 3.5 and > 2,7m for placement in sites with reduced alveolar ridge bone width. Implants with a diameter < 2.7 mm are referred to as ”mini”-implants **[21]**.

5.2 Current observations

Reduced-diameter implants generally have high survival rates (> 90%), assuming careful patient selection, bone density assessment, clinical approach, and user experience [28, 32, 55]. Reduced-diameter implants can also be used in the posterior region with high success rates [32]. These findings are supported by recent meta-analyses [23, 53, 61].

Despite the limited number of studies available, fixed dental prostheses supported b reduced-dimeter implants showed comparable survival and success rates to those supported by standard-diameter implants, with slightly lower marginal bone loss. No firm conclusions could be drawn for partial removable dental prostheses [7].

Mandibular mini-implants supporting an overdenture exhibit excellent short- to medium-term survival rates and improve patients’ chewing and speaking ability, quality of life, and satisfaction [22, 31, 35, 40]. Survival of mini-implants supporting maxillary overdentures has been observed to be lower, but patients will benefit in terms of oral health-related quality of life [35, 53, 63].
Mini-implants also show favourable results as supporting implants for removable partial dentures **[4, 45, 46]**.

5.3 Preventing complications

- Mini-implants have an increased risk of implant loss in the maxilla.
- Short mini-implants should be avoided **[64]**.
- The implant surgeon and restorative dentist must have adequate training

BDIZ EDI
Lipowskystr. 12
D-81373 Munich
GERMANY

Fon: +49-89-720 69 888
Fax: +49-89-720 69 889
office@bdizedi.org
www.bdizedi.org

6 Recommendations for short, angulated and/or reduced-diameter implants

The use of short, angulated or reduced-diameter implants in sites with reduced bone volume can be a reliable, faster and less risky therapeutic option in terms of specific treatment parameters, compared with the risks associated with the use of standard-dimension implants in combination with augmentation procedures. The implant surgeon and the restorative dentist must have appropriate training to select the best possible therapy for each patient **[44]**.

Cologne, 6 February 2023

Professor Dr Dr Joachim Zöller
Vice President

Professor Dr Jörg Neugebauer
Secretary General/Host

BDIZ EDI
Lipowskystr. 12
D-81373 Munich
GERMANY

Fon: +49-89-720 69 888
Fax: +49-89-720 69 889
office@bdizedi.org
www.bdizedi.org

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BDIZ EDI
Lipowskystr. 12
D-81373 Munich
GERMANY

Fon: +49-89-720 69 888
Fax: +49-89-720 69 889
office@bdizedi.org
www.bdizedi.org

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BDIZ EDI
Lipowskystr. 12
D-81373 Munich
GERMANY

Fon: +49-89-720 69 888
Fax: +49-89-720 69 889
office@bdizedi.org
www.bdizedi.org

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BDIZ EDI
Lipowskystr. 12
D-81373 Munich
GERMANY

Fon: +49-89-720 69 888
Fax: +49-89-720 69 889
office@bdizedi.org
www.bdizedi.org