Review

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Marco Tallarico *, Lee Soo-young, Noh Kwan-tae, Kwantae Noh, Chikahiro Ohkubo, Felipe Aguirre, Recep Uzgur, Gaetano Noè, Gabriele Cervino, Marco Cicciù

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Prosthetic Guidelines to Prevent Implant Fracture and Peri-Implantitis: A Consensus Statement from the Osstem Implant Community

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Abstract: Background: While dental implants have become a reliable solution for tooth loss, their long-term success is increasingly challenged by biological and technical complications such as impact fracture and peri-implantitis. These complications significantly impact implant longevity and patient satisfaction. Aim: This consensus conference aimed to identify and standardize clinical guidelines to prevent implant fractures and peri-implant diseases based on current evidence and expert opinions. Methods: a panel of 10 expert clinicians and researchers in prosthodontics participated in the Osstem Global Consensus Meeting. This paper focuses on the prosthetic division. A structured literature review was conducted, and evidence was synthesized to formulate consensus-based clinical recommendations. Participants answered structured questions and discussed discrepancies to achieve consensus. Results: The panel reached consensus on several key prosthetic risk factors, including: (1) the role of biomechanical overload in implant fracture; (2) the impact of emergence profile design on peri-implant tissue stability; (3) the influence of eD implant positioning and connection geometry on marginal bone loss; and (4) the importance of occlusal scheme and restorative material selection, particularly in high-risk patients such as bruxers. Guidelines to prevent implant fracture and peri-implantitis were developed addressing these factors with practical preventive strategies. Conclusion: Despite the limitations of narrative methodology and reliance on retrospective data and expert opinion, this consensus provides clinically relevant guidelines to aid in the prevention of mechanical failures and peri-implant diseases. The recommendations emphasize prosthetically driven planning, individualized risk assessment, and early intervention to support long-term implant success.

Keywords: Dental implants; peri-implantitis; complications; implant fractures; marginal bone loss; guidelines

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1. Introduction

Dental implants have revolutionized restorative dentistry by offering effective solutions for tooth loss. However, their success is challenged by potential biological and technical complications that can affect both implant longevity and patient satisfaction. Biological complications include peri-implantitis, a condition characterized by inflammation and bone loss around the implant, which can ultimately lead to implant failure. A systematic review reported that peri-implant bone loss greater than 2 mm occurred in 20.1% of cases after five years and 40.3% after ten years [1]. Technical complications, on the other hand, involve mechanical failures such as screw fractures, which have a ten-year complication rate of 20.8% [2], and prosthetic issues like chipping or fracture of the veneering material, affecting up to 66.6% of cases over the same period [3]. Understanding the incidence, risk factors, and management strategies for these complications is essential for clinicians to improve treatment outcomes and enhance the durability of dental implants. The etiology of dental implant fractures is multifactorial, encompassing biomechanical overload, material fatigue, implant design, and patient-related factors such as parafunctional habits (e.g., bruxism) and inadequate bone support. Studies have reported that implant fractures occur in an estimated 0.2% to 3.8% of cases, with a mean value of 0.52%.with a higher incidence in posterior regions where occlusal forces are greater [4]. Recent advances in implant materials, surface modifications, and prosthetic designs aim to minimize the risk of fractures. However, despite these improvements, cases of implant fractures continue to be reported, emphasizing the need for better diagnostic, preventive, and management strategies [5]. When placed in premolar or molar regions, implants face a higher risk of fracture. For posterior regions, the use of standard (3.75 mm to less than 5 mm) and wide (5.0 mm or greater) diameter implants is generally recommended to ensure adequate bone-to-implant contact and withstand occlusal forces. However, maintaining at least 1.5 mm of space between the implant and adjacent teeth and 3 mm between implants is crucial for preserving interdental papillae, achieving optimal aesthetics, and minimizing crestal bone loss. Additionally, a minimum of 1.5–2.0 mm of bone should surround the entire implant surface, including buccal and palatal/lingual regions [6,7]. In cases of narrow ridges or limited bone availability, advanced surgical approaches, such as guided bone regeneration or ridge expansion, are necessary [8]. Since implant fractures are an irreversible complication, prevention remains the most favorable treatment approach. Scientific evidence indicates that implant fractures are often preceded by other mechanical problems that can serve as indicators of implant overload. Therefore, it is crucial to prevent mechanical complications and excessive bone resorption [9,10].

Peri-implant diseases are classified as either peri-implant mucositis or peri-implantitis. Peri-implant mucositis is defined as soft tissue inflammation around a functioning dental implant, characterized by bleeding on probing (BOP), whereas peri-implantitis involves the additional loss of supporting marginal bone beyond normal bone remodeling. If not diagnosed and properly managed, peri-implant diseases may lead to implant loss [11-15]. According to the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions, peri-implantitis is defined as "a plaque-associated pathological condition occurring in tissues around dental implants, characterized by inflammation in the peri-implant mucosa and subsequent progressive loss of supporting bone" [13]. Mombelli et al. (1987) originally described peri-implant diseases as infectious conditions sharing features with chronic periodontitis [15]. While bacterial infection due to plaque accumulation is still considered a key etiological factor, peri-implant diseases are now recognized as multifactorial, with patient-, surgical-, and prosthetic-related factors contributing to their development and severity [13].

The Osstem Implant Training Center in behalf of the Scientific Community (Osstem Implant Community or OIC) is organizing this Global Consensus Meeting to propose global standards for implant dentistry, including correct terminology and concepts. Experts from around the world will first meet online and then in person in Seoul to discuss selected topics, conduct evidence-based reviews, and develop preliminary statements and recommendations through collaboration and discussion. The goal is to reach a robust consensus on these topics, which can then be submitted for

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publication for the benefit of both Osstem users and the broader scientific community. The purpose of a consensus conference is to provide guidelines based on available scientific and clinical evidence through an agreement among researchers, professors, and clinicians. These guidelines will support the implant community by offering a comprehensive overview of the causes, risk factors, prevention, and management of dental implant complications, with an emphasis on recent scientific findings and clinical approaches. Additionally, the guidelines will establish standardized terminology and concepts to enhance clarity and consistency in implant dentistry.

2. Methodology

This narrative review was written at the Department of Medicine, Surgery, and Pharmacy, University of Sassari, Italy, between November 2023 and March 2025, in conjunction with the *Osstem Global Consensus Meeting (GCM)*. Experts, including professors and clinicians, were selected based on their academic and professional credentials to participate as members of the *Audience*[1] and/or the *Scientific Committee*[2]. The consensus meeting focused on three key domains: surgery, prosthodontics, and digital dentistry. This paper specifically pertains to discussions within the *Prosthodontics Division*.

A panel of ten prosthodontic experts was convened to propose and deliberate on potential discussion topics. The final selection of topics was determined by the *Chairman*, followed by further discussions among the participants. During the initial *Kick-off Meeting*, the overarching themes and the chairperson were appointed (*Chair*). Subsequently, the topics and corresponding presenters were designated by the *Scientific Committee*. Each presenter conducted a systematic or narrative review of the available literature, synthesizing relevant data and formulating responses to predefined PICO (Population, Intervention, Comparison, Outcome) questions. The synthesized evidence was then presented to the *Conference Audience* for critical appraisal. The *Chair* and *Co-chair*, comprising key representatives from Osstem Implant, were responsible for overseeing the conference proceedings, moderating discussions, and guiding the decision-making process to achieve a consensus. Each of the three thematic sessions—surgery, prosthodontics, and digital dentistry—was led by a designated *Chair* and *Co-chair*. Their role included evaluating the presenters 'findings, providing expert opinions, and offering structured feedback to refine the presented evidence. Presenters, referred to as *Speakers* or *Members of the Scientific Committee*, were required to revise their work based on the input provided by the *Decision-Making Panel*, consisting of the *Chair* and *Co-chair*. To facilitate comprehensive discussion, preliminary online sessions were organized by the *Co-chair*, allowing presenters to introduce their findings to the *Audience* and collect initial feedback. The final evidence and consensus statements will be presented by the *Scientific Committee* in three dedicated, open-access parallel sessions—one for each topic—during the *Osstem World Meeting* in Seoul. These in-person sessions will include structured discussions, during which a designated moderator will document key deliberations and consensus outcomes as needed. The ultimate objective of these conferences is to enable the *Decision-Making Panel* to integrate the presented evidence with expert discussions and reach a scientifically validated consensus on the selected topics.

3. Topic Number 1: What are the Prosthetic Recommendations to Reduce the Risk of Implant Fracture? Presenter: Prof. Marco Tallarico

3.1. Methodology

The presenter (MT) proposed an upgrade of a Narrative Review published in 2021.[4] The presenter proposed strength and effective conclusions based on the evidence, and proposed several questions to formulate guidelines, and to reach the consensus. The presenter also describes the

[1] Audience=overall number of participants; [2] Scientific Committee=professors and/or clinicians that actively participated in the GCM.

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methods used to formulate the recommendations and how final consensus. The Audience can proposed different opinions and the AUDIENCE discussed any disagreement with the aim to reach the consensus. Finally, dichotomy questions have been provided. Due to the AUDIENCE is composed by 10 members, the proposal is to give double vote to the Chair in case of parity (5 versus 5).

Focused question: Were there any possible factors influencing the fracture of dental implants?

Search Strategy and Methods were clearly reported in the previous manuscript and in the pre-meeting presentation.[4] A literature search strategy encompassing the literature in English from 1967 up to December 2023 was performed to identify relevant studies meeting the inclusion criteria. PICO was set to retrospectively evaluate partial or fully edentulous patients (P), that received at least one implant-supported restoration (I), in comparison with same cohort of patients (C), and to understand incidence of implant failure and possible co-factors (O). The PubMed database of the U.S. National Library of Medicine has been consulted using a combination of Boolean keywords including MeSH (Medical Subject Headings), free text terms, and filters with the following combination: Search: ("Dental Implants/adverse effects" [Mesh] AND "fracture"). Filters: Abstract, Dental journals, English. Screening was performed independently by two expert examiners (MT, GC). Full-text papers on the selected topic were obtained for all abstracts and titles that appeared to meet the inclusion criteria. Additional papers were included from the reference lists of the selected studies."

The following inclusion criteria were defined for the selection of the articles:

Papers written in the English language;

Clinical examination of human patients reporting incidence of implant fracture;

Prospective and retrospective observational studies;

Systematic reviews; meta-analysis; narrative reviews, and consensus conference;

Exclusion criteria: articles were excluded if they were: animal or in vitro studies; Reports with less than 15 patients; Reports of implant outcomes with less than one year on function.

3.2. Grading of the Evidence

The selected topic is well recognized in the scientific literature. However, the evidence is based on retrospective study. Due to the nature of the topic (implant fracture) it is not possible to propose well designed aimed to evaluate fracture versus not fracture of the implants. However, it is the Chair opinion that it is possible to draw straight guidelines from the available evidence to guide the clinicians in the correct diagnosis and treatment plan, with the aim to reduce the risk of implant fracture.

3.3. Conclusions for the Attendants

The presenter (MT) prepared an upgrade of the literature, in agreement with AGREE guidelines. Level of evidence is sufficient for the purpose of this Global Consensus Meeting. The method to reach the consensus is valid and reported following this paragraph. No further action are needed.

The presenter prepared 15 questions for the attendants to answer after discussion and reach the consensus (Table 1). Possible answers were: yes/no or different proposal.

Table 1. Questions to reach the consensus: Topic Number 1 (what are the prosthetic recommendations to reduce the risk of implant fracture?): Questions to reach the consensus.

1. Do you agree to define dental implant (or fixture) fracture as: irreversible mechanical complication of multifactorial origin?
2. Do you agree with the conclusion of this narrative review? Prevention, prosthetically driven implant planning, proper treatment plan (implant diameter and design) are mandatory. Risk factors: overloading, bruxers, bone loss.

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3. Do you agree that single, malpositioned implants are at higher risk of fractures, so that prosthetically driven implant position is mandatory, hence, computer guided surgery should be recommended (gold standard)?
4. Do you agree that a wide range of peri-implant bone thickness around implants(1 to ≥2 mm related to soft tissue quality/quantity) is mandatory to reduce risk of bone resorption, and consequently, higher horizontal forces?
5. Do you agree that anticipating supracrestal tissue height establishment by adapting the apico-coronal implant position in relation to the mucosal thickness may be effective to prevent the marginal bone loss?
6. Do you agree that implants should be placed maximum up to 2 mm deeper in the bone (thin biotype, immediate implants, esthetic reasons)?
7. Do you agree that TS implants of minimum 4.5 mm of diameter are recommended for the replacement of single molars?
8. Do you agree that TS implants of minimum 4.0 mm of diameter are recommended for replacement of single premolars?
9. Do you agree that, in case overloading is expected (bruxism, cantilevers, etc.) and/or when higher marginal bone loss is expected (thin biotype, periodontally compromised patients, posterior area, mandible)? SS implants should be recommended in single molars replacement?
10. Do you agree that original prosthetic components must to be used in order to reduce the risk of screw loosening, and consequently, risk of fracture?
11. Do you agree that original screws (definitive screws, EbonyGold screws) must to be tightened with the recommended torque, only one time (no laboratory use), and re-tightened, again after 10 minutes to compensate the preload?
12. Do you agree that slightly occlusal contacts in static occlusion, and slightly or no occlusal contacts in dynamic occlusion, as well as, a variable Immediate Side Shift (ISS), should be used, independently by the occlusal scheme? This means to work with at least semi-adjustable dental articulators or digital ones.
13. Do you agree that in bruxers, proper restorative materials, and reduced occlusal areas, should be used, particularly in the posterior areas (premolars and mandibular molars), as well as, a night guard should be delivered as protection.
14. Do you agree that occlusal controls must to be done at any follow-up visit (at least once a year) lifetime, (including a check of the contact points)?
15. Do you agree that smaller implant-abutment connection (KS implants) could reduce but not eliminate the risk of implant fractures, however, evidence is still needed to define the right use (diameter) in relation to the area?

3.4. Results and Discussion

A total of 136 articles were found according to the search criteria. After evaluating abstracts and removing duplicates, 33 articles were deemed useful for the aims of the present review. A manual search using personal contacts and references from published works allowed for the inclusion of an

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additional 4 articles, resulting in a total of 37 manuscripts. Finally, after full-text selection and evaluation based on the inclusion/exclusion criteria, 12 manuscripts were included. Two were systematic reviews and ten were retrospective evaluations. Of these, eight had already been included in the previous manuscript [4], and four new manuscripts were added and discussed during this consensus meeting [16–19].

All the attendant participated in the consensus conference. However, only eight out of ten professors (including the author) answered the questions to reach consensus. Four of the ten attendees agreed with all questions. Full agreement was achieved for 11 questions (1–5, 9–11, and 13–15). Even if majority of the attendants agreed with the other four questionnaire points, some disagreements emerged regarding questions 6–8 and 12.

Partial disagreement arose regarding the question number 6 (apico-coronal positioning of implants). One author disagreed with the recommendation for deeper placement. A systematic review addressing implant depth positioning found only one study reporting 3 mm subcrestal placement [20], while most literature supports a placement depth between 1 to 2 mm. Placing implants deeper than 2 mm may increase probing depth, complicate maintenance, and potentially elevate the crown-to-implant (C/I) ratio, leading to increased mechanical leverage and risk of overload. The biomechanical implications of deeper placement also depend significantly on the implant–abutment (IA) connection design and surrounding bone density.

Regarding implant diameter (questions 7 and 8), while the implant manufacturer recommends at least a 4.5 mm diameter implant for molar regions, one expert suggested a 5.0 mm diameter for molars and 4.5 mm for premolars. Larger diameters may offer improved load distribution and mechanical stability, particularly in posterior regions subjected to higher occlusal forces. However, clinicians must also consider anatomical constraints, available bone volume, and required inter-implant distances when selecting implant diameter. One author highlighted that reducing the diameter of the implant-abutment connection can lead to an increased taper in the beveled joint area of the internal connection. It is important to evaluate whether this design modification induces additional stress on the screw, even if minimal. Notably, smaller diameter screws may be more susceptible to fatigue and fracture over time. Extended longitudinal studies are warranted to assess the mechanical performance and long-term outcomes of such designs, particularly under high-load conditions (e.g., posterior mandible, bruxism).

Another author questioned the necessity of slight occlusal contact in static occlusion (question number 12). However, the consensus largely supported the importance of evenly distributed occlusal forces, with no contact in cantilever regions, to reduce the risk of mechanical complications, including screw loosening and implant overload. Clinical studies have consistently demonstrated that occlusal overload is a key contributing factor in implant complications, including marginal bone loss and fractures, particularly in bruxers or patients with high occlusal forces.

The results of the present consensus stamens are in agreement to previous ITI (International Team for Implantology) consensus conference, the incidence of implant fracture for implant-supported fixed partial denture was 0.4% after 5 years and 1.8% after 10 years, based on 7 cohort studies with 5 years of follow-up and 4 studies with 10 years of follow-up. At the 5 years follow-up, incidence of implant fracture was twice in case of combined tooth/implant fixed partial dentures [21-23].

3.5. Consensus Guidelines and key Clinical Recommendations

1. Definition of dental implant (or fixture) fracture: an irreversible mechanical complication of multifactorial origin.
2. Prevention, prosthetically driven implant planning, proper treatment plan (implant diameter and design) are mandatory to reduce the risk of implant fracture. Additional risk factors are: overloading, bruxers, peri-implant bone loss.

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3. Single, malpositioned implants are at higher risk of fractures, so that prosthetically driven implant position is mandatory, hence, computer guided surgery should be recommended to avoid malpositioned implants.
4. A wide range of peri-implant bone thickness around implants (1 to ≥2 mm related to soft tissue quality/quantity) is mandatory to reduce risk of bone resorption, and consequently, higher lateral forces on the implant neck.
5. Anticipating supracrestal tissue height establishment by adapting the apico-coronal implant position in relation to the mucosal thickness may be effective to prevent the marginal bone loss.
6. Implants should be placed maximum to 2 mm deeper in the bone. The vertical position should be adapted in relation to the soft tissue quality and quantity and esthetic demands.
7. TS implants of at least 4.5 mm of diameter are recommended for the replacement of single molars.
8. TS implants of at least 4.0 mm of diameter are recommended for replacement of single premolars.
9. In case overloading is expected (bruxism, cantilevers, etc.) and/or when higher marginal bone loss is expected (thin biotype, periodontally compromised patients, posterior area, mandible) SS implants should be recommended in single molars replacement.
10. Original prosthetic components must to be used in order to reduce the risk of screw loosening, and consequently, risk of fracture.
11. Original screws (definitive screws, EbonyGold screws) must to be tightened with the recommended torque, only one time (no laboratory use), and re-tightened, again after 10 minutes to compensate the preload.
12. Well distributed, normal or slightly occlusal contacts in static occlusion, with no contact in cantilever regions, should be used. In addition, slightly or no occlusal contacts in dynamic occlusion, as well as, a variable Immediate Side Shift (ISS), should be used, independently by the occlusal scheme. This means to work with at least a semi-adjustable dental articulators or digital ones.
13. In bruxers, proper restorative materials, and reduced occlusal areas, should be used, particularly in the posterior areas (premolars and mandibular molars), as well as, a night guard should be delivered as protection.
14. Occlusal controls must to be done at any follow-up visit (at least once a year) lifetime, (including a check of the contact points).
15. Smaller implant-abutment connection (KS implants) could reduce but not eliminate the risk of implant fractures. However, by reducing the diameter of the connection, the internal tapered implant-abutment joint increases (from 11° to 15°), with potential increased strains. In addition, smaller diameter screws may have technical problems." For the latter, evidence from long-term clinical studies is needed to define the right use (diameter) in relation to the area.

4. Topic Number 2: What Are the Prosthetic Triggers to Reduce the Risk of Per-Implantitis Fracture? Presenter: Prof. Marco Tallarico

4.1. Methodology

The author proposed a Narrative Review, starting from two previous works on the same topic [24,25]. The presenter proposed strength and effective conclusions based on the evidence, and proposed several questions to formulate guidelines, and to reach the consensus. The presenter also

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describes the methods used to formulate the recommendations and how final consensus. The Audience can proposed different opinions and the AUDIENCE discussed any disagreement with the aim to reach the consensus. Finally, dichotomy questions have been provided. Due to the AUDIENCE is composed by 10 members, the proposal is to give double vote to the Chair in case of parity (5 versus 5).

Focused question: to evaluate whether there are so-called combined factors (patient-, surgical-, and prosthetic-related) that may contribute to the development and severity of the pathology.

Search Strategy and Methods were clearly reported in the previous manuscripts and in the pre-meeting presentation.[24,25] A literature search strategy encompassing the literature in English from 1967 up to December 2023 was performed to identify relevant studies meeting the inclusion criteria. PICO was set to retrospectively evaluate partial or fully edentulous patients that received at least one implant-supported restoration (P), affected by peri-implantitis according to Berglundh et al.[2], in comparison with healthy patients C), and to evaluate possible prosthetics co-factors (O). The PubMed database of the U.S. National Library of Medicine has been consulted using a combination of Boolean keywords including MeSH (Medical Subject Headings), free text terms, and filters with the following combination: Search: ((“peri-implantitis” [Mesh] AND “dental implants [Mesh]”) AND (diagnosis OR prevention)). Filters: in the last 10 years, Abstract, Meta-Analysis, Review, Systematic Review, English, Humans. Screening was performed independently by two expert examiners (MT, GC). Full-text papers on the selected topic were obtained for all abstracts and titles that appeared to meet the inclusion criteria. Additional papers were included from the reference lists of the selected studies.

The following inclusion criteria were defined for the selection of the articles:

Papers written in the English language

Studies with a clinical examination of human patients

Reviews, systematic reviews and meta-analysis

Exclusion criteria: articles were excluded if they included: animal or in vitro studies; prospective and retrospective observational studies in humans were also excluded.

4.2. Grading of the Evidence

The selected topic is not well recognized in the scientific literature. Results are controversial and most of the evidence (weak) comes from in-vitro research. So it is not easy to conduct a well designed review. However, for the same reasons, there is the need to discuss this crucial topic for prosthodontists, and to reach a consensus mostly based on clinical evidence.

4.3. Conclusions for the Attendants

The presenter (MT) prepared an upgrade of the literature, in agreement with AGREE guidelines where possible. No methodology and reporting quality of the included papers were applied in order to collect the greatest number of articles. However, due to the nature of the included study, level of evidence is sufficient for the purpose of this Global Consensus Meeting. The presenter prepared 10 questions for the attendants to answer after discussion and reach the consensus (Table 2). Possible answers were: yes/no or different proposal.

Table 2. Questions to reach the consensus: Topic Number 2 (what are the prosthetic triggers to reduce the risk of per-implantitis).

1 Are you agree that peri-implantitis should be considered as multi-factorial disease with an inflammatory background that occurs in both soft and hard tissues surrounding implants?
2 Are you agree that Plaque induced, prosthetically and surgically triggered peri-implantitis are different entities associated with distinguishing predictive profiles and may contribute to marginal bone loss and secondary bacterial contamination?

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3 Are you agree that malpositioned implants is one of the most important "prosthetic" factor to potentially induce MBL and consequently, risk of peri-implantitis?
4 Are you agree that excessive residual cement is an important "prosthetic" factor to potentially induce MBL and consequently, risk of peri-implantitis?
5 Are you agree that "prosthetic problems" at the implant-abutment interface can lead to higher MBL and consequently risk of peri-implantitis?
6 Are you agree that "prosthetic problems" (micromovements, microleakage, etc.) at the implant-abutment interface can lead to higher MBL and consequently risk of peri-implantitis?
7 Are you agree that overloading (i.e. tilted implants, bruxism, cantilever, etc.) can lead to higher MBL and consequently risk of peri-implantitis?
8 Are you agree that smokers and systemic conditions are co-factors in the developing of the peri-implant diseases, so that, in these patients, proper surgical and prosthetic protocols must ~~to~~ be considered?
9 Are you agree that larger (>30°) emergence angle (EA) could be associated with a higher prevalence of peri-implantitis or marginal bone loss compared to a smaller EA (<30°).
10 Are you agree that convex emergence profile could be associated with a higher prevalence of peri-implantitis or marginal bone loss compared to a flat emergence profile?

4.4. Results and Discussion

A total of 240 articles were identified based on the search criteria. After evaluation of abstracts and removal of duplicates, 23 articles were deemed relevant to the objectives of the present review. A manual search using professional networks and reference lists from published studies led to the inclusion of one additional article, resulting in a total of 24 manuscripts. Following full-text selection and review based on the defined inclusion and exclusion criteria, 13 manuscripts were ultimately included and discussed during this consensus meeting [24–36].

All the attendant participated in the consensus conference. However, seven authors completed the consensus form. After a brief clarification session, all participants agreed with questions 1 through 8. Regarding questions 9 and 10, one author expressed a differing opinion.

- For Question 9 ("Do you agree that a convex emergence profile could be associated with a higher prevalence of peri-implantitis or marginal bone loss compared to a flat emergence profile?"), the author suggested that a convex profile in the coronal portion of the gingiva may be acceptable, but a convex shape in the apical (subgingival) region could increase the risk of marginal bone loss compared to a flat emergence profile. This view aligns with evidence suggesting that emergence profile geometry significantly influences plaque accumulation and soft tissue adaptation.
- Regarding Question 10 ("Do you agree that, depending on implant position and quality/quantity of hard and soft tissues, a convex emergence profile at the subcritical contour could be associated with a higher marginal bone loss compared to a flat emergence profile, and therefore, a higher risk of peri-implantitis?"), the same doctor clarified that convex emergence profiles may indeed present challenges in critical contour regions, but may also influence subcritical areas depending on implant placement and soft tissue morphology.

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In response to these insights, the questions were refined to reflect these clinical nuances, and a new consensus was successfully reached.

Updated Questions:

9. Do you agree that a convex emergence profile at the subcritical contour could be associated with a higher prevalence of peri-implantitis or marginal bone loss compared to a flat emergence profile?
10. Do you agree that, depending on implant position and the quality and quantity of hard and soft tissues, a convex emergence profile at the subcritical contour could be associated with greater marginal bone loss and thus an increased risk of peri-implantitis?

Finally, one participant commented on Question 10, questioning whether the commonly cited 30-degree angle represents a definitive threshold for increased risk. The author proposed that this specific value be addressed in a future consensus topic focused on abutment design, where angulation and emergence geometry can be explored in greater detail. This suggestion highlights the need for further research to define geometric thresholds that contribute to soft and hard tissue stability around implants.

In alignment with previously established guidelines for the prevention and management of peri-implantitis, including those from the ITI (International Team for Implantology), this consensus statement emphasizes a multifaceted approach that addresses infection control, correction of iatrogenic factors, and implementation of long-term supportive care. The primary objective remains the resolution of infection through biofilm disruption, removal of calculus, correction of overhanging restorative margins, and prevention of disease recurrence. However, this study places particular emphasis on prosthetic triggers as significant co-factors in the development of peri-implantitis. In the authors' view, the early identification and prevention of these prosthetic risk factors play a critical role in reducing the overall incidence of peri-implant diseases [2,11,37-38].

4.5. Consensus Guidelines and key Clinical Recommendations

1. Peri-implantitis should be considered as multi-factorial disease with an inflammatory background that occurs in both soft and hard tissues surrounding implants.
2. Plaque induced, prosthetically and surgically triggered peri-implantitis are different entities associated with distinguishing predictive profiles and may contribute to marginal bone loss and secondary bacterial contamination.
3. Malpositioned implants is one of the most important “prosthetic” factor to potentially induce MBL and consequently, risk of peri-implantitis.
4. Excessive residual cement is an important “prosthetic” factor to potentially induce MBL and consequently, risk of peri-implantitis.
5. “Prosthetic problems” at the implant-abutment interface can lead to higher MBL and consequently risk of peri-implantitis.
6. “Prosthetic problems” (micromovements, microleakage, etc.) at the implant-abutment interface can lead to higher MBL and consequently risk of peri-implantitis.
7. Overloading (i.e. tilted implants, bruxism, cantilever, etc.) can lead to higher MBL and consequently risk of peri-implantitis.
8. Smokers and systemic conditions are co-factors in the developing of the peri-implant diseases, so that, in these patients, proper surgical and prosthetic protocols must to be considered?
9. According to the implant position and quality/quantity of hard and soft tissues, convex emergence profile at the subcritical contour could be associated with a higher marginal bone loss compared to a flat emergence profile, and so that, higher risk of peri-implantitis.

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10. Convex emergence profile could be associated with a higher prevalence of peri-implantitis or marginal bone loss compared to a flat emergence profile.

5. Conclusions

Biological and technical complications remain major challenges in implant dentistry. Implant fracture, though infrequent, is a serious mechanical complication with multifactorial causes, often linked to poor planning, improper implant selection, and occlusal overload—especially in high-risk patients such as bruxers or those with single posterior restorations. Peri-implantitis is a multifactorial inflammatory condition affecting both soft and hard peri-implant tissues. Beyond plaque-induced inflammation, several prosthetic and surgical factors—including implant malposition, excessive cement, biomechanical overload, and issues at the implant-abutment interface—are associated with increased marginal bone loss and heightened risk of peri-implant disease. Additionally, patient-specific factors such as smoking, systemic conditions, and emergence profile design further influence disease susceptibility, underscoring the need for individualized, interdisciplinary treatment planning to mitigate risk and ensure long-term implant success.

Both conditions should be viewed as part of a spectrum of preventable, complex diseases affecting the peri-implant environment. Prevention—through individualized treatment planning, optimal prosthetic design, and early diagnosis—is critical to long-term implant success. These conclusions are based on a consensus statement focused on the prosthetic aspects of implant complications. Despite inherent limitations—primarily the reliance on narrative reviews, retrospective studies, and expert opinion—the proposed guidelines provide clinically relevant strategies that may aid in the prevention of implant fractures and peri-implant diseases in daily practice.

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