

Risk Factors for implant failure (Occlusion)

1. TN Bertolini MM, Del Bel Cury AA, Pizzoloto L, Acapa IRH, Shibli JA, Bordin D. Does traumatic occlusal forces lead to peri-implant bone loss? A systematic review. *Braz Oral Res.* 2019 Sep 30;33(suppl 1):e069.
2. ES Nagasawa M, Takano R, Maeda T, Uoshima K. Observation of the bone surrounding an overloaded implant in a novel rat model. *Int J Oral Maxillofac Implants.* 2013 Jan-Feb;28(1):109-16.
3. BT Zhou Y, Gao J, Luo L, Wang Y. Does Bruxism Contribute to Dental Implant Failure? A Systematic Review and Meta-Analysis. *Clin Implant Dent Relat Res.* 2016 Apr;18(2):410-20.
4. AK Kim Y, Oh TJ, Misch CE, Wang HL. Occlusal considerations in implant therapy: clinical guidelines with biomechanical rationale. *Clin Oral Implants Res.* 2005 Feb;16(1):26-35.
5. TV Naert I, Duyck J, Vandamme K. Occlusal overload and bone/implant loss. *Clin Oral Implants Res.* 2012 Oct;23 Suppl 6:95-107.
6. DL Chambrone L, Chambrone LA, Lima LA. Effects of occlusal overload on peri-implant tissue health: a systematic review of animal-model studies. *J Periodontol.* 2010 Oct;81(10):1367-78.
7. CM Goldstein G, Goodacre C, Taylor T. Occlusal Schemes for Implant Restorations: Best Evidence Consensus Statement. *J Prosthodont.* 2021 Apr;30(S1):84-90.

Risk Factors for implant failure (Medications)

1. VX Rogoszinski T, Dazen C, Rekawek P, Coburn JF, Carr BR, Boggess W, Chuang SK, Lee KC, Panchal N, Ford BP. Are proton pump inhibitors associated with implant failure and peri-implantitis? *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2022 Jan;133(1):15-20.
2. TN Wu X, Al-Abedalla K, Abi-Nader S, Daniel NG, Nicolau B, Tamimi F. Proton Pump Inhibitors and the Risk of Osseointegrated Dental Implant Failure: A Cohort Study. *Clin Implant Dent Relat Res.* 2017 Apr;19(2):222-232.
3. ES Zahra B, Nicholas B, Geoffrey R, Dina Z, Janal MN, Stuart F. Dental implant failure rates in patients with self-reported allergy to penicillin. *Clin Implant Dent Relat Res.* 2022 Jun;24(3):301-306.
4. BT Ata-Ali J, Ata-Ali F, Peñarrocha-Oltra D, Galindo-Moreno P. What is the impact of bisphosphonate therapy upon dental implant survival? A systematic review and meta-analysis. *Clin Oral Implants Res.* 2016 Feb;27(2):e38-46.
5. AK Chappuis V, Avila-Ortiz G, Araújo MG, Monje A. Medication-related dental implant failure: Systematic review and meta-analysis. *Clin Oral Implants Res.* 2018 Oct;29 Suppl 16:55-68.
6. TV Carr AB, Revuru VS, Lohse CM. Risk of Dental Implant Failure Associated With Medication Use. *J Prosthodont.* 2019 Aug;28(7):743-749.
7. DL Carr AB, Gonzalez RLV, Jia L, Lohse CM. Relationship between Selective Serotonin Reuptake Inhibitors and Risk of Dental Implant Failure. *J Prosthodont.* 2019 Mar;28(3):252-257.

Topic: Occlusion

Authors: Bertolini MM, Del Bel Cury AA, Pizzoloto L, Acapa IRH, Shibli JA, Bordin D.

Title: Does traumatic occlusal forces lead to peri-implant bone loss? A systematic review.

Source: *Braz Oral Res.* 2019 Sep 30;33(suppl 1):e069.

DOI: 10.1590/1807-3107bor-2019.vol33.0069.

Type: Systematic Review

Reviewer: Trisha Nguyen-Luu

Keywords: Bone resorption, alveolar bone loss, peri-implantitis

Background: hypothetical mechanisms:

- Lack of PDL on implants making them less tolerable to non-axial occlusal loads
- Occlusal loads are concentration at the implant marginal bone + Excessive stress can lead to bone resorption depending on bone quality
- Microdamage theory: traumatic occlusal forces are correlated to bone microfractures + consequently

Purpose: To examine the effects of traumatic occlusion on peri-implant bone levels

Material and methods:

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- PICO Question: does traumatic occlusal forces lead to peri-implant bone loss?

Results:

- 4 Animal studies:
 - o **Podaropoulos:** controlled progressive orthodontic loading results in sig higher BIC % vs unloaded implants + NSSD in crestal bone resorption
 - o **Ferrari:** Excessive lateral static load neg affected peri-implant bone around immediate restore implants (3.68 mm vs 0.45 mm MBL)
 - o **Nagasawa:** Degenerative changes in osseointegration and or in the bone around implants upon excessive occlusal loading + immediate loading --> no OHI
 - o **Miyamoto:** static overload-induced forces resulted in sg greater bone loss --> no OHI
- 1 human study:
 - o **Jofre:** no relationship btw max bite force + MBL for patients wearing overdenture using bar or ball attachment system

Conclusions

- May be an association between occlusal overloading + peri-implant bone loss when pathologic overload ($> 12 \text{ Kg/mm}^2$) is applied prior to osseointegration in the absence of inflammation
- Bone homeostasis loads ($< 2 \text{ kg/mm}^2$) applied after osseointegration leads to higher BIC + no crestal bone bone resorption in the absence of inflammation
 - o Magnitude of strain below the threshold will result in bone apposition + strain above the threshold will result in bone loss
- **Chvartsaid:** Healing adaption theory:
 - o The magnitude of the trauma determines whether an implant may fail or/ and will result in marginal bone loss
- Lack of clinical and scientific evidence on the influence of traumatic occlusal forces in dental implants

Topic: risk for DI failure- occlusion

Authors: Nagasawa M, Takano R, Maeda T, Uoshima K

Title: Observation of the bone surrounding an overloaded implant in a novel rat model.

Source: Int J Oral Maxillofac Implants. 2013 Jan-Feb;28(1):109-16.

DOI: 10.11607/jomi.2388

Type: animal (rat) study

Reviewer: Erin Schwoegl

Keywords: animal experiments, bone remodeling, dental implants.

Purpose: to use an animal model to assess changes in osseointegration with early and excessive loading

Material and methods:

- Included 40 rats; 16 control and 24 experimental
- Bilateral max first and second molars were extracted,
- One-month post-ext, machined DIs were placed in both groups.
- Experimental group: abutments designed to overload DIs were placed at 2 weeks (12 rats) or 4

weeks (12 rats) post-DI placement

- No abutments placed in control group
- Animals sacrificed at various timepoints, and sections prepared for histological examination

Results:

- All controls DIs were osseointegrated
- 2 DIs failed in the group with abutments placed at 2 weeks; DIs failed btwn 10-15 post-abutment placement
- placement

Histology

Control:

- Decalcified specimens: partial osseointegration at bone-implant interface. Active bone formation adjacent to DI surface. No signs of active bone resorption around the DIs.
 - 4 weeks post-placement: osseointegration widely established and bone density higher at vs 2 weeks post-placement
- Non-decalcified sections: osseointegration confirmed in, esp after 4 weeks vs 2 weeks.

Experimental:

- 5 days after overloading: active bone resorption around DIs in 2 week, vs 4 week specimens.
- 10 days after overloading: degenerative tendency of osseointegration more pronounced. Bone at the DI surface was less due active bone resorption in 2-week specimens.
- 15 days: almost all osseointegration had been lost in 2-week specimens. While bone formation was found around residual bone, re-establishment of osseointegration was rarely observed. Two DIs failed before 15 days.
 - In the 4-week specimens, a wide area of preserved osseointegration was found.

Conclusions:

- Loss of osseointegration was found around DIs with excessive occlusal load
- First study to show possibility of loss of osseointegration in absence of infection

Topic: Occlusion

Authors: Zhou Y, Gao J, Luo L, Wang Y.

Title: Does Bruxism Contribute to Dental Implant Failure? A Systematic Review and Meta-Analysis.

Source: Clin Implant Dent Relat Res. 2016 Apr;18(2):410-20.

DOI: 10.1111/cid.12300

Type: Systematic Review

Reviewer: Brook Thibodeaux

Keywords: bruxism, complication, dental implant, implant failure, teeth grinding

Purpose: To determine the relationship between bruxism and DI failure.

Material and methods: Systematic review and meta-analysis. Electronic search performed. Hand search also utilized. 7 cohort studies included that meet the inclusion criteria.

Results: Most of the studies were published within the last 10 years. 3 studies based on number of prostheses, 2 on number of patients and number of prosthesis, and 2 based on patients. 2 groups created, group a was number of prostheses based and group b was number of patients based. 445 patients were included, 81 patients had a history of bruxism in group B. 1788 prosthesis were placed in group A 509 prosthesis were in patients with a history of bruxism. Both groups showed a relationship between dental implant failure and bruxism. Bruxism and DI failure showed SS and prosthesis in bruxers had higher failure rate than nonbruxers. In group A OR of bruxers vs nonbruxers for all subgroups was 4.72. In group B OR of bruxers vs nonbruxers for all subgroups was 3.63. In all of the complications, ceramic/porcelain chipping/fracture had higher failure rates vs others. Density and strength of bite force was higher in bruxers (105N) vs nonbruxers (81N). Overload may cause imbalance of bone absorption and remodeling leading to biologic complications, MBLoss peri-implantitis. Evidence from current reviews explain that the bruxism and DI failure cause and effect relationship remains controversial.

Conclusions: This meta-analysis showed that bruxism plays a role in dental implant failure. Patients with bruxism had higher failure rates versus nonbruxers, and bruxism contributes to technical/biological complications of DIs.

Topic: occlusion

Authors: Kim Y, Oh TJ, Misch CE, Wang HL.

Title: Occlusal considerations in implant therapy: clinical guidelines with biomechanical rationale

Source: Clin Oral Implants Res. 2005 Feb;16(1):26-35.

DOI: 10.1111/j.1600-0501.2004.01067.x

Reviewer: Amber Kreko

Type: discussion

Keywords: dental implant, implant longevity, implant occlusion, overloading

Purpose: To discuss the importance of implant occlusion for implant longevity and to provide clinical guidelines of optimal implant occlusion and possible solutions managing complication related to implant occlusion

Discussion:

- Implant occlusion

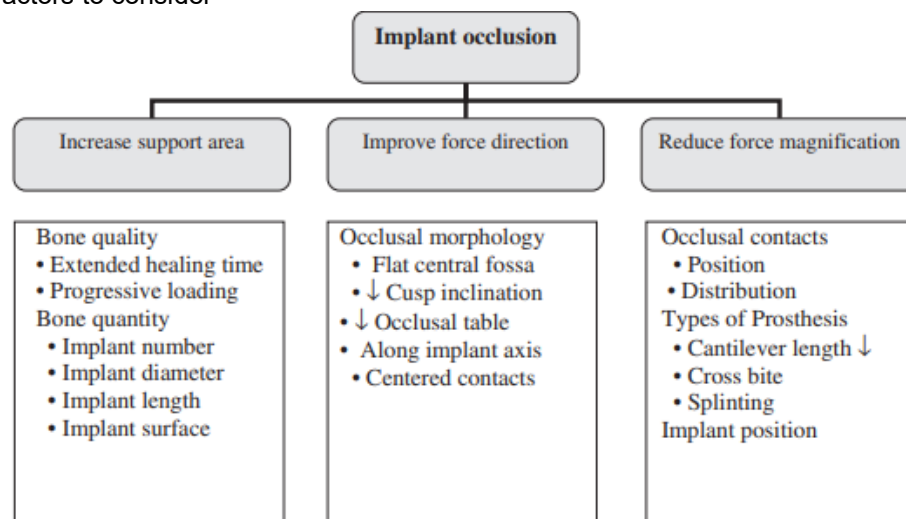
- o Overloading factors –

Table 2. Possible overloading factors

Overextended cantilever
• > 15 mm in the mandible (Shackleton et al. 1994)
• > 10–12 mm in the maxilla (Rangert et al. 1989; Taylor 1991)
Parafunctional habits/Heavy bite force
Excessive premature contacts
• > 180 µm in monkey studies (Miyata et al. 2000)
• > 100 µm in human (Falk et al. 1990)
Large occlusal table
Steep cusp inclination
Poor bone density/quality
Inadequate number of implants

- o

- o Factors to consider -



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- Clinical applications

- Occlusion on full-arch fixed prostheses – bilateral balanced occlusion for opposing complete denture; group function for opposing natural dentition, mutually protected occlusion with a shallow anterior guidance also recommended; canine guidance increased potential risk of screw joint failure at canine site.
- Occlusion on overdentures – bilateral balanced occlusion with lingualized occlusion on a normal ridge; monoplane occlusion recommended for severely resorbed ridge
- Occlusion on posterior fixed prostheses – anterior guidance to reduce potential lateral force on osseointegrated implants; group function should only be utilized when anterior teeth are periodontally compromised.
 - Reduced inclination of cusps, centrally oriented contacts with a 1-1.5mm flat area, narrowed occlusal table, and elimination of cantilevers have been proposed as key factors to control bend overload.
- Occlusion on single implant prosthesis – minimize occlusal force and maximize force distribution to adjacent natural teeth.

Table 3. Occlusal guidelines

Clinical situations	Occlusal principles
Full-arch fixed prosthesis	• Bilateral balanced occlusion with opposing complete denture • Group function occlusion or mutually protected occlusion with shallow anterior guidance when opposing natural dentition • No working and balancing contact on cantilever • Infraocclusion in cantilever segment (100 µm) • Freedom in centric (1–1.5 mm)
Overdenture	• Bilateral balanced occlusion using lingualized occlusion • Monoplane occlusion on a severely resorbed ridge
Posterior fixed prosthesis	• Anterior guidance with natural dentition • Group function occlusion with compromised canines • Centered contacts, narrow occlusal tables, flat cusps, minimized cantilever • Cross bite posterior occlusion when necessary • Natural tooth connection with rigid attachment when compromised support
Single implant prosthesis	• Anterior or lateral guidance with natural dentition • Light contact at heavy bite and no contact at light bite • Centered contacts (1–1.5 mm flat area) • No offset contacts • Increased proximal contact
Poor quality of bone/Grafted bone	• Longer healing time • Progressive loading by staging diet and occlusal contacts/materials

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Table 1. Comparison between tooth and implant

	Tooth	Implant
Connection	Periodontal ligament (PDL)	Osseointegration (Brånemark et al. 1977), functional ankylosis (Schroeder et al. 1976)
Proprioception	Periodontal mechanoreceptors	Osseoperception
Tactile sensitivity (Mericske-Stern et al. 1995)	High	Low
Axial mobility (Sekine et al. 1986; Schulte 1995)	25–100 µm	3–5 µm
Movement phases (Sekine et al. 1986)	Two phases Primary: non-linear and complex Secondary: linear and elastic	One phase Linear and elastic
Movement patterns (Schulte 1995)	Primary: immediate movement Secondary: gradual movement	Gradual movement
Fulcrum to lateral force	Apical third of root (Parfitt 1960)	Crestal bone (Sekine et al. 1986)
Load-bearing characteristics	Shock absorbing function Stress distribution	Stress concentration at crestal bone (Sekine et al. 1986)
Signs of overloading	PDL thickening, mobility, wear facets, fremitus, pain	Screw loosening or fracture, abutment or prosthesis fracture, bone loss, implant fracture (Zarb & Schmitt 1990)

Conclusions: The objective of implant occlusion are to minimize overload on the bone-implant interface and implant prosthesis, to maintain implant load within the physiological limits of individualized occlusion, and to provide long-term stability of implants and implant prostheses. This can be accomplished by increased support area, improved force direction, and reduced for magnification.

Good article.

Topic: Occlusal overload

Authors: Naert I, Duyck J, Vandamme K

Title: Occlusal overload and bone/implant loss

Source: Clin Oral Implants Res. 2012 Oct;23 Suppl 6:95-107

DOI: 10.1111/j.1600-0501.2012.02550.x

Reviewer: Tam Vu

Type: Review

Keywords: peri-implant, bone loss, occlusal overload

Purpose: to review the biological consequences of overloading osseointegrated implants

Material and methods: Electronic database search to answer focus question: "what is the effect of overload compared to controls on marginal bone loss, in clinically stable implants?"

Results:

- 16 clinical and 25 animal studies were considered
- All clinical studies were excluded due to high risk of bias, lack of sample size, missing or incomplete data, lack of evidence to support to oppose cause-effect relationship between bone loss and overload.
- 3 animals studies included.
- Uninflamed conditions
 - Insignificant crestal bone resorption noted in response to supra-occlusion and confined to implant neck at 12 mo
 - Supra-occlusion loading significantly increased % bone-to-implant contact and peri-implant bone density
- Inflamed conditions
 - Marked radiographic peri-implant bone loss extending to implant threads at 12 mo
 - Supra-occlusal loading worsened plaque-induced bone loss

Conclusion:

- In animal studies, occlusal overload did not have a negative effect on osseointegrated implants in the absence of inflammation. While in the presence of inflammation, occlusal overload significantly increased plaque-induced bone resorption

Topic: Implant Risk factors-occlusion

Authors: Chambrone, L., Chambrone, L., Lima, L.

Title: Effects of Occlusal Overload on Peri-Implant Tissue Health: A Systematic Review of Animal-Model Studies

Source: Periodontol. 2010 Oct;81(10):1367-78

DOI: 10.1902/jop.2010.100176

Reviewer: Daeoo Lee

Type: Review

Keywords: Alveolar bone loss; dental implantation, endosseous; dental occlusion, traumatic; evidence-based dentistry; osseointegration

Purpose: To assess the clinical, radiographic, and histologic effects of excessive occlusal loads (i.e., overload) on clinically stable dental implants by questioning to what extent excessive overload may affect peri-implant tissue health.

Material and methods:

- Electronic search of MEDLINE, EMBASE, and LILACS up to January 2010.
- Studies that reported outcomes of non-splinted titanium dental implants that became susceptible to occlusal overload (OV).
- Probing depth (PD), clinical attachment level (CAL), radiographic and histologic distances from the implant base to the most coronal point of bone-to-implant contact (RDIB and DIB, respectively), and bone density (BD) were the main outcomes of interest.
- From initial search results of 347 articles only 2 were considered for full analysis; non-RCT. The follow-up periods of the study ranged from 8 to 12 months.
- Total of 10 animals and total of 80 implants were analyzed.
- Stringent levels of plaque control (i.e., implant brushing three to seven times a week and rinsing with chlorhexidine solutions)

Discussion/Results:

- When adequate plaque control was performed, there was a lack of association between OV and peri-implant tissue loss. In other words, a positive correlation between plaque accumulation and OV in terms of a significant PD increase between baseline and final measurements and DIB
 - When there was no inflammation of peri-implant mucosa, the overloading of dental implants did not lead to clinical attachment loss or deepening of PDs
- Analogous to the concept of influence of traumatic occlusal forces on natural teeth.
 - In the absence of dental plaque, trauma from occlusion did not contribute to the loss of periodontal structures or to the development of infrabony defects.
- In the absence of inflammation, OV led to an increase in the percentage of bone-to-implant contact and a slight reduction of marginal bone levels
- BOP was recorded in only 18% of the OV sites, although 53% of the sites showed the presence of dental plaque.

Conclusions:

- It is not well established if an excessive occlusal load negatively affects osseointegration when adequate plaque control is performed. OV seems to increase BD around dental implants.
- OV might play a key role in the development of peri-implant tissue breakdown when plaque accumulation is present.

Topic: Implant occlusion

Authors: Goldstein G., Goodacre C., Taylor T.

Title: Occlusal Schemes for Implant Restorations: Best Evidence Consensus Statement

Source: Journal of Prosthodontics, 30: 84-90.

DOI: 10.1111/jopr.13319

Reviewer: Cyrus J Mansouri

Type: Consensus statement

Keywords: Dental implants; occlusal schemes; occlusion; restoration.

Purpose:

To review the published concepts on implant occlusal schemes and determine the effects of occlusion on implants prostheses.

Material and methods:

Focus question: Is there a preferred occlusal scheme for an implant retained restoration?

Literature search was completed for clinical trials, RCTs, SRs, and Meta-analyses. A total of 15 articles were included in the review.

Results:

Most of the identified studies reported on bone or implant loss with no definitive relationship with occlusion. With the loss of the PDL, some concern exists in the loss of proprioception leading to more susceptibility to overloading. A small number of studies suggested a potential relationship exists between implant failure and factors such as bending moments, occlusal overload, and occlusal table dimension but without strong evidence. Many studies exist reporting on implant complications. However, very few articles report on the occlusal scheme utilized in the restoration. Examining failing implants retrospectively is also problematic, as similar to teeth, causation cannot be proved, and the original occlusal scheme cannot be confirmed with certainty. Overall, there is a lack of evidence supporting one occlusal scheme over another when restoring implants.

Conclusion:

There is a lack of evidence supporting an occlusal scheme to utilize with implant restorations. The planned occlusal scheme may mimic that used for tooth or mucosal supported prostheses until compelling evidence may dictate otherwise.

Topic: PPI and Implants

Author: Rogoszinski T, Dazen C, Rekawek P, Coburn JF, Carr BR, Boggess W, Chuang SK, Lee KC, Panchal N, Ford BP.

Title: Are proton pump inhibitors associated with implant failure and peri-implantitis?

Source Oral Surg Oral Med Oral Pathol Oral Radiol. 2022 Jan;133(1):15-20.

DOI: 10.1016/j.oooo.2021.05.002.

Type: Retrospective Study

Reviewer: Veronica Xia

Keywords: proton pump inhibitors, dental implants, failure, peri-implantitis

Purpose:

- Estimate effect of proton pump inhibitors (PPI) on long-term implant failure and peri-implantitis and identify additional variables influencing long-term implant failure and peri-implantitis in PPI users and nonusers

Materials and Methods:

- Patients with PPI use for a minimum of 5 years before and after implant placement
- Long-term implant failure was the primary study outcome, and the presence of peri-implantitis was a secondary outcome
 - Long-term implant failure: lack of osseointegration, implant mobility, or bone loss >1mm/year evaluated at least 6 months after implant placement
 - Peri-implantitis: radiographic evidence of changes in crestal bone level of osseointegrated implants in conjunction with clinical evidence of inflammation (BOP/PD >5mm with/out suppuration)

Results:

- 933 implants in 284 patients
- PPI users had sig lower rates of peri-implantitis and long-term implant failure

- PPI use not a significant risk factor for both late failure and peri-implantitis
- Age, location, diabetes status, smoking status, and illicit drug use were significantly associated with peri-implantitis and long-term failure
- Sex only linked to incidence of peri-implantitis

Conclusion:

- PPI use did not significantly affect the odds of long-term implant failure or peri-implantitis
- PPI has anti-inflammatory benefits that may play a protective role in decreasing the incidence of peri-implantitis

Topic: Medications

Authors: Wu X, Al-Abedalla K, Abi-Nader S, Daniel NG, Nicolau B, Tamimi F.

Title: Proton Pump Inhibitors and the Risk of Osseointegrated Dental Implant Failure: A Cohort Study.

Source: J Clin Implant Dent Relat Res. 2017 Apr;19(2):222-232.

DOI: 10.1111/cid.12455.

Type: Retrospective Cohort Study

Reviewer: Trisha Nguyen-Luu

Keywords: epidemiology, medical devices, multilevel, osseointegrated implants, proton pump inhibitor

Background:

- PPI (Omeprazole, Lansoprazole, etc) are used to treat + prevent gastrointestinal acid-related conditions (peptic ulcer, GERD, d

Purpose: To determine the effect of proton pump inhibitors (PPI) on the failure of osseointegrated implants

Material and methods:

- Total of 799 patients were included in the study in Canada
 - 133 osseointegrated Nobel TiUnite implants in 58 patients that take PPI
 - 1640 osseointegrated Nobel TiUnite
- Kaplan-Meier estimator used to describe the hazard function of dental implant failure due to PPI use.

Results:

- 1,711 implants survived and 62 implants failure --> overall 96.5% implant survival rate
- 6.8% implant failure rate in pts that take PPI vs 3.2% failure rate in patients that don't take PPI
- Smoking is associated with an increased risk of implant failure
- Regular NSAID use increase risk of implant failure HR: 2.47
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Conclusions

- PPI is associated with higher implant failure rate with a hazard ratio 2.73
- MOA:
 - suppress gastric acidity by irreversibly inhibiting function of proton pump (H⁺/K⁺ ATPase) in the membranes of parietal gastric cells --> inhibit gastric acid secretions
 - BUT H⁺/K⁺ ATPase are also found on the plasma membrane of osteoclast
 - Proton pump inhibition of osteoclast decrease activity + disrupts bone metabolism/turnover + osseointegration

- Increases pH in small intestine which reduces Ca²⁺ absorption + altered calcium homeostasis -->decreases bone mineral density
- Prolonged PPI use decrease Vit B12 serum levels which can cause hyperhomocysteinemia , impaired collagen cross linking + reduce bone strength
- Interferes with absorption + excretion of magnesium which can neg affect bone metabolism
- Reduce expression of BMP-2, BMP-4 + CYR61 - Decrease endosteal transverse growth, increase osteoid width + decrease the ratio of bone mineral substance mass to bone mass
- Chronic gastric acid suppression can result in hyperplasia + hypertrophy of parathyroid glands which can increase PTH levels --> can decrease bone strength + quality
- Recommend a calcium rich diet in patients taking PPI
- Smoking can impair new bone formation, reduction Ca²⁺ + absorption + decrease BMD transiently
- Regular use of NSAID is usually given to patients taking PPI to prevent side effects – may affect bone metabolism by inhibiting COX-2 activity + decrease synthesis of proinflammatory prostaglandins + neg effect on endochondral ossification (Decrease bone formation)
- Patients taking PPI had the most failures btw 10 – 20 months after implant placement
 - Possible due to the inhibition of bone remodeling process around functional implants

Topic: risk for DI failure- medication

Authors: Zahra B, Nicholas B, Geoffrey R, Dina Z, Janal MN, Stuart F.

Title: Dental implant failure rates in patients with self-reported allergy to penicillin

Source: Clin Implant Dent Relat Res. 2022 Jun;24(3):301-306

DOI: 10.1111/cid.13082

Type: retrospective

Reviewer: Erin Schwoegl

Keywords: allergy, dental implant, penicillin

Purpose: To compare DI failure rates in pts rx'ed amoxicillin with pts who report a penicillin allergy

Material and methods:

- Chart review conducted
- Included pts w 1+ DI placed by dentists in postgrad specialty programs at New York University College of Dentistry with follow-ups at 1-2 wk and 1+ year post-DI placement
- Excluded medically-compromised pts

Results:

- DI failure rates
 - Overall failure rate: 12.9%; NSSD with gender (13.2% men and 12.6% women)
 - Pts w/o a reported PCN allergy: 8.4%
 - Pts reporting allergy: 17.1% (SSD)
 - OR: 2.22
- Clindamycin + azithromycin were major abx prescribed to pts reporting PCN allergy; both had elevated failure rates.
 - DI failure relative to that with amoxicillin
 - Clindamycin: OR= 2.9
 - Any other abx tx: OR= 2.77
- Most failures occurred before 6mo in pts w reported allergy and after 12mo in pts w/o allergy

Conclusions:

- Study show a sig relationship btwn pts with reported PCN allergy and DI failure.
- Routine testing for those who report an allergy may be advised.
- Advise studying those with true allergies

Topic: Implant survival and Medications

Authors: Ata-Ali J, Ata-Ali F, Peñarrocha-Oltra D, Galindo-Moreno P.

Title: What is the impact of bisphosphonate therapy upon dental implant survival? A systematic review and

meta-analysis.

Source: Clin Oral Implants Res. 2016 Feb;27(2):e38-46.
DOI: 10.1111/clr.12526
Type: Systematic Review
Reviewer: Brook Thibodeaux
Keywords: bisphosphonate-related osteonecrosis of the jaws, dental implant, failure, risk factor, success rate, survival rate

Purpose: To determine what impact bisphosphonate therapy has on dental implant survival.

Material and methods: Systematic review and meta-analysis. Electronic data search utilized, as well as manual search. 14 studies were included in the systematic review that met the inclusion criteria. Eight studies were included in the meta-analysis, six retrospective and two prospective studies. Statistical analysis then took place.

Results: 1288 participated in total, 386 patients receiving bisphosphonate therapy and 902 patient controls. 4562 DI were placed in total, 3472 DI were placed in patients without bisphosphonate therapy and 1090 DIs were placed in patients receiving bisphosphonate therapy. 26/1090 DIs failed in the test group. 76/3472 DIs failed in the control group. In the meta-analysis, the OR of 1.43 showed that enough evidence does not exist to show that BPs have negative effect on DI survival. The number needed to harm was 509 DIs.

Conclusions: This study determined that placing DIs in patients who have received bisphosphonate therapy does not cause a reduction in success rates of the DIs. Statistical significance was not reached, but the OR did suggest poorer results in the test group versus the control. Complications in patients receiving bisphosphonate therapy have been observed and need to be explained to the patient prior to surgery. Evaluation must be individualized, due to the serious but infrequent complication of bisphosphonate-related osteonecrosis of the jaw in patients with a history of BP therapy. Prospective studies with larger sample sizes and longer duration follow-up must be used in the future to confirm the results of the present study.

Topic: implant failure

Authors: Chappuis V, Avila-Ortiz G, Araújo MG, Monje A.

Title: Medication-related dental implant failure: Systematic review and meta-analysis.

Source: Clin Oral Implants Res. 2018 Oct;29 Suppl 16:55-68.

DOI: 10.1111/clr.13137

Reviewer: Amber Kreko

Type: systematic review

Keywords: biological complications, dental implant, drug, endosseous implant, epidemiology, failure, medication

Purpose: To investigate the association between the intake of systemic medications that may affect bone metabolism and their subsequent impact on implant failures.

Material and methods:

- Systematic review with focused question "Is there an association between medication intake and implant outcomes (i.e. implant failure)?" If yes, then what are the medications and dosages, does failure occur in early stages of healing or after osseointegration, are there more mechanical complications, are there any other confounders, what is the strength of evidence

Results:

- 17 articles included
 - o Non-steroidal anti-inflammatory drugs (NSAIDs) – 5 studies – no statistical significance
 - o Selective serotonin reuptake inhibitors (SSRIs) – 2 studies – increased risk of implant failures; difference of IF rates of 7.5%
 - o Proton pump inhibitors (PPIs) – 2 studies – increased risk of implant failure; difference of IF rates of 4.3%

- Bisphosphonates (BPs) – 7 studies – no statistical significance
- Anti-hypertensives (AHTNs) – 1 study – increased survival rate

Conclusions: Proton pump inhibitors and selective serotonin reuptake inhibitors showed an association with implant failure.

Topic: Medication and implant failure

Authors: Carr AB, Revuru VS, Lohse CM

Title: Risk of Dental Implant Failure Associated With Medication Use

Source: J Prosthodont. 2019 Aug;28(7):743-749

DOI: 10.1111/jopr.12773

Reviewer: Tam Vu

Type: Clinical

Keywords: medication, risk, implant failure rate

Purpose: to identify risk of implant failure related to medication use

Material and methods:

- 6384 pts receiving dental implants at Mayo Clinic between Oct 1983 to Dec 2014
- Demographics included age at time of first implant placement, sex, race/ethnicity, and era of first implantation (1983-2000 and 2001-2014)
- Analysis of medications divided into aspirin and 6 drug classes
 - Anticonvulsants
 - Bisphosphonates (Oral)
 - Bisphosphonates (IV)
 - Antihypertensives
 - Antidepressants
 - Corticosteroids

Results:

- 6358 patients analyzed
 - 713 pts had implant failure, median of 0.6 year after 1st implant placement
 - 5645 pts implants survived, median 5.8 years
- Medication use significantly associated with age
 - Some meds sig assoc with sex (women and antidepressants, men and aspirin)
- Era of implantation was strongest predictor of implant failure
 - Implants placed between 2001 – 2014 sig less implant failure than 1983 – 2000
- Use of multiple medications with and without aspirin had no sig influence on implant failure
- Each 10 year increase in age was assoc w/ 6% increased risk of implant failure
- Men were 22% more likely to have implant failure (vs women)
- Corticosteroids assoc with reduced risk of implant failure
- No meds started after implant placement was assoc with increased risk of implant failure

Discussion

	This study	Other studies

Bisphosphonates	NSD risk of implant failure among pts receiving oral BP, IV BP, and no BP	Mixed evidence on risk of implant failure
Antihypertensives	NSD	Wu reduced risk of implant failure rates in pts taking antihypertensive meds
Antidepressants	NSD	Wu higher implant failure rate in pts using SSRI Chrcanovic higher implant failure rate, but NSSD

- Anticonvulsants – no diff in implant failure rate
- Corticosteroids – protective association
- PPI (not included in this study) – associated with increased risk of implant failure

Conclusion: Use of medication was not associated with an increased risk of implant failure. Corticosteroid may reduce risk of implant failure.

Topic: Implant Risk factor-medications

Authors: Carr, A., Gonzalez, R., Jia, L., Lohse, C.

Title: Relationship between Selective Serotonin Reuptake Inhibitors and Risk of Dental Implant Failure

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Reviewer: Daeoo Lee

Type: Retrospective

Keywords: Antidepressants; implant outcome; shared decision making

Purpose: To identify associations between implant failure and SSRI use.

Material and methods: Retrospective review of patient who received at least 1 dental implant in Mayo clinic between 1995 through 2014. Analyzed patient who took SSRI (6) (citalopram (Celexa), escitalopram (Lexapro, Cipralex), fluoxetine (Prozac, Sarafem), fluvoxamine (Luvox), paroxetine (Paxil, Paxil CR, Pexeva), and sertraline (Zoloft)). Statistical analysis performed.

Results:

- 3 Temporal relationship of SSRI use and implant failure:
 - History of SSRI use: used concurrent with or before the date of first implant placement
 - The 284 patients (5.2%) who started treatment with sertraline before the date of first implant were significantly more likely to have implant failure than patients who started a different SSRI before the date of first implant and patients with no history of SSRI use (Hazard Ratio: 1.60; 60% more likely)
 - HR: history 1 SSRI (1.08) compared to 2 or more SSRI (1.67) with implant failure rate
 - Active SSRI use: use concurrent with time of first implant placement
 - Active SSRI use was not significantly associated with implant failure for any of the SSRIs evaluated.
 - Nearly all patients with active SSRI use were taking only 1 SSRI (98%)
 - Follow-up use: initiating SSRI use after implant placement
 - no significant association between SSRI use during follow-up and implant failure

Discussion:

- Only sertraline (Zoloft) had a significant association with implant failure, and this association was evident only in patients with a history of medication use. Neither active users of sertraline nor those who began sertraline use after implant placement had significantly greater risk

- Multiple SSRIs significantly increases risk of implant failure. Compared with patients with no history of SSRI use, patients who used 2 or more SSRIs had significantly greater risk of implant failure.

Conclusions: The findings of this study shows that patients who have a history of sertraline use and are considering oral reconstruction with dental implants have a 60% greater risk of implant failure than patients with no history of sertraline use.