

## 2011 ABGD Study Guide - Implants

257. Which of the following surface treatments is said to have the highest bone-to-implant contact percentage?

- A. Titanium Plasma Spray (TPS)
- B. Sandblasting
- C. Acid-etch with HCl-H<sub>2</sub>SO<sub>4</sub>
- D. Machined smooth surface

**Answer: C. Acid-etch with HCl-H<sub>2</sub>SO<sub>4</sub>**

- Numerous studies have shown that bone contact with an etched surface (HCl-H<sub>2</sub>SO<sub>4</sub>) has the highest bone-to-implant contact percentage
- A study by Cordioli, Int J Oral Maxillofacial Implants 2000 showed the contact percentage of acid etched implants at 72%, TPS at 57%, 55% for sandblasting surfaces and 49% for machined smooth surface.

*Clinical Implant Dentistry, Davarpanah and Martinez First Edition, pages 207-212.*

- Implant surface modifications promote new bone growth through “Osteoconduction” and include enhanced hydrophilic surface properties of the titanium oxide surface, development of a three-dimensional oxide surface, sintered beads of titanium on the implant surface or modification of the titanium oxide to a titanium fluoroxide.

*Newman MG, Takei HH, Carranza FA, “Clinical Periodontology”, ninth edition, 2002.*

258. The best way to improve support of dental implants is to

- a. increase the width of the implant
- b. increase the length of the implant
- c. roughen the surface of the implant
- d. use a tapered implant

**Answer B.**

To maximize the chance of success, the implant should be placed entirely within bone and away from significant anatomic structures (i.g. the inferior alveolar canal). Ideally 10mm of vertical bone dimension and 6mm of horizontal should be available for implant placement. Placement at these demensions prevent encroachment on anatomic structures and facial aspects of the implant. **If short implants (8-10mm) are used, “overengineering” and placing more implants than usual to withstand the occlusal load is recommended.** Short implants are often necessary because of bone resorption, which thus increase the crown/implant ratio when the normal plan of occlusion is reestablished.

*Rosenstiel, Land, Fujimoto. Contemporary Fixed Prosthodontics 4<sup>th</sup> ed. Implant-supported Fixed Prosthodontics*

- Implant length
  - Longer = greater surface area for osseointegration
  - “BIC”= bone implant contact
  - At least 10mm for predictability
  - Consider anatomic structures (from radiographs)
  - Consider maximum patient opening before opting for a longer implant
- Implant diameter
  - Know B-L and M-D osseous dimensions
  - Increased diameter also increases surface area but (i.e. 6mm) present more of a surgical challenge, and require more space
  - Instead of a 6mm fixture in the posterior, a 5/6 expanded platform fixture will provide the same restorative advantage with more surgical leeway

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*Rudmann M. Dental Implants, treatment planning and Restorative Procedures. 2010*

Bone quantity: The occlusocervical height of the residual ridge should be at least 7mm, since that is the shortest available implant length. It should also be remembered that **short implants (7-10 mm) have a higher failure rate.**

The **faciolingual ridge thickness should have a minimal dimension of 6-8 mm so the implants can be housed within bone.** These minimal dimensions make the implant placement very critical to avoid fenestration/dehiscence of the implant. Minimal faciolingual dimensions do not permit changing the implant angulation in the bone.

Effect of Implant length (evaluated in 13 studies)

- 10mm or less-274 of 2754 implants failed (10%)
- Greater than 10mm-105 of 3015 implants failed (3%)

*Bernal G, Goodacre JC, Leyman JW. LLU, Diagnosis and treatment planning or endosseous root from implants: Implant dentistry*

This study compared the effect of diameter and length on the pullout force required to extract hydroxylapatite-coated implants from dog alveolar bone. After 15 weeks for integration, implants of 3.0, 3.3, and 4.0 mm diameter and 4, 8, and 15 mm length were pulled. The results showed that **the ultimate pullout force correlated strongly to implant length, but not diameter.** Cortical bone contributed more to implant retention than cancellous bone.

*Block MS, DMD<sup>a</sup>, Delgado A, Fontenot MG, The effect of diameter and length of hydroxylapatite-coated dental implants on ultimate pullout force in dog alveolar bone. J Oral Maxillofac Surg. 1990 Feb;48(2):174-8.*

Finite element analyses were performed for various shapes of dental implant to study effects on stress distribution generated in the surrounding jaw bone and to determine an optimal thread shape for even stress distribution. It was found that the square thread shape filleted with a small radius was more effective on stress distribution than other dental implants used in the analyses. Additional analyses were performed on the implant with the thread shape obtained from previous analyses for varying other design parameters, such as the width of thread end and height of thread for various load directions, to determine the optimal dimensions of the implant. Stress distribution was more effective in the case when the width of thread end and the height of thread were  $0.5p$  and  $0.46p$ , respectively, where  $p$  is the screw pitch. Then, using the optimal implant thread dimensions determined previously, stress analyses were performed with various screw pitches and implant lengths, to investigate effects on stress distribution and to find the way to reduce the maximum effective stress generated in the jaw bone. **Results show that the maximum effective stress decreased not only as screw pitch decreased gradually but also as implant length increased.**

*Chun HJ, et al. Evaluation of design parameters of osseointegrated dental implants using finite element analysis. J Oral Rehabil. 2002 Jun;29(6):565-74.*

**259.** Which type of bone could be described as a thin layer of cortical bone that surrounds a core of dense trabecular bone of favorable strength?

- A. Type I
- B. Type II
- C. Type III
- D. Type IV

**ANSWER: C. Type III**

**Quality of bone**

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Type I: Almost the entire jaw comprises homogenous cortical bone.

Type II: A thick layer of cortical bone surrounds a core of dense trabecular bone.

Type III: A thin layer of cortical bone surrounds a core of dense trabecular bone of favorable strength.

Type IV: A thin layer of cortical bone surrounds a core of low density trabecular bone.

### Quantity of bone

A: Most of the alveolar ridge is present.

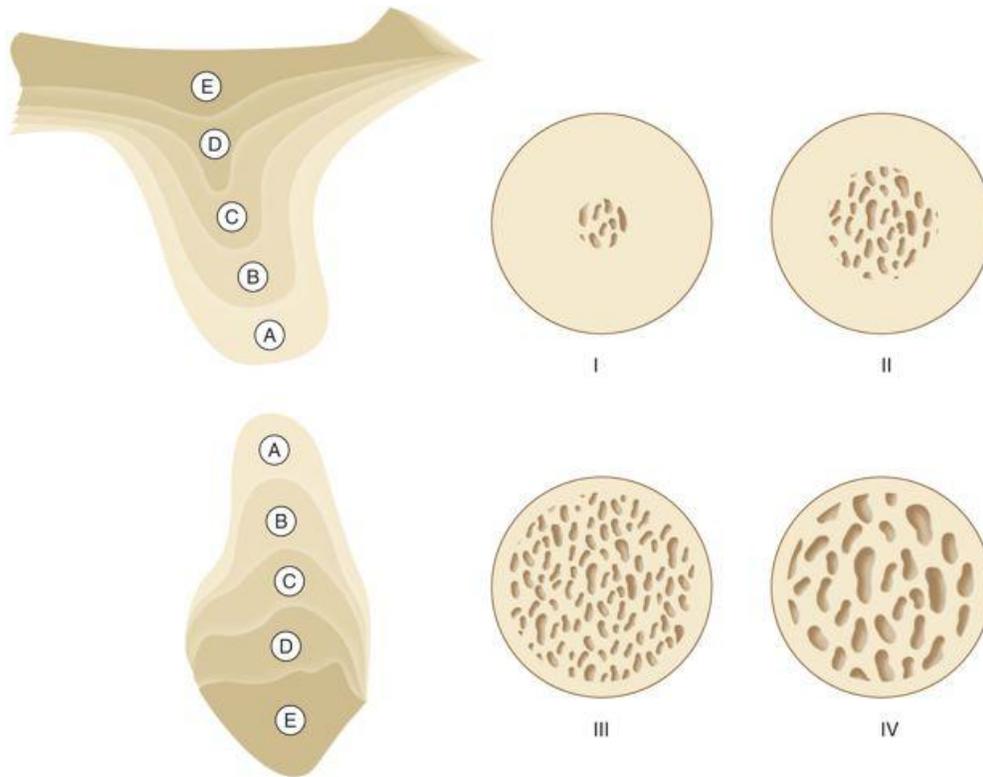
B: Moderate residual ridge resorption has occurred.

C: Advanced residual ridge resorption has occurred and only basal bone remains.

D: Minimal to moderate resorption of the basal bone has occurred.

E: Extreme resorption of the basal bone has occurred.

*Adapted from Brånemark P-I, Zarb GA, Albrektsson T: Tissue-integrated prostheses: osseointegration in clinical dentistry, Chicago, 1985, Quintessence Publishing.*



**Figure 26-8.**

*Rose, Louis F. Periodontics: Medicine, Surgery and Implants. 2004.*

**260.** The following are contraindications for implant placement except:

- A. Pregnancy
- B. Patient who is a smoker
- C. Uncontrolled metabolic disease
- D. Improper patient motivation

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**Answer: B. Patient who is a smoker**

Contraindications to Implant Placement (National Institutes of Health Consensus Conference):

1. Acute Illness
2. Terminal Illness
3. Pregnancy
4. Uncontrolled metabolic disease
5. Tumoricidal irradiation of the implant site
6. Unrealistic patient expectation
7. Improper patient motivation
8. Lack of operator experience
9. Inability to restore with a prosthesis

Indications for Implant Placement in the Partially Edentulous Patient:

1. Inability to wear a removable partial dental prosthesis or complete denture
2. Need for long-span FDP with questionable prognosis
3. Unfavorable number and location of potential natural tooth abutments
4. Single tooth loss that would necessitate preparation of minimally restored teeth for fixed prosthesis

*Rosenstiel, Land, Fujimoto. Contemporary Fixed Prosthodontics. 4<sup>th</sup> edition, 2006.*

**261.** Implant restorations should be designed to minimize damaging forces by:

- a. Creating more horizontal resultant forces on a shorter moment arm
- b. Creating more vertical resultant forces and a longer moment arm
- c. Creating more vertical resultant forces and a shorter moment arm
- d. Creating more horizontal resultant forces on a longer moment arm

**ANSWER: C. Creating more vertical resultant forces and a shorter moment arm**

Because dental implants most effectively resist forces directed primarily in their long axis, lateral forces on implants should be minimized. Lateral forces in the posterior part of the mouth are greater and more destructive than lateral forces in the anterior part of the mouth. When they cannot be completely eliminated from the implant prosthesis, efforts should be made to distribute them equally over as many teeth as possible.

Implant restorations should be designed to minimize damaging forces at the implant-bone interface, with particular attention of the occlusion. **Flatter inclines can be developed on implant-supported cusps, creating more vertical resultant forces and a shorter moment arm.** Whenever possible, a cusp-fossa relationship should be established in maximum intercuspation with no eccentric occlusal contact. The maxillary single-tooth restoration is vulnerable to screw loosening as a result of occlusal contacts, which usually produce an inclined resultant force with increased torque on the retaining screw. Optimum implant orientation effectively reduces these forces.

Inadequate implant distribution may also lead to excessive cantilevers or forces that could potentiate overloading of implant bodies. Whenever possible, dental implants should be joined so that forces may be more equally distributed over multiple implants. Ideally, one implant for every tooth to be restored should be placed. Complete arch restorations should not be considered on fewer than six implants in the maxilla and five in the mandible. Implant cantilevers should be kept as short as possible. However, cantilevering considerable distances off five well-integrated fixtures in the anterior mandible is possible. Quite often, cantilevering to the first molar is possible.

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### Occlusion on Implant –Supported Dental Prosthesis

- Direct forces in long axis of the implant body
- Minimize lateral forces on the implant
- Place lateral forces when necessary as far anterior in the arch as possible
- When it is impossible to minimize or move lateral forces anteriorly, distribute them over as many teeth and implants as possible

262. Which of the following statements is not correct when comparing force distribution and implant length?

- a. For initial stability, length of implant is the most important.
- b. After osseointegration, the greatest force stress is seen within the cervical area.
- c. Increasing the length of an implant increases long term success.
- d. The posterior maxilla requires the most fixture length in bone for success.

**ANSWER: c. Increasing the length of an implant increases long term success.**

The implant macrogeometry may be increased to decrease stress. D4 bone requires relatively longer implants for initial fixation and early loading compared with other bone densities. This may require sinus grafts in the posterior maxilla. Based on long term clinical experience of V-shaped threaded implant bodies, **the minimum bone height for initial fixation and healing for D1 bone is 10mm; for D2 bone is 12mm; for D3 14mm using the classic V-thread screw implant design and titanium surface condition. These sizes may be reduced with improved implant designs. However, because the crestal region is where pathologic overload of bone most often occurs, once initial healing is complete the length of the implant is not effective to solve crestal bone loss and the quality of implant health.**

The width of the implant may also decrease stress by increasing the surface area. This may reduce the length requirement. For every 0.5mm increase in width, there is an increased surface area between 10 and 15%. **Since the greatest stresses are concentrated at the crestal region (first 6 threads) of the implant, width is more significant than length for an implant design.** D4 bone should often use wider implants compared with D1 or D2 bone. This may require only onlay grafts to increase the width of bone, when other stress factors are high.

**Once the implant bone interface is formed, excessively long implant do not relieve stress transfer in the apical region and are not needed.**

*Misch, C.E. Contemporary Implant Dentistry; 2<sup>nd</sup> edition, 1999.*

263. All of the following are ways to enhance implant osseointegration except:

- A. Immediate loading to avoid an inflammatory response
- B. Placing osteoconductive bone graft along with the implant
- C. Placing osteoinductive bone graft along with the implant
- D. Implant surface treatment

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### Answer: A. immediate loading to avoid an inflammatory response

- Implant surface modifications promote new bone growth through a process called “osteoconduction” and include enhanced hydrophilic surface properties of the titanium oxide surface, development of a three-dimensional oxide surface, sintered beads of titanium on the implant surface or modification of the titanium oxide to a titanium fluoroxide.
- Osteoconduction is the formation of bone by osteoblasts from the margins of the defect on the bone graft material. Materials that are osteoconductive serve as scaffold for bone growth. They do not inhibit bone formation, nor do they induce bone formation. They simply allow the normal formation of bone by osteoblasts into the graft defect along the surface of the graft material.
- Osteoconductive bone graft materials facilitate bone formation by bridging the gap between the existing bone and a distant location that otherwise would not be occupied by bone. Osteoinduction involves new bone formation via stimulation of osteoprogenitors from the defect (or from the vasculature) to differentiate into osteoblasts and begin forming new bone. This induction of the bone-forming process by cells that would otherwise remain inactive occurs via cell mediators that “turn on” these bone forming cells. The most widely studied of these is the family of bone morphogenic proteins (BMPs).
- Grit-blasted and acid-etched implant surfaces increase bone apposition (Buser)
- Uncalcified bone interfaces with Titanium has shown connective tissue interposed between the two surfaces
- Inflammatory cells are potential constituents of connective tissue, and improper loading of implant may trigger an inflammatory response leading to bone resorption

*Newman MG, Takei HH, Carranza FA, “Clinical Periodontology”, ninth edition, 2002.*

**264.** Osteoporosis is a systemic skeletal disease characterized by reduced bone strength that predisposes an individual to an increased risk of fractures. Current evidence based dentistry indicates that

- a. Most patients with osteoporosis have no contraindications to dental implant placement
- b. Osteoporosis is a relative contraindication for osseointegrated implants.
- c. Hyperbaric oxygen treatment must be completed before starting a surgical implant in people with osteoporosis.
- d. The success rates of implants in patients with osteoporosis are similar to those obtained in healthy subjects, except in cases in which there was poor quality of bone during or placement

### ANSWER: A. Patients with osteoporosis have no contraindications to dental implant placement

**Osteoporosis is** a systemic skeletal disease characterized by reduced bone strength that predisposes to an increased risk of fractures. It is characterized by a deterioration of bone microarchitecture with reduced bone mass and strength and increased fragility. The resistance reflects the amount of bone density and bone quality. **There are different treatments for osteoporosis, all aimed at reducing the risk of fractures.** Thus, estrogen treatment in post-menopausal women, selective modulators of estrogen receptors (especially raloxifene), calcitonin, strontium ralenate, and especially bisphosphonates, are drugs widely used in clinical practice. There are histological studies in humans conducted on osseointegrated implants which are removed to patients with osteoporosis by a prosthetic failure. They show healthy bone in close contact with the implant surface and the percentages of bone-implant contact confirm that osseointegration was produced (6,7). Shibili et al. performed a comparative histological analysis between implants with load removed in patients with and without osteoporosis. The percentages of bone implant contact did not show differences between both groups. The histomorphometric results were not different either between groups once the osseointegration was established. These **data suggest that osteoporosis cannot be**

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**considered a contraindication to placement of implants in patients with osteoporosis (8).** The results of the reviewed studies show that it is **feasible to place implants in subjects with osteoporosis, with success rates similar to those obtained in healthy subjects, even in cases in which there was poor quality of bone during or placement.**

In the last 5 years a new complication has been described associated with treatment with BP: osteonecrosis of the jaw (ONJ), which consists of the appearance of foci of bone necrosis with exposure of maxillary or jaw bone and which has a slow healing process (or not heal) in 6-8 weeks. The causal relationship between BP and ONJ is still in research, but there is a **clear correlation with the systemic administration of aminobisphosphonates (15).** In a review published in 2006 about 368 cases of ONJ, 4.1% was found in patients who received BP for the treatment of osteoporosis, and 91.6% in patients treated for multiple myeloma and breast or prostate cancer. 60% of cases occurred after dentoalveolar intervention and in other cases the cause was not identified (16). Reviewing the literature from 2003 to 2005, ONJ is mostly associated with BP administered by injection, and also with greater activity (pamidronate and zoledronic acid), which were used in over 80% of cases for the treatment of multiple myeloma and breast cancer. It has also been reported for the orally administered BP, including alendronate, but they are of low frequency. A recent revision in 2007 also reported a low risk of ONJ in patients receiving oral therapy with BP (1/10.000-1/100.000) (17). As it is stated in the literature, more than 90% of the cases occur in patients receiving intravenous BP (pamidronate and zoledronic acid) for treatment of multiple myeloma and metastatic breast cancer or prostate cancer, while cases in patients receiving the BP orally for the treatment of osteoporosis are rare. The risk increases with treatment time due to the long half-life of these drugs, and within the oral cavity, jaw is the primary location of the foci of osteonecrosis.

### **Risk factors for Development of Osteonecrosis of the Jaw**

Systemic factors	<ul style="list-style-type: none"> <li>- Type BP</li> <li>- Dosage and administration time</li> <li>- Concomitant medications: immunosuppressives, steroids, antiangiogenic, and so on.</li> <li>- Systemic diseases: diabetes, immunodeficiencies, etc...</li> </ul>
Local factors	<ul style="list-style-type: none"> <li>- Dental extractions</li> <li>- Oral Surgery</li> <li>- Trauma of the mucose by rubbing</li> <li>- Periodontal disease</li> <li>- Poor dental hygiene</li> </ul>

### **Special recommendations for implant placement in patients with osteoporosis treated with**

**oral bisphosphonates** Although patients treated with oral BP do not require any special protocol, as opposed to intravenous (20), it is desirable to adopt a series of preventive measures, which aim to restore a proper state of oral health before the start of therapy with BP. Inform the patient of the convenience of periodic revision and instruction in oral hygiene procedures to ensure adequate dental and periodontal health. As for the orthodontic implications little is known, but according to the antiresorptive effect of bone that BP have, the movement of teeth can be reduced or prevented after initiating treatment. Before any type of surgery the start of treatment with BP will be delayed as far as possible until the wound is completely healed. In the case the patient with osteoporosis has already commenced oral treatment with BP: - The first 3 months are not of any risk for any dental intervention. - The non-invasive treatments (fillings, endodontics, carvings, root debridement...) can be conducted without specific measures. - If the patient has been in treatment less than 3 years, the risk when undergoing extractions or surgery appears to be minimal, although the patient should be warned in the informed consent of a remote possibility of ONJ. - The use of other immunosuppressive medications such as steroids, antiangiogenic agents, or the presence of concomitant systemic diseases such as diabetes mellitus, increase the risk of ONJ before surgical action, although the patient has followed treatment for less than 3 years. - The patient treated for more than 3 years has a higher risk of ONJ in case of surgical intervention. However, most cases of ONJ associated to oral BP according to the literature are found in patients treated over 10 years (14, 18). Before any invasive procedure such as implant placement, most consulted authors recommend to make the intervention under antibiotic prophylaxis with penicillin, or metronidazole in combination with a quinolone (in the case of allergy to penicillin). Clindamycin alone is not recommended because it is ineffective against *Eikenella corrodens*, *Actynomices* and other similar species that

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frequently colonize the oral cavity. It is also recommended to perform chlorhexidine rinses at 0.12% twice a day for 15 days. The possibility of stopping treatment with oral BP 2-3 months before the intervention and until the completion of osseointegration depends on the opinion of the professional who prescribes it, considering the benefit / risk for discontinuation of the drug. From our point of view, the withdrawal of the drug is not very useful, because the effect of BP on the bone is maintained for years. For this reason it is convenient to reach an agreement among dentists and specialists in maxillo-facial surgery, and the physicians who treat osteoporosis in patients (rheumatologists, endocrinologists, internists, family doctors, etc.) (20). It has also been recommended the establishment of the level of carboxyterminal telopeptide of collagen type I (CTX) in blood, as this telopeptide is separated of the collagen molecule by osteoclasts during bone resorption, and its level in blood would be proportional to the degree of reabsorptive osteoclastic activity, which could have a specific value for predicting ONJ in patients undergoing surgery or extractions (15): - If the levels of CTX are equal to or greater than 150 pg / ml the risk of ONM in connection with surgical procedures is minimal. If the levels of CTX are less than 150 pg / ml, it is advisable to postpone the surgery, to assess the temporary withdrawal of the drug, and to repeat the determination of CTX in 4-6 months' time. If it continues being lower after this time, carry on without the drug, and repeat 3 months later. However, there is insufficient scientific basis about the predictive ability of CTX, and therefore its use should be considered with caution and this information should be detailed in the informed consent

*Osteoporosis and Implants. Med Oral Patol Oral Cir Bucal, 2010 Jan 1;15 (1):e52-7.*

**265.** What term accurately describes an asymptomatic, immobile implant with 2mm peri-implant bone loss after 2 years, and no sign of infection? Are there techniques to manage or improve the prognosis?

- A. Failed / Yes
- B. Failed / No
- C. Ailing / No
- D. Ailing / Yes

**ANSWER: D. Ailing**

“The following criteria have long been established as necessary for dental implantation to be successful: (1) The individual, unattached implant must be immobile when tested clinically; (2) there must be no radiographic evidence of peri-implant radiolucency; (3) after the first year of placement, there must be no more than 0.2mm of vertical bone loss annually; and (4) no pain, infection, neuropathy, or paresthesia can be associated with the individual implants.

The term ailing implant suggests that there are means by which to manage or improve the prognosis of fixtures that present with progressive peri-implant bone loss and pocketing as a result of peri-implantitis... Treatment may be surgical or non-surgical.”

“When the bone is resorbed one-third the total length of the implant, surgical salvage should be attempted”

*Garg, AK. Implant Dentistry: A Practical Approach, 2<sup>nd</sup> ed. Mosby 2004, 18; 226-8.*

“The ailing implant exhibits bone loss with pocketing; the situation seems to be a static at the 3 to 4 month maintenance checks. A lamina dura indicating a state of chronicity may be present at the borders of the osseous defect.

The failing implant may evidence bone loss, pocketing, bleeding upon probing, purulence, and indications that the bone loss patterns are progressing irrespective of therapy.

The failed implant has mobility, a dull sound when percussed, and radiographically a peri-implant radiolucency. The failed implant must be removed since it is nonfunctional and bone loss will continue.”

*Meffert RM. How to treat ailing and failing implants. Implant Dentistry 1992. 1.1.25-33.*

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266. What are the minimum appropriate osseous dimensions for implants?

- A. 1.5mm of bone on the buccal and lingual
- B. 1.0mm of bone on the buccal and lingual
- C. 1.5mm of bone on the buccal and 1.0mm of bone on the lingual
- D. 1.5mm of bone on the lingual and 2.0mm of bone on the buccal

**Answer: B. 1.0mm of bone on the buccal and lingual**

Ideally, 10mm of vertical bone dimension and 6mm of horizontal should be available for placement.

The minimum space between adjacent implants is 3.0mm (1.5mm for each).

Some common guidelines include staying 2.0mm above the superior aspect of the inferior alveolar nerve canal, 5.0mm anterior to the mental foramen, and 1.0mm from the PDL of adjacent teeth (1.0mm + 0.3mm for PDL). A minimum of 1.0mm of bone should exist between the apex of the implant and the nasal vestibule. The same goes for the floor of the sinus.

*Rosenstiel, Land, Fujimoto. Contemporary Fixed Prosthodontics. 4<sup>th</sup> edition, 2006.*

267. How much interocclusal space is needed for implant retained overdentures?

- A. > 20 mm
- B. > 8 mm
- C. > 11 mm
- D. > 15 mm

**ANSWER: D. > 15 mm**

**TABLE 4.1.** Intra-oral Diagnostic Guidelines for Fixed/ Removable Implant Prosthesis

	<b>Fixed</b>	<b>Removable</b>
Ridge Shape	Thin, knife-edged	Broad, U-Shaped
Inter-occlusal clearance	10mm	> 15 mm
Jaw Relationship	Class I	Class II, III
Biotype	Thick	Thin

*Drago CJ. Implant restorations: a step-by-step guide 2<sup>nd</sup> Ed. 2007; Wiley Inc; 4:88.*

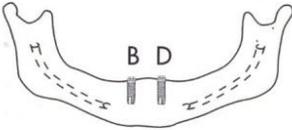
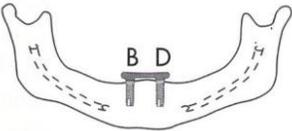
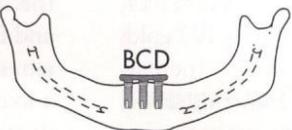
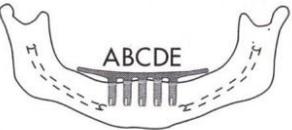
268. What is the minimum number of implants required for implanted supported overdentures?

- a. 4 in the mandible and 5 in the maxilla
- b. 6 in the mandible and 10 in the maxilla
- c. 5 in the mandible and 6-8 in the maxilla
- d. 2 in the mandible and 4 in the maxilla

**ANSWER c. 5 in the mandible and 6-8 in the maxilla**

Usually 5 implants in the mandible and 6-8 implants in the maxilla are required to fabricate completely implant-supported prostheses in patients with favorable dental criteria.

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OPTION	DESCRIPTION		
OD-1	Implants in the B and D positions, independent of each other		Ideal anterior and posterior ridge form Ideal denture Cost is a major factor Retention only PM-6
OD-2	Implants in the B and D positions, joined rigidly by a bar		Ideal posterior ridge form Ideal denture Cost is a major factor Retention and minor stability PM-3 to PM-6
OD-3	1 Implants in the A, C, and E positions, rigidly joined by a bar if posterior ridge form is good		Ideal posterior ridge form Ideal denture Retention and moderate stability PM-2 to PM-6 (two-legged chair)
	2 Implants in the B, C, and D positions, joined by a rigid bar when posterior ridge form is poor		Division C-h anterior bone volume Poor posterior ridge form Retention and minor stability PM-3 to PM-6
OD-4	Implants in A, B, D, and E positions, rigidly joined by a bar cantilevered distally about 10 mm		Patient desires greater retention, major stability, and support PM-2 to PM-6 (three-legged chair)
OD-5	Implants in the A, B, C, D, and E positions, rigidly joined by a bar cantilevered distally about 15 mm		Patient has high demands or desires Retention, stability, and support PM-0 (four-legged chair)

*Misch, C.E. Contemporary Implant Dentistry; 2<sup>nd</sup> edition, 1999.*

**269.** When designing an occlusal scheme on a molar implant supported single crown:

- A. a narrow occlusal table is recommended to avoid loading the implant
- B. axial loads should be avoided due to absence of periodontal ligament
- C. a wide occlusal table will result in more offset loads to the implant
- D. equal lateral excursive and MI contacts are desired to evenly distribute forces

**Answer: C. a wide occlusal table is will result in more offset loads to the implant**

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- Natural tooth can move in an apical direction 28  $\mu\text{m}$  with an axial load. An implant under similar load moves 5  $\mu\text{m}$
- An implant moves only 10-50  $\mu\text{m}$  (56-108  $\mu\text{m}$  in natural tooth) and does not pivot as much as a tooth toward the apex, but instead concentrates greater forces at the crest of surrounding bone
- If an initial load of equal magnitude and directions placed on both an implant and a natural tooth, the implant will bear a higher proportion of the load
- The wider the occlusal table, the more frequently offset contacts occur during mastication or parafunction.
- The narrower the implant body, the greater the influence of occlusal table width and offset loads.
- Wider root-form implants have a broader range for vertical occlusal contacts and transmit less force at the transosteal site with offset loads, as compared to narrow root-form or plate-form implants.
- The implant protected occlusion dictates that the width of the occlusal table is directly related to the width of the implant body.
- The occlusal table is reduced to favor an axial load on the implant in nonesthetic regions.

*Parfitt GS. Measurement of the physiologic mobility of individual teeth in an axial direction. J Dent Res 39;68, 1960.*

*Misch CE. Occlusal considerations for implant-supported prostheses.*

- 270.** A potential problem of connecting natural teeth to implants is
- a. failure of the natural tooth prosthesis
  - b. cement failure on the implant abutment
  - c. screw or abutment loosening
  - d. intrusion of the natural tooth

**Answer C.**

### **Connecting Implants to Natural Teeth**

Connecting a single osseous integrated implant to one natural tooth with a fixed dental prosthesis can create excessive forces because of the relative immobility of the osseous integrated implant in comparison with the functional mobility of a natural tooth. During function, the tooth moves within the limits of its periodontal ligament, which can create stress at the neck of the implant up to two times the implied load on the prosthesis. Potential problems with this type of restoration include (1) breakdown of the osseous integration, (2) cement failure on the natural abutment (3) screw or abutment loosening, and (4) failure of the implant prosthetic component. This situation is encountered clinically when the most posterior abutment is lost in the dental arch and a fixed prosthesis is needed to connect a single implant to the natural tooth. If possible, a totally implant supported fixed prosthesis with two or more implants should be provided.

When connecting an implant to a natural tooth is necessary, multiple implant or natural tooth abutments should be used. A semi-precision attachment may compensate for vertical displacement forces in the tooth and an implant-supported fixed prosthesis. It does not compensate for forces in the bucco-lingual direction. When circumstances dictate use of a natural tooth abutment, a telescopic coping should be considered. This is permanently cemented to the natural tooth and can prevent decay if loosening occurs. Interim cement is used to attach the prosthesis to the coping. If it leaches out of the implant crown, that natural tooth is still protected.

*Implant-Supported Fixed Prostheses . Rosensteel, Contemporary Fixed Prosthodontics 4<sup>th</sup> edition*

## 2011 ABGD Study Guide - Implants

271. Which of the following statements are true when comparing span lengths of tooth-borne vs. implant-supported FDPs.

- A. implant-supported FDPs are not indicated
- B. tooth-borne FDPs can be longer
- C. implant-supported FDPs can be longer
- D. tooth-borne and implant-supported FDPs are equal in their limitations

**ANSWER:** C. implant-supported FDPs can be longer

Fixed partial dentures supported by implants are ideally suited for use where there are insufficient numbers of abutment teeth or inadequate strength in the abutments to support a conventional fixed partial denture, and when patient attitude and/or a combination of intraoral factors make a removable partial denture a poor choice. Implant-supported fixed partial dentures can be employed in the replacement of teeth when there is no distal abutment. Span length is limited only by the availability of alveolar bone with satisfactory density and thickness in a broad, flat ridge configuration that will permit implant placement.

A single tooth can be replaced by a single implant, saving defect-free adjacent teeth from the destructive effects of retainer crown preparations. A span length of two to six teeth can be replaced by multiple implants, either as single-unit restorations or as implant-supported fixed partial dentures. An implant can be used as a pier in an edentulous span three or more teeth long. There is some risk involved in using an immovable implant abutment in the same rigid prosthesis with natural teeth. In such a situation, it is preferred that implants serve as the abutments at both ends and as the pier(s) of a long span. In fact, an entire arch can be replaced by an implant-supported complete prosthesis, but that type of restoration lies outside the realm of this discussion.

The retainers used for most implant systems require a greater degree of abutment alignment precision than do the retainers for a tooth-supported fixed partial denture. If implants are placed by someone other than the restoring dentist, implant/abutment alignment demands close coordination between surgeon and restorative dentist. The abutments should be positioned so that the occlusal forces will be as nearly vertical to the implants as possible to prevent destructive lateral forces.

Implants should be better able than natural teeth to survive in a dry mouth. Implants may be a better choice for FPD abutments if prospective tooth abutments will require endodontic therapy with or without dowel cores, periodontal surgery, and possibly root resections to support a long-span, complex, and expensive prosthesis whose success is dependent on "feet of clay."

*Shillingburg, H.. Fundamentals of Fixed Prosthodontics, 3rd Edition. Quintessence Publishing (IL), 1997, 7.1.4.*