Contemporary Implant Dentistry

CHAPTER 14 OF
CONTEMPORARY ORAL AND MAXILLOFACIAL SURGERY

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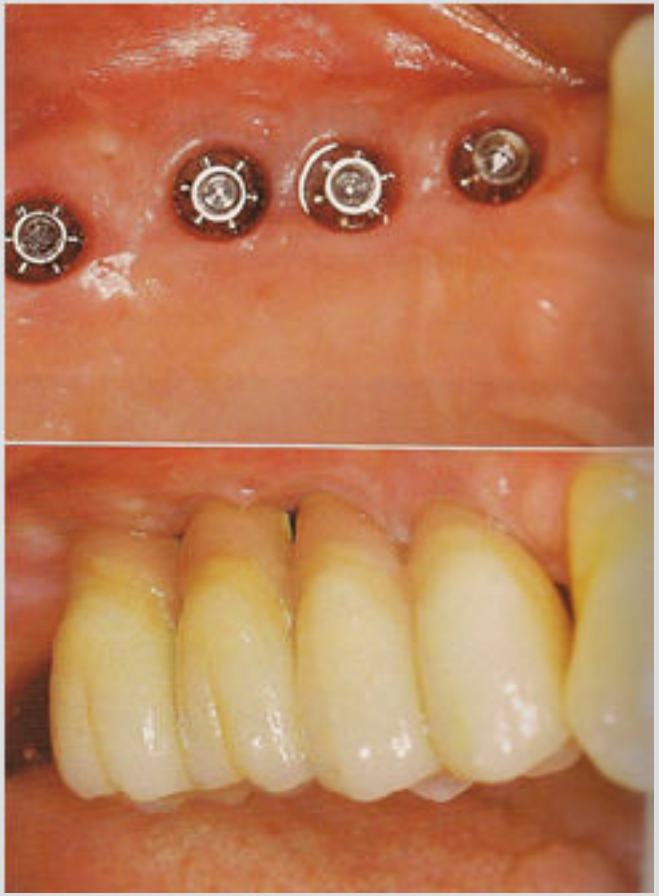
Dental implant is suitable for:

- ✓ completely edentulous patients
- ✓ patients missing posterior teeth
- ✓ Trauma victims with missing of teeth and bone
- ✓ patient missing a single tooth

completely edentulous patients

patients missing posterior teeth



Trauma victims with missing of teeth and bone

patient missing a single tooth

osseointegration

a histological definition meaning “ a direct connection between living bone and load bearing endosseous implant at the light microscopic level”

factors required for successful osseointegration:

1. A biocompatible material
2. An implant adapted to the prepared bony site
3. Atraumatic surgery
4. An immobile, undisturbed healing phase

Osseointegration

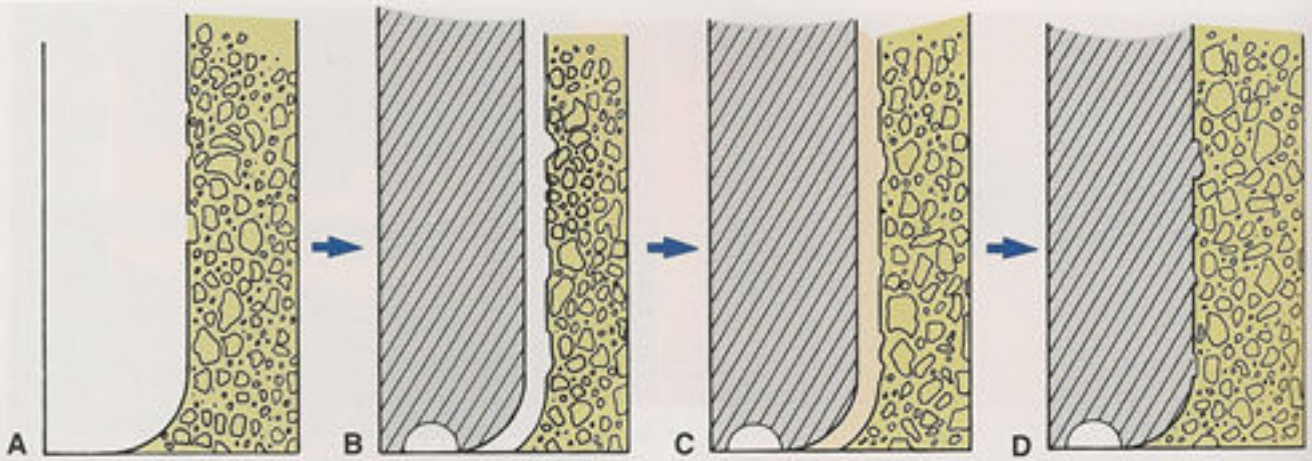


FIGURE 14-6 A, Implant site prepared in bone using irrigation to keep temperatures below 47° C to prevent cell damage and death in area. B, Precisely machined implant placed in site. Gap between implant and bone should be much less than 1 mm. C, If gap between implant and bone is small enough, embryonic bone will rapidly bridge gap. D, If implant is left undisturbed during healing phase, embryonic bone on the implant surface will mature to lamellar load-bearing bone.

Accepted implant success criteria

- ✓ The individual unattached implant is immobile when tested clinically.
- ✓ No evidence of periimplant radiolucency is present.
- ✓ The mean vertical bone loss is less than 0.2mm annually after the first year of services.
- ✓ No pain, discomfort or infection
- ✓ The implant design appropriate for prosthesis with an satisfactory to the patient and dentist.

Contraindications to implant placement

- ✓ Acute illness
- ✓ Terminal illness
- ✓ Pregnancy
- ✓ Uncontrolled metabolic disease
- ✓ Tumoricidal radiation including the implant site
- ✓ History of IV use of Bisphosphonate therapy
- ✓ Unrealistic expectation
- ✓ Improper motivation
- ✓ Lack of operator experience
- ✓ Unable to restore prosthodonticly

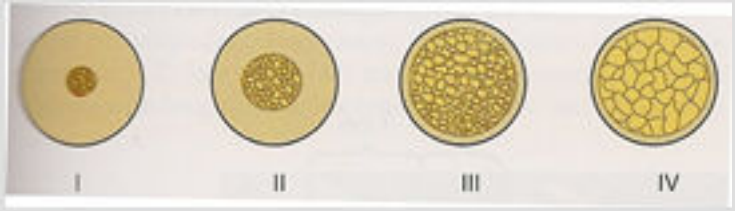
Evaluation of implant site

- ✓ initial film: panoramic radiograph
- ✓ use of a small radiopaque reference object of known size placed at the area of implant placement allows correct magnification
- ✓ bone width will be evaluated in lateral cephalometric film.
- ✓ cone- Beam computed tomography has become commonly available in dental offices.

Bone height, width, and anatomic limitations

- ✓ more coritcal bone and denser cancellous bone = higher implant success
- ✓ to maximiza the chance for success, there must be adequate bone width to allow 1mm of bone the lingual aspect and 1 mm on the facial aspect of implant.
- ✓ specific limitations as a result of anatomic variations between different areas of the jaws must also be considered.

Bone types based on quality of cortical bone and density of cancellous marrow



Anatomic limitation to implant placement

Structure	Minimum Required Distance Between Implant and Indicated Structure
Buccal plate	1 mm
Lingual plate	1 mm
Maxillary sinus	1 mm
Nasal cavity	1 mm
Incisive canal	Avoid midline maxilla
Interimplant distance	3 mm between outer edge of implants
Inferior alveolar canal	2 mm from superior aspect of bony canal
Mental nerve	5 mm from anterior of bony foramen
Inferior border	1 mm
Adjacent natural tooth	1 mm

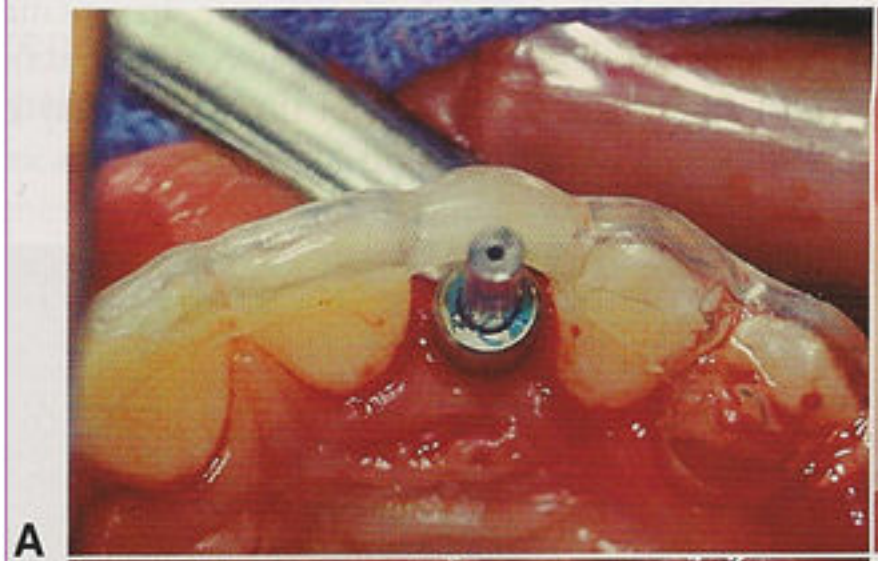
Traditional minimum integration times

Region of Implant Placement	Minimum Integration Time
Anterior mandible	3 months
Posterior mandible	4 months
Anterior maxilla	6 months
Posterior maxilla	6 months
Into bone graft	6 to 9 months

Surgical guide template

1. delineate embrasure
2. locate implant within tooth contour
3. aligns implants with long axis of completed restorations
4. identify level of CEJ or tooth emergence from the soft tissue

Surgical guide template



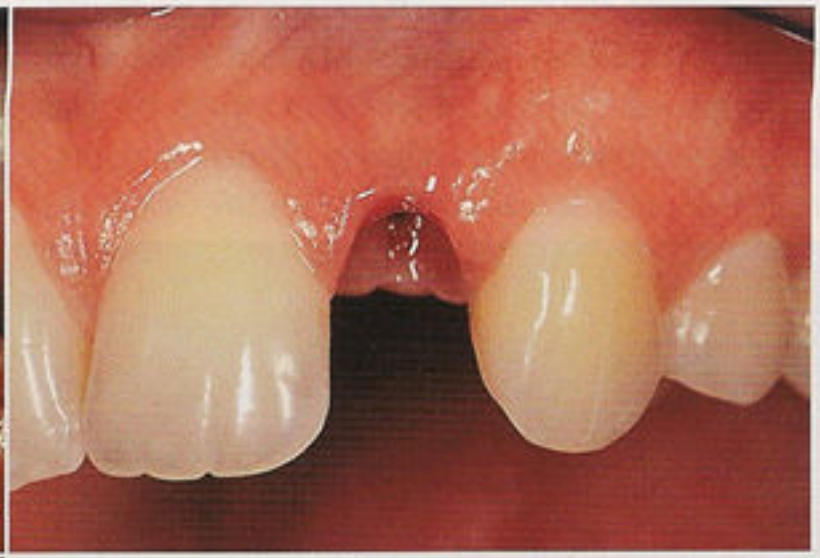


FIGURE 14-21 A, Surgical guide in place with paralleling pin identifying the position of the implant, which is well within the contours of the planned restoration. B, Resulting implant position, angulation, and depth produces natural contours that (C) result in ideal form of the final restoration.

Basic surgical technique

Before implant placement

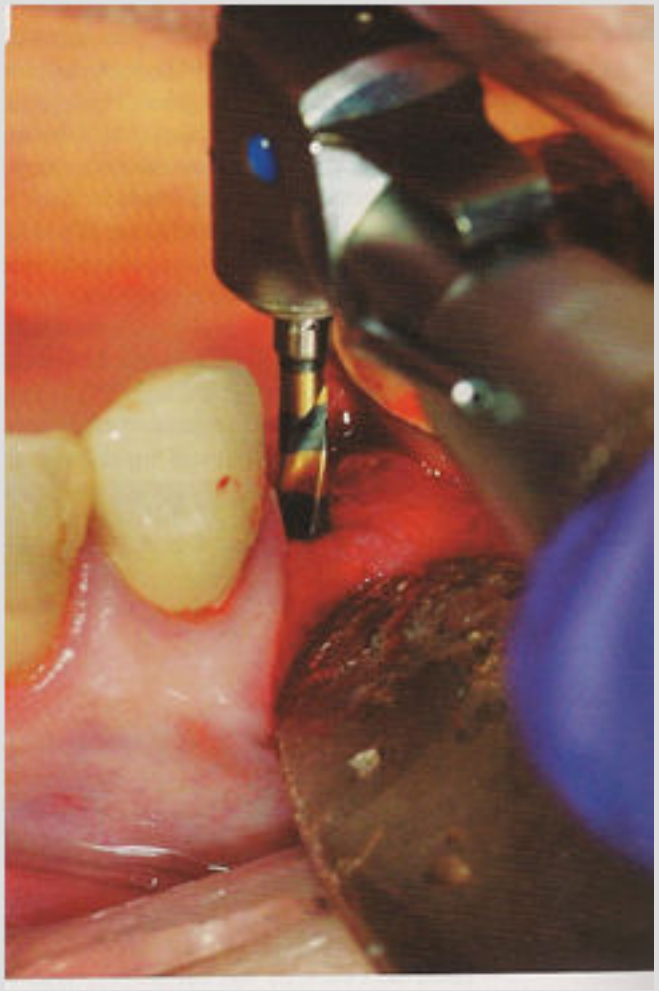
- ✓ Atraumatic extraction
- ✓ Socket preservation
- ✓ Interim prosthesis design
- ✓ Timing of implant placement

Implant placement

- **patient preparation** : Local anesthesia, preoperative antibiotic prophylaxis, rinse with 15 ml 0.12% cholorhexidine gluconate for 30 seconds.
- **Soft tissue incision**: usually a simple crestal incision
- **preparation of implant site**: with a low speed, high torque hand piece and copious irrigation. Initial position, angulation and depth is established with the first twist drill in sequence.
- **Implant placement**: implant can be screwed by a very low speed hand piece. Final tightening with a ratchet.

Soft tissue incision

Initial position, angulation, depth is established with first twist drill.



Paralleling pin evaluates position and angulation.

Implant placement

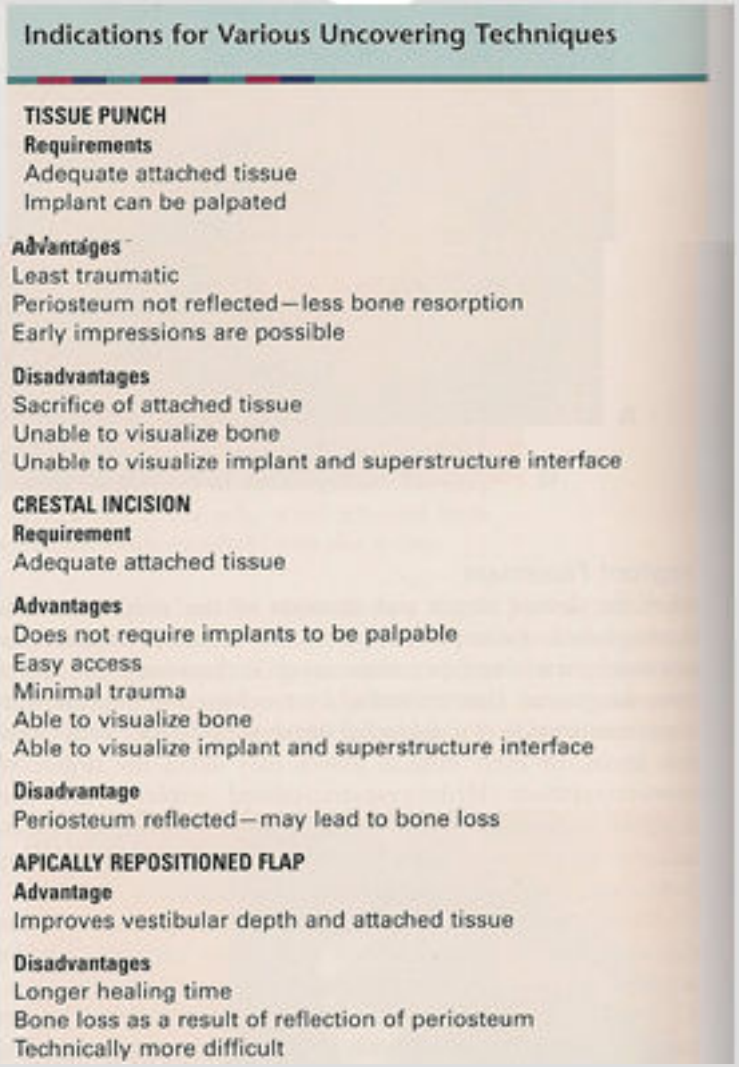
A B C

FIGURE 14-28 A, Most implants are threaded and must be screwed into place. B, This can be done by handpiece at very low speeds (e.g., 15 rpm) or by hand. C, Final tightening is done with a ratchet.

Postoperative care

- ✓ a radiograph should be taken.
- ✓ mild to moderate analgesics
- ✓ use of 0.12% cholorhexidine glunate rinses for 2 weeks
- ✓ check up visits every week

Uncovering



Indications for Various Uncovering Techniques

TISSUE PUNCH

Requirements

Adequate attached tissue
Implant can be palpated

Advantages

Least traumatic
Periosteum not reflected—less bone resorption
Early impressions are possible

Disadvantages

Sacrifice of attached tissue
Unable to visualize bone
Unable to visualize implant and superstructure interface

CRESTAL INCISION

Requirement

Adequate attached tissue

Advantages

Does not require implants to be palpable
Easy access
Minimal trauma
Able to visualize bone
Able to visualize implant and superstructure interface

Disadvantage

Periosteum reflected—may lead to bone loss

APICALLY REPOSITIONED FLAP

Advantage

Improves vestibular depth and attached tissue

Disadvantages

Longer healing time
Bone loss as a result of reflection of periosteum
Technically more difficult

Implant uncovering

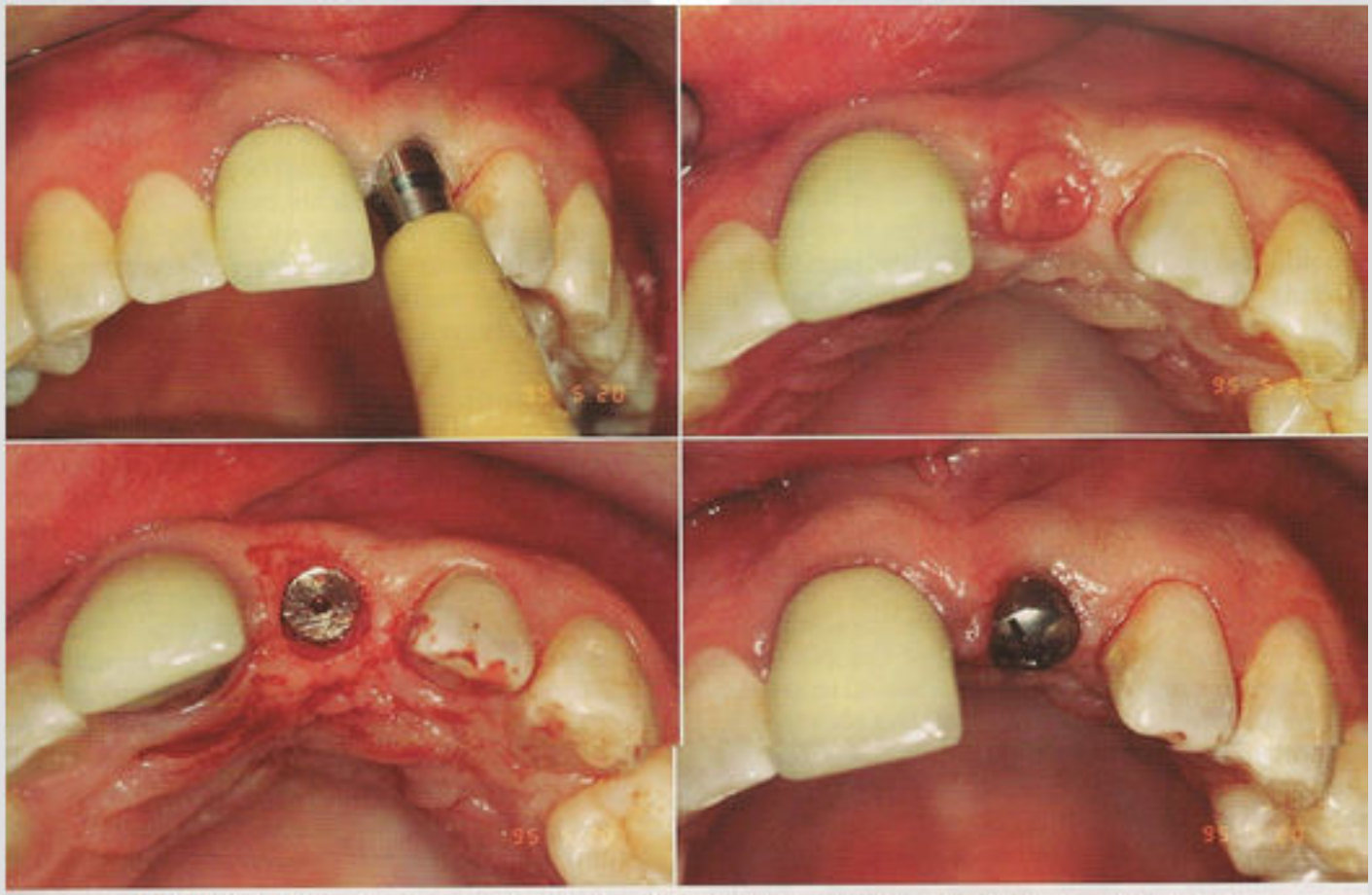


FIGURE 14-29 A to D, The simplest method of implant uncovering is the tissue punch. This method of uncovering is easy to perform, only minimally disturbs the tissue surrounding the implant, and produces minimal patient discomfort. To use this technique, the implant must be located with certainty below the tissue.

Complications

- ✓ improper angulation or position
- ✓ perforation of inferior border, the maxillary sinus, the inferior alveolar canal
- ✓ dehiscence of buccocortical or lingocortical plate
- ✓ mandibular fracture
- ✓ soft tissue wound dehiscence

Clinical implant components

- ✓ Implant body
- ✓ Healing screw
- ✓ Interim abutment
- ✓ Abutment
- ✓ Impression coping
- ✓ Implant analog
- ✓ Waxing sleeve
- ✓ Prosthetic retaining screw

Implant body

FIGURE 14-32 Four main categories of osseous integrated implants. A, Titanium screw. B, Hydroxyapatite-coated screw. C, Titanium plasma-sprayed cylinder. D, Hydroxyapatite-coated cylinder. (Rosenstiel SF, Land MF, Fujimoto J: *Contemporary fixed prosthodontics*, ed 4, St Louis, 2006, Mosby.)

Healing screw

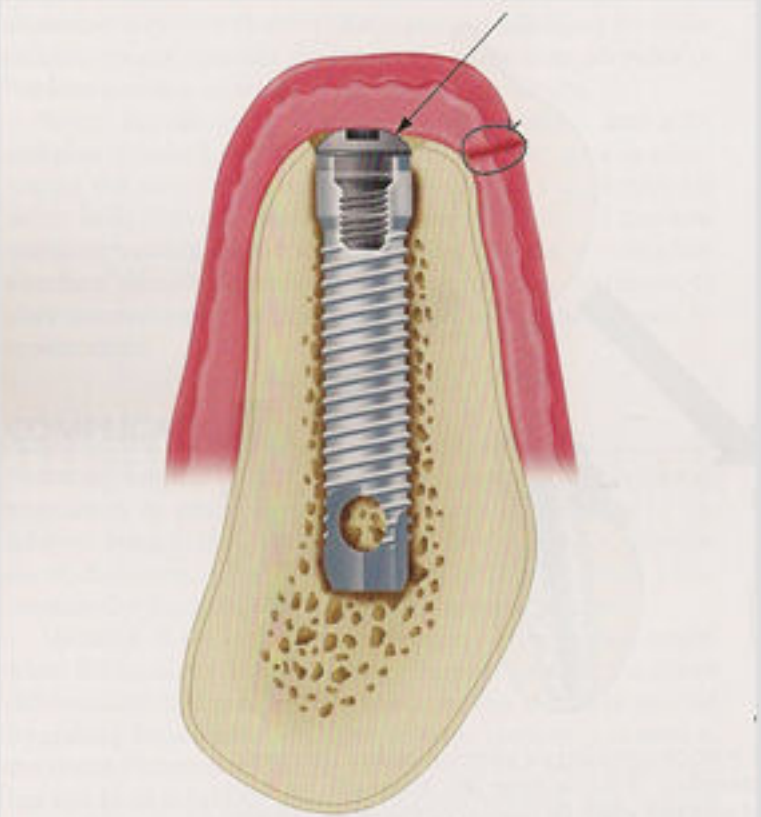
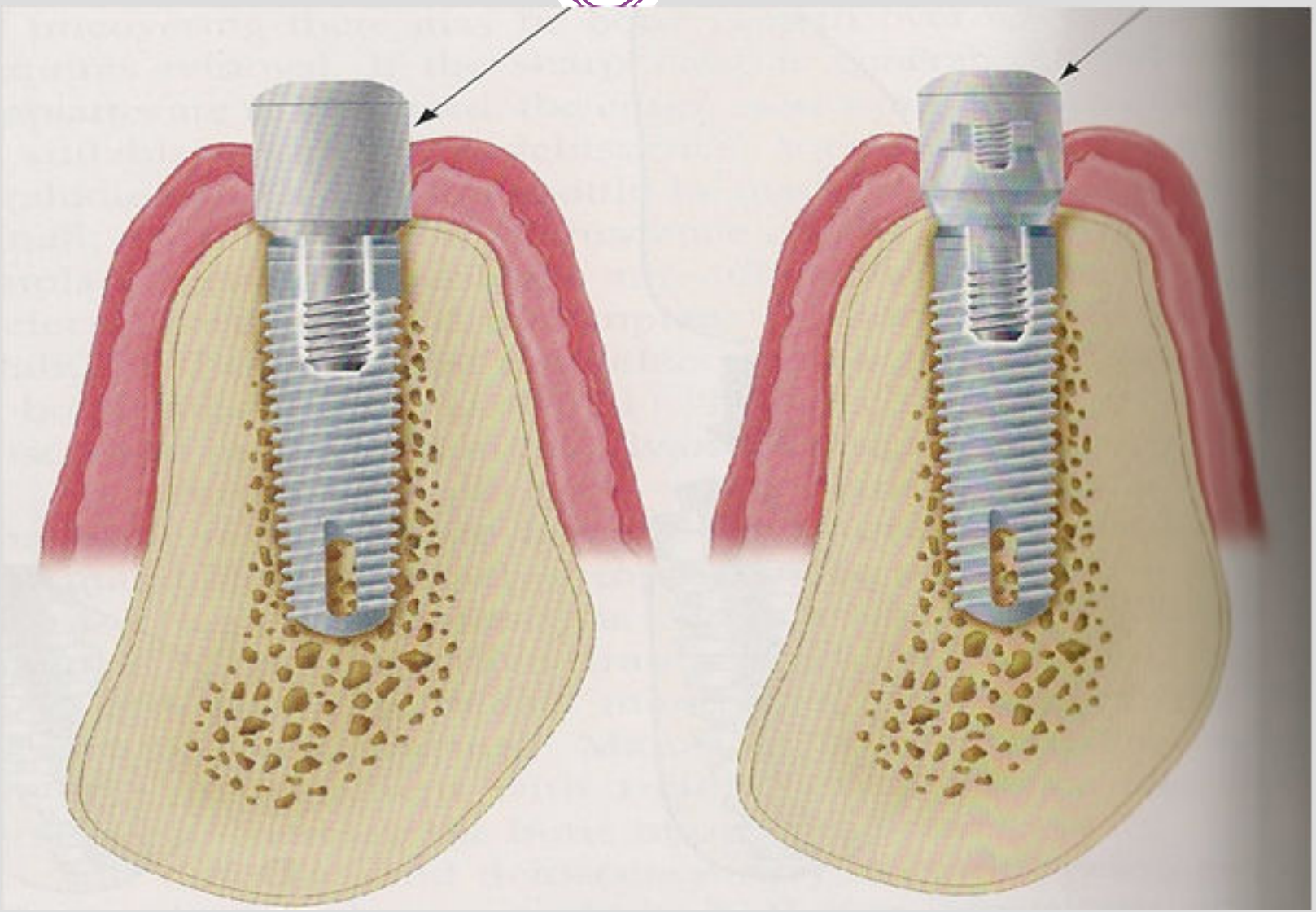


FIGURE 14-33 Healing screw (*arrow*) in place during the initial implant healing phase. Soft tissue is sutured over the implant. A removable prosthesis can be worn over this area during healing. (Rosenstiel SF, Land MF, Fujimoto J: *Contemporary fixed prosthodontics*, ed 4, St Louis, 2006, Mosby.)

Interim abutment



Abutment

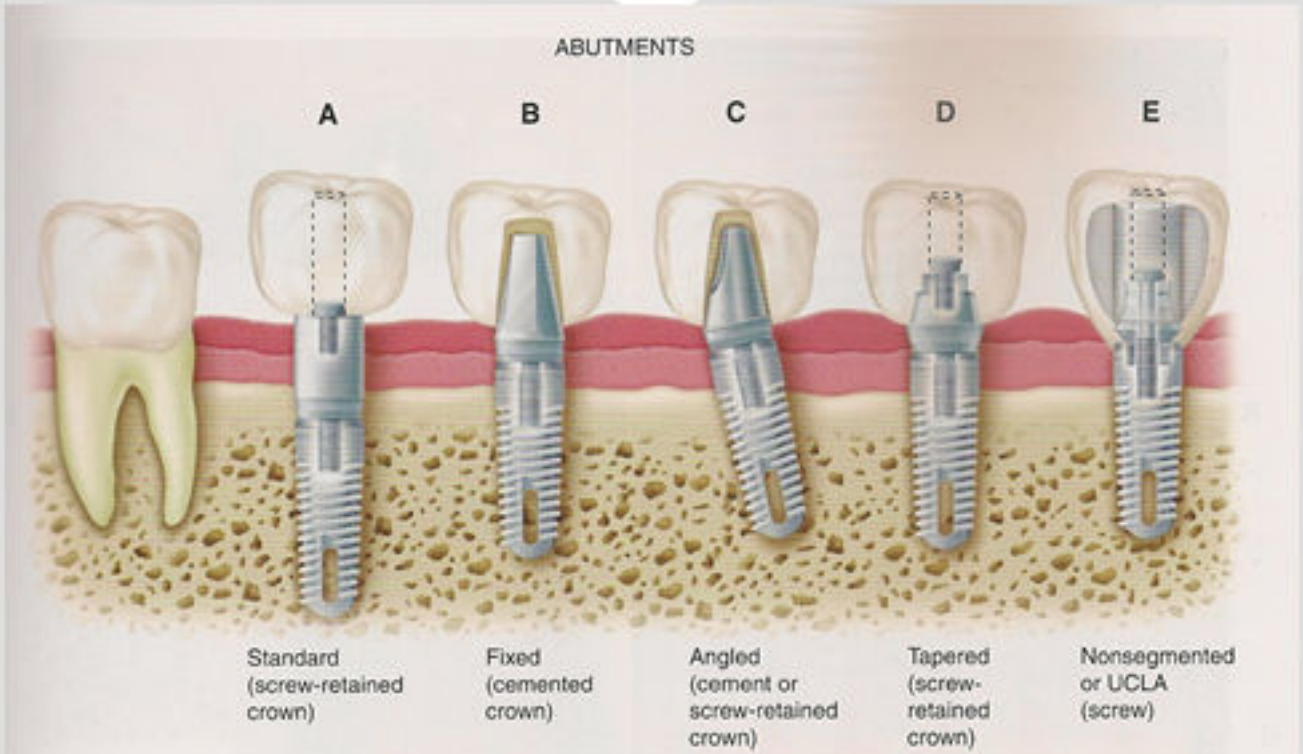


FIGURE 14-35 Types of abutments (*left to right*). **A**, Standard. Length can be selected to make the margin subgingival or supragingival. **B**, Fixed. This abutment is much like a conventional post and core. It is screwed into the implants, has a prepared finish line, and receives a cemented restoration. **C**, Angled. This type is available when implant angles must be corrected for esthetic or biomechanical reasons. **D**, Tapered. This type can be used to make the transition to restoration more gradual in larger teeth. **E**, Nonsegmented, or direct. This type is used in areas of limited interarch distance or areas where an esthetic outcome is important. The restoration can be built directly on the implant, so there is no intervening abutment. This direct restoration technique as been called the UCLA abutment. (Rosenstiel SF, Land MF, Fujimoto J: *Contemporary fixed prosthodontics*, ed 4, St Louis, 2006, Mosby.)

Impression coping

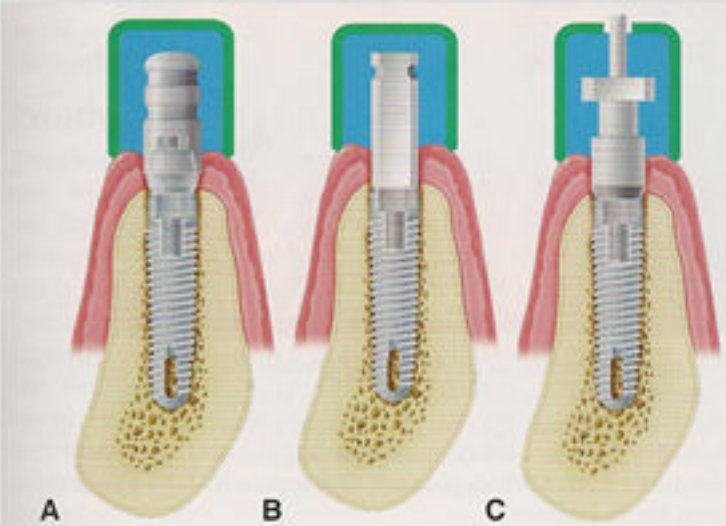
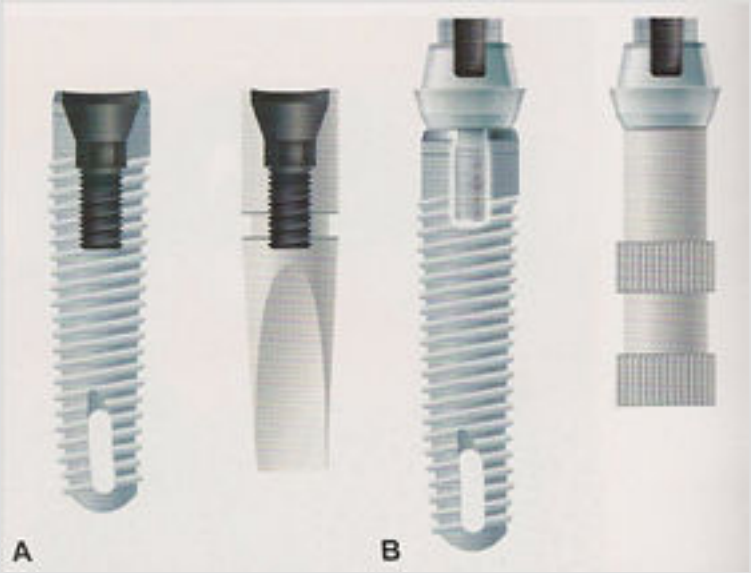


FIGURE 14-41 Types of impression copings. **A**, A one-piece coping (screws onto abutment) is used if the abutment does not need to be changed on the laboratory cast. **B**, A two-piece coping (transfer/closed tray) is attached directly to the fixture if the abutment does need to be changed on the cast (it should have a flat side if angle correction is necessary). **C**, A two-piece coping (pickup/open tray), used to orient the antirotational feature or to make impressions of very divergent implants. (Rosenstiel SF, Land MF, Fujimoto J: *Contemporary fixed prosthodontics*, ed 4, St Louis, 2006, Mosby.)

Implant analogs



Waxing sleeve

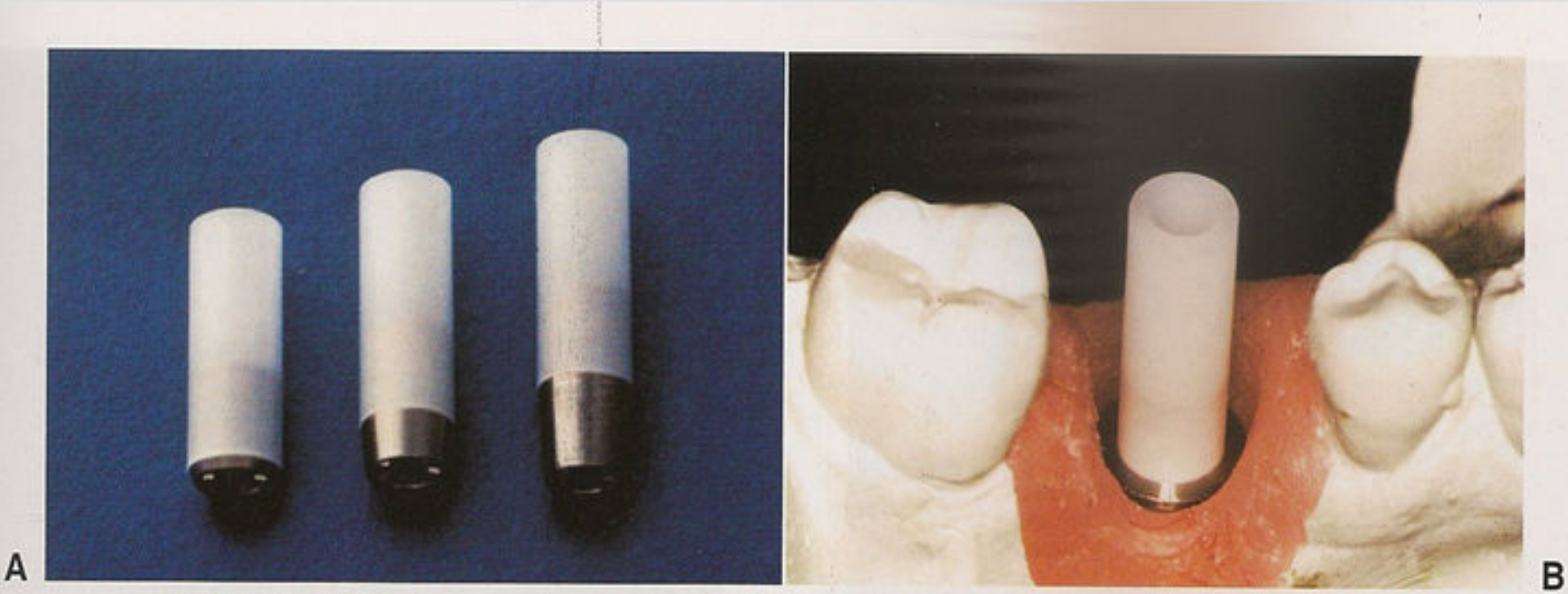


FIGURE 14-44 A, Waxing sleeves with gold alloy base and plastic extension. B, On the laboratory cast the technician can wax to the plastic extension. The wax and plastic are burned out, and the new alloy is "cast to" the original alloy base. (Rosenstiel SF, Land MF, Fujimoto J: *Contemporary fixed prosthodontics*, ed 4, St Louis, 2006, Mosby.)

Prosthesis- Retaining Screw

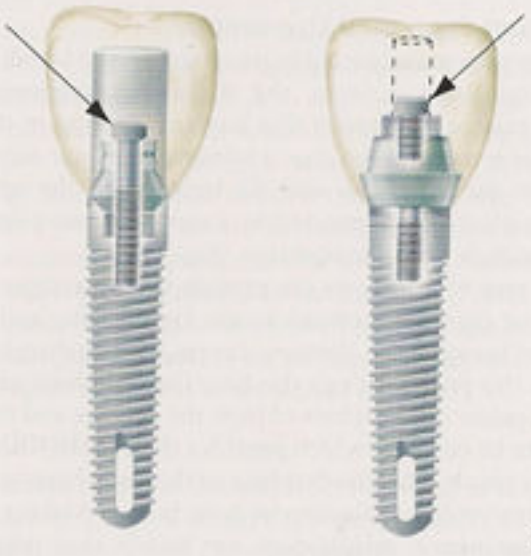


FIGURE 14-45 Two types of prosthesis-retaining screws. A, Nonsegmented crown retained to implant. B, Crown retained on abutment. (Rosenstiel SF, Land MF, Fujimoto J: *Contemporary fixed prosthodontics*, ed 4, St Louis, 2006, Mosby.)

Completely Edentulous patients

- ✓ implant and tissue supported over denture
- ✓ all implant supported over denture
- ✓ Fixed porcelain metal or resin metal restoration

Implant supported over dentures

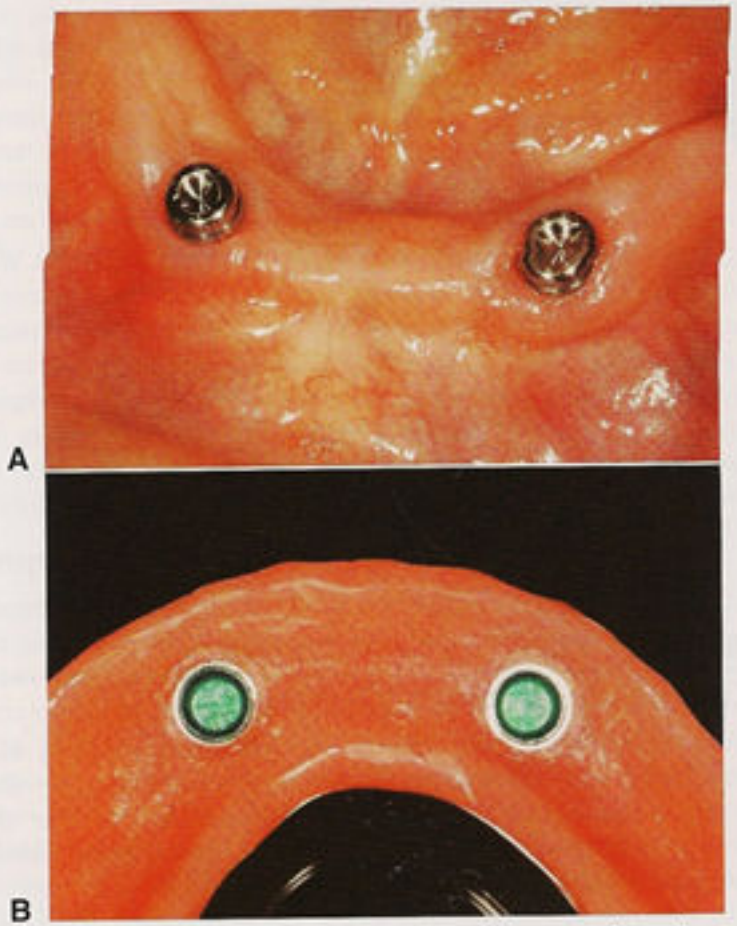


FIGURE 14-46 A and B, Implant- and tissue-supported overdenture retained by individual attachments.

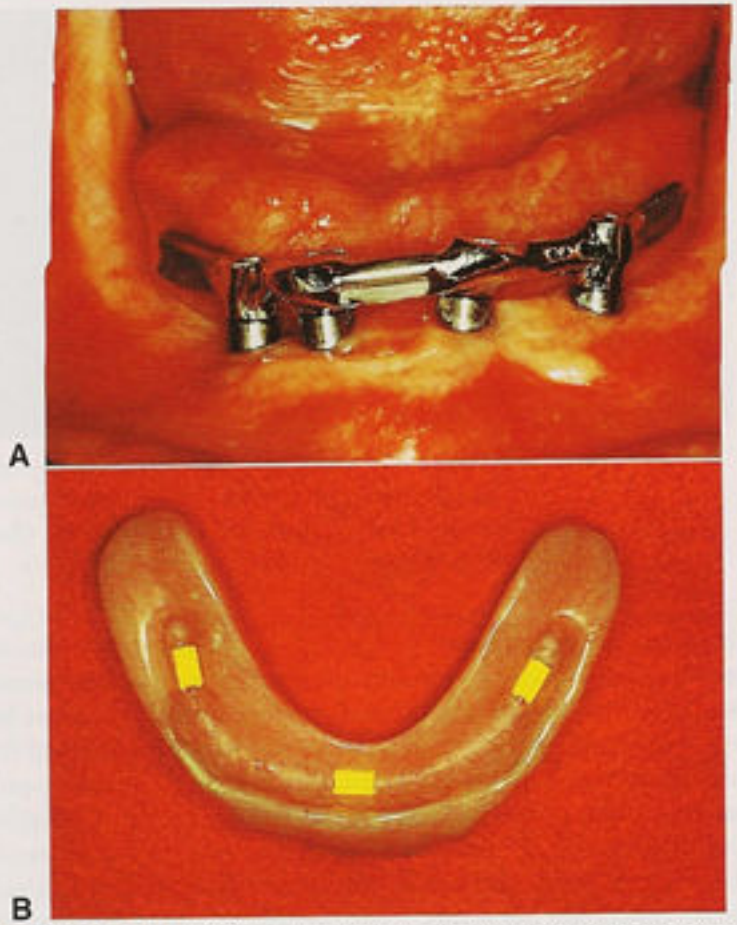


FIGURE 14-47 A, More extensive bar design with distal cantilevers joining four mandibular implants. B, Three Hader clips in an all implant-supported overdenture.

Fixed Porcelain metal restoration

FIGURE 14-48 Occlusal view of a porcelain-fused-to-metal implant-supported rehabilitation.

Partially Edentulous Patient

- ✓ Free end distal extension
- ✓ Single-tooth implant restoration
- ❖ esthetics
- ❖ antirotation
- ❖ simplicity
- ❖ accessibility
- ❖ variability

Free end distal extension

FIGURE 14-50 A, Two implants placed distal to the mandibular premolar. B to D, The completed restoration is not connected to the crown on the natural tooth. (Rosenstiel SF, Land MF, Fujimoto J: *Contemporary fixed prosthodontics*, ed 4, St Louis, 2006, Mosby; courtesy Dr. R.B. Miller.)

Implant failure occurs

- **at the time of (or shortly after) stage II of surgery:** over heating, ill fit implant, infection, excessive pressure, wound healing problems.
- **approximately 18 months after stage II of surgery:** excessive force, lack of attached tissue and oral hygiene, smoking.
- **more than 18 months after stage II of surgery (ailing implant):** progressive bone loss

Advanced surgical techniques

Guided bone regeneration

- ✓ a process that allows bone growth while retarding the ingrowth of fibrous connective tissue and epithelium.
- ✓ it uses a barrier that is placed over the bone defect.
- ✓ characteristics of an ideal membrane: effective, ease of handling, inexpensive, resorbable, tolerates exposure.

Block bone grafting

- ✓ bone can be harvested from the genial region, mandibular ramus, illiac crest.
- ✓ the defect prepared for grafting by perforating cortical bone.
- ✓ stabilization of the graft and primary closure is paramount.
- ✓ after 4 to 6 months of healing, the implant surgery can be accomplished.

Bone graft

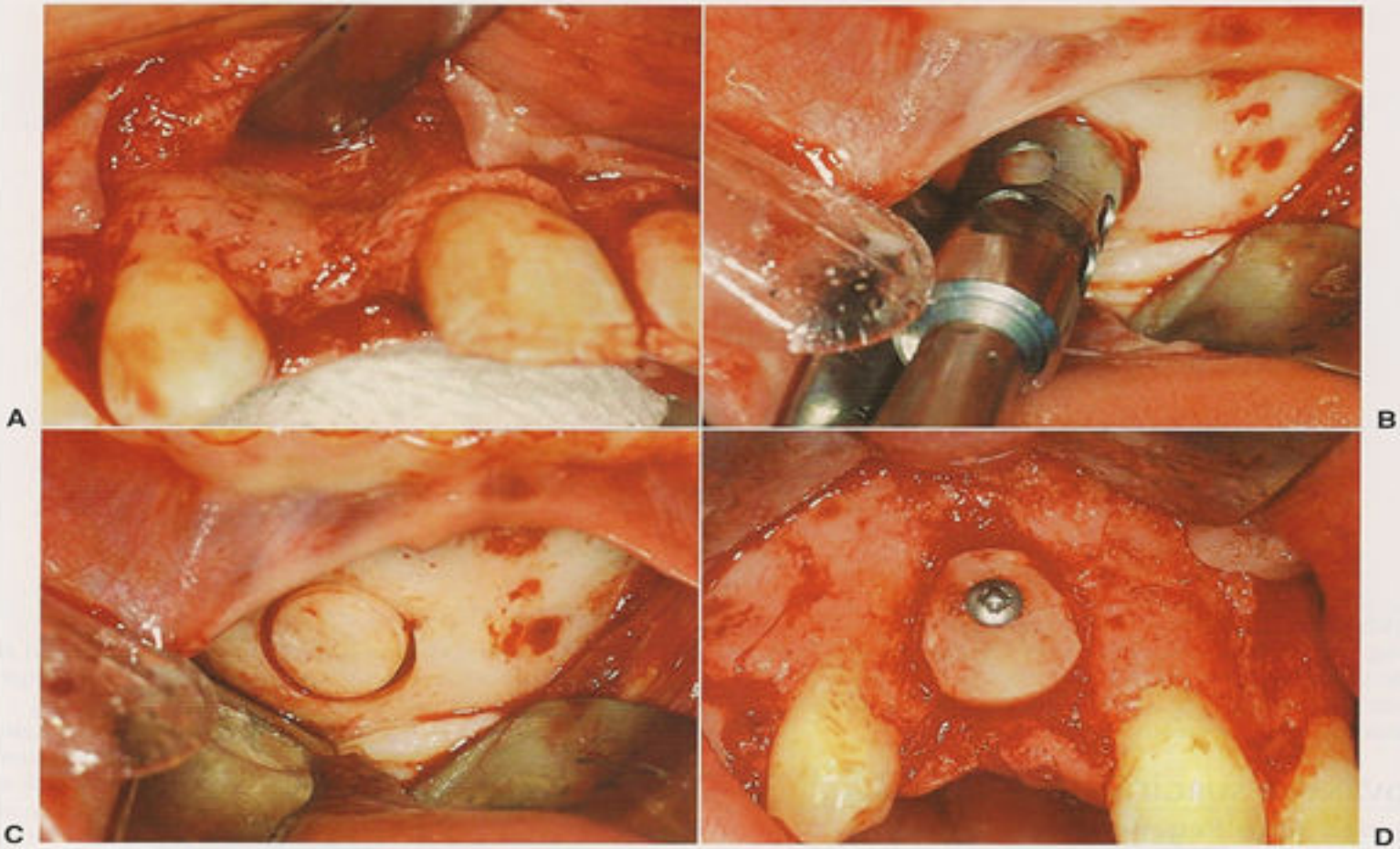


FIGURE 14-54 A, A bony defect is suspected in the anterior maxilla caused by congenitally missing lateral incisor. B, View of the defect after the bone is exposed. C, Harvest of a cortical cancellous bone graft from the genial region with a trephine. D, The graft is placed and stabilized with a screw.

Alveolar distraction

- ✓ it is used for anterior maxilla when vertical hard and soft tissue defects exist.
- ✓ when an osteotomized segment is slowly moved, allowing new bone formation within the gap.
- ✓ its disadvantages: increased cost, compromised esthetic during distraction.

Alveolar distraction

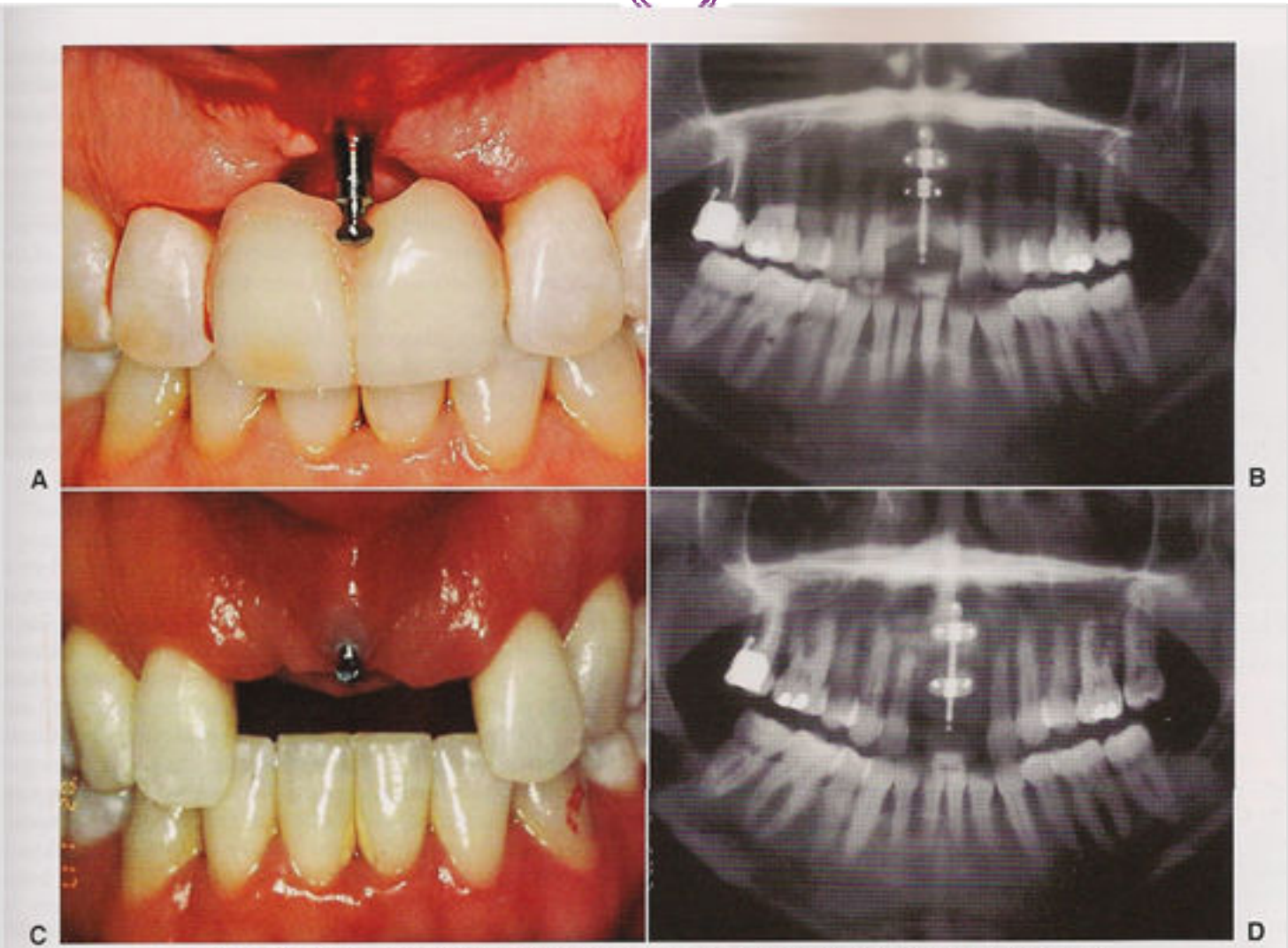


FIGURE 14-55 A, A large anterior maxillary defect is the result of trauma. A distraction device is in place. B, Radiograph of distraction device in place. C, Clinical presentation after distraction. Note increase bone height. D, Radiograph showing expanded distractor and increased bone height.

Transantral grafting (Sinus lift)

- ✓ in the posterior maxilla, crestal resorption is associated with sinus pneumatization.
- ✓ indirect sinus lift: when only few mm of augmentation is needed.
- ✓ direct sinus lift: several implants are placed, more than 4 to 5 mm augmentation is needed.
- ✓ smoking is a contraindication to sinus lift.

indirect sinus lift

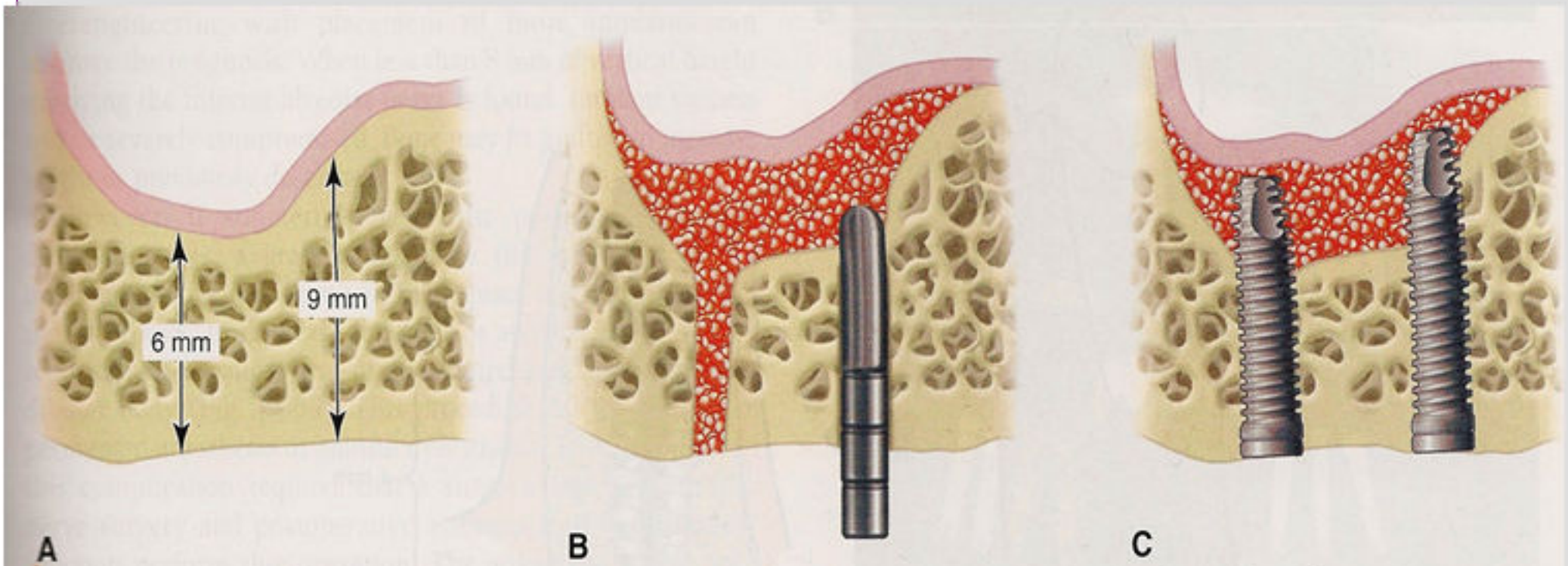


FIGURE 14-56 Indirect sinus elevation procedure. A, Pneumatized sinus with adequate bone for primary stability. B, After drilling pilot holes, osteotomes are used to enlarge the osteotomy while placing graft material. C, The pressure created by the graft material as it is inserted into the osteotomy expands the intact sinus membrane and elevates the floor of the sinus, allowing implant placement.

Direct sinus lift

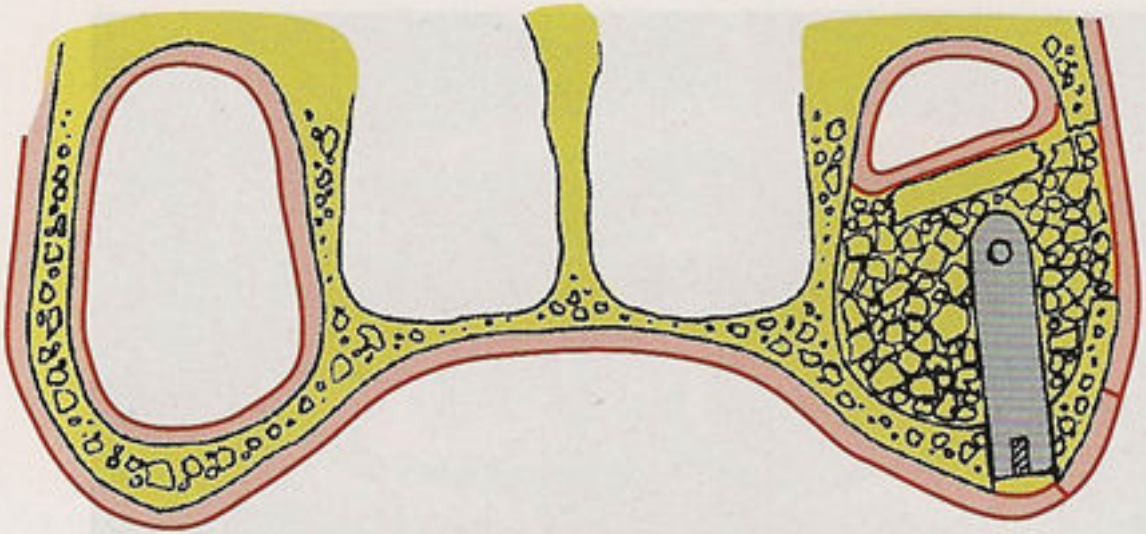


FIGURE 14-57 Direct sinus lift procedure.

Special situations

Post extraction placement of implant

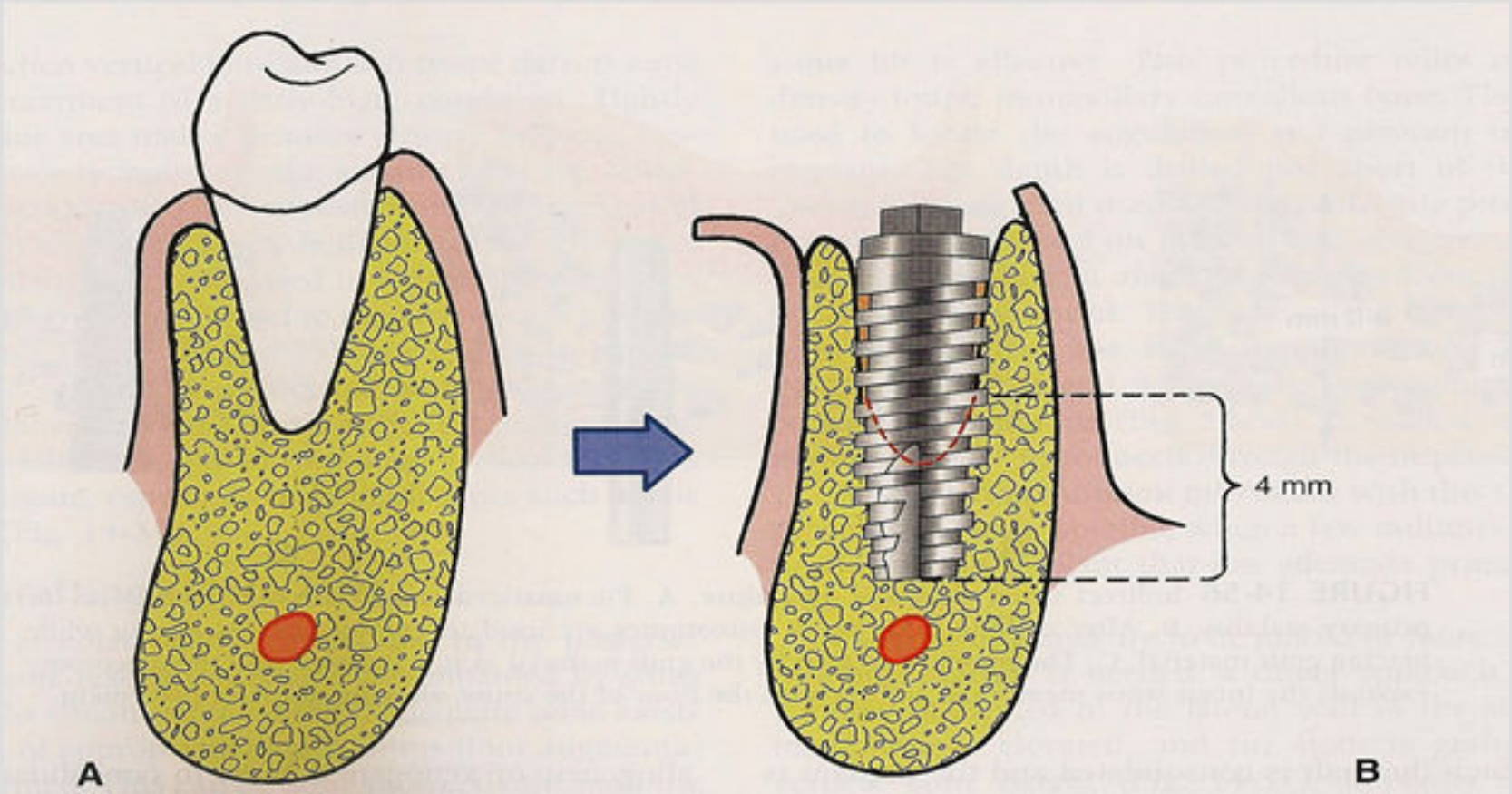


FIGURE 14-58 Implants placed in fresh extraction sockets must have 4 mm of precise fit along apical aspect of implant. Implants should be countersunk slightly below the crest of bone, and any gap between sides of extraction socket and implant should be less than 1 mm. If the gap is greater than 1 mm, grafting with a scientifically validated particulate graft material of the surgeon's choice should be considered.

Anterior maxilla esthetic zone

- ✓ esthetic concern and compromised bone often present in the situation of congenitally missing teeth.
- ✓ grafting or corticocancellus blocks must be considered.

Atrophic anterior mandible

- ✓ it is good to place 5 implants, leaving 2 to 3 mm above the height of the residual bone.
- ✓ the transmandibular implant is effective in the atrophic mandible, with similar remodeling and formation of new bone.
- ✓ if the bone height is less than 6 mm, augmentation with autogenous graft may be necessary.

Atrophic posterior mandible

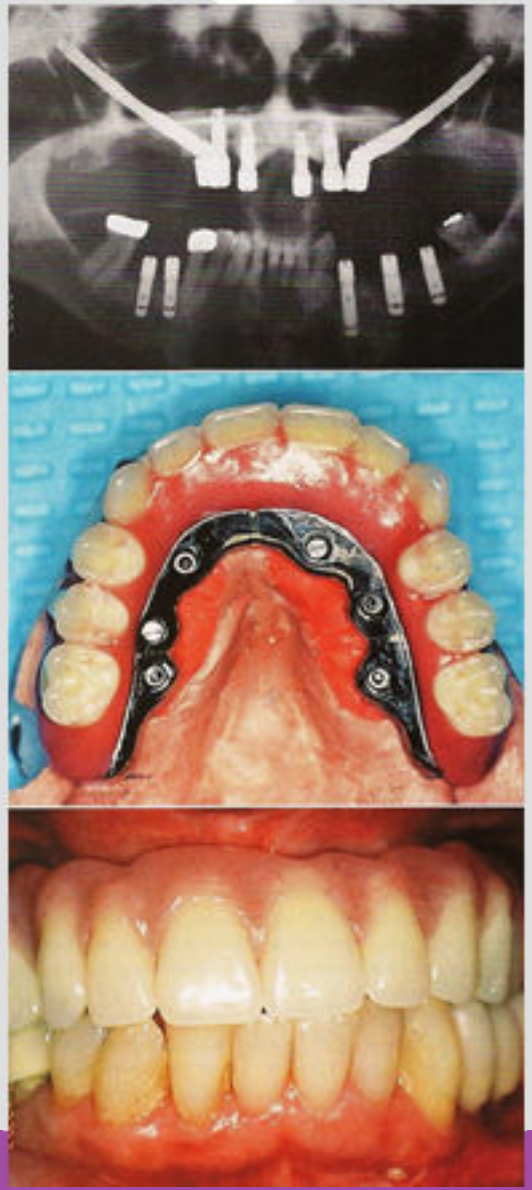
- ✓ when less than 8 mm overlying the inferior alveolar nerve is found, implant success is compromised, and Bone may be grafted.
- ✓ super eruption of posterior maxillary teeth may results in adequate interarch space. It this case the inferior alveolar nerve repositioned to allow use of the entire height of mandibular body.
- ✓ It carries the risk of permanent anesthesia or painful dysesthesia.

Inferior alveolar nerve positioning

Atrophic maxilla

- ✓ implant placed bilaterally in the posterior maxilla, a prosthesis with ideal esthetics, phonetics and hygiene access an be created.
- ✓ a new technique is to place long implants into the body of the zygoma, along with shorts anterior implants.

The Zygomaticus implant



Implants in growing patients

- ✓ implant can be placed as soon as patient is old enough to cooperate with hygiene requirement. (7 years)
- ✓ no implant should be placed until eruption of natural teeth and alveolar growth are completed.
- ✓ implant placed before this time behave similar to an ankylosed tooth.

Implant in irradiated bone

- ✓ an implant supported prosthesis could improve esthetic and function.
- ✓ careful soft tissue handling and perioperative hyperbaric oxygen treatments is necessary.

Early loading

- ✓ important factors for minimizing time: bone quality, implant material, surface and prosthesis configuration.
- ✓ the most extreme variation on them of early loading is immediate loading.

Extra oral implants

A B C

FIGURE 14-61 *A, Congenitally absent ear with unsatisfactory autogenous reconstruction. B,* Endosseous implants placed into temporal bone with framework. C, Implant-supported prosthetic ear.