



Periodontal Regenerative Therapy in Old Adults

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- Geriatric population comprises of adults of ≥ 65 years old and currently counts some 11% of the world's population with an estimated increase of up to 22% by 2050 according to the United Nations
- Whether periodontitis represents a part of physiological aging or its simple consequence was a subject of controversy over the years
- The simple fact is that periodontitis is highly prevalent lifelong multifactorial disease and the sixth most common health condition



- ▶ The effectiveness of periodontal therapy is made possible by the remarkable healing capacity of the periodontal tissues.
- ▶ Periodontal therapy → restore chronically inflamed gingiva → identical with gingiva that has never been exposed to excessive plaque accumulation

- ▶ Periodontal disease >>> genetic background, general inflammatory status, environmental factors, and systemic diseases,
- ▶ Neglected oral hygiene
- ▶ Decreased salivary flow >>> Xerostomia is reported in 25–50% of older people and is associated with systemic diseases (such as Sjögren syndrome, parkinsonism, or DM)

- ▶ Healing Capacity is not decreased significantly due to aging (multiple systematic reviews)
- ▶ >>> Regenerative therapy of incidental periodontal defects and diseases is feasible

Properly performed, periodontal treatment→

- can eliminate pain, exudate, gingival inflammation, and bleeding.
- It can also reduce periodontal pockets,
- eliminate infection,
- arrest the destruction of soft tissue and bone,
- and reduce abnormal tooth mobility
- Other benefits are to establish optimal occlusal function,
- restore tissue destroyed by disease
- reestablish physiologic gingival contour,
- and prevent the recurrence of disease

Local Therapy

- ▶ *The removal of plaque and all of the factors that favor its accumulation is the primary goal in local therapy*
- ▶ The thorough elimination of plaque and the prevention of its formation can help maintain periodontal health, even if traumatic forces are allowed to persist
- ▶ However, the elimination of trauma may increase the chances for bone regeneration and the gain of attachment.
- ▶ creating occlusal relationships that are more tolerable to the periodontal tissues increases the margin of safety of the periodontium to the buildup of plaque, in addition to reducing tooth mobility.

Systemic Therapy

Systemic therapy may be employed as an adjunct to local measures :

- ▶ systemic complications from acute infections or chemotherapy and preventing harmful effects of post-treatment bacteremia
- ▶ The control of systemic diseases that aggravate the patient's periodontal condition is always a consideration so proper precautions can be instituted
- ▶ Systemic therapy for treatment of the periodontal condition in conjunction with local therapy is indicated in patients with aggressive periodontitis
- ▶ the concept of *host modulation* → paper by Nyman, Schroeder, and Lindhe
→ it was possible to block periodontal bone loss in animals with the aspirin-like drug indomethacin

- (NSAIDs), such as flurbiprofen and ibuprofen, can reduce the development of experimental gingivitis and the loss of alveolar bone in periodontitis
- NSAIDs ➔ are propionic acid derivatives and act by inhibiting the cyclooxygenase pathway of arachidonic acid metabolism, thereby reducing prostaglandin formation. These NSAIDs can be administered by mouth or applied topically
- *bisphosphonate*, which is currently used to treat metabolic diseases in humans, such as Paget disease or hypercalcemia of malignancy, which result in bone resorption ➔ Experimental studies in monkeys have shown that alendronate reduced the bone loss associated with periodontitis

Factors That Affect Healing

➤ Local Factors :

local factors, particularly plaque microorganisms, are the most common deterrents to healing after periodontal treatment

Healing is also delayed by ➔

- (1)excessive tissue manipulation during treatment
- (2)trauma to the tissues
- (3)the presence of foreign bodies
- (4)repetitive treatment procedures that disrupt the orderly cellular activity in the healing process

➤ **Systemic Factors:**

- ❑ extensively documented in animal experiments but are less clearly defined in humans.
- ❑ Healing capacity diminishes with age ➔ probably because of the atherosclerotic vascular changes common in aging and the resulting reduction in blood circulation
- ❑ delayed in patients with generalized infections and in those with diabetes and other debilitating diseases
- ❑ insufficient food intake; bodily conditions that interfere with the use of nutrients; and deficiencies in vitamin C , proteins, and other nutrients.

- ❑ affected by hormones. Systemically administered glucocorticoids such as cortisone hinder repair by depressing the inflammatory reaction or by inhibiting the growth of fibroblasts, the production of collagen, and the formation of endothelial cells
- ❑ Systemic stress, thyroidectomy, testosterone, adrenocorticotrophic hormone (ACTH), and large doses of estrogen suppress the formation of granulation tissue and impair healing
- ❑ Progesterone increases and accelerates the vascularization of immature granulation tissue and appears to increase the susceptibility of the gingiva to mechanical injury by causing dilation of the marginal vessels.

Healing After Periodontal Therapy

- ▶ basic healing processes are the same after all forms of periodontal therapy → removal of degenerated tissue debris and the replacement of tissues destroyed by disease → regeneration and repair of the periodontal structures but not necessarily a gain in attachment

Regeneration

- ▶ Is the natural renewal of a structure, produced by growth and differentiation of new cells and intercellular substances to form new tissues or part
- ▶ Regeneration occurs through growth from the same type of tissue that has been destroyed or from its precursor
- ▶ Gingival epithelium is replaced by epithelium, and the underlying connective tissue and periodontal ligament are derived from connective tissue. Bone and cementum are replaced by connective tissue, which is the precursor of both. Undifferentiated connective tissue cells develop into osteoblasts and cementoblasts, which form bone and cementum

- Regeneration of the periodontium is a continuous physiologic process ➔ wear and tear repair ➔
 - ❑ (1) mitotic activity in the epithelium of the gingiva and the connective tissue of the periodontal ligament,
 - ❑ (2) the formation of new bone, and
 - ❑ (3) the continuous deposition of cementum
- occurring even during destructive periodontal disease.
- Most gingival and periodontal diseases are chronic inflammatory processes

- ▶ bacteria and bacterial products plus inflammatory exudate
➔ prevent completion of the healing process
- ▶ removing bacterial plaque and creating the conditions to prevent its new formation, periodontal treatment removes the obstacles to regeneration and enables the patient to benefit from the inherent regenerative capacity of the tissues

Repair

- ▶ restores the continuity of the diseased marginal gingiva and reestablishes a normal gingival sulcus at the same level on the root as the base of the preexisting periodontal pocket
- ▶ This process → healing by scar
- ▶ arrests bone destruction but does not result in gain of gingival attachment or bone height.

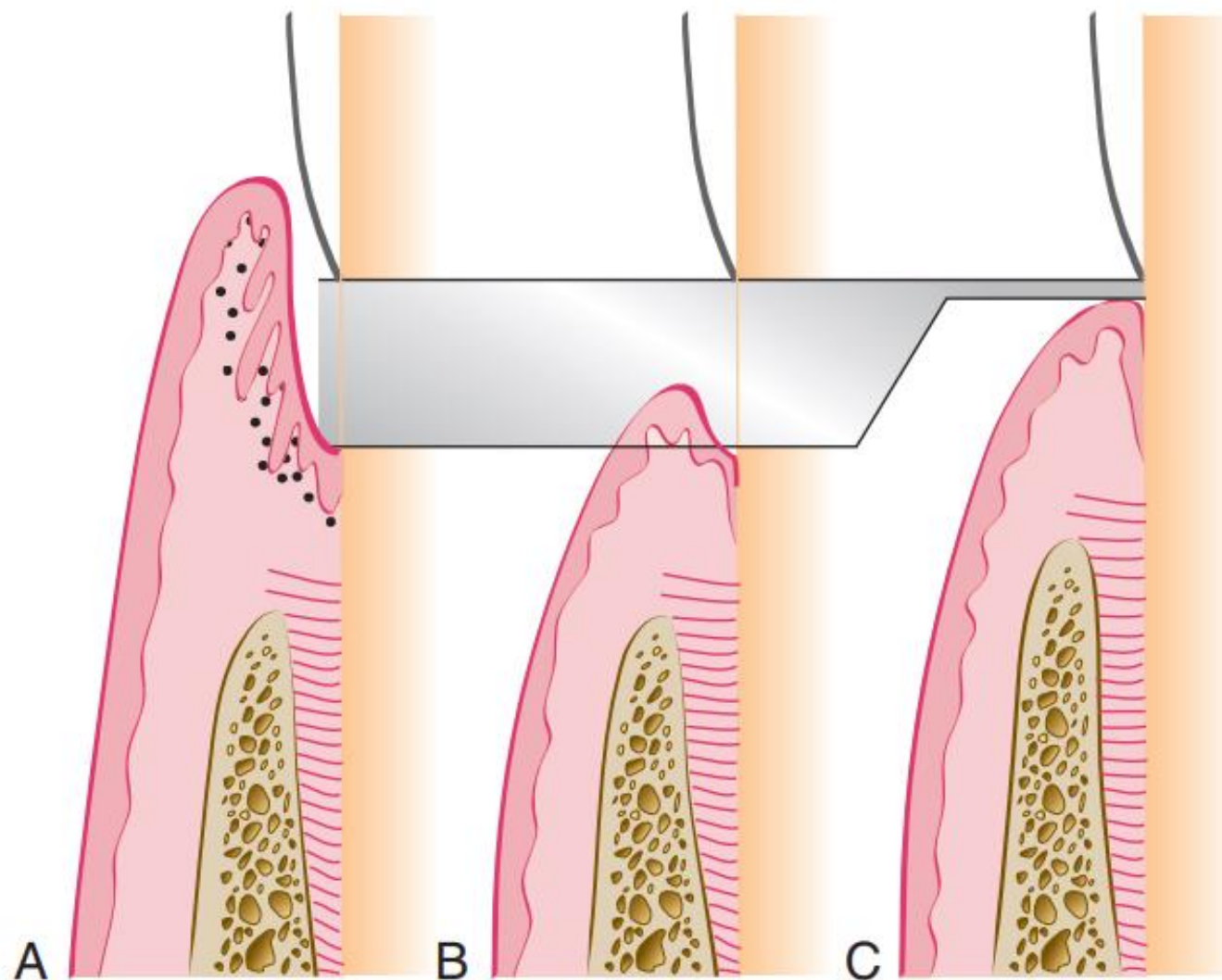


Figure 34-2 Two possible outcomes of pocket elimination. **A**, Periodontal pocket before treatment. **B**, Normal sulcus reestablished at the level of the base of the pocket. **C**, Periodontium restored on the root surface previously denuded by disease; this is called *new attachment*. Shaded areas show denudation caused by periodontal disease.

- Involves regeneration and mobilization of epithelial and connective tissue cells into the damaged area and increased local mitotic divisions to provide sufficient numbers of cells
- For the diseased gingiva and attachment apparatus to regain (totally or partially) their level on the root ➔ therapy must include special materials and techniques. If these are not used or are not successful, tissues undergo repair only
- reconstruction of the periodontium ➔ therapeutic techniques that seek to rebuild the periodontium and result in a significant gain of attachment and bone height

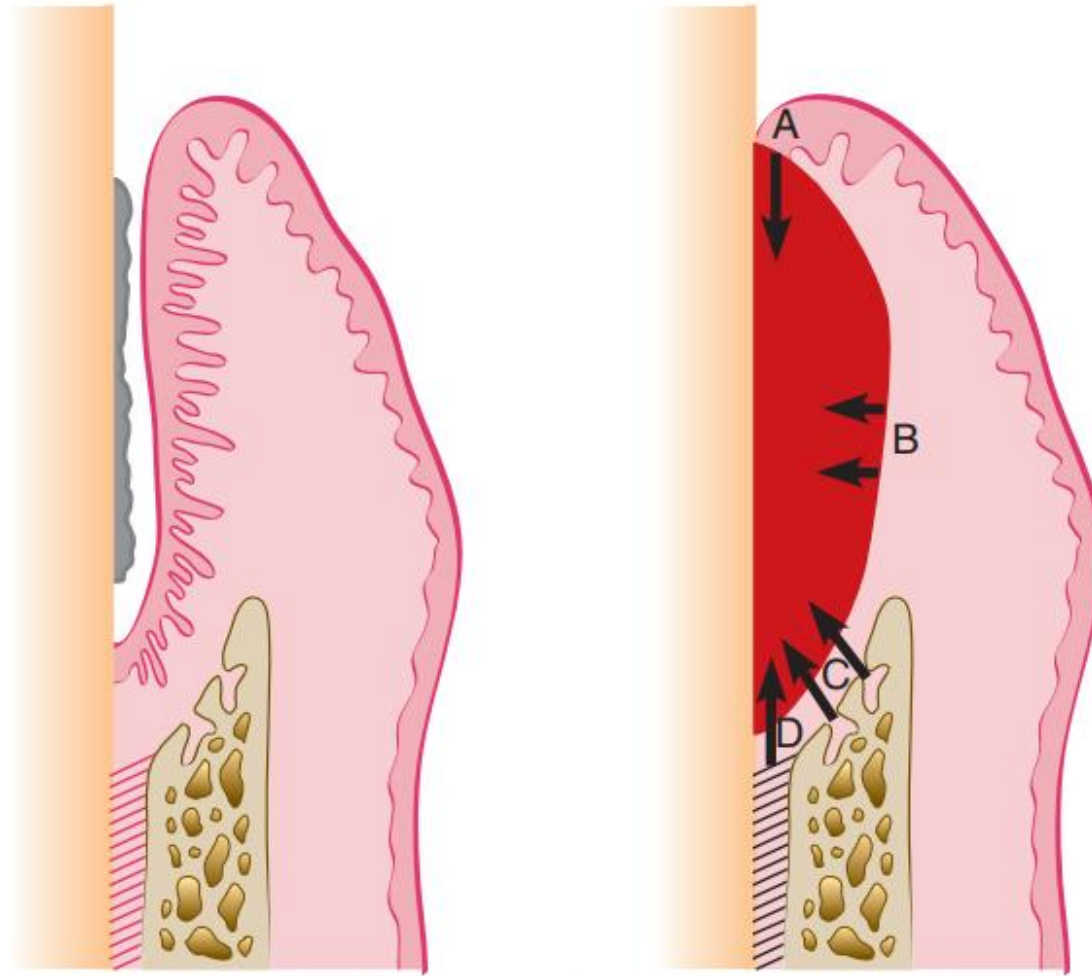


Figure 34-3 Sources of regenerating cells in the healing stages of a periodontal pocket. *Left*, Intrabony pocket. *Right*, After therapy the clot formed is invaded by cells from, *A*, the marginal epithelium; *B*, the gingival connective tissue; *C*, the bone marrow; and, *D*, the periodontal ligament.

New Attachment

- ▶ New attachment is the embedding of new periodontal ligament fibers into new cementum and the attachment of the gingival epithelium to a tooth surface previously denuded by disease
- ▶ The attachment of the gingiva or the periodontal ligament to areas of the tooth from which they have been removed in the course of treatment (or during preparation of teeth for restorations) represents simple healing or reattachment of the periodontium, not new attachment
- ▶ *reattachment* → repair in areas of the root not previously exposed to the pocket such as after surgical detachment of the tissues or following traumatic tears in the cementum, tooth fractures, or the treatment of periapical lesions

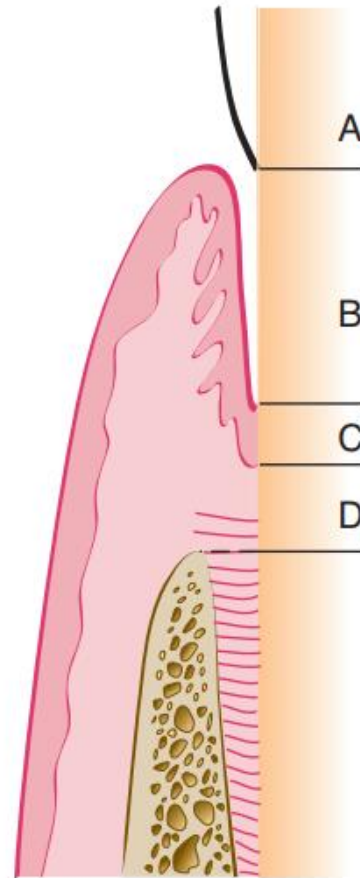


Figure 34-4 Enamel surface (A). Area of cementum denuded by pocket formation (B). Area of cementum covered by junctional epithelium (C). Area of cementum apical to junctional epithelium (D). The term *new attachment* refers to a new junctional epithelium and attached connective tissue fibers formed on area B.

- ▶ *Epithelial adaptation* ➔ close apposition of the gingival epithelium to the tooth surface, with no gain in height of gingival fiber attachment. The pocket is not completely obliterated, although it may not permit passage of a probe

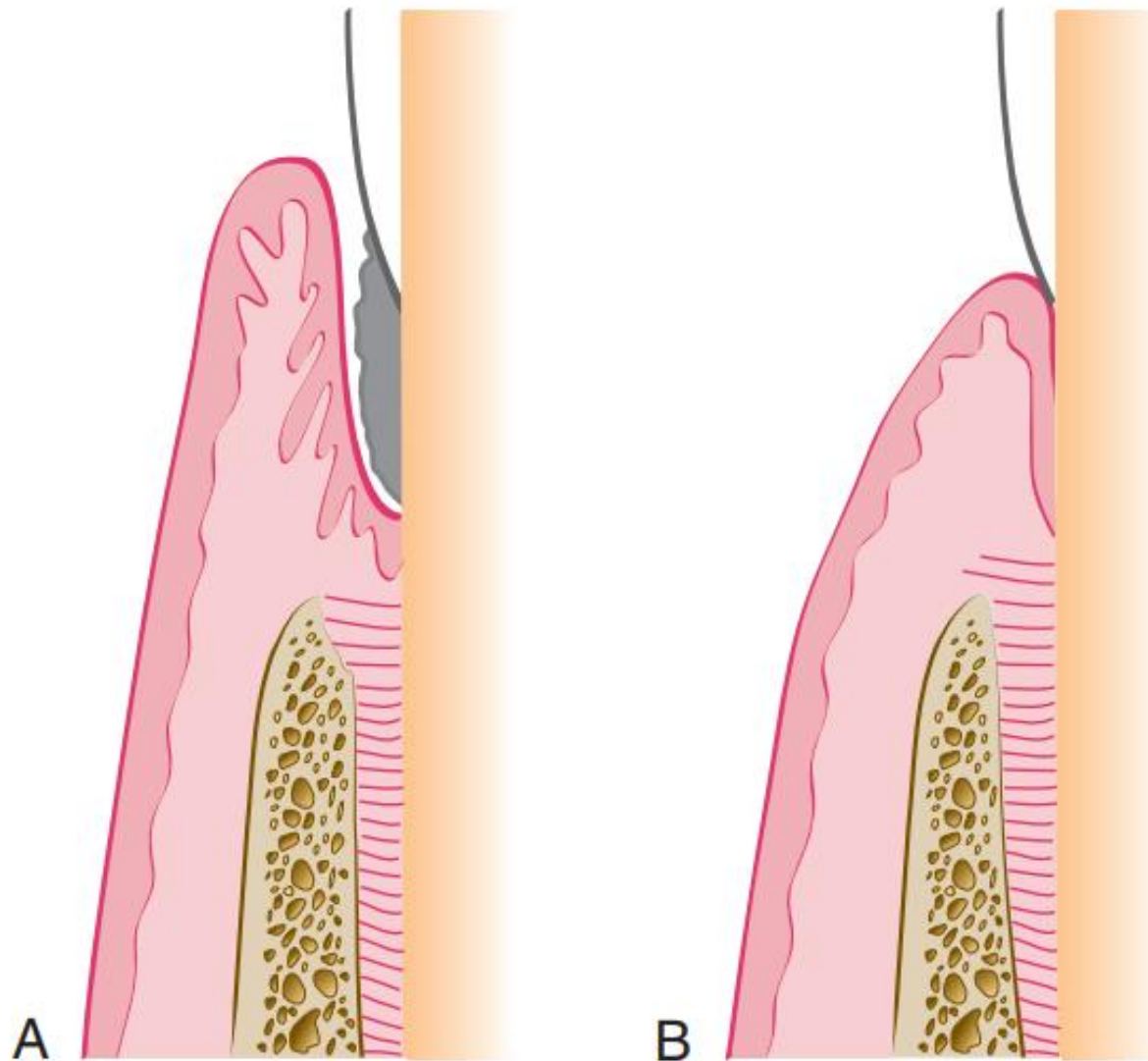


Figure 34-5 Epithelial adaptation after periodontal treatment. **A**, Periodontal pocket. **B**, After treatment. The pocket epithelium is closely adapted to but not attached to the root.

- ▶ studies have shown that these deep sulci lined by long, thin epithelium may be as resistant to disease as true connective tissue attachments
- ▶ The absence of bleeding or secretion on probing, the absence of clinically visible inflammation, and the absence of stainable plaque on the root surface when the pocket wall is deflected from the tooth may indicate that the “deep sulcus” persists in an inactive state, causing no further loss of attachment → posttherapy depth of 4 mm or even 5 mm may therefore be acceptable in these cases

Periodontal Reconstruction

- (1) gain of attachment level,
- (2) formation of new periodontal ligament fibers, and
- (3) a level of alveolar bone significantly coronal to that present before treatment
- Melcher ➔ regeneration of the periodontal ligament is the key to periodontal reconstruction because it “provides continuity between the alveolar bone and the cementum and also because it contains cells that can synthesize and remodel the three connective tissues of the alveolar part of the periodontium.

- During the healing stages of a periodontal pocket, the area is invaded by cells from four different sources : oral epithelium, gingival connective tissue, bone, and periodontal ligament
- If the epithelium proliferates along the tooth surface before the other tissues reach the area, the result will be a long junctional epithelium
- If the cells from the gingival connective tissue are the first to populate the area, the result will be fibers parallel to the tooth surface and remodeling of the alveolar bone with no attachment to the cementum
- If bone cells arrive first, root resorption and ankylosis may occur.
- only when cells from the periodontal ligament proliferate coronally is there new formation of cementum and periodontal ligament

- Important goal of periodontal therapy is to obtain a reduced pocket depth after treatment in order to prevent further disease progression
- Can be accomplished by non-surgical therapy in patients with moderate periodontitis, whereas in severe cases - presence of intrabony defects and furcations, the treatment must be supplemented with periodontal surgery.

Regenerative Periodontal Therapy

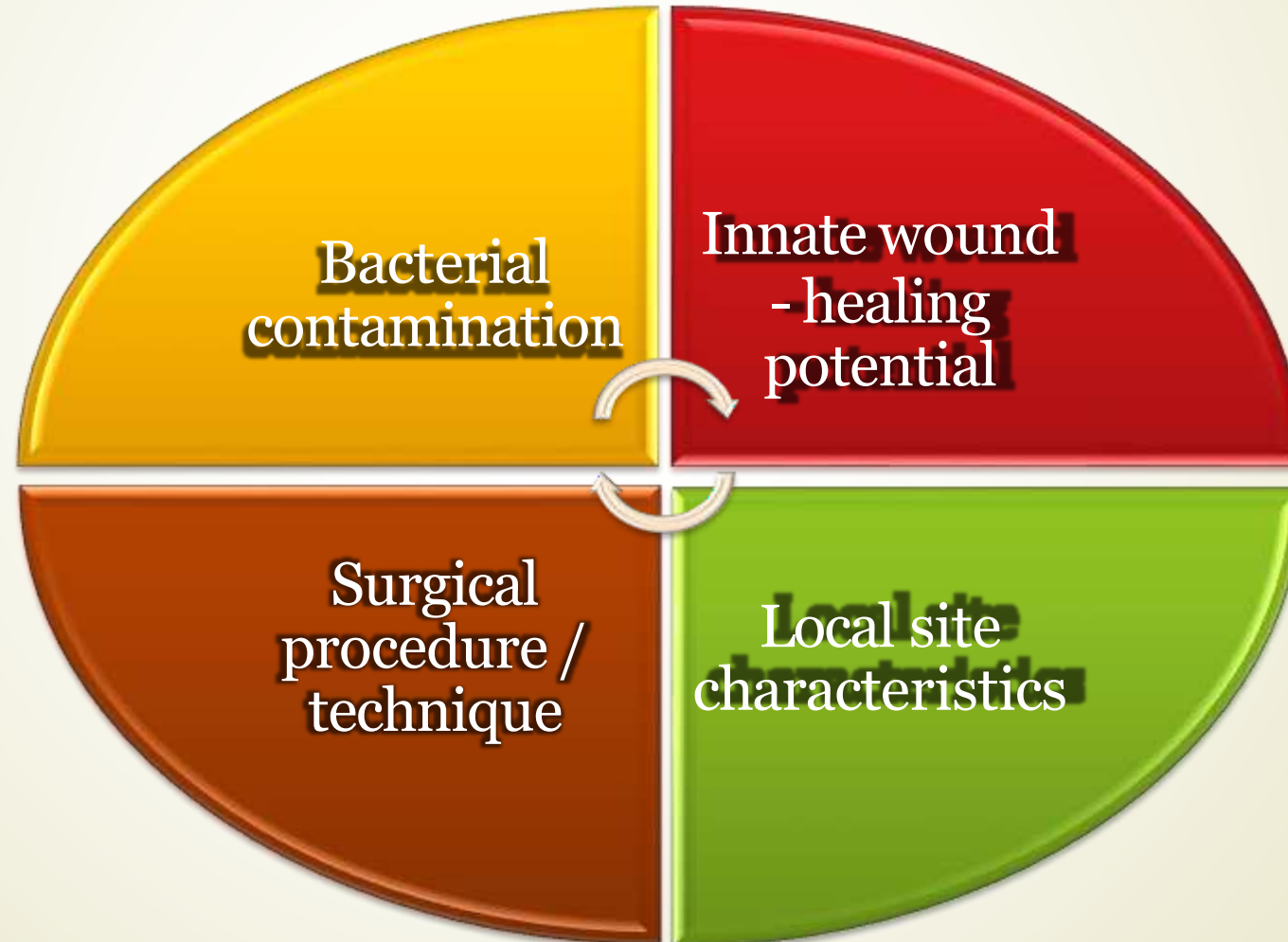
- Fundamental objective of periodontal surgery is to provide access for proper instrumentation and cleaning of the root surface
- Most surgical procedures result in the elimination or the reduction of the soft tissue component of the periodontal pocket.
- Periodontal treatment, both surgical and nonsurgical, results in recession of the gingival margin after healing (Isidor et al. 1984)

- ▶ Localized gingival recession and root exposure may represent an esthetic problem to the patient, and it is often associated with root sensitivity.
- ▶ Such a situation is an indication to apply regenerative periodontal therapy to obtain root coverage in order to improve esthetics and reduce root sensitivity.

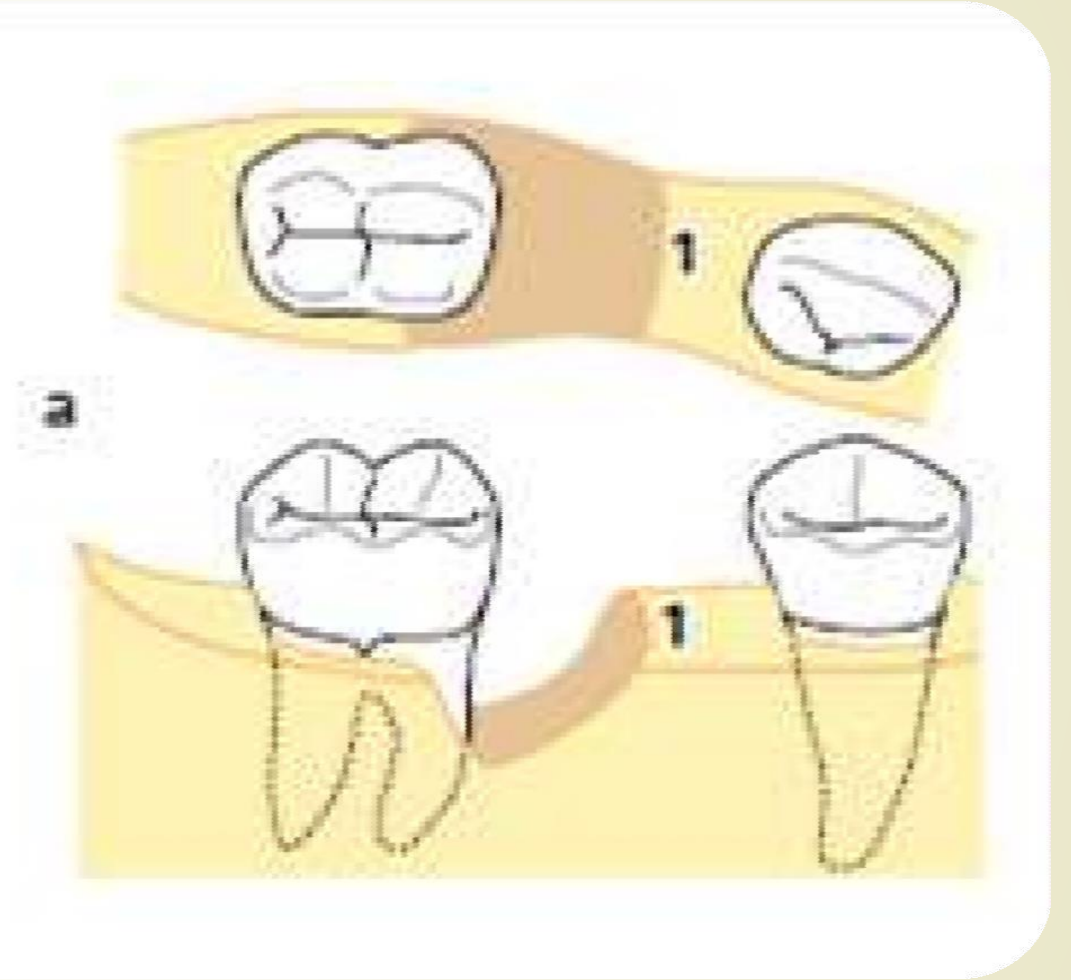
- Successful root coverage implies regeneration of the attachment apparatus on the exposed root surface including cementum with inserting collagen fibers, as well as an esthetically acceptable restoration of the anatomy of the mucogingival complex.

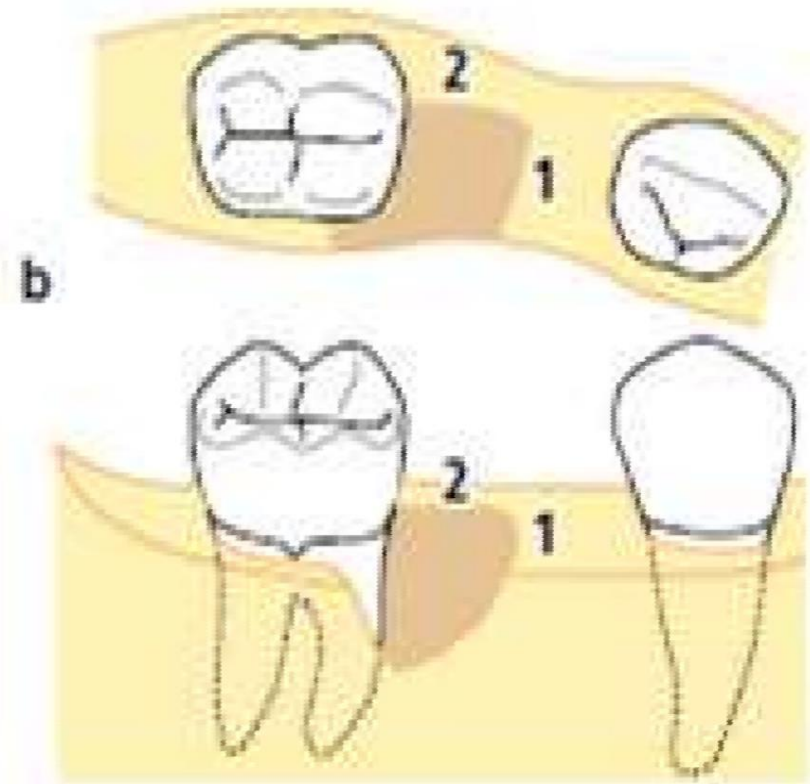
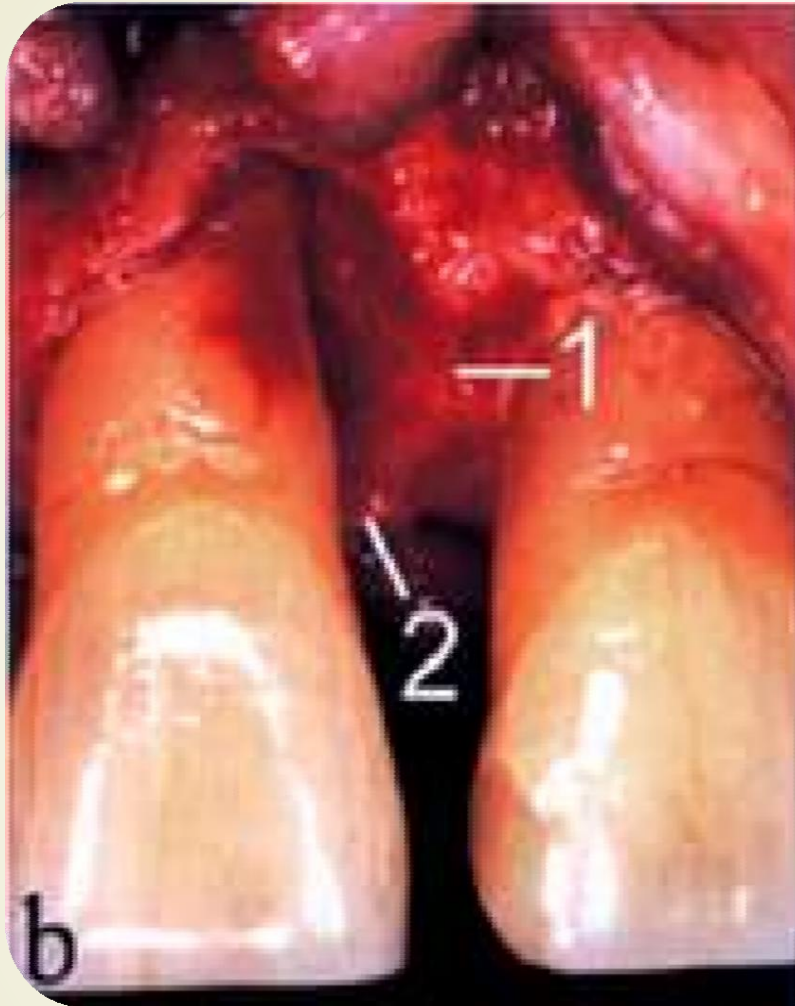
- ▶ Another indication for RPT is furcation-involved teeth. The furcation area is often inaccessible to adequate instrumentation and frequently the roots present concavities and furrows which make proper cleaning of the area after resective surgery impossible.
- ▶ Long-term prognosis of furcation-involved teeth can be improved considerably by successful regenerative periodontal therapy.

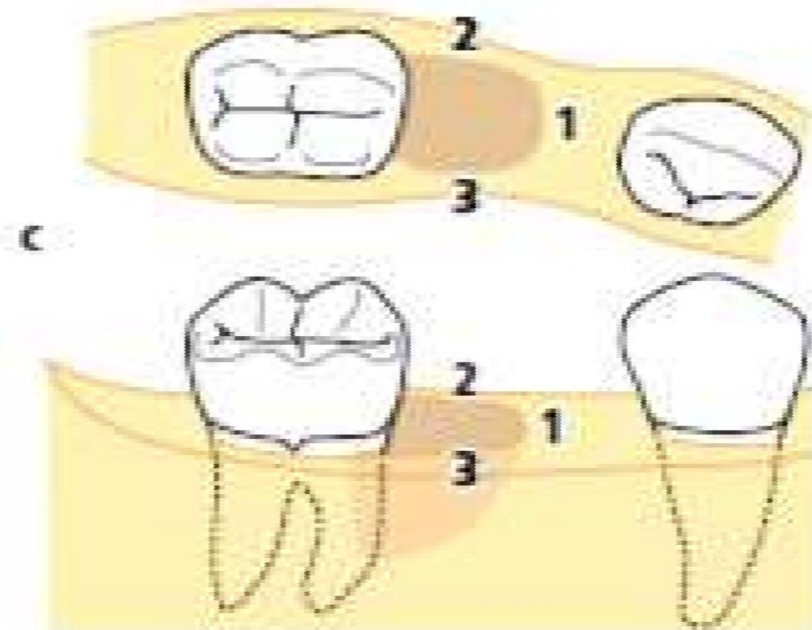
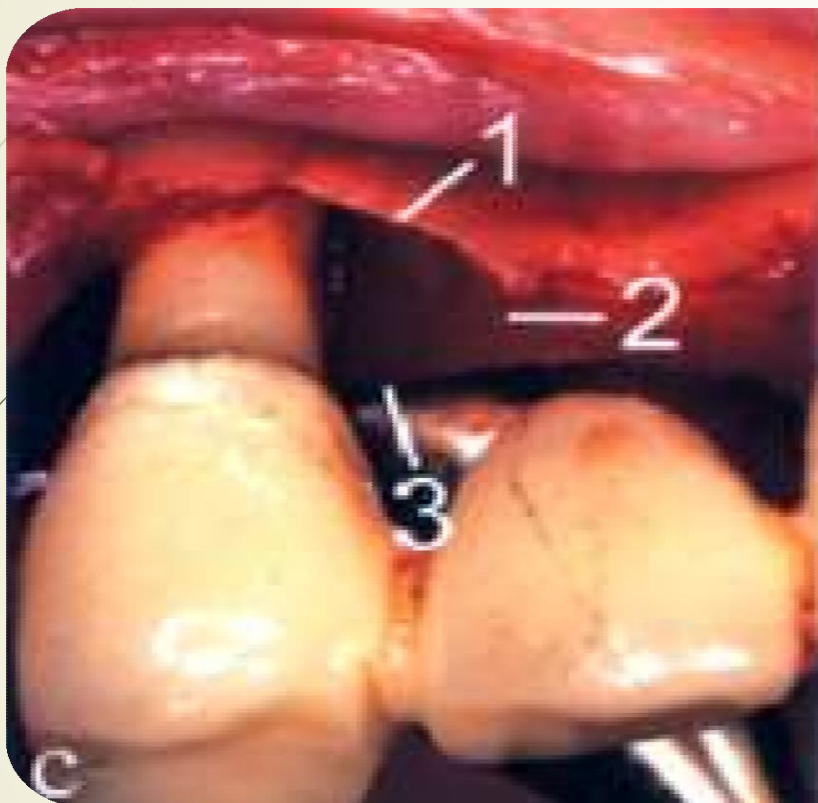
Factors that may influence the successful management of osseous defects (Kornman & Robertson 2000)



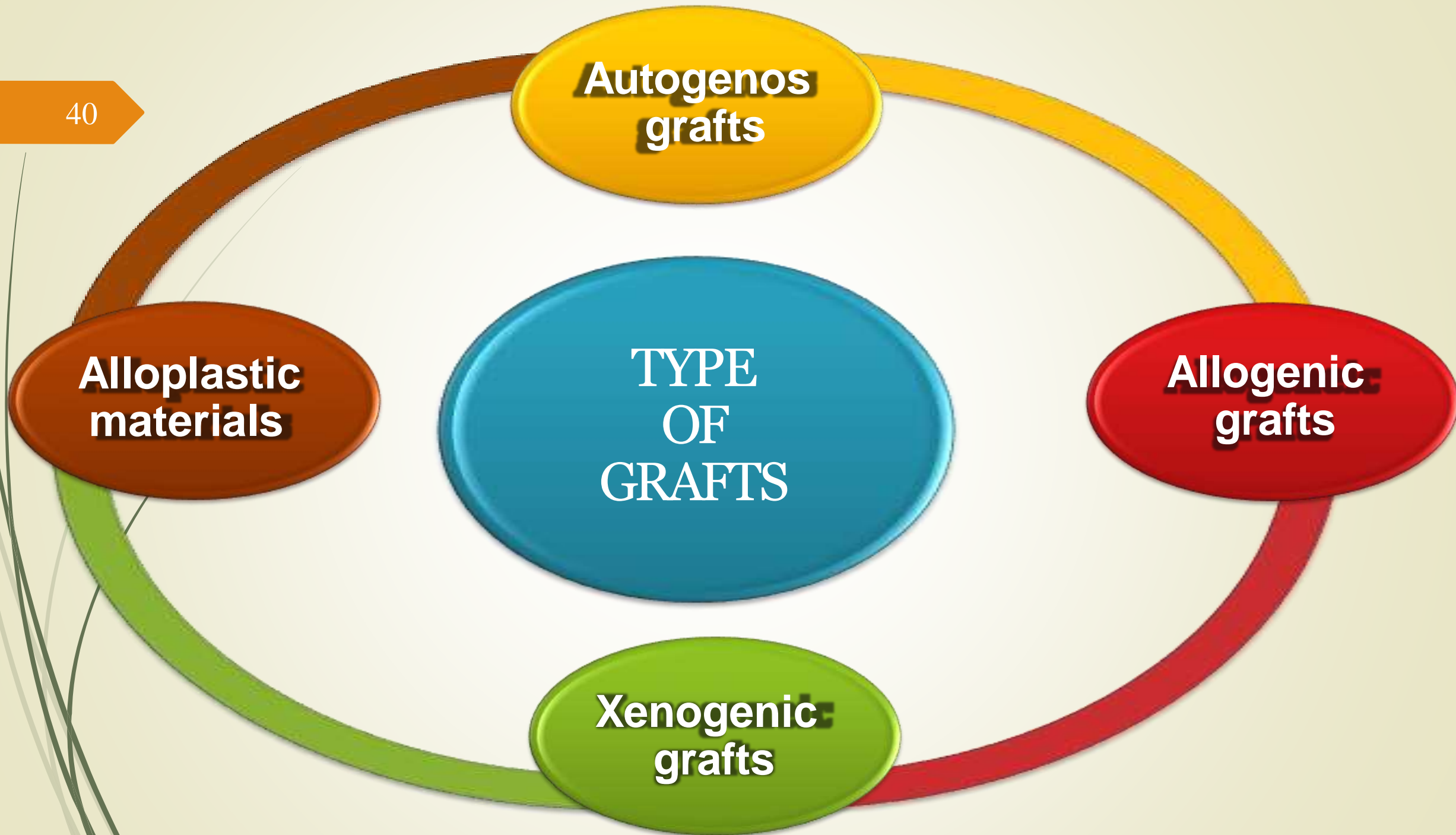
- ▶ The morphology of the periodontal bony defect - essential for the establishment of a predictable prognosis
- ▶ Goldman and Cohen (1958) introduced a classification of periodontal intrabony defects which was based on the number of osseous walls surrounding the defect, being either three-wall, two-wall or one-wall defects or a combination of such situations





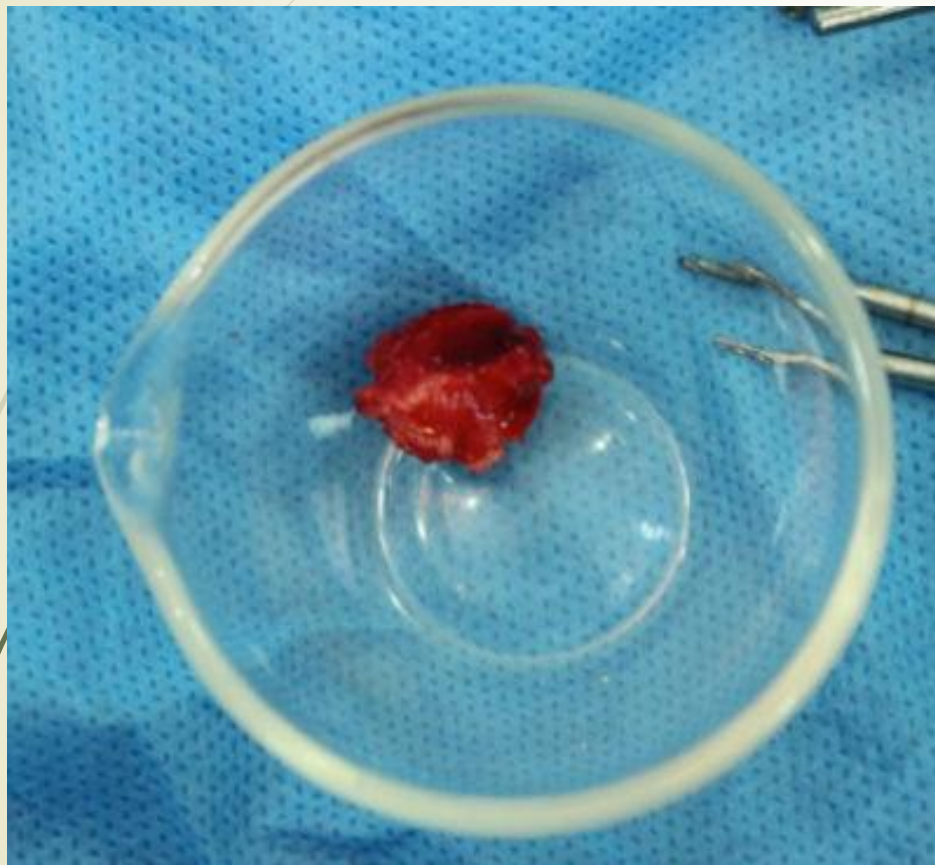


- ▶ Results from a study by Ellegaard and Löe (1971) comprising 191 defects in 24 patients with periodontal disease indicated that complete regeneration, determined radiographically and by periodontal probing, had occurred in around 70% of the three-wall defects, in 40% of the combined two-wall and three-wall defects, and in 45% of the two-wall defects.



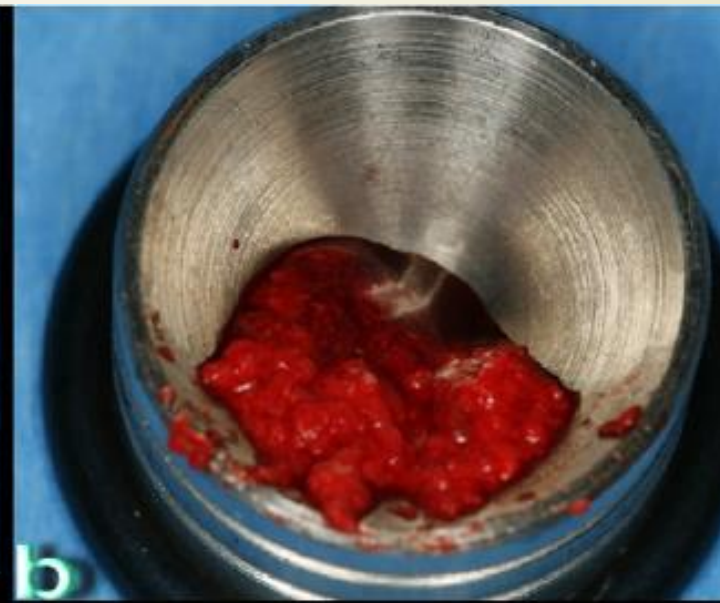
Autogenous grafts

- Grafts transferred from one position to another within the same individual.
- No potential problems of histocompatibility and
- disease transmission
- Comprises (i) cortical bone or (ii) cancellous bone and marrow
- Promote bone healing
- Mainly through osteogenesis and/or osteoconduction.
- Harvested either from intraoral or extraoral donor sites.
- Intraoral : edentulous areas of the jaw, healing extraction sites, maxillary tuberosities or the mandibular retromolar area
- Extraoral : iliac crest marrow









Allogenic grafts

- Grafts transferred between genetically dissimilar
- members of the same species.
- Frozen iliac cancellous bone and marrow, mineralized freeze dried bone allogeneic grafts (FDBA), and decalcified freeze-dried allogeneic bone grafts (DFDBA).
- The need for cross matching to decrease the likelihood of graft rejection as well as the risk of disease transmission virtually eliminated the use of frozen iliac allogeneic grafts in periodontics.



Xenogenic grafts

- Grafts taken from a donor of another species.
- Nielsen et al. (1981) treated 46 intrabony defects with Kielbone® (i.e. defatted and deproteinized ox bone) and another 46 defects with intraoral autogenous bone grafts. The results showed no difference between the amount of clinical gain of attachment and bone fill obtained in the two categories of defect.
- Bio-Oss®, Geistlich AG, Switzerland;
- Lubbock®/Laddec®, Ost Development
- SA, France;
- Endobone®, Biomet Inc. Dordrecht, The Netherlands;
- OsteoGraf®/N, DENTSPLY, Friadent Cera-Med,
- Lakewood, CO, USA;
- Cerabone®, aap Implantate AG, Berlin, Germany







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Alloplastic materials

- ▶ Synthetic, biocompatible, inorganic implant materials which synthetic, which are used as substitutes for bone grafts.
- ▶ Promote bone healing through osteoconduction.
- ▶ 1. Hydroxyapatite (HA) - non-resorbable ceramic / resorbable non-ceramic
- ▶ 2. Betatricalcium phosphate (β -TCP),
- ▶ 3. Polymers - a non-resorbable, calcium hydroxide coated co-polymer of polymethylmethacrylate (PMMA) and polyhydroxyethylmethacrylate (PHEMA)
- ▶ 4. Bioactive glasses (bio-glasses) - composed of SiO_2 , Na_2O , P_2O_5 and are resorbable or not resorbable



Grafting materials is periodontal bony defects

Osteoproliferative (osteogenetic)

new bone is formed by bone-forming cells contained in the grafted material

Osteoconductive

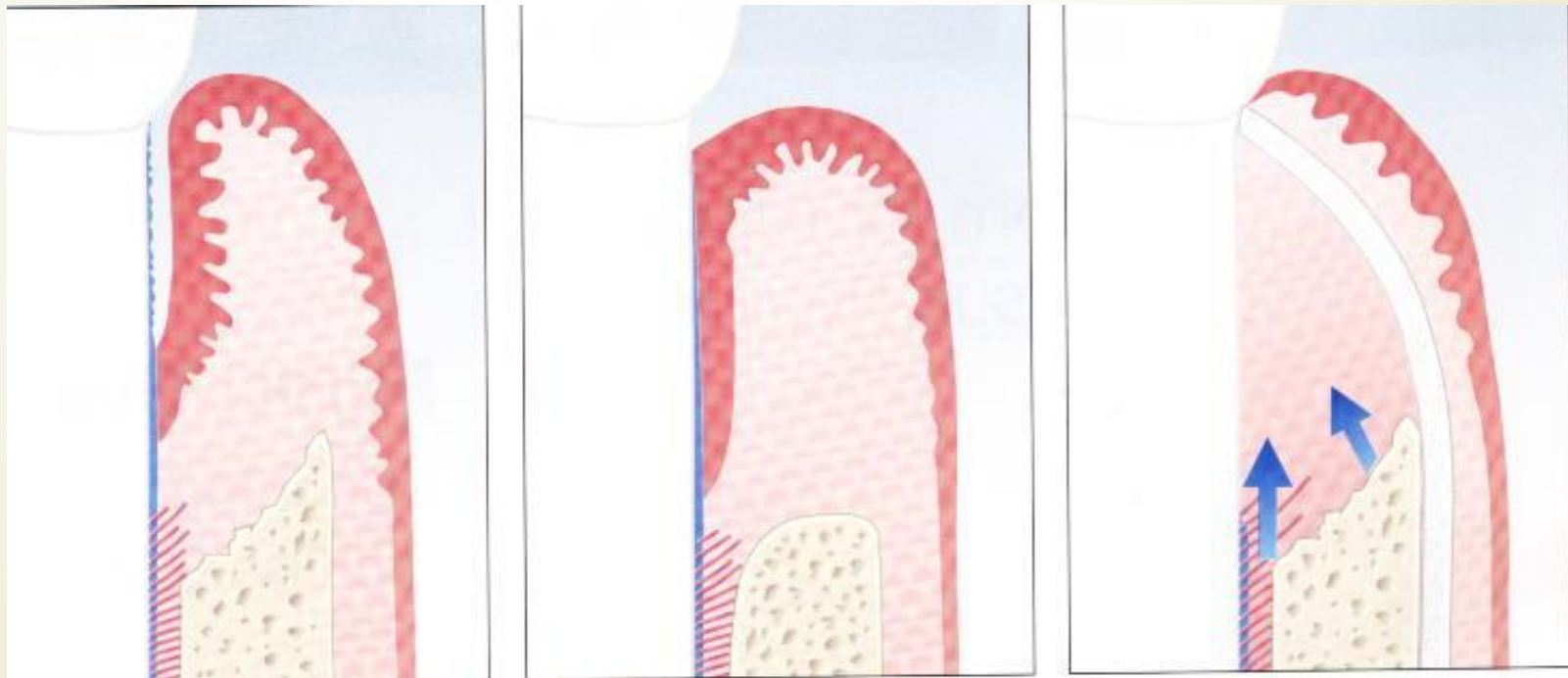
the grafted material does not contribute to new bone formation per se but serves as scaffold for bone formation originating from adjacent host bone

Osteoinductive

bone formation is induced in the surrounding soft tissue immediately adjacent to the grafted material.

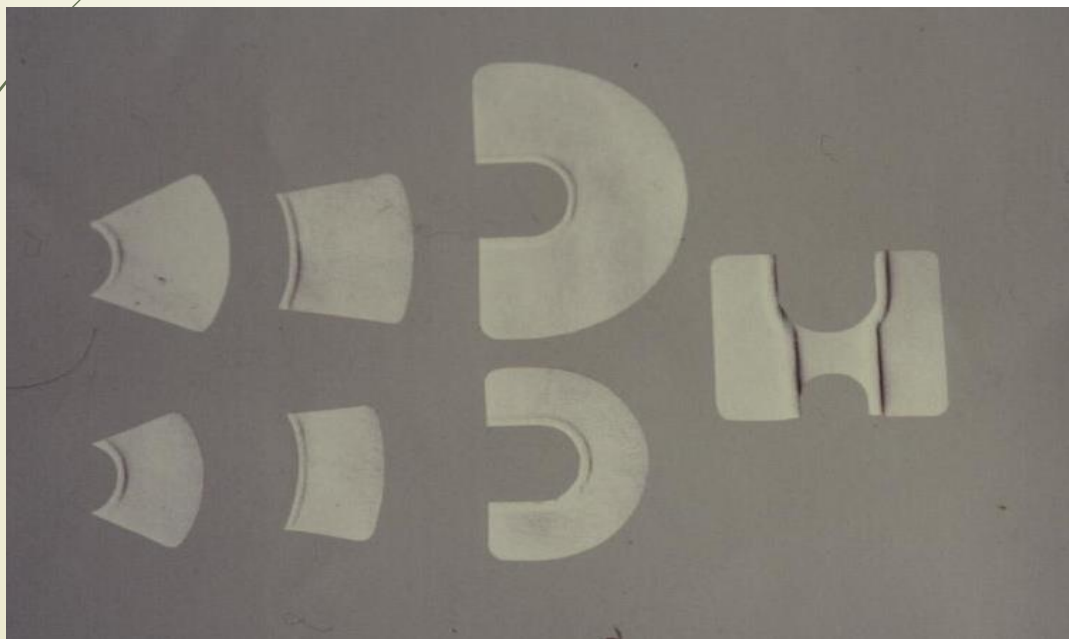
Guided Tissue Regeneration (GTR)

- GTR is achieved by placing barrier membranes over periodontal defects to exclude gingival epithelium and connective tissues, and to create a space into which proliferating cells from the periodontal ligament and bone can migrate.
- Nyman et al. (1982) reported new cementum with inserting collagen fibers had formed on the previously exposed root surface.



Non-resorbable

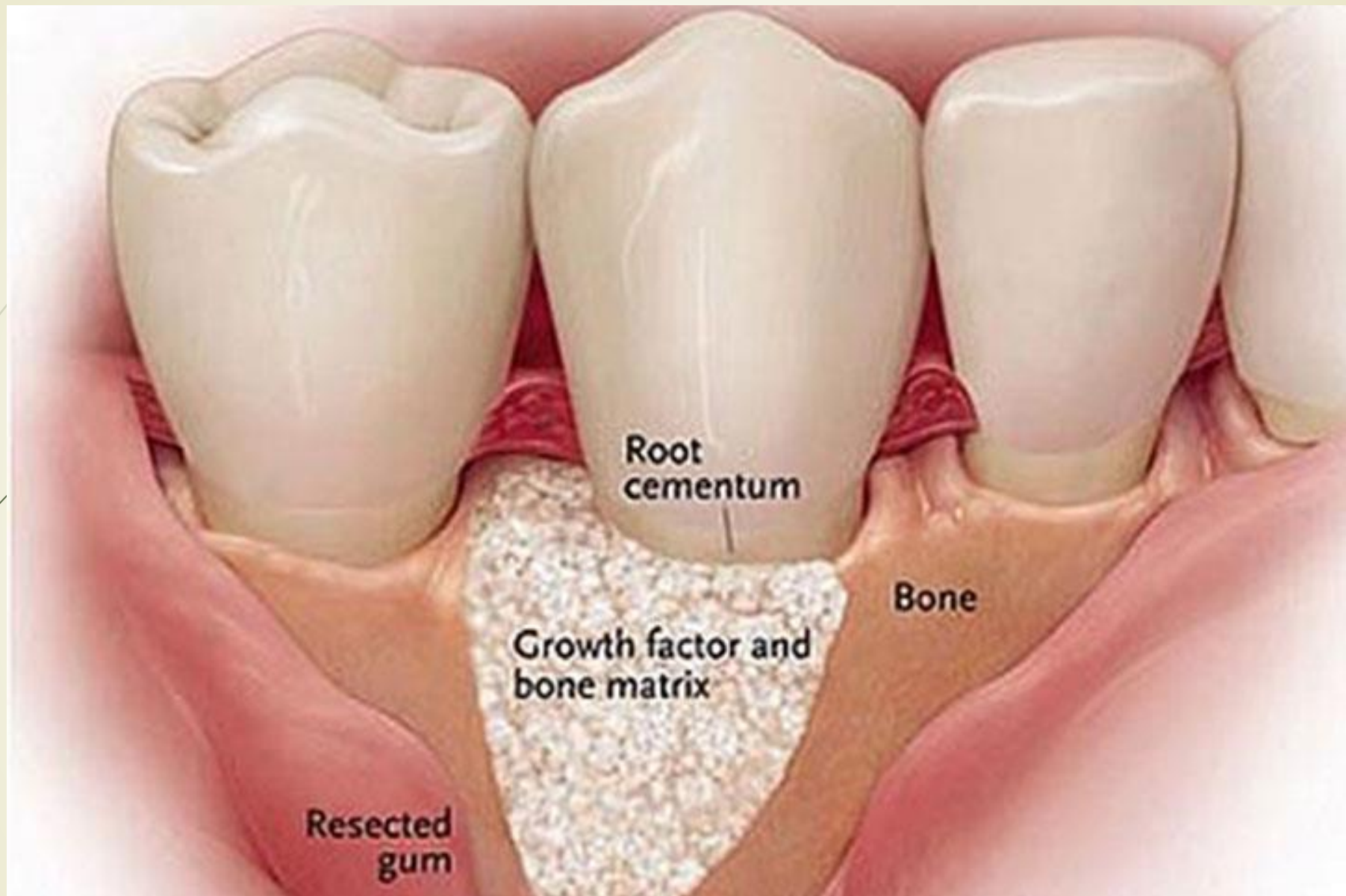
- ▶ expanded polytetrafluoroethylene, ePTFE) – require removal 4–6 weeks after placement.

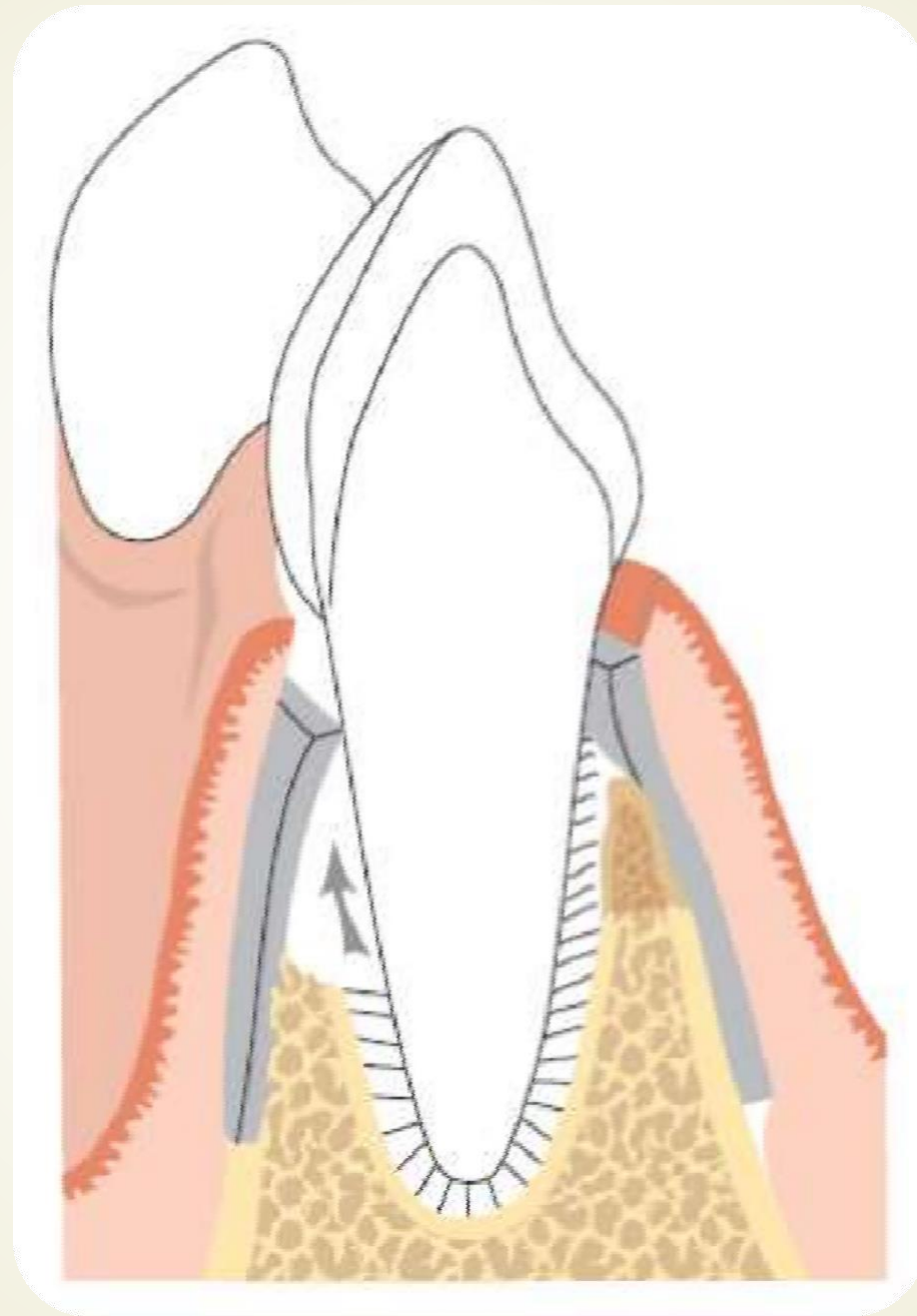


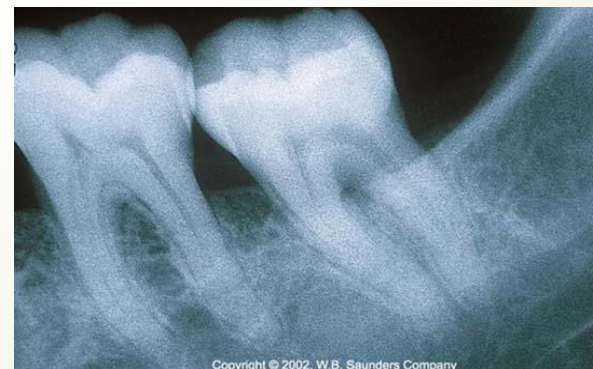
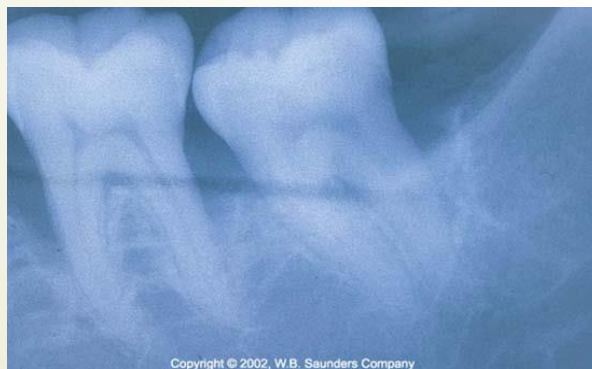
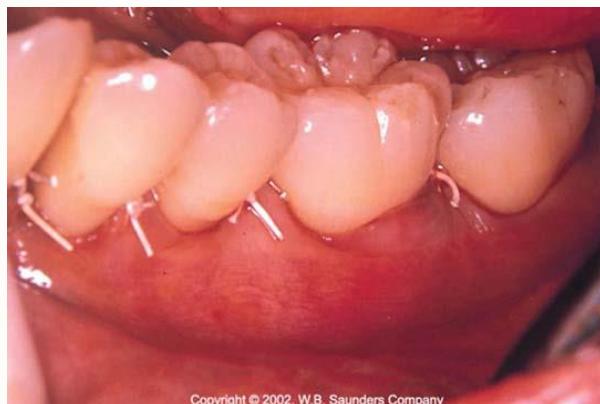
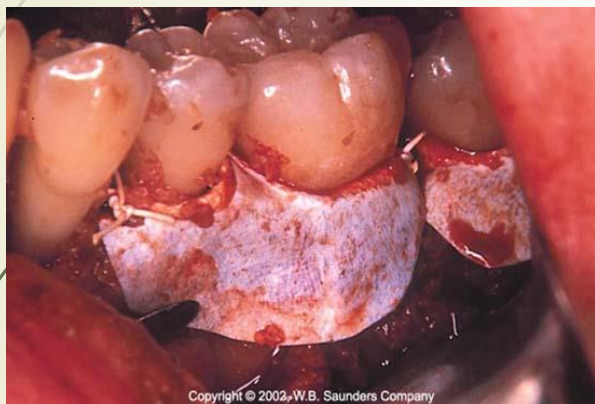
Resorbable

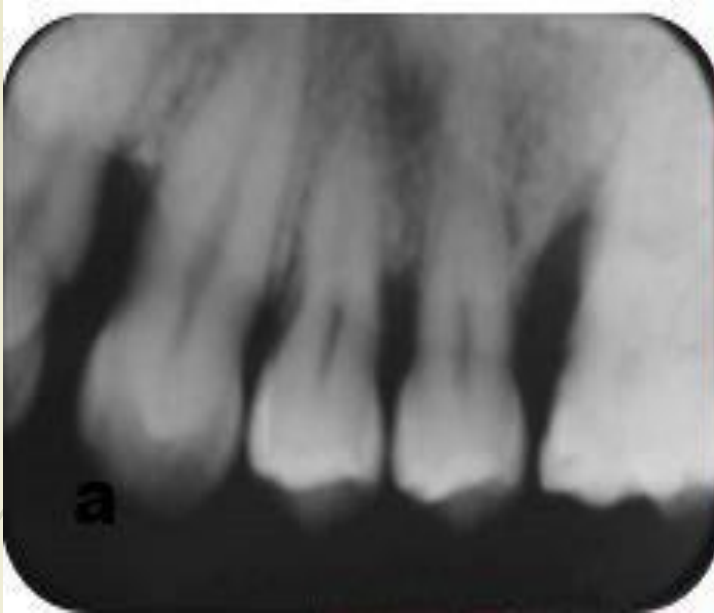
- ▶ (e.g. polylactic acid membranes, collagen membranes) - biodegrade within the tissues over 1–2 months and do not require a second surgical procedure for removal.
- ▶ May also be placed over implants and in conjunction with bone grafts in an attempt to increase the quantity of available bone.
- ▶ GTR produces most predictable results in class II furcations and in two- and three-walled osseous defects.

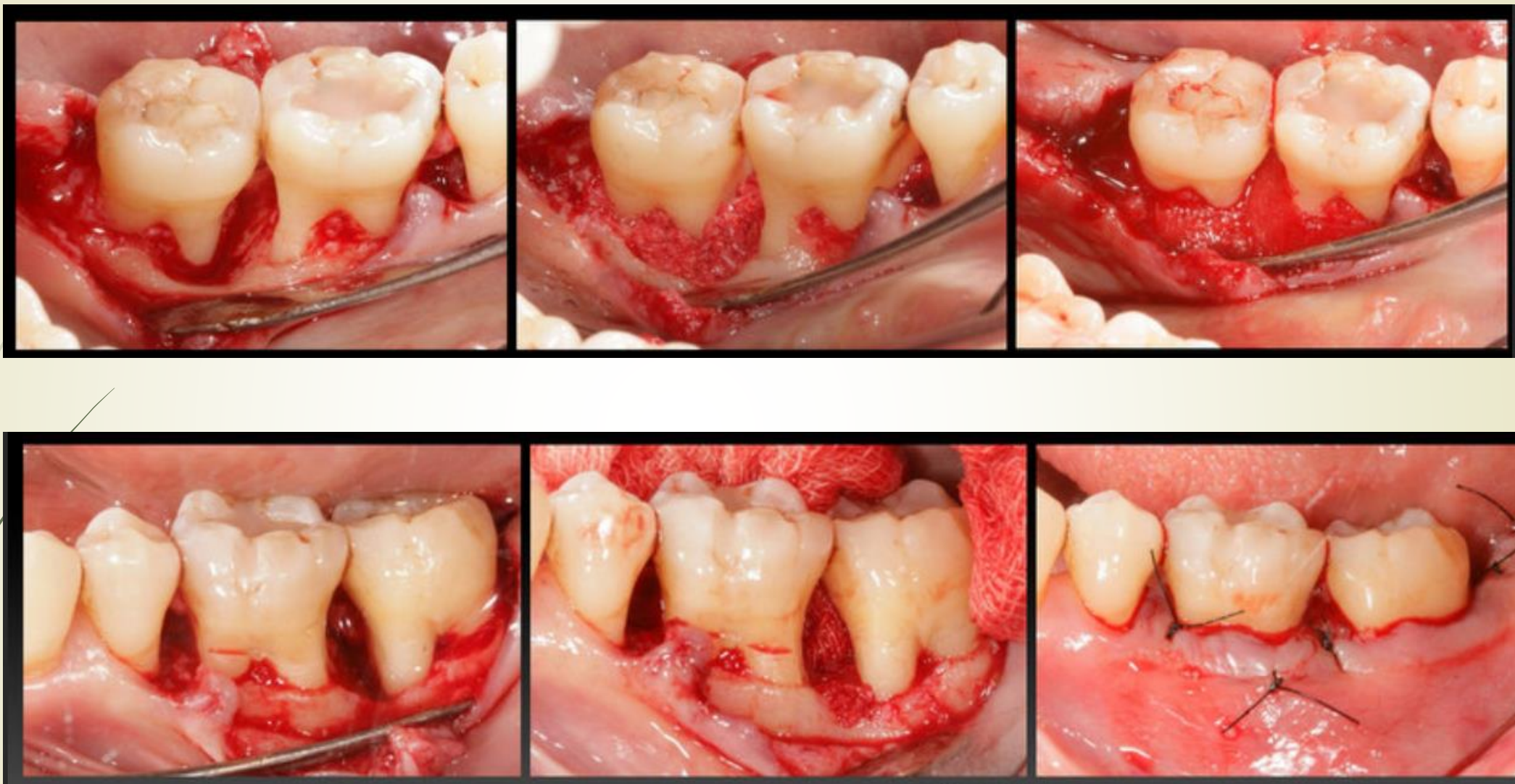












Initial

1 week

1 year









Obstacles to new attachment

- Degeneration of remnants of Sharpey's fibers
- Accumulation of bacteria and their products
- Disintegration of the cementum and dentin

Bio modification of the root surface

- ▶ **Citric acid**
- ▶ **Fibronectin** (The glycoprotein that fibroblasts require to attach to root surface) >>> New Attachmet
- ▶ **Tetracycline** >>> (In vivo): greater connective tissue attachment after tetracyclin treatment of roots
- ▶ **Polypeptide growth factors** >>> PDGF, IGF, bFGF , TGF
- ▶ **Enamel Matrix Proteins** >>> amelogenin (Emdogain) >>> osteopromotive

Outcome

- ▶ The clinical outcomes of GTR - frequently evaluated by changes in clinical attachment levels , bone levels, PPD and the position of the gingival margin.
- ▶ In some studies on grade II and III furcations, horizontal changes in clinical attachment, bone level, and pocket depth were also measured.
- ▶ However, evidence of true regeneration of periodontal attachment can only be provided by histologic means

Assessment of periodontal regeneration

- ▶ Successful regeneration is assessed by periodontal probing, radiographic analysis, direct measurements of new bone, and histology.
- ▶ Although histology remains the ultimate standard in assessing true periodontal regeneration, periodontal probing, direct bone measurements, and radiographic measurements of osseous changes are used in the majority of studies of regenerative therapy (Reddy & Jeffcoat 1999).

Gingival recession

73

- Gingival recession in its localized or generalized form of an undesirable condition resulting in root exposure where there is an apical shift in position of gingival margin from the CEJ occurring gradually
- The recent surveys reported that 88% of 65 years old and 50 % of people between 18 to 64 years old have one or more sites with recession. (American dental association 2003)



Symptoms

- Sensitivity
- Esthetic complains
- Root caries
- Teeth discoloration
- Abrasion
- Difficulty maintaining plaque control

Etiology

- 1 Anatomical**
- 2 Plaque induced periodontitis**
- 3 Trauma**
- 4 Iatrogenic factors**
- 5 Smoking and Tobacco products**
- 6 Aging**
- 7 Hormonal changes**
- 8 Gingival biotype**



Stillman Cleft (left) Cleft-like defect of traumatic etiology. Such clefts may spread laterally, creating an area of gingival recession. The exposed root surface may be extremely sensitive. Such clefts are often covered with plaque.

McCall's Festoons The attached gingiva consists of nothing more than a collar-like, fibrous thickening (arrow). This may be a tissue response to further recession beyond the mucogingival line







Visual method
(By periodontal probe)



Probe not visible- Thick
Biotype



Probe Visible- Thin
Biotype

Direct method
(By # 20 endodontic reamer)



Assessment by reamer

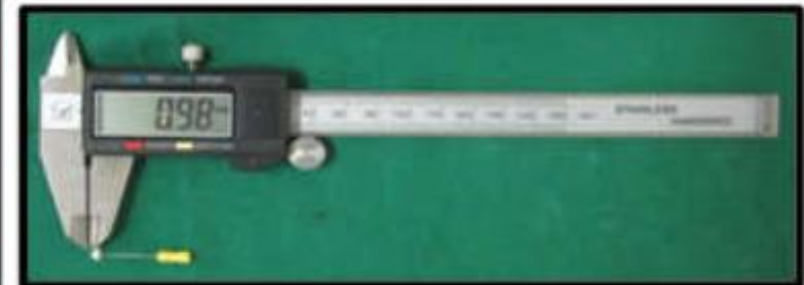


Assessment by reamer

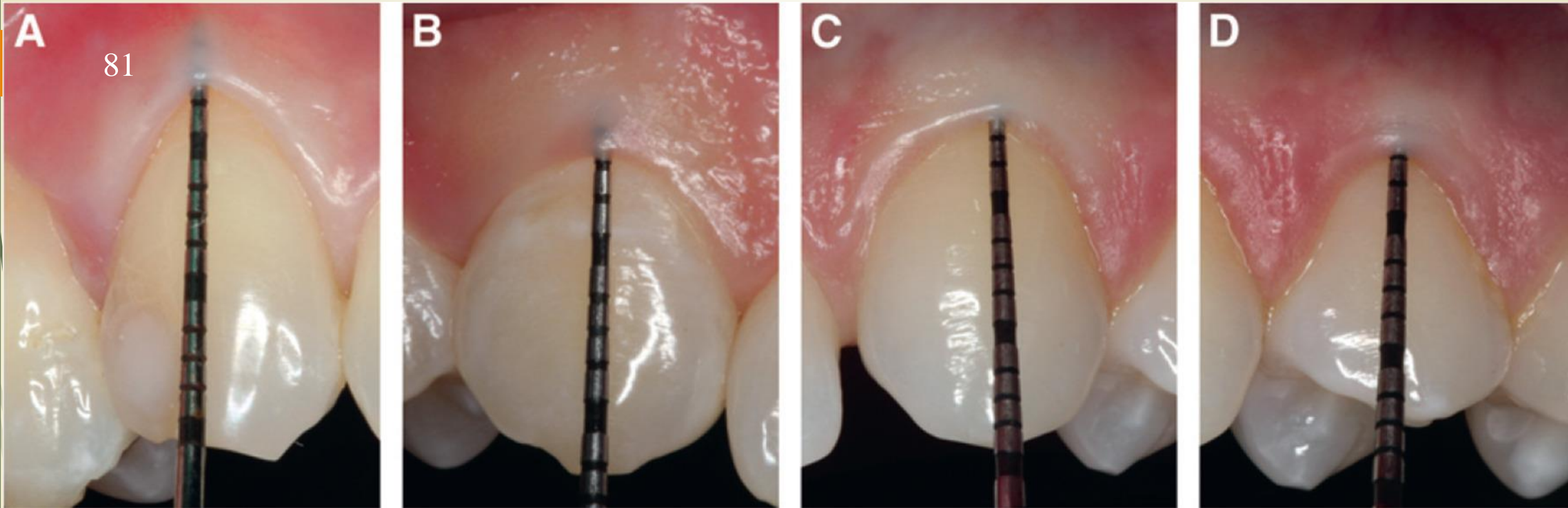
Measurement by digital
vernier caliper



$>1\text{mm}$ = Thick Biotype



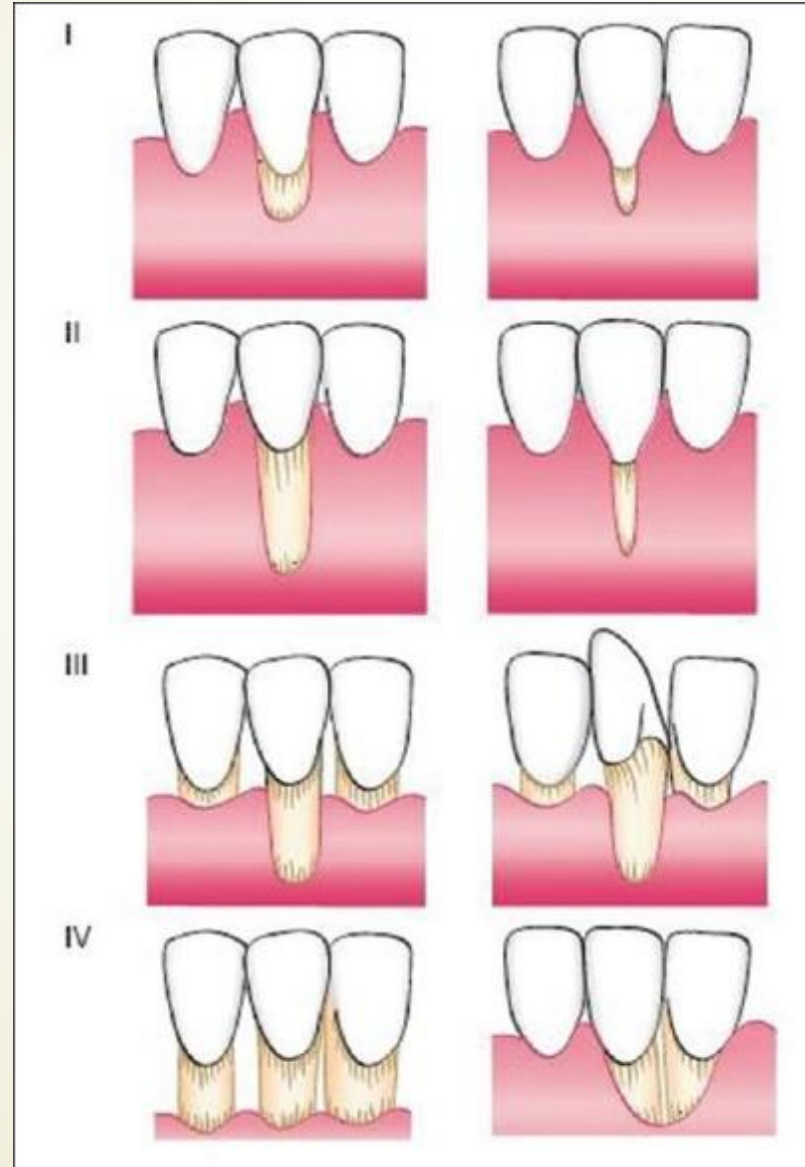
$\leq 1\text{mm}$ = Thin Biotype

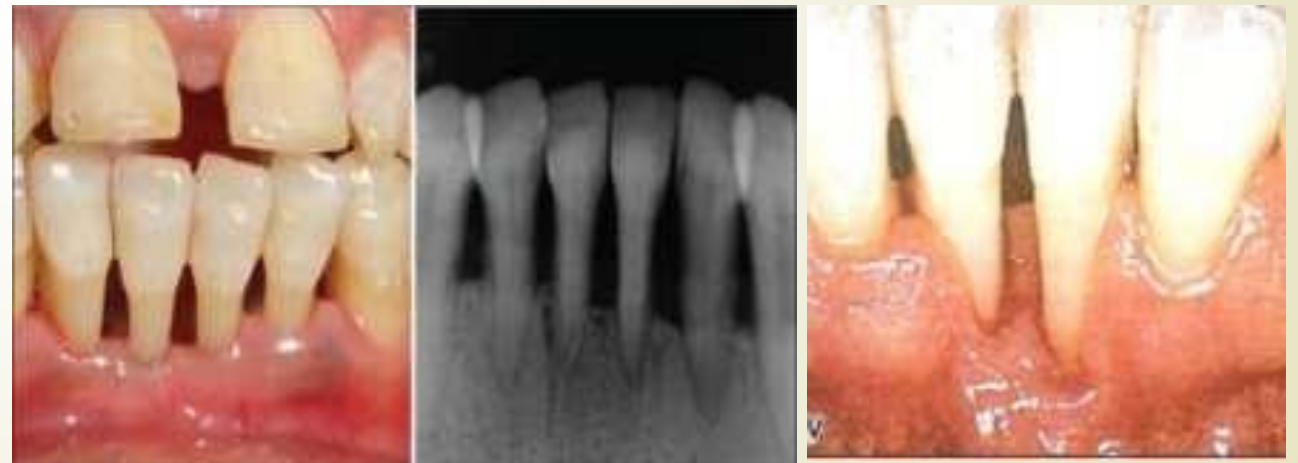


- The gingival thickness that most closely corresponded with probe invisibility was >0.8 mm (0.666 AUC, 67.7% sensitivity, 65.4% specificity). When the probe was visible, mean gingival thickness was 0.17 mm less ($P < 0.001$) compared to the “thick” counterparts.
- Natalie A. Frost et al 2015 JOP

Miller's Classification

82





Mucogingival Surgery for Root Coverage

Types

85

- Free soft tissue graft procedures
 - Free gingival grafts
 - Subepithelial connective tissue graft
- Pedicle soft tissue graft procedures
 - Rotational flaps
 - Double-papilla repositioned flap
 - Laterally positioned flaps
 - Transpositional flaps
 - Advanced flap
 - Coronally positioned flap
 - Semilunar coronally positioned flaps

Free Gingival Graft

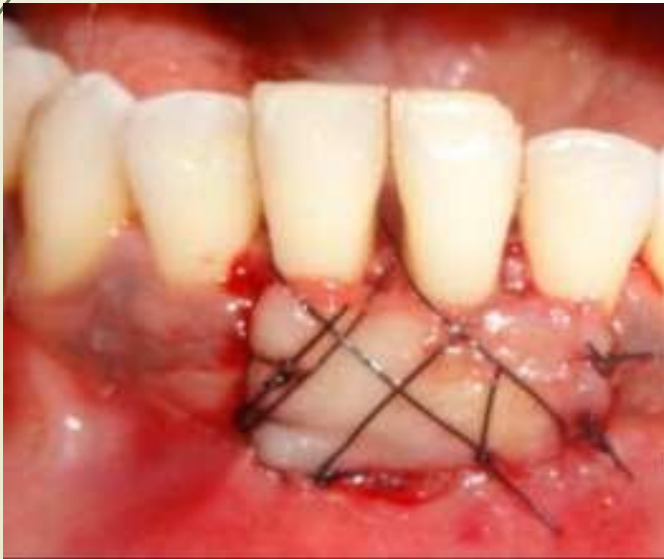
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Class II gingival recession



Horizontal papillary incision and vertical releasing incision is made and partial thickness flap is reflected and removed.







Subepithelial connective tissue graft

90



A partial-thickness horizontal incision in the interdental papilla



Two vertical incisions are made mesiodistally 3 mm from the gingival recession area apical to MGJ



A sulcular incision is made in the gingival recession area and connected to the vertical incisions and horizontal incision.



A partial-thickness flap elevated



Template on the recipient site

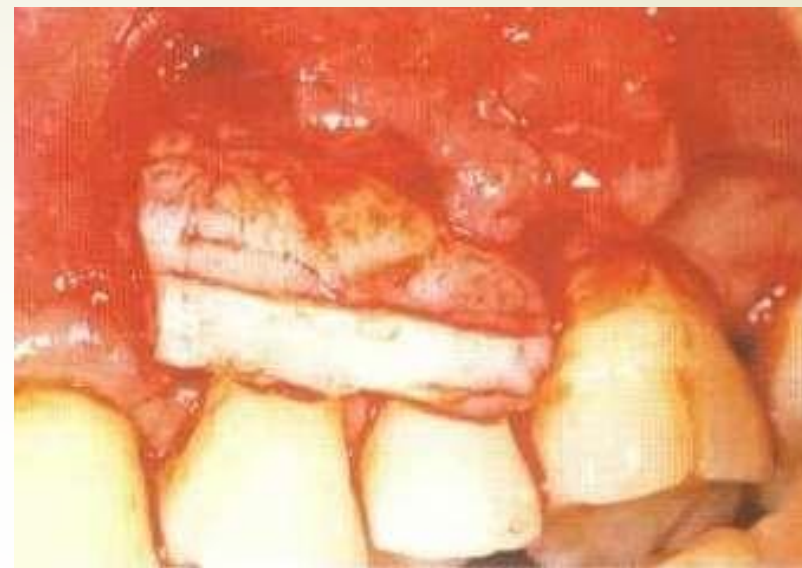
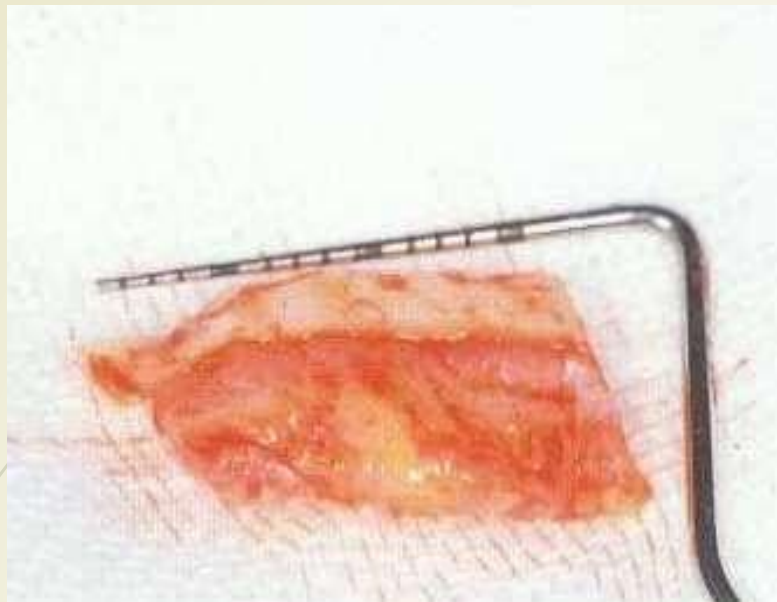


Template on the donor site

93



A full-thickness periosteal connective tissue is reflected from the bone and separated from the bone surface.





Composite restorations!



Use of composite resin to mask recession defects and eliminate black triangles caused by recession.

Enameloplasty was carried out to even incisal plane in this case









Thanks for
Your Attention

