3-Regenerative procedures:

Bone grafting procedures, such as the use of autogenous graft from both extraoral and intraoral donor sites, allogenic marrow grafts, and non-decalcified / decalcified lyophilized bone grafts, or implant procedures utilizing slowly resorbable tricalcium phosphate and non-resorbable, nonporous hydroxyapatite.

The use of citric acid for root surface demineralization or the use of methods for improved root surface biocompatibility or to enhance cellular responses.

The use of physical barriers, such as membranes (non-resorbable: removal after 4-6 weeks from placement, or resorbable: biodegrade within the tissue over -2 months), to retard or prevent apical migration of epithelium as well as exclude gingival connective tissue from the healing wound and to create a space into which the proliferation cells from periodontal ligament and bone can migrate into healing area these cells differentiate into fibroblast, cementoblast and osteoblast and thus can produce new cementum, bone and periodontal ligament fibers, known as "guided tissue regeneration" (Gottlow et al. 1986) (figure 45). The procedure can be described as a coronally repositioned flap procedure without bone recontouring.

In the late 1990s the use of a derivative of enamel matrix proteins. These proteins are involved in the embryogenesis of cementum, periodontal ligament, and supporting bone, and when applied to the exposed root surface facing an infrabony periodontal defect they mediate regeneration of a new attachment apparatus. The surgical procedure is performed as a coronally repositioned flap procedure without bone recontouring. Before repositioning of the flaps, the exposed roots are treated with EDTA for removal of the *smear layer", followed by the application of the derivative of enamel matrix proteins.

Types of bone graft:

Autograft

Autologous or autogenous bone grafting involves utilizing bone obtained from same individual receiving the graft. Bone can be harvested from nonessential bones, such as from iliac crest, mandibular symphysis (chin area), and anterior mandibular ramus (coronoid process). It would be osteoinductive and osteogenic, as well as osteoconductive. Disadvantage of autologous grafts is that additional surgical site is required, another potential location for postoperative pain and complications.

Allografts

Allograft is derived from humans. The difference is that allograft is harvested from an individual other than the one receiving the graft. Allograft bone is taken from cadavers that have donated

their bone so that it can be used for living people who are in need of it; it is typically sourced from a bone bank.

There are three types of bone allograft available

1. Fresh or fresh-frozen bone
2. FDBA (freeze-dried bone allograft)
3. DFDBA (demineralized freeze –dried bone allograft)

The use of freeze-dried bone allografts (FDBA) and demineralized freeze-dried bone allografts (DFDBA) has reduced the problem of immunogenicity that was associated with fresh-frozen bone.

Xenograft

Xenogratfs are bone grafts from a species other than human, such as bovine and are used as a calcified matrix.

Alloplastic grafts

Alloplastic grafts may be made from hydroxyapatite, a naturally occurring mineral (main mineral component of bone), made from bioactive glass. Hydroxyapatite is a synthetic bone graft, which is the most used now due to its osteoconduction, hardness, and acceptability by bone. Some synthetic bone grafts are made of calcium carbonate, which start to decrease in usage because it is completely resorbable in short time and makes breaking of the bone easier. Finally used is the tricalcium phosphate in combination with hydroxyapatite and thus giving effect of both, osteoconduction and resorbability.

The biologic mechanisms that provide a rationale for bone grafting are osteoconduction, osteoinduction, and osteogenesis

Osteoconduction

Occurs when bone graft material serves as a scaffold for new bone growth, which is perpetuated by the native bone. Osteoblasts from the margin of defect that is being grafted, utilize the bone graft material as a framework upon which to spread and generate new bone. In the very least, a bone graft material should be osteoconductive (every bone graft material should be osteoconductive).

Osteoinduction

Involves stimulation of osteoprogenitor cells to differentiate into osteoblasts and then begins formation of new bone. A bone graft material that is osteoconductive and osteoinductive will not only serve as a scaffold for currently existing osteoblasts but will also trigger formation of new osteoblasts, promoting faster integration of the graft.

Osteogenesis

It occurs when vital osteoblasts originating from bone graft material contributes to the growth of new bone along with bone formation.

Osteopromotion

Involves enhancement of osteoinduction without possession of osteoinductive properties. For example, enamel matrix derivative enhances the osteoinductive effect of demineralized freeze-dried bone allograft (DFDBA), but will not stimulate bone growth alone.

Variable	Allograft	Autograft	Xenograft	Ceramics
Osteoconduction	+++	+++	+++	++
Osteoinduction	++	+++	+	–
Osteogenesis	–	+++	–	–

From the previous schedule we conclude that allograft (autogenous) is osteoconductive, osteoinductive and osteogenesis, alloplastic graft (like ceramics) possess only osteoconductive properties

4. Distal wedge procedures:

In many cases the treatment of periodontal pockets on the distal surface of distal molars is complicated by the presence of bulbous tissues over the tuberosity or by a prominent retromolar pad. The most direct approach to pocket elimination in such cases in the maxillary jaw is the gingivectomy procedure\ The incision is started on the distal surface of the tuberosity and carried forward to the base of the pocket of the distal surface of the molar.

However, when only limited amounts of keratinized gingiva are present, or none at all, or if a distal angular bony defect has been diagnosed, the bulbous tissue should be reduced in size rather than being removed. This may be accomplished by the distal wedge procedure Which facilitates access to the osseous defect and makes it possible to preserve sufficient amounts of gingival and mucosa to achieve soft tissue coverage.

Technique:

Buccal and lingual incisions are made in a vertical direction through the tuberosity or retromolar pad to form a triangular wedge. The facial and lingual incisions should be extended

in a mesial direction along the buccal and lingual surfaces of the distal molar to facilitate flap elevation.

The facial and lingual walls of the tuberosity or retromolar pad are deflected and the incised wedge of tissue is dissected and separated from the bone

The walls of the facial and lingual flaps are then reduced in thickness by undermining incisions. Loose tags of tissue are removed and the root surfaces are scaled and planed. If necessary, the bone is recontoured. The buccal and lingual flaps are replaced over the exposed alveolar bone, and the edges trimmed to avoid overlapping wound margins. The flaps are secured in this position with interrupted sutures. The sutures are removed after approximately 1 week.

The original distal wedge procedure may be modified according to individual requirements. Some commonly used modifications of the incision technique are illustrated in, all having the goals of eliminating the deep pocket and achieving mucosal coverage of the remaining periodontium.

Patterns of bone loss

- **1-horizontal bone loss**

-Most common type

- Bone is reduced in such a way that bone margin become perpendicular to the tooth surface
- Interdental septa, facial and lingual bone plate are all affected but necessary to an equal degree around the same tooth.

- **2-angular or vertical bone loss**
  Classified based on the number of osseous walls remains (goldman and cohen)

- **One walled defects**
- **Two walled defects**
- **Three walled defects**
- **Combined osseous defects (the apical part of combined defect will usually have higher number of alveolar bone walls than the total number of walls which are present coronally).**

Osseous crater

Is another type of bone loss in which concavities in the crest of the interdental bone are confined within the facial and lingual walls.

The high frequency of interdental craters has been attributed to:
1- The interdental area collects plaque and it is difficult to clean

2- The normal flat or even slightly concave faciolingual shape of the interdental septum in lower molars may favor crater formation.
3- Vascular patterns from the gingiva to the center of the crest may provide a pathway for inflammation.

5. Osseous surgery:

The principles of Osseous surgery in periodontal therapy were outlined by Schluger (1949) and Goldman (1950). They pointed out that alveolar bone loss caused by inflammatory periodontal disease often results in an uneven outline of the bone crest. Since, according to these authors, the gingival contour is closely dependent on the contour of the underlying bone as well as the proximity and anatomy of adjacent tooth surfaces, the elimination of soft tissue pockets often has to be combined with osseous reshaping and the elimination of osseous craters and angular bony defects to establish and maintain shallow pockets and optimal gingival contour after surgery. Osseous surgery should be always carried out under continuous irrigation with normal saline to avoid bone necrosis

A. Osteoplasty: The leveling of interproximal craters and the elimination (or reduction) of bony walls of circumferential osseous defects are often referred to as "osteoplasty" since usually no resection of supporting bone is required. It was introduced by Friedman in 1955

Examples of osteoplasty are the thinning of thick osseous ledges and the establishment of a scalloped contour of the buccal (lingual and palatal) bone crests It may be required to gain access for intrabony root surface debridement.

The various Treatment options available for hard tissue defect may include:

1. Elimination of the osseous defect by resection of bone (osteoplasty and/or ostectomy).
2. Maintenance of area without osseous resection (hoping for some type of periodontal repair, e.g bone fill leading to gain of clinical attachment).
3. Compromising the amount of bone removal and accepting that acertain pocket depth will remain.
4. An attempt to improve healing through the use of regenerative procedure.
5. Extract the involved tooth if the bony defect is considered too advanced.

Treatment decisions for soft and hard tissue pockets in flap surgery
From a didactic point of view it seems more appropriate to discuss surgical therapy with regard to how to heal (1) the soft tissue component and (2) the hard tissue component of periodontal pocket at a specific tooth site.
There are number of factors that should be considered in the treatment decision, such as:

1.Esthetics

2.Tooth/tooth site involved.

3.Defect morphology

4. Amount of remaining periodontium

Since the alveolar bone supports the soft tissue, an altered bone level through recontouring will result in recession of the soft tissue margin. For esthetic reasons one may therefore be restrictive in eliminating proximal bony defects in the anterior tooth region.

For example, in case of approximal crater it may often sufficient to region.

For example, in the case of an approximal crater it may often be sufficient to reduce/eliminate the bone wall on the lingual side of the crater, thereby maintaining the bone support for the soft tissue on the facial aspect. In favor of esthetics one may even have to compromise the amount of bone removal and accept that some pocket depth will remain in certain situations. In addition to esthetics, the presence of furcations may limit the extent to which bone recontouring can be performed.

Defect morphology is a variable of significance for repair/regeneration during healing. While two- and, especially, three-wall defects may show great potential for repair/regeneration, one-wall defects and approximal craters will rarely result in such good healing. Further, the removal of intrabony connective tissue/granulation tissue during a surgical procedure will always lead to crestal resorption of bone, especially in sites with thin bony walls This results in reduction of the vertical dimensions of the bone tissue at the site. Thus, the potential for bone fill following a compromise in regard to surgery is greater in areas with thick, non-supporting bone.

6. Crown lengthening:

It is increase in clinical crown length. It's performed by removing often significant amounts of supporting bone and by recontouring. A "biologic width" of approximately 3 mm between the (alveolar bone crest to be established) and the anticipated restoration margin must be ensured for successful results. It's indicated in:

1.Subgingival caries, perforations.

2. Root fractures in the coronal third of the root

3.Deep subgingivally located crown preparation margins; resulting in difficulty finishing margins and taking impressions.

4 Esthetic improvement of anterior teeth with short crowns and high lip line.

7. Mucogingival surgery (M.G.S):

They are plastic surgical procedures designed to correct defects in the morphology, Position &or amount of the gingiva surrounding the teeth. It's indicated in:

1. In areas where the change in the morphology of gingival margin will facilitate proper plaque control e.g. correction of high frenum attachment & deep narrow recession defect especially if it is extend to the level of vestibular fornix.
2. In areas with localized soft tissue recession that creates esthetic or root sensitivity problems.
3. When we have a thin gingiva facial to a tooth planned for orthodontic movement when the final position of that tooth expected to result in an alveolar bone dehiscence.

Types of M.G.S:

a. Vestibular extenuation procedures.

b.Transplantation of gingiva & palatal mucosa That may be either, free gingival graft or pedicle graft e.g. lateraly repositioned flap .

C. Frenectomy and Frenetomy: Frenectomy is complete removal of the frenum including its attachment to the underlying bone. While Frenetomy is the incision of frenum. They are indicated when the frenum is present with:

1) Significantly interferes with the patient's ability to maintain the area.

2) Compromises the labial flange of a maxillary denture.

3) Produces pull on the free gingival margin (that by history is causing progressive attachment loss).

4) Interferes with the orthodontic closure of a diastema.

A.Labial Frenectomy:

There are 2 techniques for the labial Frenectomy:

1.Dieffenbachia V-shape:

- Hold frenum with hemostat
- Surgical incision with #15 blade
- Excise wedge of tissue
- Dissect fibers from periosteum
- Interrupted suture placed

2. Schuchardt Z-shape:

The main advantage of this method over the V-shape method was minimal Scar tissue formation. The method requires a skilled operator as it is tedious to perform. The technique is done to reduce loss of vestibular depth sometimes seen with linear incision.

- Make elliptical incision
- Excise fibrous tissue
- Make 2 oblique incisions
- Undermine pointed flaps

B.Lingual Frenectomy: Patient say "I feel tongue tied." During surgery w instruct patient to elevate his tongue, then by using blade 12 to incise the area of frenum in the midway, then do undermined for the connective tissue, then -suturing the area.

Suturing

Sutures should not interfere with incision lines and must not pass through the tissues near the flap margins or too close to a papilla, because this may result in tearing of the tissues. The use of non-irritating, mono-filamentous materials is recommended. These materials are nonresorbable and extremely inert, do not adhere to tissues, and are therefore easy to pull out. *Wicking", the phenomenon of bacteria moving along or within multi-stranded suture materials, particularly silk, is also avoided. The dimensions usually preferred are 4/0 to 5/0, but even finer suture material (6/0 or 7/0) may be used, particularly in conjunction with periodontal micro- and plastic surgical procedures. Sutures are removed after 7-14 days.

Curved or straight non-traumatic needles (eyeless), with a small diameter. should be used. Such needles are available as rounded (noncutting) or with different cutting edges. In the latter case, a reverse cutting needle should be selected.

Suturing technique:

1. Interrupted interdental suture: provides a close interdental adaptation between the buccal and lingual flaps with equal tension on both units. not recommended when the buccal and lingual flaps are repositioned at different levels. In this technique the needle is passed through the buccal flap from the external surface, across the interdental area and through the lingual flap from the internal surface, or vice versa.

In order to avoid having the suture material between the mucosa and the alveolar bone in the interdental area, an alternative technique in the use of the interrupted interdental suture can be used if the flaps have not been elevated beyond the mucogingival line .With the use of a curved needle the suture is anchored in the

attached tissue on the buccal aspect of the proximal site, the suture brought to the lingual side through the proximal sites, and anchored in the attached tissue on the lingual side. The suture is then brought back to the starting point and tied. Hence, the suture will be lying on the surface of the interdental tissue. keeping the soft tissue flaps in close contact with the underlying bone.

In regenerative procedures, which usually require a coronal advancement of the flap, a modified mattress suture may be used to secure close flap adaptation. The needle is passed through the buccal flap from the external surface, across the interdental area and through the lingual flap from the internal surface. The suture is run back to the buccal side by passing the needle through the lingual and buccal flaps. Thereafter, the suture is brought through the approximal site coronally to the tissue, passed through the loop of the suture on the lingual aspect, and then brought back to the starting point on the buccal side and tied

2. Suspensory suture: used when the surgical procedure involves only the tissue of the buccal or lingual aspect of the teeth. It is also the suture of choice when the buccal and lingual flaps are repositioned at different levels. The needle is passed through the buccal flap from its external surface at the mesial side of the tooth, the suture is placed around the lingual surface of the tooth and the needle is passed through the buccal flap on the distal side of the tooth. The suture is brought back to the starting point via the lingual surface of the tooth and tied. If a lingual flap has been elevated as well, this is secured in the intended position using the same technique. Suturing. Suspensory suture.

3. The continuous suture: is commonly used when flaps involving several teeth are to be repositioned apically. When flaps have been elevated on both sides of the teeth, one flap at a time is secured in its correct position. It is started at the mesial/distal aspect of the buccal flap by passing the needle through the flap and across the interdental area. The suture is laid around the lingual surface of the tooth and returned to the buccal side through the next interdental space. The procedure is repeated tooth by tooth until the distal/mesial end of the flap is reached. Thereafter. the needle is passed through the lingual flap, with the suture laid around the buccal aspect of each tooth and through each interproximal space. When the suturing of the lingual flap is completed and the needle has been brought back to the first interdental area, the positions of the flaps are adjusted and secured in their proper positions by closing the suture Thus, only one knot is needed.

(Periodontal dressings)

Periodontal dressings are mainly used:

1. To protect the wound post-surgically.
2. To maintain close adaptation of the flap to the underlying bone.
3. For the comfort of the patient.

4. To prevent post-operative bleeding.
5. To prevent the formation of excessive granulation tissue.

Periodontal dressing should have the following properties:

1. Soft, but have enough flexibility (to) facilitate its placement in the operated area and to) allow proper adaptation.
2. It should harden within a reasonable time.
3. After setting, the dressing should be sufficiently rigid (to prevent fracture and dislocation.
4. It should have a smooth surface after setting to prevent irritation to the cheeks and lips.
5. It have bactericidal properties (to prevent plaque formation.
6. It must not detrimentally interfere with healing.

types of periodontal dressing:

1. Coe-Pak TM (Coe Laboratories Inc., Chicago, IL, USA), which is supplied in two tubes. One tube contains oxides of various metals (mainly Zinc oxide) and lorothidol (a fungicide). The second tube contains
nonionizing carboxylic acids and chlorothymol (a bacteriostatic agent) Equal parts from both tubes are mixed together immediately prior to insertion). Adding a retarder can prolong the setting time of the dressing. GOCPAICLCS Figure 65: Coe-PakTM (gun type).

2. A light-cured dressing, e.g. Barricaid TM (Dentsply International Inc., Milford, DE, USA), is useful in the anterior region, because it has a esthetic appearance and it can be applied without dislocating the soft tissue. However, it is not the choice of dressing for situations where the flap has to be retained apically, due to its soft state before curing.

3. Cyanoacrylate as liquid or sprayed over the wound surface.

Application technique:

Ensure that bleeding from the operated tissues has ceased before the dressing material is inserted. Dry teeth and soft tissue before the application for optimal adherence of the dressing -Moisten the surgical gloves to avoid the material sticking to the fingertips. When using the Coe-PakTM dressing, the interproximal areas are filled first. Thin rolls of the dressing, adjusted in length to cover the entire field of operation, are then placed against the buccal and lingual surfaces of the teeth. It is forced into the interproximal areas. It is important to ensure that dressing material is never introduced between the flap and the underlying bone or root surface. Excess material is removed With a suitable instrument. The dressing should not cover more than the apical third of the tooth surfaces. Furthermore, interference of the dressing with mucogingival structures (e.g.

vestibular fold, frenula) should be carefully checked to avoid displacement of the dressing during normal function. The light-cured dressing is preferably applied with the supplied syringe, adjusted and then cured by light. Excess can be removed following curing with a knife or finishing burs in a low-speed handpiece.

Post-operative pain control

In order to minimize post-operative pain and discomfort for the patient, surgical handling of the tissues should be as a traumatic as possible. Care should be taken during surgery to avoid tearing of the flaps, to keep the bone moistened, and to secure complete soft tissue coverage of the alveolar bone at suturing. The pain experience is limited to the first days following surgery and controlled with used drugs for pain control. However, it is important to recognize that pain threshold level is subjective and may vary between individuals. It is also important to give the patient information about the post-surgical sequence further, during the early phase of healing; the patient shouid be instructed to avoid chewing in the surgical area.

Post-surgical care

Post-operative plaque control is determining the long-term result of periodontal surgery. It is often associated with pain and discomfort during the immediate post-surgical phase, regularly performed professional tooth cleaning is a more effective means of mechanical infection control following periodontal surgery. In the immediate post-surgical period self-performed rinsing with antiplaque agent, e.g. twice daily rinsing with 0.1-0.2% chlorhexidine solution is recommended. Maintaining good post-surgical wound stability is important factor affecting the outcome of some types of flap surgery. The measures to stabilize the healing wound include (e.g. adequate suturing technique, protection from mechanical trauma to the marginal tissues during the initial healing phase). If a mucoperiosteal flap is replaced rather than repositioned apically, early apical migration of gingival epithelial cells will occur as a consequence of a break between root surface and healing conn tissue. Hence, maintenance of a tight adaptation of the flap to the root surface is essential and one may therefor consider keeping the sutures in place for longer than the 7-10 days usually prescribed following standard flap surgery.
Following suture removal, the surgical area is irrigated with dental spray and the teeth are carefully polished. If the healing is satisfactory, the patient is instructed in gentle brushing of the operated area using a soft toothbrush in hot water.
Toothpicks are prescribed for cleaning the interdental area. Following surgical treatment, the use of interdental brushes is abandoned due to risk of traumatizing the interdental tissues. Visits are scheduled for supportive care at 2-week intervals to monitor the patient's plaque control closely.
By the professional treatment of periodontal disease, the dentist prepares the dentition in such a way that home care can be effectively managed.

At the completion of treatment, the following objectives should have been met.

1-No sub- or supragingival dental deposits.

2-No pathologic pockets (no bleeding on probing to the bottom of the pockets)

3-No plaque – retaining aberrations of gingival morphology.

4- No plaque-retaining parts of restorations in relation to the gingival margin