

# RESECTIVE OSSEOUS SURGERY - I

Dept. Of Periodontology



# LEARNING OBJECTIVES

- To learn about definitions, factors in the selection of techniques, methods of resective osseous surgery, osteoplasty, ostectomy, positive, flat and negative bony architecture, armamentarium and post – operative maintenance.



# CONTENT

- Introduction
- Definitions
- Factors In The Selection Of Resective Osseous Surgery
- Examination And Treatment Planning With Resective Surgery
- Methods Of Osseous Resective Surgery
- Post-operative Maintenance
- Conclusion



- The earlier rationale for osseous surgery was that the bone surface was considered infected or necrotic and had to be removed.
- Many therapists in the late 1800s and early 1900s, advocated gingivectomy surgery with denudation of the radicular and interproximal crestal bone followed by some osseous removal.

- S. Robicsek, G.V. Black, A.D. Black, A. Crane, H. Kaplan, A. Ward and W. Ziesel



- Most of the early pioneers in flap surgery, such as R. Neumann, A. Cieszynski and A. Zentler, also removed bone because its surface was considered necrotic.
- L. Widman, however reshaped the alveolus to facilitate flap replacement, and Neumann also tried to recontour bone to mimic more normal anatomy.

- Gold SI. 1982

- R. Kronfeld (1935) >> proved that the bone was not infected or necrotic and therefore did not need to be removed.
- F.A. Carranza, Sr. >> on the recontouring of bone to facilitate the reduction of pockets by allowing the gingival tissues to follow a more physiological contour.

-Caffesse RG. Resective procedures. In: Proceedings of the World Workshop in Clinical Periodontics. Chicago: American Academy of Periodontology, 1989: IV 1–8.





- Schluger S. 1949 >> outlined the principles of osseous surgery for the purpose of recontouring the bone so that the elimination of the periodontal pocket was predictable and less likely to return over time.
- Schluger and his colleagues, J. Prichard, N. Friedman and C. Ochsenbein, popularized the use of *osseous surgery* in the treatment of periodontitis.
- They pointed out that alveolar bone loss caused by inflammatory periodontal disease often results in an uneven outline of the bone crest.

-Clinical Periodontology And Implant Dentistry; 5<sup>th</sup> Edition; Jan Lindhe, Niklaus Lang, Thorkild Karring.



- 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.

-Clinical Periodontology And Implant Dentistry; 5<sup>th</sup> Edition; Jan Lindhe, Niklaus Lang, Thorkild Karring.



# Osseous surgery

## Additive

Procedures directed at restoring the alveolar bone to its original level

brings about the ideal result of periodontal therapy; it implies regeneration of lost bone, reestablishment of the PDL, gingival fibers, and junctional epithelium at a more coronal level.

## Subtractive

subtractive osseous surgery is designed to restore the form of preexisting alveolar bone to the level existing at the time of surgery or slightly more apical to this level.

### **Definitive:**

Establishes a positive or normal parabolic osseous form

### **Compromised:**

Indicates an osseous topography requiring extensive osseous removal that would be detrimental to the long term prognosis of the tooth.

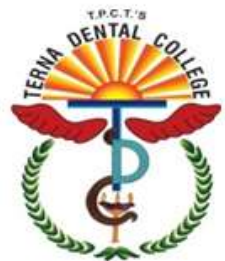


# DEFINITIONS

- **Osseous surgery:** periodontal surgery involving modification of the bony support of the teeth.
- **Osseous surgery** may be defined as the procedure by which changes in the alveolar bone can be accompanied to rid it of deformities induced by the periodontal disease process or other related factors, such as exostosis and tooth supraeruption.

-Glossary of periodontal terms. 3rd edn. Chicago: American Academy of Periodontology, 1992: 34–35.

-Clinical Periodontology ;10<sup>th</sup> Edition ; Newman, Takie, Klokkevold, Carranza.



- Procedures used to correct osseous defects have been classified in two groups:
- **Osteoplasty:** reshaping of the alveolar process to achieve a more physiological form without removal of supporting bone.
- **Ostectomy:** the excision of bone or portion of a bone.  
In periodontics, ostectomy is done to correct or reduce deformities caused by periodontitis in the marginal and intra-alveolar bone and includes the removal of supporting bone.

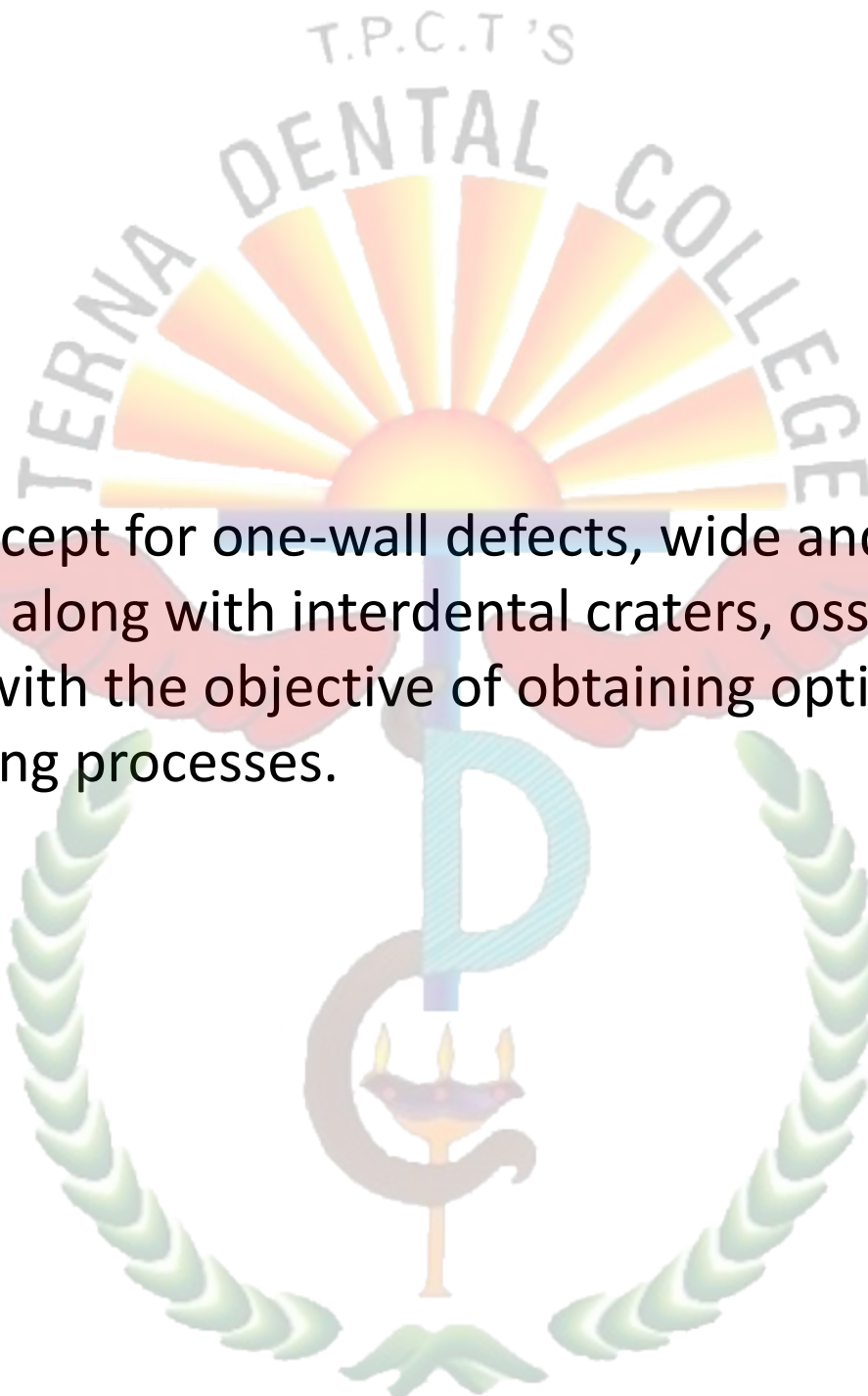
-Glossary of periodontal terms. 3rd edn. Chicago: American Academy of Periodontology, 1992: 34–35.



# Selection Of Treatment Technique

- The morphology of the osseous defect largely determines the treatment technique to be used.
- **One-wall angular defects** usually have to be **recontoured surgically**.
- **Three-wall defects**, particularly if they are narrow and deep, can be successfully treated with techniques that **aim at new attachment and bone regeneration**.
- Two-wall angular defects can be treated with either method, depending on their depth, width, and general configuration.





- Therefore except for one-wall defects, wide and shallow two-wall defects, along with interdental craters, osseous defects are treated with the objective of obtaining optimal repair by natural healing processes.

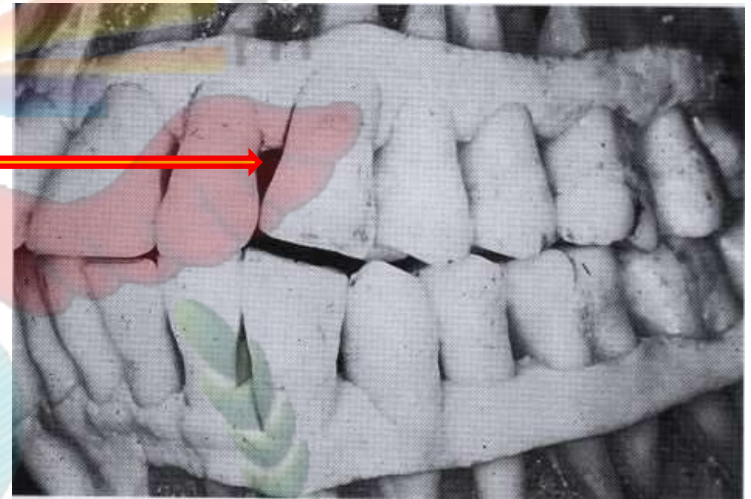




# Osseous topography

- Osseous form is classified based on the interrelationship of the interdental bone to the radicular bone.

- 1) Positive or scalloped: interdental bone higher than the radicular or facial bone.
- 2) Flat: interdental bone and radicular bone at same level.
- 3) Negative or reversed: interdental bone is apical to the radicular bone.



Osseous resective surgery is the most predictable and maintainable pocket reduction technique, and it's the only technique that significantly reduces the destructive bacterial colonies.

-Mombelli et al 1995, Rawlinson et al 1995, Levy et al 1999,2004, Tuan et al 2000

Chevy et al 2002 >> the reduction in pocket depth by surgical means and the associated decrease in reservoirs of periodontal pathogens may be important in achieving sustained periodontal stability...surgery appears to be an important part...to control periodontal infections.



Pocket elimination with osseous surgery results in:

- Fewer probing or bleeding sites  
-Townsend-Olsen 1985, Saxen et al 1990
- The greatest pocket reduction with the least recurrent breakdown  
-Kaldahl et al 1996
- Alteration of subgingival microflora from gram negative anaerobes to gram positive anaerobes.  
-Gunsolley et al 1994, Mobelli et al 1995

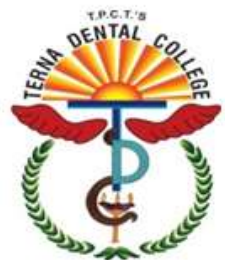


# Factors In The Selection Of Resective Osseous Surgery

- The relationship between the depth and configuration of the bony lesion(s) to root morphology and the adjacent teeth determines the extent that bone and attachment is removed during resection.
- The technique of ostectomy is best applied to patients with **early-to-moderate bone loss (2 to 3 mm)** with **moderate-length root trunks** that have bony defects with one or two walls.

-Ochsenbein C, 1964

- These shallow-to-moderate bony defects can be effectively managed by osteoplasty and osteoectomy.
- Patients with advanced attachment loss and deep intrabony defects are not candidates for resection to produce a positive contour.
- To simulate a normal architectural form, so much bone would have to be removed that the survival of the teeth could be compromised.





- Two-walled defects/craters occur at the expense of the interseptal bone.
- As a result, they have buccal and lingual/palatal walls that extend from one tooth to the adjacent tooth.
- The interdental loss of bone exposes the proximal aspects of both adjacent teeth.
- The buccal lingual interproximal contour that results is opposite to the contour of the cemento-enamel junction of the teeth

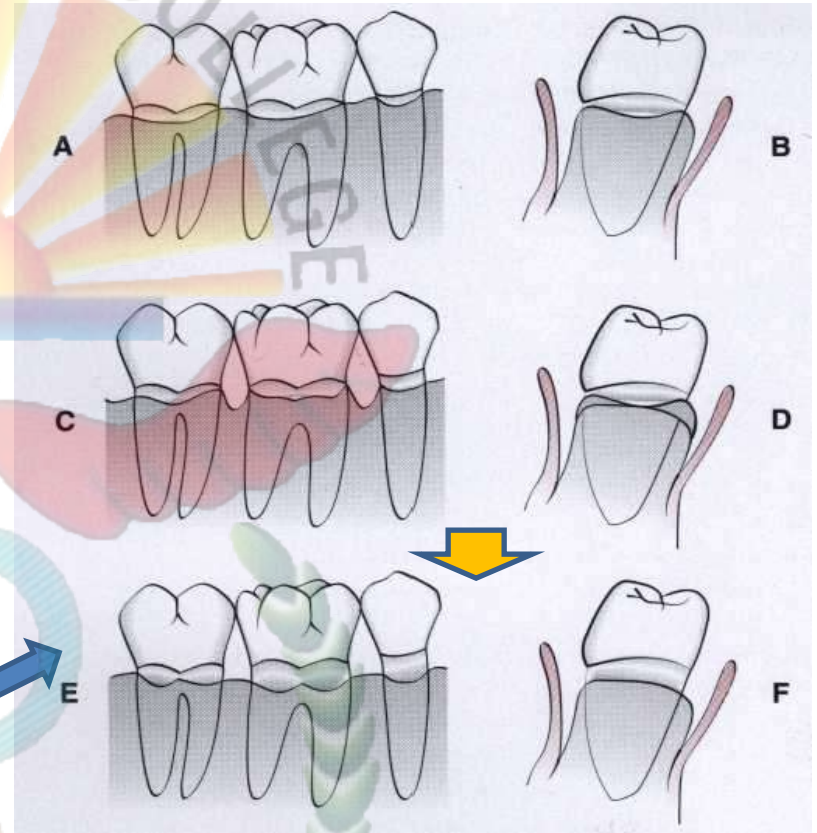


- If the facial and/or lingual plates of this bone are resected, the resultant interproximal contour would become more flattened or ovate.

- However, confining resection only to ledges and the interproximal lesion results in a facial and lingual bone form in which the interproximal bone is located more apically than is the bone on the facial or lingual aspects of the tooth.

- This resulting anatomic form is *reversed or negative architecture*.

-Ochsenbein C: 1986, 1964; Selipsky HS 1976



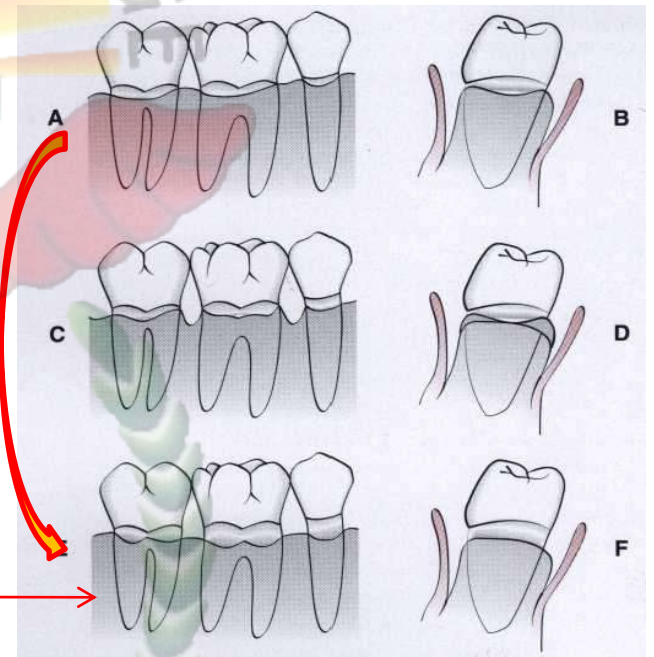
- Although the production of a reversed architecture minimizes the amount of osteotomy that is performed,
- Peaks of bone commonly remain at the facial, lingual/palatal line angles of the teeth >>> **widow's peaks**
- *During healing, the soft tissue* tends to bridge the embrasure from the most coronal height of the bone on one tooth to the most coronal heights on the adjacent teeth.
- The result therefore is the tendency to replicate the attachment contour on the tooth.
- The interproximal soft tissues invest these peaks of bone, which may subsequently resorb with a tendency to rebound without gain in attachment over time.
- A recurrence of interproximal pocket depth can occur.

-Selipsky HS: 1976; Townsend-Olsen C 1985





- Osteotomy to a positive architecture requires the removal of the line angle inconsistencies (widow's peaks), as well as some of the facial, lingual and palatal and interproximal bone.



- The result is a loss of some attachment on the facial and lingual root surfaces but a topography that more closely resembles normal bone form before disease .



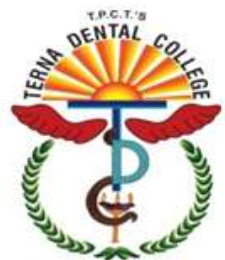
- Proponents of osseous resection to create a positive contour believe that this architecture, devoid of sharp angles and spines, is conducive to the formation of a more uniform and reduced soft tissue dimension postoperatively.

-Ochsenbein C 1986; Schluger S, 1990

- The therapeutic result is less pocket depth and increased ease of periodontal maintenance by the patient, dental hygienist or dentist.



- The amount of attachment lost from the use of ostectomy varies with the depth and configuration of the osseous defects that are treated.
- Osseous resection applied to two-wall intrabony defects (craters), the most common osseous defects, results in attachment loss at the proximal line angles and the facial and lingual aspects of the affected teeth without affecting the base of the pocket.
- Selipsky HS 1976 >>> The extent of attachment loss during resection to a positive architecture has been measured.
- When the technique is properly applied to appropriate patients, the mean reduction in attachment circumferentially around the tooth has been determined to be **0.6 mm at six probing sites.**



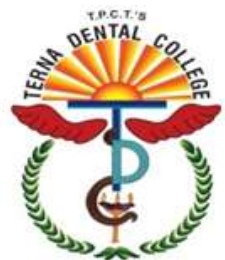
- Practically, this means that the technique is best applied to interproximal lesions **1- to 3-mm deep in patients with moderate to long root trunks.**

-Ochsenbein C: 1986

- Patients with deep, multiwalled defects are not candidates for resective osseous surgery.



- better treated with regenerative therapies or by combining osteoplasty to reduce bony ledges and to facilitate flap closure with new attachment/regeneration procedures.



# EXAMINATION AND TREATMENT PLANNING WITH RESECTIVE SURGERY

- The potential for the use of resective osseous surgery is usually identified during a comprehensive periodontal examination.
- Suitable patients display the signs and symptoms of periodontitis.
- The gingiva may be inflamed and deposits of plaque, calculus, and oral debris may be present.
- An increased flow of crevicular fluid may be detected, and bleeding on probing and exudation are commonly observed.





- Periodontal probing and exploration are key aspects of the examination. Careful probing reveals the presence of

(1) pocket depth greater than that of a normal gingival sulcus,

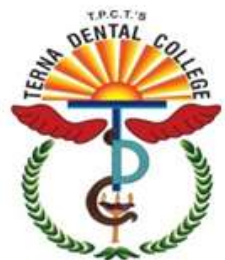
(2) the location of the base of the pocket relative to the mucogingival junction and attachment level on adjacent teeth,

(3) the number of bony walls,

(4) the presence of furcation defects.

Transgingival probing, or *sounding*, under local anesthesia confirms the extent and configuration of the intrabony component of the pocket or of furcation defects .

-Easley J 1967, Kaldahl WB 1996



- Treatment planning should provide solutions for active periodontal diseases and correction of deformities that result from periodontitis, and it should facilitate the performance of other dental procedures included in a comprehensive dental treatment plan.
- The extent of periodontal involvement can vary significantly from tooth to tooth in the same patient.
- The response to therapy from patient to patient may also vary, as may the treatment objectives for the patients.
- Therefore a treatment plan may encompass a number of steps and/or combinations of procedures in the same surgical area.



- After oral hygiene instruction, scaling, and root planing, along with other disease control procedures, the response of the patient to these treatment procedures is evaluated by reexamination and recording the changes that have occurred in the periodontium.
- Because the extent of periodontal involvement can vary significantly from tooth to tooth in the same patient, the local response to therapy is also variable.
- The resolution of inflammation and decrease in edema and swelling may have resulted in a return to normal depth and configuration of some pockets and additional therapy beyond periodic maintenance is not required.



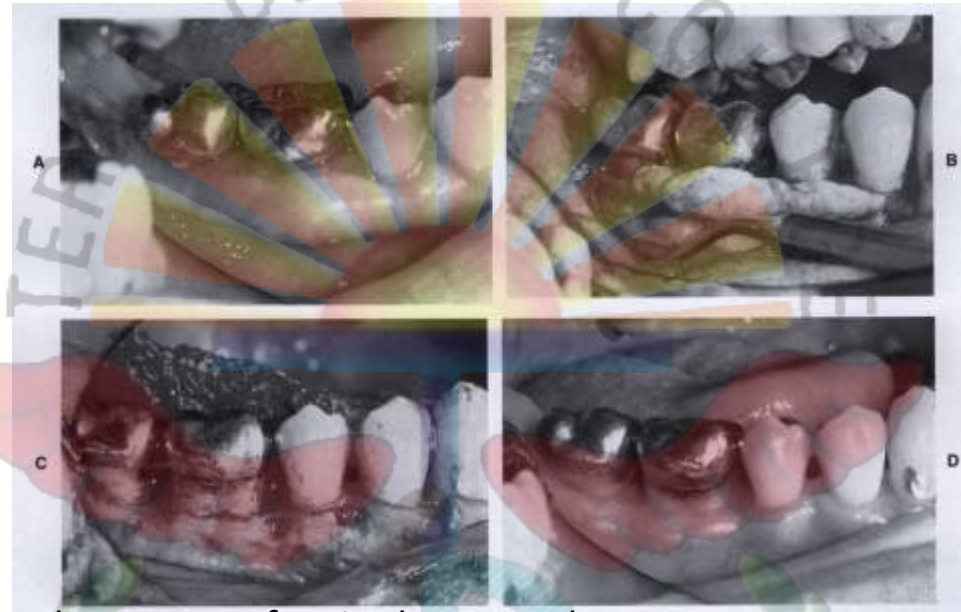
- The patient with moderate to advanced periodontitis and bony defects, although the overt signs of periodontitis may be reduced, may display a persistence of pocket depth bleeding on probing and suppuration.
- These signs may indicate the presence of residual plaque and calculus attributable to the difficulty of instrumentation in these deep pockets or an inability or unwillingness of the patient to perform adequate oral hygiene in these sites.
- Patients with inadequate oral hygiene are not good candidates for periodontal surgery.
- If the supragingival plaque control is good, and the residual pocket depths are **5 mm** or more, such areas may be candidates for periodontal surgery.
- Resective osseous surgery is also used to facilitate certain restorative/prosthetic dental procedures.

-Lindhe J, Socransky S, Nyman S, et al: Critical probing depths in periodontal therapy. J Clin Periodontol 1982; 9:323.





- Dental caries can be exposed for restoration, fractured roots of abutment teeth can be exposed for removal, and bony exostoses and ridge deformities can be altered in contour to improve the performance of removable or fixed prostheses..



Reduction of bony ledges and exposure of caries by osteoplasty.

A, Buccal preoperative photograph showing two crowns, exostoses, and caries.

B, Flap reflected to reveal caries on both molars at the restoration margins, interdental cratering, and a facial exostosis.

C, Postosseous surgery; the bulk of the bony removal was by osteoplasty with minor ostectomy between the two molars. The caries is now exposed and the crowns lengthened for restoration.

D, Six weeks postoperative photograph. The plaque control is deficient but the teeth should be readily restorable at this time.

- Severely decayed teeth or teeth with short anatomic crowns can be lengthened by resection or by a combination of orthodontic tooth extrusion and osseous resection.
- Such procedures allow the therapist to expose more tooth for restoration, prevent an invasion of the biologic width of attachment, and create a periodontal attachment of normal dimension.

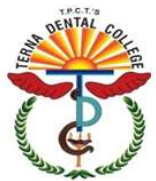
- Garguilo AW 1961; Maynard JG 1979

& producing optimal crown length for cosmetic purposes.



# METHODS OF OSSEOUS RESECTIVE SURGERY

- The reshaping process >> an attempt to gradualize the bone sufficiently to allow soft tissue structures to follow the contour of the bone >> The soft tissue predictably attaches to the bone within certain specific dimensions.
- The length and quality of connective tissue and junctional epithelium that reforms in the surgical site are dependent on numerous factors, including
  - ✓ the health of the tissue,
  - ✓ the condition of the root surface and the topography,
  - ✓ the proximity of the bone surrounding the tooth.
- Each of these factors must be controlled to the best of the clinician's ability to obtain the optimal result, making osseous resective surgery an extremely precise technique.
- For this reason, it is important for the clinician to know about the underlying bone tissue before flap reflection.
- The clinician must gain as much indirect knowledge as possible from soft tissue palpation, radiographic assessment, and transgingival probing, or sounding.



- **Radiographic examination** can reveal the existence of angular bone loss in the interdental spaces; these usually coincide with intrabony pockets.
- The radiograph does not show the number of bony walls of the defect, nor does it determine with any accuracy the presence of angular cone defects on facial or lingual surfaces.
- Clinical examination and **probing** determines the presence and depth of periodontal pockets on any surface of any tooth and can also give a general sense of the bony topography, but intrabony pockets can go undetected by probing.
- Both clinical and radiographic examinations can indicate the presence of intrabony pockets when
  - (1) angular boneloss,
  - (2) irregular bone loss, or
  - (3) pockets of irregular depth in adjacent areas of the same tooth or adjacent teeth are found.

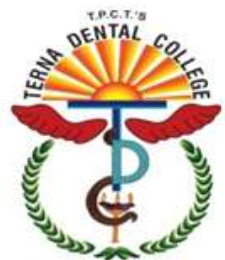


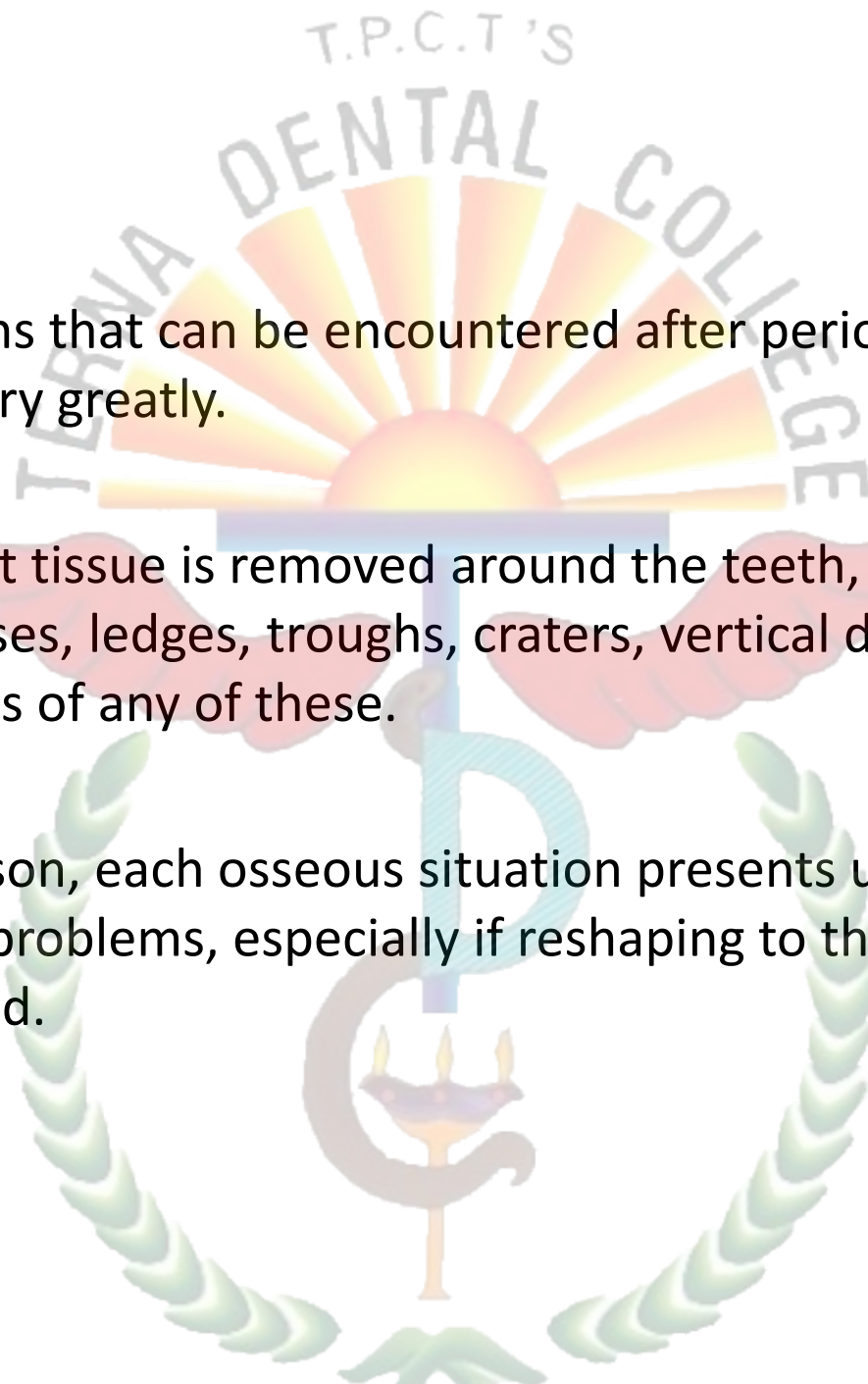


- The use of transgingival probing to predict many features of the underlying bony topography.
- The information thus obtained can change the treatment plan.
- For example, an area that had been selected for osseous resective surgery may be found to have a narrow defect that was unnoticed in the initial probing and radiographic assessment and is ideal for augmentation procedures.
- Such findings can and do change the flap design, osseous procedure, and results expected from the surgical intervention.

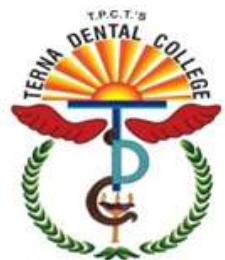


- Transgingival probing is extremely useful just before flap reflection.
- It is necessary to anesthetize the tissue locally before inserting the probe.
- The probe should be "walked" along the tissue-tooth interface so that the operator can feel the bony topography.
- The probe may also be passed horizontally through the tissue to provide three-dimensional information regarding bony contours (i.e., thickness, height, and shape of the underlying base).
- It must be remembered, however, that this information is still "blind," and although it is undoubtedly better than probing alone.
- Nevertheless, this step is recommended immediately before the surgical intervention.





- The situations that can be encountered after periodontal flap reflection vary greatly.
- When all soft tissue is removed around the teeth, there may be larger exostoses, ledges, troughs, craters, vertical defects, or combinations of any of these.
- For this reason, each osseous situation presents uniquely challenging problems, especially if reshaping to the optimal level is contemplated.



# CONCLUSION

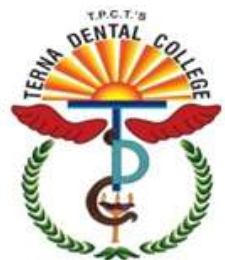
- Osseous resective surgery necessitates following certain guidelines for proper recontouring of the alveolar bone and proper management and positioning of the gingival tissues.
- The results from osseous resective surgery are technique sensitive.
- Osseous resective surgery has been and remains one of the principal periodontal treatment modalities because of its proven success.





# TAKE HOME MESSAGE

- Resective Osseous Surgery is particularly useful in the management of osseous defects, 1 wall and 2 wall defects, ledges and tori.
- Osteotomy and osteoplasty can help correct osseous anomalies and increase clinical crown heights.



# PROBABLY ASK SAQ's AND LAQ's

- Define Osseous Resective Technique.
- Write about Osteoplasty and Ostectomy
- Give indications and contraindications of osseous resection
- What are the steps in osseous resection techniques
- What is the armamentarium used in osseous resection
- What is positive, negative and flat bony architecture
- What is the treatment for bony defects
- What are 1- wall/2 – wall and 3 wall bony defects

