

A close-up photograph of a human eye. The iris is a vibrant rainbow color, transitioning from purple at the top to red, orange, yellow, green, and blue. A white contact lens is visible in the center of the eye. The eyelashes are dark and long. The background is a soft, out-of-focus skin tone.

PROGNOSIS

An art of clinical forecasting

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What is prognosis?

- Prognosis is a prediction of the probable course, duration and outcome of a disease based on a general knowledge of the pathogenesis of the disease and the presence of risk factors for the disease.
- Prognosis is established after the diagnosis is made and before the treatment plan is established.



Prognosis and Risk

risk.
is it in
you?



As a part...or Whole?

Prognosis can be divided into:

- overall prognosis
- individual tooth prognosis
- The overall prognosis answers the following questions:
 - Should the treatment be undertaken?
 - Is the treatment likely to succeed?
 - When prosthetic replacements are needed, are the remaining teeth able to support the added burden of the prosthesis?
- The individual tooth prognosis is determined after the overall prognosis and is affected by it (McGuire : Prognosis versus actual outcome , JOP 1991)



Factors to Consider When Determining Prognosis

- **Overall Clinical Factors:**

- Patients age
- Plaque control
- Patients Compliance

- **Systemic and environmental Factors**

- Smoking
- Systemic disease or Condition
- Genetic factors
- Stress

- **Local Factors:**

- ✓ Plaque and calculus
- ✓ Subgingival restorations

Anatomical factors

- ✓ Short, tapered roots
- ✓ Cervical enamel projections
- ✓ Enamel pearls
- ✓ Bifurcation ridges
- ✓ Root concavities
- ✓ Developmental grooves
- ✓ Root proximity
- ✓ Furcation involvement

Tooth mobility

Prosthetic and restorative factors

- ✓ Abutment selection
- ✓ Caries
- ✓ Non vital teeth
- ✓ Root resorption



Factors affecting overall tooth prognosis

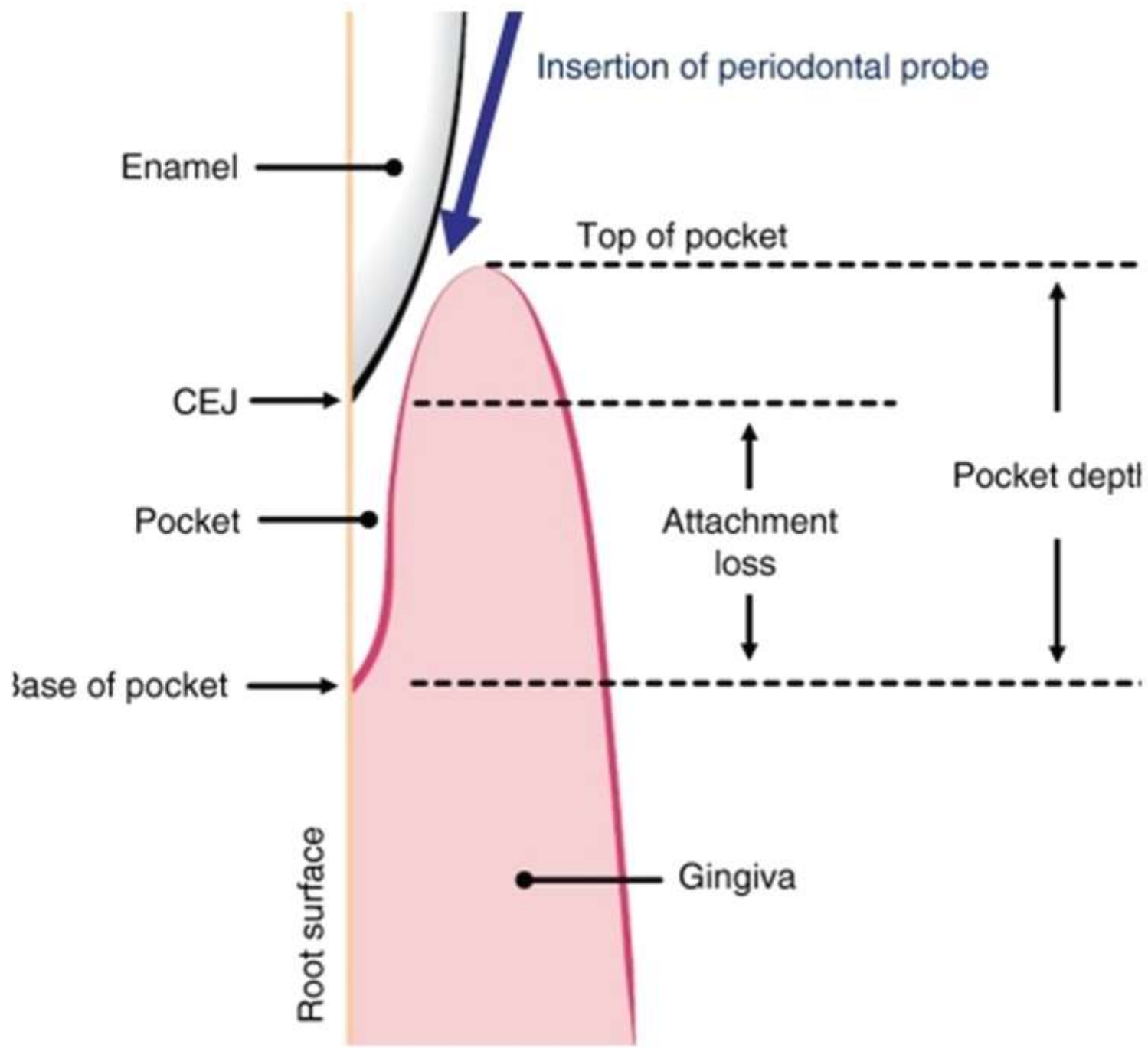
Age



- For two patients with comparable levels of remaining connective tissue attachment and alveolar bone, the **prognosis is generally better in the older** of the two.
- Younger patients may have aggressive periodontitis.
- Although the younger patient would ordinarily be expected to have a greater reparative capacity, the occurrence of so much destruction in a relatively short period would exceed any naturally occurring periodontal repair.

Disease Severity

- Patient's history of **previous periodontal disease** may be indicative of their susceptibility for future periodontal breakdown.
- Pocket depth is less important than level of attachment, because it is not necessarily related to bone loss.
- Prognosis is adversely affected if the base of the pocket (level of attachment) is close to the root apex.



- The prognosis also can be related to the **height of remaining bone**.
- The prognosis for horizontal bone loss depends on the height of the existing bone, because it is unlikely that clinically significant bone height regeneration will be induced by therapy.
- In the case of angular, intrabony defects, if the contour of the existing bone and the number of osseous walls are favorable, there is an excellent chance that therapy could regenerate bone to approximately the level of the alveolar crest

Various Bone Destructive Patterns In Periodontal Disease

(i) Horizontal bone loss



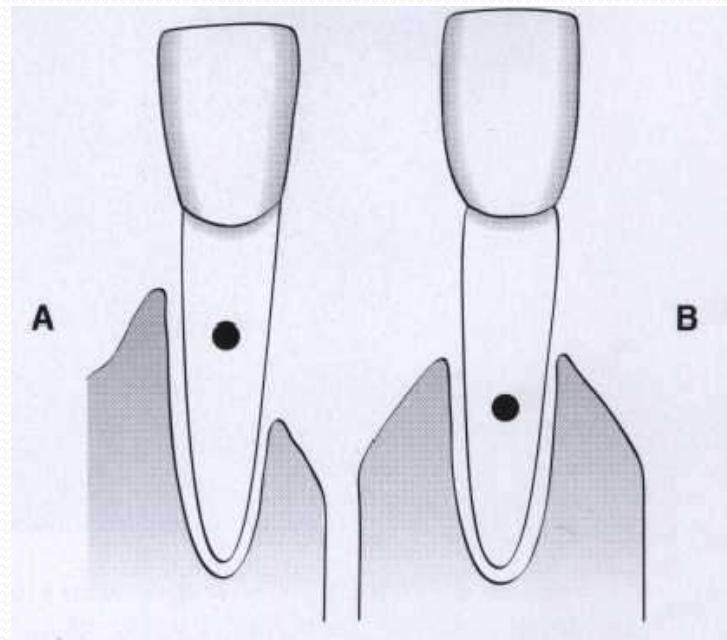
Fig. 24.2: Radiographic illustration of horizontal bone loss

(ii) Vertical/angular defects

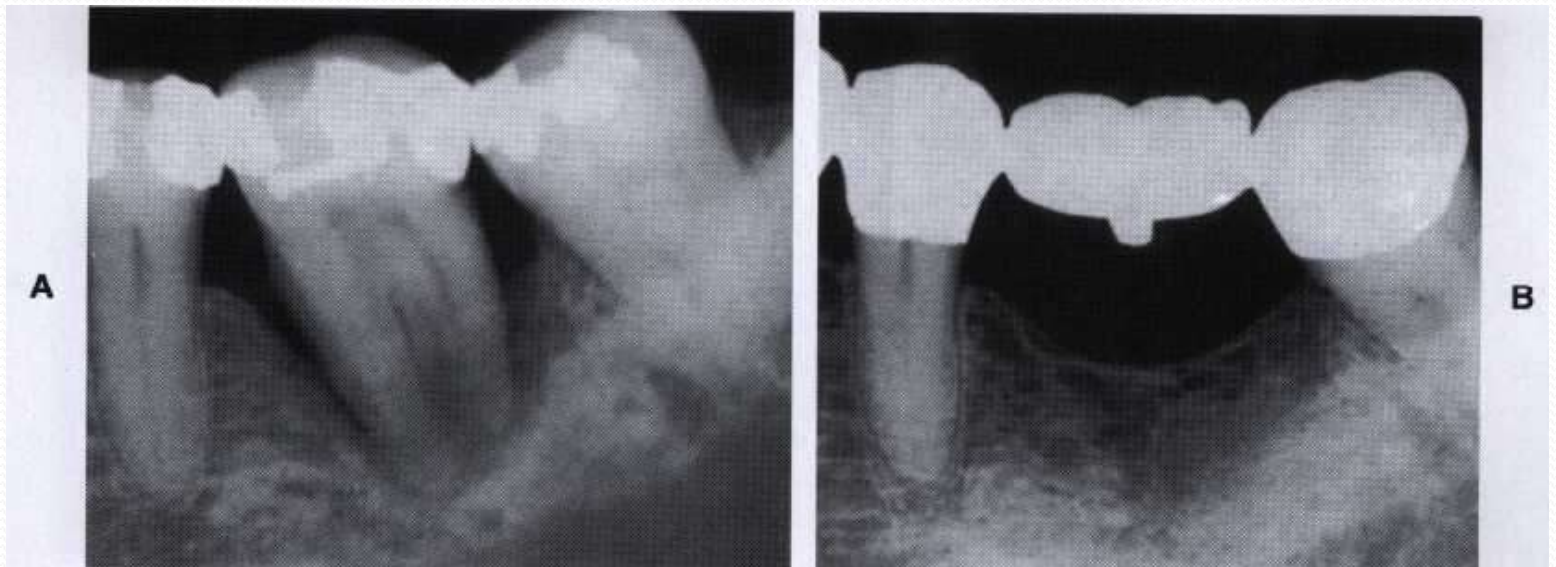


Fig. 24.3: Vertical bone defect in relation to lower first molar

- When greater bone loss has occurred on one surface of a tooth, the bone height on the less involved surfaces should be taken into consideration when determining the prognosis.



- In dealing with a tooth with a questionable prognosis, the chances of successful treatment should be weighed against any benefits that would accrue to the adjacent teeth if the tooth under consideration were extracted.



Plaque Control.

- Bacterial plaque is the primary etiologic factor associated with periodontal disease.
- Therefore effective removal of plaque on a daily basis by the patient is critical to the success of periodontal therapy and to the prognosis.

Systemic Diseases



Prevalence and severity of periodontitis is higher in patient with systemic disorders like

- **Diabetes**
- **hyper parathyroidism**
- **nutritional deficiency. (calcium and vitamin C)**
- **Incapacitating conditions like parkinson's disease adversely affects the prognosis.(Newer automated oral hygiene devices are useful for these patients to improve prognosis.)**
- **Any condition that causes a suppression of the host defenses also can predispose to periodontal disease eg: HIV/AIDS, neutrophil defects and similar patients.**
- **Systemic conditions should definitely be considered for prognosis.**

Smoking



- Patients who smoke do not respond well to conventional therapy.

✱Bolin Aeklund et al – 1993, Dental Journal).

- Patients (smokers) with slight to moderate periodontitis have fair to poor prognosis. Patients (smokers) with severe periodontitis have poor to hopeless prognosis

✱.(Mcguire and Nunn,Prognosis versus actual outcome,JOP 1991)

- Heavy smokers were almost three times more likely to lose teeth after periodontal therapy than non-smokers

✱.(Haffajee, Socransky:Relationship of cigarette smoking to attachment level profiles,JCP 2001)

- Smoking increases the attachment loss in the maxillary palatal and mandibular anterior regions.

✠ Studies by McGuire and Nunn



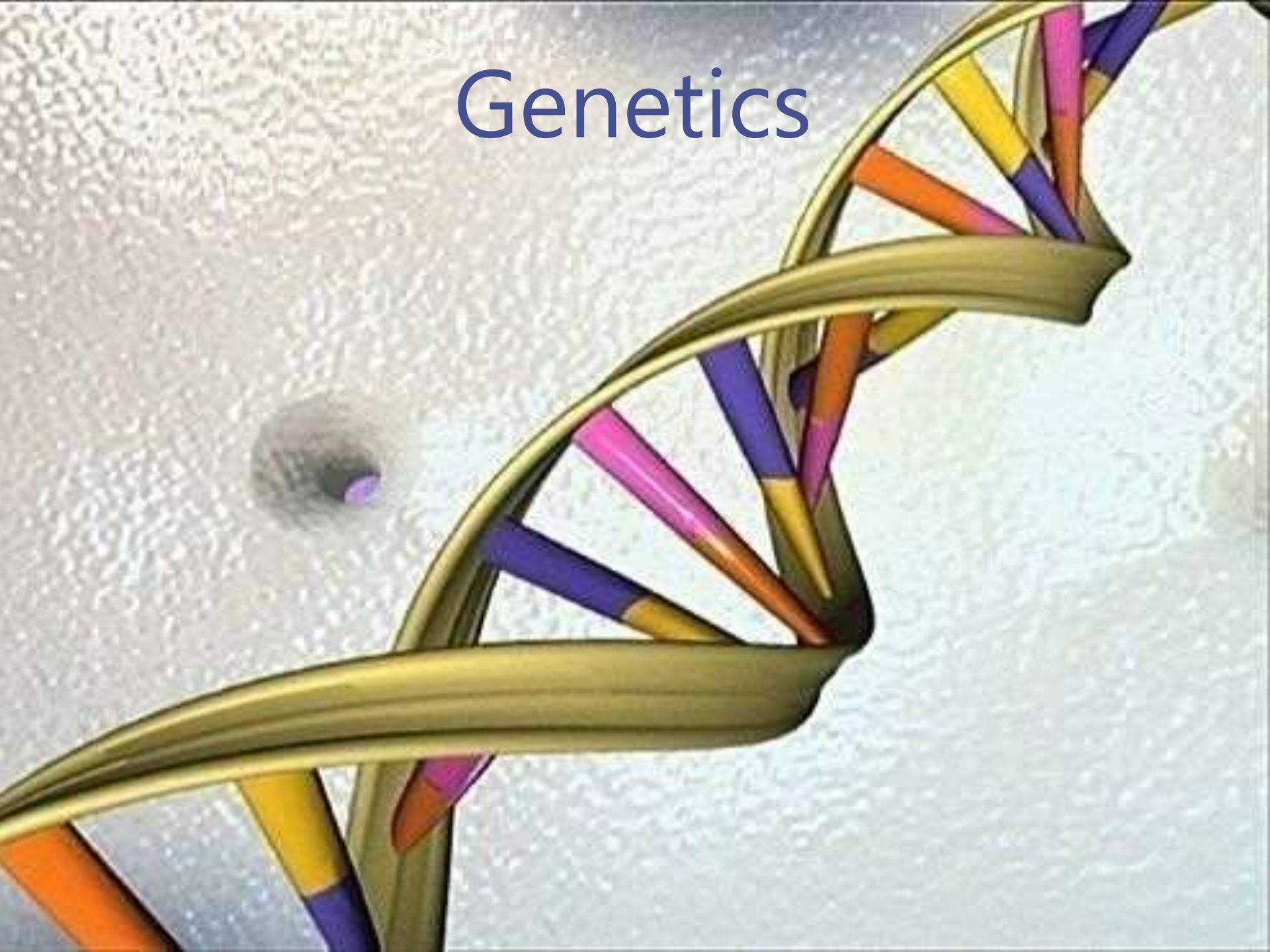
- Smoking decreased the likelihood of an improved prognosis after treatment by 60%.

✠ Packhill and colleagues (2006)

Patient compliance

- Prognosis critically depends on **patient's attitude**, desire to retain natural teeth and ability to maintain good oral hygiene.
- If the patients are unwilling or unable to perform adequate plaque control and to receive the timely periodontal maintenance checkups and treatments that the dentist deems necessary, the dentist can:
 1. **Refuse** to accept the patient for treatment.
 2. **Extract teeth that have hopeless or poor prognosis and perform scaling and root planning on the remaining teeth.** The dentist should make it clear to the patient and in the patients record that further treatment is needed but will not be performed due to lack of patient co-operation

Genetics



- Bacteria initiate a response which was modified by a combination of genetic and acquired factors.
- Genetic polymorphism in IL-1 gene that code for the production of proinflammatory cytokine IL-1 β , which has been associated with significant risk for severe, generalized chronic periodontitis.
- The presence of this genotype results in the individual's macrophages producing more of the proinflammatory cytokine IL-1 when stimulated by agents such as lipopolysaccharide from gram negative bacteria

**Kornman and colleagues
(1997)**

- Individuals possessing this IL-1 gene polymorphisms are about 2.7 times more likely to lose teeth than those without the genotype. The risk is increased by 7.7 fold in genotype positive individuals who are also long time heavy smokers. The genotype is acting as an effect modifier and the nature of the interaction is multiplicative rather than additive
- Studies showing IL-1 to be positively associated with bone loss and disease progression.

Masada and colleagues, 1990;
Stashenko and colleagues, 1991;
Wilton and colleagues, 1992;
Feldner and colleagues, 1994.

- Showed a direct increased crevicular fluid level and more severe bone loss.

Cavanaugh and colleagues 1998

- Although the regenerated tissue was stable over 4 years in IL- 1 negative patients, the IL-1 positive patients lost up to 70% of the regenerated tissue.

Desanctis and Zuchelli(1999)

- **IL-1 positive patients are more likely to have a high frequency of bleeding on probing.** } **Lang and colleagues(2000)**
- **IL-1 positive subjects had a higher mean count of periodontal pathogens than IL-1 negative subjects.** } **Socransky and colleagues(2000)**
- **Genetic Polymorphisms and Smoking appear to be synergistic prognostic risk factors.** } **Kornman(1997, 2000); Hart and Kornman (1997); McGuire and Nunn(1999); Meisel and colleagues(2004);Neiri and colleagues (2002)**

Stress

A man in a dark suit is seen from behind, standing in an office. He is holding a brown briefcase in his right hand and has his left hand resting on a dark wooden desk. A plume of white smoke or steam is rising from the top of his head, symbolizing stress. The background is a plain, light-colored wall with a framed picture on the right.

- Stress may alter patient's ability to respond to periodontal treatment. This factor have to be realistically faced in attempting to establish prognosis.

Factors affecting individual tooth prognosis



Local Factors

Plaque/Calculus.

- The microbial challenge presented by bacterial plaque and calculus is the most important local factor in periodontal diseases.
- Therefore in most cases, having a good prognosis is dependent on the ability of the patient and the clinician to remove these etiologic factors

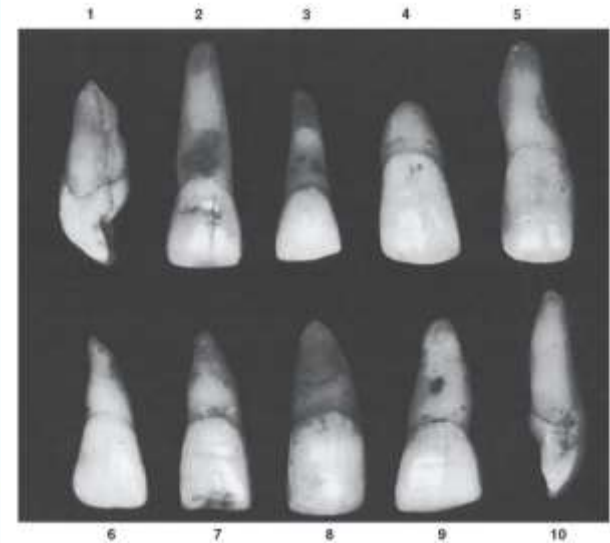
Subgingival Restorations

- Subgingival margins may contribute to increased plaque accumulation, increased inflammation, and increased bone loss when compared with supragingival margins. (Bjorn Grkovic et al , 1969,Newcomb, 1974)
- A tooth with a discrepancy in its subgingival margins has a poorer prognosis than a tooth with well contoured supragingival margins.

Anatomical factors

a. Short tapered Roots

- Prognosis poor for teeth with short, tapered roots and relatively large crowns.
- Because of the disproportionate crown to root ratio and the reduced root surface available for periodontal support, the periodontium may be more susceptible to injury by occlusal forces. (Kay, Forscher, Sackett, 1954)



b. Developmental grooves

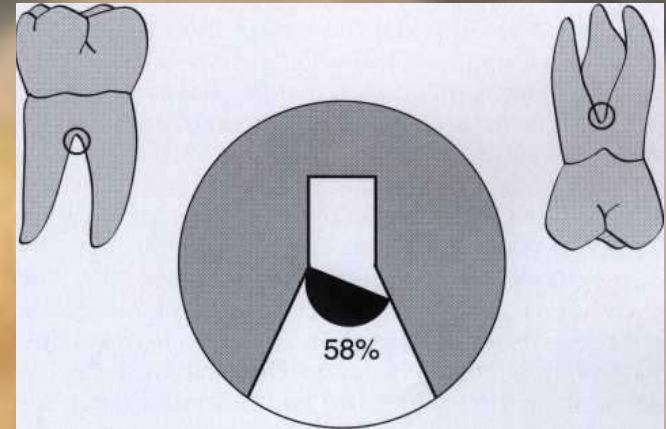


- **Developmental grooves** which sometimes appear in the maxillary lateral incisor (palatogingival groove) or in the lower incisors, create an accessibility problem. (5.6% maxillary lateral incisors and 3.4% maxillary central incisor)

(Everett, Kramer, The distolingual groove in the maxillary lateral incisors, JOP 1972)

- They initiate on the enamel and can extend a significant distance on the root surface, providing a plaque-retentive area that is difficult to instrument.
- Similarly root proximity can result in the interproximal areas that are difficult for the clinician and the patient to access.

c. Furcation Areas

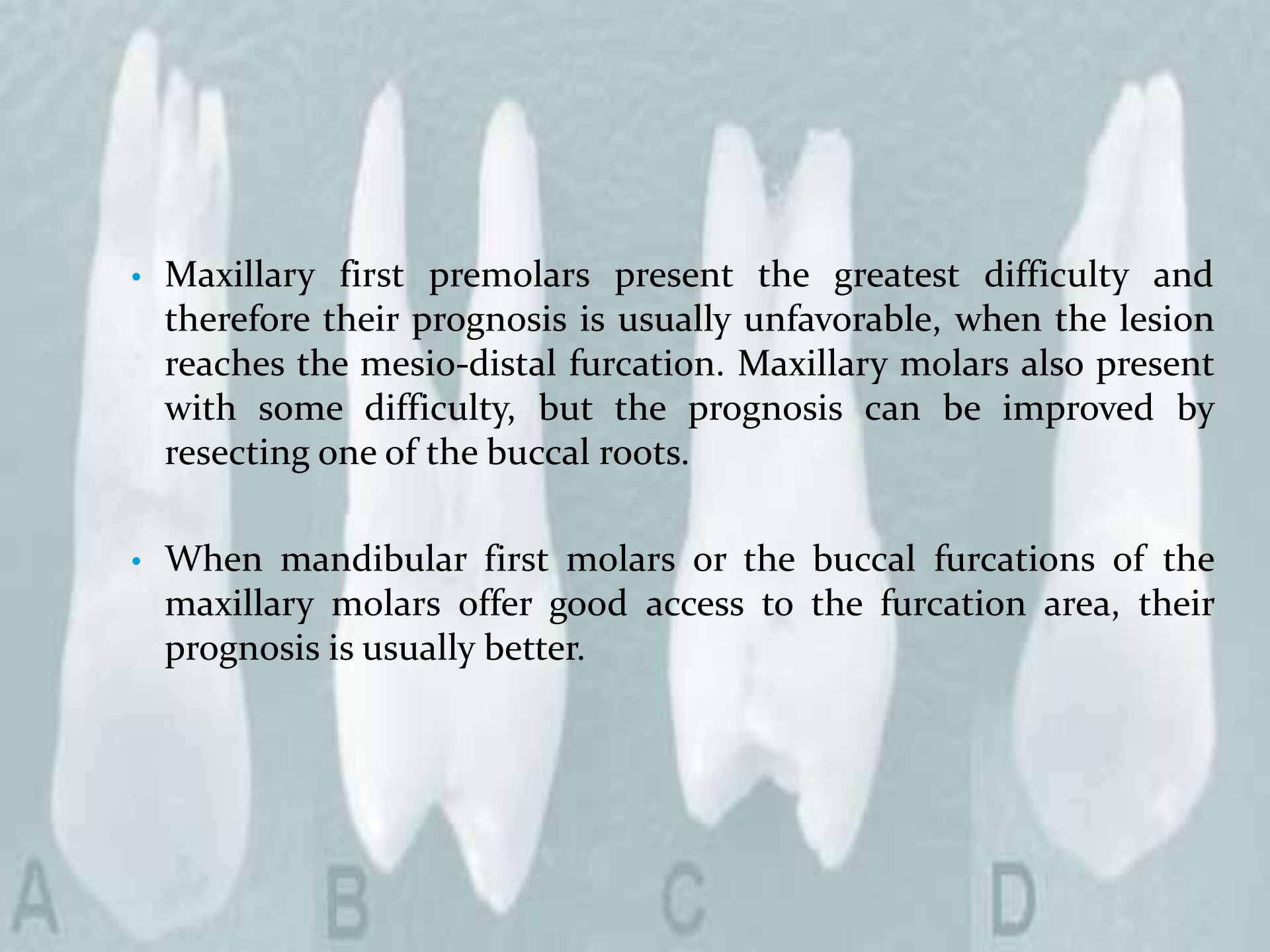


- **Factors that should be considered are:**

- Extent of furcation involvement
- Status of bone support
- Angulation of root spread

Access to the furcation area is usually difficult to obtain.

In 58% of the maxillary and mandibular first molars, the furcation entrance diameter is narrower than the width of a conventional periodontal curette. (Bower RC, JOP 1979)

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- The image displays four dental teeth, labeled A, B, C, and D, against a light blue background. Each tooth is shown from a lingual perspective. Tooth A is a maxillary first premolar with a single root. Tooth B is a maxillary molar with two roots, one buccal and one lingual. Tooth C is a mandibular first molar with a single root. Tooth D is a maxillary molar with two roots, one buccal and one lingual, similar to B but with a different root morphology. The text overlaid on the image discusses the prognosis of these teeth based on furcation access.
- Maxillary first premolars present the greatest difficulty and therefore their prognosis is usually unfavorable, when the lesion reaches the mesio-distal furcation. Maxillary molars also present with some difficulty, but the prognosis can be improved by resecting one of the buccal roots.
 - When mandibular first molars or the buccal furcations of the maxillary molars offer good access to the furcation area, their prognosis is usually better.

d. Cervical enamel projections



- Cervical enamel projections are flat, ectopic extensions of enamel that extend beyond the normal contours of the cementoenamel junction(Masters, Hoskins: Projection of cervical enamel into molar furcations, JOP 1964)
- CEP's extend into furcation of 28.6% of mandibular molars and 17% of maxillary molars
- They most likely found on the buccal surfaces of maxillary second molars.(Grewe, Meskin, Miller : Cervical enamel projections: prevalence, location and extent, with associated periodontal implications, JOP 1965)
- Cervical enamel projections on the root surface interfere with the attachment apparatus and may prevent regenerative procedures from achieving their maximum potential. Therefore their presence may have a negative effect on the prognosis for an individual tooth.

e. Enamel pearls



- Enamel pearls are larger, round deposits of enamel that can be located in the furcations or other areas on the root surface. (Moskow, Canut, 1990)
- Enamel pearls are seen less frequently than cervical enamel projections. i.e 1.1% - 5.7% of permanent molars: 75% occurring in the maxillary third molars.)

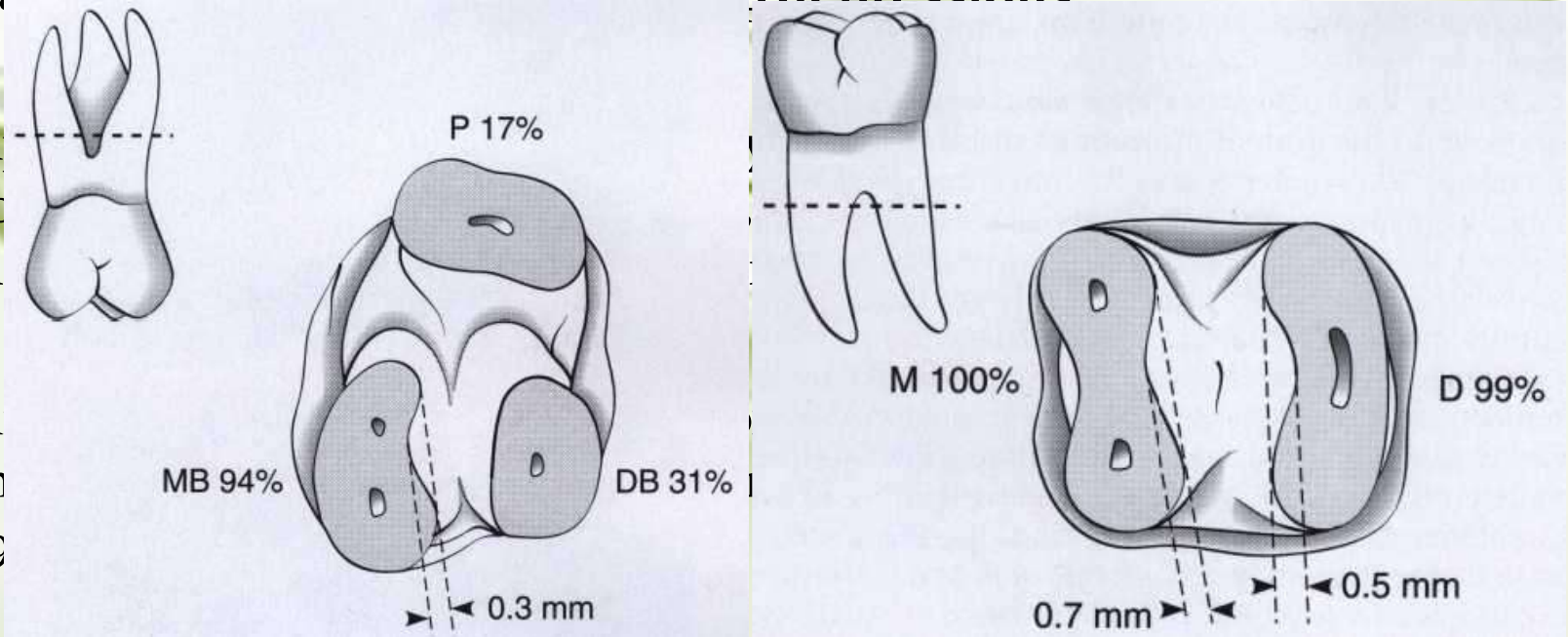
f. Bifurcation Ridges

- An intermediate bifurcation ridge has been described in 73% of the mandibular first molars, crossing from mesial to distal root at the midpoint of the furcation.(Everett, Jump, Holder et al, J Dent Res 1958)

g. Root Concavities

- Vary from shallow **flutings** to **deep depressions**

- A
rc
fi



- A
m
19

- Although these concavities increase the attachment area and produce a root shape that may be more resistant to torquing forces, they also create areas that can be difficult for both the dentist and the patient to clean.

8.Mobility



The principal causes of tooth mobility are,

- Loss of alveolar bone
- Inflammatory changes in periodontal ligament
- Trauma from occlusion

- Tooth mobility caused by inflammation and trauma from occlusion may be correctable. } Morris: the diagnosis, prognosis and treatment of loose tooth, Oral Surg 1953)0
- pockets on clinically mobile teeth do not respond as well to periodontal therapy as pockets on non-mobile teeth exhibiting the same initial disease severity } Flezar, Knowles and Morrison, Tooth mobility and periodontal therapy, JCP 1980)
- Another study , in which ideal plaque control was maintained, found similar healing in both hypermobile and firm teeth. } Rosling, Nyman, Lindhe, JCP 1976)
- anything that increases mobility decreases prognosis } Nieri and colleagues(2002)

The stabilization of tooth mobility through the use of splinting may have a beneficial impact on the overall and individual tooth prognosis.

(Teeth with 4 – 5mm remaining bone or grade 3 mobility have a doubtful prognosis.)

9. Prosthetic and restorative factors

- The overall prognosis requires a general consideration of the bone levels (evaluated radiographically) and attachment levels determined clinically to establish whether enough teeth can be saved either to provide a functional and aesthetic dentition or to serve as abutments for a useful prosthetic replacement of the missing teeth.
- The overall prognosis and the individual tooth prognosis overlap because the prognosis for the key individual teeth may affect the overall prognosis for prosthetic rehabilitation. When a few teeth remain, the prosthodontic needs become more important and sometimes periodontally treatable teeth may have to be extracted if they are not compatible with the design of the prosthesis.

10. Tooth adjacent to edentulous area

Teeth that serve as abutments are subjected to increased functional demand. More rigid standards are required when evaluating prognosis of teeth adjacent to edentulous area.



12. Caries, Non-vital teeth, Tooth resorption



- In teeth with extensive caries, feasibility of adequate endodontic therapy should be considered before undertaking periodontal therapy.
- Root resorption (idiopathic/orthodontic) jeopardizes stability of teeth and adversely affects the response to periodontal treatment.
- Periodontal prognosis of treated non-vital teeth is no different from vital teeth. New attachment can occur in cementum of both non-vital and vital teeth.

Clinical applications- Types of prognosis.
.....how to differentiate



Adapted from McGuire and Nunn- Prognosis versus actual outcome, JOP 1991

- **Excellent prognosis:**
 - No bone loss
 - Excellent gingival condition
 - Good patient cooperation
 - No systemic / environmental factors
- **Good prognosis:**
 - Adequate remaining bone support
 - Adequate possibilities to control etiologic factors and establish a maintainable dentition
 - Adequate patient cooperation
 - No systemic / environmental factors or if systemic factors are present, they are well controlled

- **Fair prognosis:**

- Less than adequate remaining bone support
- Some tooth mobility
- Grade I furcation involvement
- Adequate maintenance possible
- Acceptable patient cooperation
- Presence of limited systemic / environmental factors

- **Poor prognosis:**

- Moderate-to-advanced bone loss
- Tooth mobility
- Grade I and II furcation involvements
- Difficult-to-maintain areas and/or doubtful patient cooperation
- Presence of systemic / environmental factors

- **Questionable prognosis:**

- Advanced bone loss
- Grade II and III furcation involvements
- Tooth mobility
- Inaccessible areas
- Presence of systemic / environmental factors

- **Hopeless prognosis:**

- Advanced bone loss
- Non-maintainable areas
- Extraction indicated
- Presence of uncontrolled systemic / environmental factors.

- Excellent, good and hopeless prognoses are the only prognoses that can be established with a reasonable degree of accuracy.

- Fair, poor and even questionable prognosis depends on a large number of factors that can interact in an unpredictable number of ways. In many of these cases, it may be advisable to establish a **provisional prognosis** until phase I therapy is completed and evaluated.

Conclusion

- Periodontal prognosis, a fascinating aspect of periodontal therapy, requires experience and judgement as well as a keen attention to meticulous detail.
- The fate of the dentition sometimes rests on the decision of the therapist. Patients almost always ask for reassurance on the chances of retaining natural teeth and usually express their questions in the form of an expressed doubt on the advisability of proceeding with therapy.
- There are no reliable algorithms for prognosis , so clinicians must use their clinical judgment. Constant reviewing of the results of treatment coupled with detailed documentation of the periodontal status will sharpen the clinicians acumen for accurate assessment of prognosis.
- Needless to say, the determination of prognosis is a vital and essential step in periodontal treatment planning.

THANK

YOU