# Determination of prognosis

## Definitions

**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. It is established **after** the diagnosis is made and **before** the treatment plan is established.

**Prognosis is often confused with the term risk.**

**Risk** generally deals with the probability that an individual will develop a disease in a specified period.

**Risk factors** are characteristics that put an individual at increased risk for developing a disease.

**Prognostic factors** are characteristics that predict the outcome once the disease is present.

In some cases, risk factors and prognostic factors are the same. For example, patients with diabetes or patients who smoke are more at risk for acquiring periodontal disease, and once they have it, they generally have a worse prognosis.

## TYPES OF PROGNOSIS

**Prognosis classification have been designed based on tooth mortality**

**Excellent prognosis** No bone loss, excellent gingival condition, good patient cooperation, no systemic environmental factors.

**Good prognosis:** Control of etiologic factors and adequate periodontal support ensure the tooth will be easy to maintain by the patient and clinician.

**Fair prognosis:** Approximately 25% attachment loss or grade I furcation invasion (location and depth allow proper maintenance with good patient compliance).

**Poor prognosis:** 50% attachment loss, grade II furcation invasion (location and depth make maintenance possible but difficult).

**Questionable prognosis:** >50% attachment loss, poor crown-to root ratio, poor root form, grade II furcation invasion (location and depth make access difficult) or grade III furcation invasion; mobility no. 2 or no. 3; root proximity.

**Hopeless prognosis**: Inadequate attachment to maintain health, comfort, and function.

**Kwok and Caton proposed a scheme based on "the probability of obtaining**

**stability of the periodontal supporting apparatus:-**

**Favorable prognosis:** Comprehensive periodontal treatment and maintenance will stabilize the status of the tooth. Future loss of periodontal support is unlikely.

**Questionable prognosis:** Local or systemic factors influencing the periodontal status of the tooth may or may not be controllable. If controlled, the periodontal status can be stabilized with comprehensive periodontal treatment. If not, future periodontal breakdown may occur.

**Unfavorable prognosis:** Local or systemic factors influencing the periodontal status cannot be controlled. Comprehensive periodontal treatment and maintenance are unlikely to prevent future periodontal breakdown.

**Hopeless prognosis:** The tooth must be extracted.

**Overall Versus Individual Tooth Prognosis**

Prognosis can be divided into overall prognosis and individual tooth prognosis.

**The overall prognosis** is concerned with the dentition as a whole.

**Factors that may influence the overall prognosis include** patient age; current severity of disease; systemic factors; smoking; the presence of biofilm, calculus, and other local factors; patient compliance; and prosthetic possibilities.

**The individual tooth prognosis** is determined after the overall prognosis and is affected by it. For example, in a patient with a poor overall prognosis, the dentist likely would not attempt to retain a tooth that has a questionable prognosis because of local conditions.

## Factors to Consider When Determining a Prognosis

### Overall Clinical Factors

- ☒ Patient age
- ☒ Disease severity
- ☒ Biofilm control
- ☒ Patient compliance

### Systemic and Environmental Factors

- ☒ Smoking
- ☒ Systemic disease or condition
- ☒ Genetic factors
- ☒ Stress

### Local Factors

- ☒ Biofilm and calculus
- ☒ Subgingival restorations

### Anatomic Factors

- ☒ Short, tapered roots
- ☒ Cervical enamel projections
- ☒ Enamel pearls
- ☒ Root concavities
- ☒ Developmental grooves
- ☒ Root proximity
- ☒ Furcation invasion
- ☒ Tooth mobility
- ☒ Caries
- ☒ Tooth vitality
- ☒ Root resorption

### Prosthetic and Restorative Factors

- ☒ Abutment selection

## Factors in Determination of Prognosis

### Overall Clinical Factors

### Patient Age

For two patients with comparable levels of remaining connective tissue attachment and alveolar bone, the prognosis is generally **better** for the older of the two. For the younger patient, the prognosis is not as good because of the shorter time frame in which the periodontal destruction has occurred; the younger patient may have an aggressive type of periodontitis, or disease progression may have increased because of systemic disease or smoking.

### Disease Severity

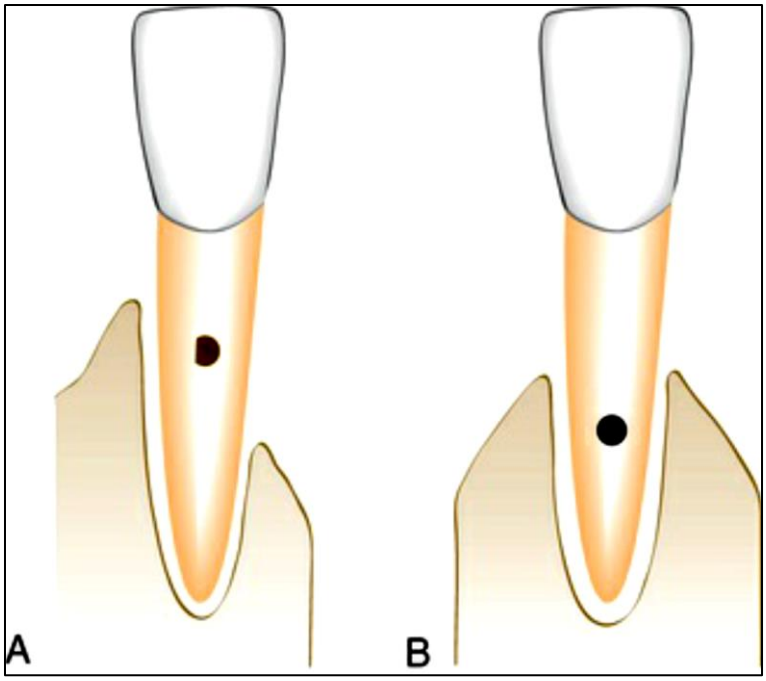
Studies have demonstrated that a patient's history of previous periodontal disease may be indicative of their susceptibility to future periodontal breakdown. Therefore the following variables should be carefully recorded because they are important in determining the patient's past history of periodontal disease: probing pocket depth, level of attachment, amount of bone loss, and type of bony defect. These factors are determined by clinical and radiographic evaluation.

Determining clinical attachment loss reveals the approximate extent of root surface that is devoid of periodontal ligament.

Probing pocket depth is **less** important than level of attachment. In general, a tooth with **deep probing depths and little attachment and bone loss** has a better prognosis than one with **shallow pockets and severe attachment and bone loss**.

The type of defect also must be determined. The prognosis for **horizontal bone loss** depends on the height of the existing bone. 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.

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. Because of the greater height of bone in relation to other surfaces, the center of rotation of the tooth will be nearer the crown. This results in a more favorable distribution of forces to the periodontium and less tooth mobility.




**Prognosis for tooth A is better than for tooth B, despite less bone on one of the surfaces of A. Because the center of rotation of tooth A is closer to the crown, the distribution of occlusal forces to the periodontium is more favorable than in B.**

## Biofilm Control

Bacterial biofilm is the primary etiologic factor associated with periodontal disease. Therefore effective removal of biofilm by the patient is critical to the success of periodontal therapy and the prognosis.

## Patient Compliance and Cooperation

The prognosis for patients with gingival and periodontal disease is critically dependent on the patient's attitude, desire to retain the natural teeth, and willingness and ability to effectively control biofilm. Without these, treatment cannot succeed. If a patient is unwilling to perform adequate biofilm control and receive the timely periodic maintenance checkups and treatments the dentist can refuse to accept the patient for treatment.

## Systemic and Environmental Factors

### Smoking

Smoking may be the most important environmental risk factor impacting the development and progression of periodontal disease. The is direct relationship

exists between smoking and the prevalence and incidence of periodontitis. In addition, patients should be informed that smoking affects not only the severity of periodontal destruction but also the healing potential of the periodontal tissues. Therefore the prognosis in patients who smoke and have slight to moderate chronic periodontitis is generally **questionable**. In patients with severe chronic periodontitis, the prognosis may be **unfavorable or hopeless**. However, it should be emphasized that smoking cessation can affect the treatment outcome and therefore the prognosis. As such, for patients who stop smoking, the prognosis can improve to favorable in those with slight to moderate chronic periodontitis and to questionable in those with severe chronic periodontitis.

**Systemic disease or condition**

The patient's systemic background affects overall prognosis in several ways. For example, the prevalence and severity of periodontitis is **significantly higher** in patients with **type l and type II diabetes** than in those without diabetes and that the level of control of the diabetes is an important variable in this relationship. Well-controlled diabetics with slight-to-moderate periodontitis who comply with their recommended periodontal treatment should have a good prognosis. Conditions that limit the patient's performance of oral procedures (e.g., Parkinson's disease) also adversely affect the prognosis.

**Genetic Factors**

Periodontal diseases represent a complex interaction between a microbial challenge and the host's response to that challenge. Genetic factors may play an important role in determining the nature of the host response. Genetic polymorphisms in the interleukin-1 (IL-1) genes, resulting in increased production of **IL-1β**, have been associated with a significant increase in risk for severe, generalized, and chronic periodontitis. Genetic factors also appear to influence serum immunoglobulin G2 **(IgG2)** antibody titers which may be significant in aggressive periodontitis. Other genetic disorders, such as leukocyte adhesion deficiency type 1, can influence neutrophil function, creating an additional risk factor for aggressive periodontitis.

## Local Factors

### Biofilm and Calculus

The microbial challenge presented by bacterial plaque and calculus is the most important local factor in periodontal diseases.

### Subgingival Restorations

Subgingival margins may contribute to increased biofilm accumulation, increased inflammation, and increased bone loss when compared with supragingival margins. Furthermore, discrepancies in these margins (e.g., **overhangs**) can negatively impact the periodontium.

### Anatomic factors

Anatomic factors that may predispose the periodontium to disease, and therefore affect the prognosis, **include** short, tapered roots with large crowns, cervical enamel projections (CEPs) and enamel pearls, intermediate bifurcation ridges, root concavities, and developmental grooves.

Prognosis is **poor** for teeth with short tapered roots and large crowns. 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.

**Cervical enamel projections (CEPs)** are flat, ectopic extensions of enamel that extend beyond the normal contours of the cementoenamel junction. CEPs extend into the furcation of **28.6%** of mandibular molars and **17%** of maxillary molars. CEPs are most likely to be found on buccal surfaces of maxillary second molars.

**Enamel pearls** are larger, round deposits of enamel that can be located in furcations or other areas on the root surface. Enamel pearls are seen less frequently (1.1% to 5.7% of permanent molars; 75% appearing in maxillary third molars) than CEPs.

Scaling with root planing is a fundamental procedure in periodontal therapy. Anatomic factors that decrease the efficiency of this procedure can have a negative impact on the prognosis.

**Tooth mobility**

The principal causes of tooth mobility **are** loss of alveolar bone, inflammatory changes in the periodontal ligament, and trauma from occlusion. Tooth mobility caused by inflammation and trauma from occlusion may be **correctable**. However tooth mobility resulting from loss of alveolar bone is **not likely to be corrected**.

**Prosthetics and restorative factors**

The overall prognosis requires a general consideration of 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.

**Relationship between prognosis and diagnosis**

Factors such as patient age, severity of disease, genetic susceptibility and presence of systemic disease are important criteria in the diagnosis and in prognosis.

**Dental plaque induced gingival disorder**

**Gingivitis associated with dental plaque only**

Plaque-induced gingivitis is a reversible disease that occurs when bacterial plaque accumulates at the gingival margin.

**Plaque-induced gingival diseases modified by systemic factors**

The inflammatory response to bacterial plaque at the gingival margin can be influenced by systemic factors such as endocrine-related changes associated with puberty, pregnancy, and diabetes and the presence of blood disorder.

**Plaque-induced gingival diseases modified by medications**

Gingival diseases associated with medications include drug-influenced gingival enlargement, often seen with **phenytoin, cyclosporin, nifedipine, and oral contraceptive- associated gingivitis**. Eliminating the source of inflammation, either trauma or biofilm, can limit the severity of the gingival overgrowth. However, surgical intervention is usually necessary to correct the alterations in gingival contour.

**Gingival Diseases Modified by Malnutrition**

Most clinical studies have not shown a relationship between the two. One **possible exception** is severe vitamin C deficiency. The prognosis in these patients may depend on the severity and duration of the deficiency and on the reversing the deficiency through dietary supplementation.

**Non-plaque-induced gingival lesions**

Prognosis is dependent on elimination of the source of the infectious agent Dermatologic disorders such as lichen planus, pemphigoid, pemphigus vulgaris, erythema multiforme, and lupus erythematosus manifest in the oral cavity as atypical gingivitis.

**Prognosis for patients with periodontitis**

**Chronic Periodontitis**

Chronic periodontitis is a slowly progressive disease associated with well-known local environmental factors. It can present in a localized or generalized form. In cases in which the clinical attachment loss and bone loss are not advanced **(slight to moderate periodontitis)**, the prognosis is generally **favorable**, provided the inflammation can be controlled through good oral hygiene and the removal of local biofilm-retentive factors. In patients with more **severe disease**, as evidenced by furcation invasion and tooth mobility, or in patients who are noncompliant with oral hygiene practices, the prognosis may be **questionable or unfavorable**, and even hopeless.

**Aggressive Periodontitis**

Aggressive periodontitis can present in a localized or generalized form.

Two common features are

(1) rapid attachment loss and bone destruction in clinically healthy patient

(2) a familial aggregation.

The deposits that are present often have elevated levels of Aggregatibacter actinomycetemcomitans or Porphyromonas gingivalis. These patients also may

present with phagocyte abnormalities. The patients diagnosed with aggressive periodontitis would have an unfavorable prognosis.

**Periodontitis as a Manifestation of Systemic Diseases**

Periodontitis as a manifestation of systemic diseases can be divided into the following two categories:-

1. Periodontitis associated with hematologic disorders such as leukemia and acquired neutropenias

2. Periodontitis associated with genetic disorders such as familial and cyclic neutropenia, Down syndrome, Papillon- Lefèvre syndrome, and hypophosphatasia The prognosis will be fair to poor.

**Necrotizing Periodontal Diseases**

The primary predisposing factor is bacterial plaque. However, this disease is usually complicated by the presence of secondary factors such as acute psychological stress, tobacco smoking, and poor nutrition, all of which can contribute to immunosuppression. With control of both the bacterial plaque and the secondary factors, the prognosis for a patient is favorable.

**Examination → Diagnosis → Prognosis ↔ Treatment**

- ☒ Diagnosis requires thorough and careful examination.
- ☒ Prognosis is based on accurate diagnosis.
- ☒ Treatment decisions are based on prognosis.
- ☒ Treatment decisions are made to improve prognosis.
- ☒ Diagnosis and prognosis will change with treatment.