

# Effects of tobacco on teeth and periodontal tissues

Dr. Mahsa Moannaei

Assistant professor , dental school, Hormozgan university of medical sciences

# Effects of tobacco on oral tissue

- ▶ Tobacco and its various forms cause major oral health problems.
- ▶ Tobacco either in smoked or smokeless forms is prevalent and counts as a risk factor for the causation of various;
  1. Red and white lesions,
  2. Premalignant lesions,
  3. Oral cancers,
  4. Gingival and periodontal diseases , dental implant failures
  5. Halitosis
  6. Taste derangement
  7. Stained teeth and restorations

# Oral lesions and conditions associated with tobacco use

## Oral precancerous lesions

- Leukoplakia
- Erythroplakia
- Smokeless tobacco keratosis

## Oral cancers

### *Squamous cell carcinomas of the*

- Tongue
- Floor of the mouth
- Lip
- Gingiva

### *Verrucous carcinomas of the*

- Buccal mucosa
- Gingiva
- Alveolar ridge

## Periodontal diseases

- Increased plaque and calculus depositions
- Ischaemia
- Gingival inflammation
- Periodontal pockets
- Gingival recession
- Alveolar bone loss

## Root caries

## Peri-implantitis

## Halitosis

## Taste derangement

## Stained teeth and restorations

- ▶ These lesions most likely result from the many irritants, toxins, and carcinogens found in the smoke emitted from burning tobacco, but they may also arise from drying of the mucosa by the high intra-oral temperature, pH change, alteration in immune response, or altered resistance to fungal or viral infections.



# Effects of tobacco on oral tissue

- ▶ Tobacco in conjunction with other risk factors adds a potential threat to oral diseases and its timely control is a cure to those threats.
- ▶ Most of these problems are reversible after cessation of tobacco use.

# Tobacco smoking and periodontal diseases

- ▶ Periodontal diseases, including gingivitis and periodontitis, are common human bacterial infections that affect the gingiva and bone supporting the teeth.



# Tobacco smoking and periodontal diseases

- ▶ Tobacco products are considered **significant** factors related to initiation and progression of periodontal diseases.
- ▶ An almost **two to four-fold** increased risk of developing periodontitis is attributable to smoking as compared with adults who never smoke
- ▶ Disease severity increases with the frequency of smoking.
- ▶ Smokers accumulate markedly more dental calculus than do non-smokers, and the quantity of calculus is correlated with the frequency of smoking.



# Tobacco smoking and periodontal diseases

- ▶ Increased plaque and calculus depositions
- ▶ Ischaemia
- ▶ Gingival inflammation
- ▶ Periodontal pockets
- ▶ Gingival recession
- ▶ Alveolar bone loss

# Tobacco smoking and periodontal diseases

- ▶ Gingivitis is a form of inflammation limited to the marginal gingival tissues, and is usually caused by the accumulation of dento-gingival plaque due to inadequate oral hygiene.
- ▶ Gingivitis is **reversible** with professional treatment and good oral care at home. Untreated gingivitis may advance to periodontitis under certain conditions when plaque accumulates below the gingival line

# Gingivitis

Red, swollen gums

Plaque/tartar



## Signs and symptoms



Bad breath



Gums that  
bleed easily



Sensitivity to  
heat and cold



Tenderness  
or pain

# Tobacco smoking and periodontal diseases

- ▶ Periodontitis refers to the destructive inflammation that results in **irreversible** loss of periodontal attachment and tooth-supporting alveolar bone.
- ▶ Gingival recession may result from periodontal destruction and exposure of part of the root surfaces of teeth to the oral environment.
- ▶ The exposed root surfaces are at risk of developing root surface caries.
- ▶ Root surface caries among individuals with gingival recession is more prevalent among tobacco smokers than among non-smokers.



Smoking is associated with an increased risk of periodontal attachment loss and formation of periodontal pockets, as well as alveolar bone loss

# Tobacco smoking and periodontal diseases

- ▶ Acute necrotising gingivitis is also strongly correlated with tobacco use.
- ▶ Although the precise cause of this disease remains unknown, it tends to occur most frequently in teenagers and young adults.
- ▶ Some patients with acute necrotising gingivitis have defective neutrophil function, thereby allowing bacterial, or possibly viral (cytomegalovirus) invasion of gingival tissues.



# Tobacco smoking and periodontal diseases

- ▶ The gingival bleeding in smokers is 'less severe' than in non-smokers, which could be related to the vasoconstrictive effect of the nicotine.
- ▶ The main vasoconstrictive property of nicotine exerts its effect at the end-arterial vasculature of the gingivae
- ▶ Other tobacco components can also induce tissue necrosis and ulceration seen in the disease

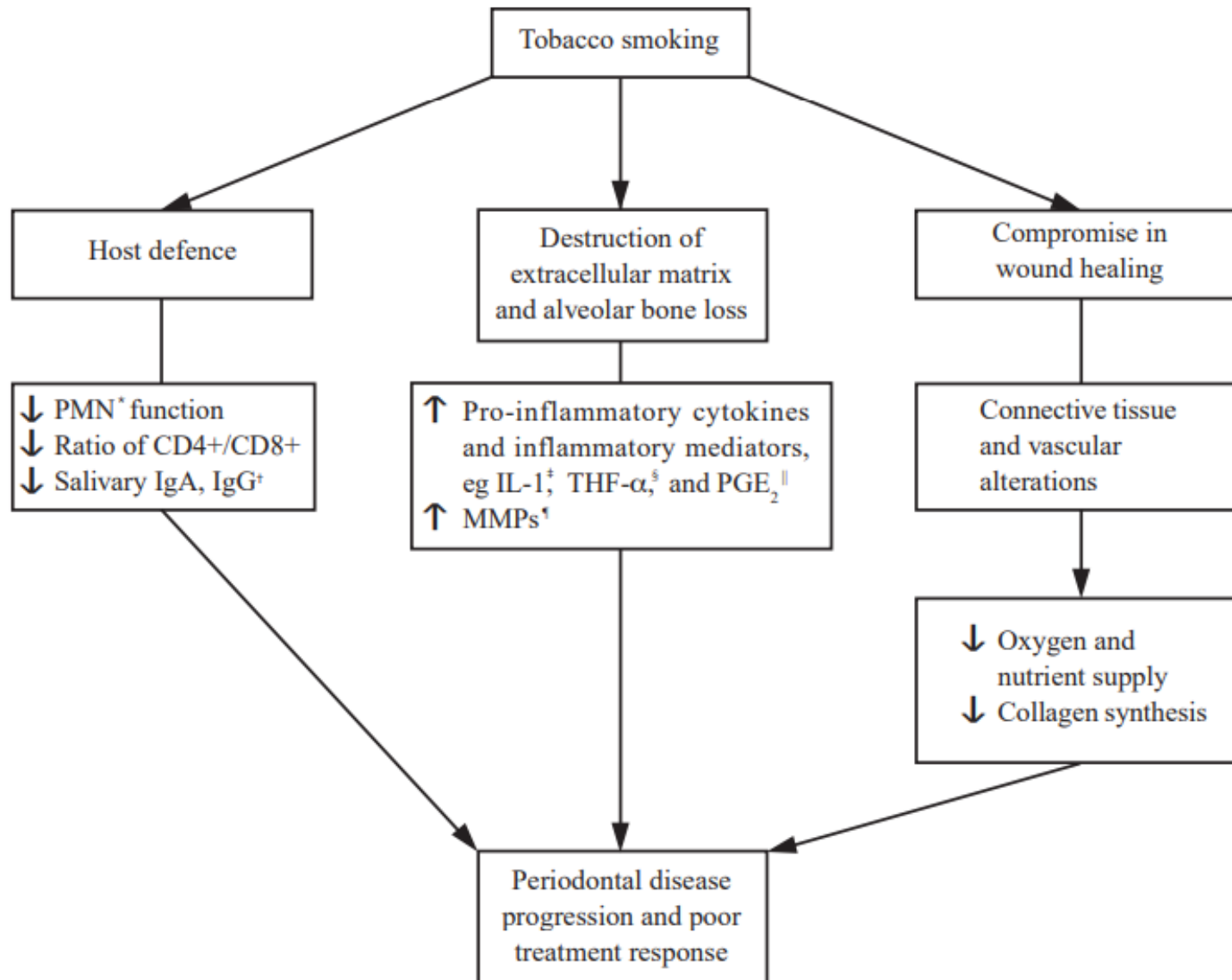
# Smokeless tobacco and periodontal diseases

- ▶ **Smokeless** tobacco users have an incidence of gingivitis and gingival bleeding that is **similar** to the incidence among **non-users**.
- ▶ Nevertheless, use of this form of tobacco is known to produce a **painless loss of gingival tissues and alveolar bone destruction** in the **area of chronic tobacco contact**, as a result of collagen breakdown due to increased release of collagenase.



# Smokeless tobacco and periodontal diseases

- ▶ Nicotine inhibits the growth of gingival fibroblasts and their production of fibronectin and collagen.
- ▶ Furthermore, oral leukocytes, especially neutrophils, may exhibit diminished ability to migrate and phagocytose, and they contribute to the inactivation of tissue proteinase inhibitors.
- ▶ Smoking upregulates the expression of pro-inflammatory cytokines, such as interleukin-1, which contributes to increased tissue damage and alveolar bone resorption. Interleukin-1 genotypepositive smokers are more susceptible to severe adult periodontitis.



\* PMN polymorphonuclear leukocytes  
 † IgA, IgG immunoglobulin A, immunoglobulin G  
 ‡ IL-1 interleukin-1  
 § TNF- $\alpha$  tumour necrosis factor- $\alpha$   
 || PGE<sub>2</sub> prostaglandin E2  
 ¶ MMPs matrix metalloproteinases

# Effects of tobacco on periodontal therapy outcomes

- ▶ Tobacco users respond less favorably to nonsurgical and surgical periodontal therapy.
- ▶ Tobacco users exhibited less improvement when compared with nonsmokers, in terms of pocket depth reduction, resolution of gingival inflammation and clinical attachment level.
- ▶ Heavy smokers exhibited a lower degree of probing-depth reduction and less gain in clinical attachment level than did ex-smokers and nonsmokers during active periodontal treatment.

# Effects of tobacco on periodontal therapy outcomes

- ▶ Current smokers have poor healing ability, which may be associated with persistent subgingival infection with *Bacteroides forsythus* and *Porphyromonas gingivalis* following subgingival scaling and root planning when compared with ex-smokers and non-smokers.
- ▶ Cigarette smoking adversely affects outcomes of guided-tissue regeneration treatment

# Dental implant failure



# Dental implant failure

- ▶ Tobacco smoking contributes to increased tooth mobility and tooth loss occurs 1.53 times more frequently in smokers
- ▶ Tooth loss reduces the oral chewing function and quality of life and leads to the subsequent demand for tooth replacement, such as dentures or implant supported prostheses.
- ▶ Furthermore, smoking addiction is directly related to dental implant failure, and there is a general consensus on the negative effect of smoking on implant survival.

# Dental implant failure

- ▶ Significantly greater proportions of implant failures occur in smokers than in non-smokers (11.28% versus 4.76%).
- ▶ Furthermore, Wallace showed a failure rate of 16.6% in smokers, compared with 6.9% in non-smokers after a review of 56 patients having 187 dental implants over a 4-year period; shorter implants (<10 mm in length) were more susceptible to failure in smokers.
- ▶ In this study, the failure rate before loading the implants was 9% in smokers versus 1% in non-smokers, which was statistically significant, even though the bone quality in both groups was comparable.

# Dental implant failure

- ▶ Peri-implantitis is the formation of deep mucosal pockets around dental implants, inflammation of the peri-implant tissues, and increased resorption of implant-surrounding bone.
- ▶ Tobacco use may directly compromise the osseointegration of dental implants.
- ▶ The difference in peri-implant bone loss is significant in the **mandible** between smokers and non-smokers but insignificant in the maxilla.
- ▶ The combination of smoking and plaque-induced inflammation significantly influences bone loss around the implants, whereas occlusal loading has only a minor role.





# Tobacco and dental caries

- ▶ the possible lower pH of smokers' saliva, along with its reduced buffering effect and the increased number of oral bacteria have been demonstrated to make teeth susceptible to caries
- ▶ Smokeless tobacco (ST) is referred to tobacco products typically dipped, chewed, sucked, or simply put on the gingiva. It has been suggested that by suppressing the immune system's response to oral infections, tobacco can contribute to tooth decay
- ▶ Abrasive constituents of ST can increase the risk of dental caries

# Smoking and dental caries

- ▶ From early reports in literature and a common belief was that smoking actually helps to reduce dental caries
- ▶ Schmidt, in 1951, supported this belief when he reported that increase in tobacco smoking was followed by a decrease in caries rate
- ▶ The concentration of thiocyanate, a constituent of tobacco smoke and normal saliva with possible caries-inhibiting effect, was found to be higher in smoker's saliva

# Smoking and dental caries

- ▶ On the other hand, the decreased buffering effect and possible lower pH of smoker's saliva and the higher number of Lactobacilli and Streptococcus mutans may indicate an increased susceptibility to caries
- ▶ Investigators have discovered a correlation between elevated smoking level and dental caries

# Smoking and dental caries

- ▶ In natural tobacco, sugar can be present in a level up to 20%.
- ▶ In addition, various sugars and sweeteners are added intentionally during tobacco manufacturing process up to 4% or can be up to 13% of sugars.
- ▶ Sugars used as cigarette additive include glucose, fructose, invert sugar (glucose/fructose mixture) and sucrose
- ▶ Moreover, the sweet taste and the pleasant smell of caramelized sugar flavors are appreciated in particular by starting adolescent smokers.

# Environmental tobacco smoke and dental caries

- ▶ Studies provided strongest evidence yet of an increased risk of dental caries in the deciduous dentition of children who are 4 to 11 years of age and have been exposed to passive smoking or environmental tobacco smoke (ETS).
- ▶ Children residing in regularly smoking homes had significantly higher prevalence of caries compared to nonregular/nonsmoking homes
- ▶ Bacteria responsible for caries formation are acquired in infancy from the saliva of mothers (via kissing, etc)

# Smokeless tobacco and dental caries

- ▶ Evidence linking ST use with increased dental caries prevalence
- ▶ “Cervical caries” in the area of tobacco placement and he also had gingivitis and recession in that same tooth





# Tobacco and dental caries

**Table 1.** Summary of major biological effects of tobacco related to dental caries

Forms of tobacco use	Biological effects
Tobacco smoking	<ul style="list-style-type: none"><li>• Concentration of thiocynate found to be higher in smoker's saliva may have possible caries inhibiting effect (13).</li><li>• Decreased buffering effect and possible lower pH of saliva in smokers may indicate increased susceptibility to caries (13, 14).</li><li>• Higher number of <i>Lactobacilli</i> and <i>Streptococcus mutans</i> in smokers may indicate caries susceptibility (13, 14).</li></ul>
Environmental tobacco smoke (ETS)	<ul style="list-style-type: none"><li>• Biological plausibility of causal role of ETS in caries formation in children (32).</li><li>• Immunosuppressive properties of ETS might be a risk factor for dental caries development (32, 36, 37).</li><li>• ETS may decrease serum vitamin C level, which may be associated with growth of cariogenic bacteria in children (32, 38, 39).</li><li>• ETS may reduce the protective properties of saliva that can operate against caries (32, 40).</li></ul>
Smokeless tobacco (ST)	<ul style="list-style-type: none"><li>• High levels of fermentable sugar and sweeteners in ST can stimulate growth of cariogenic bacteria (55, 56, 59).</li><li>• Extracts from chewing tobacco with high sugar content increased in vitro growth of <i>Lactobacillus casei</i> (59, 61).</li><li>• Extracts of ST may serve as a growth substrate for <i>Streptococcus mutans</i>, <i>Streptococcus salivarius</i> and <i>Streptococcus sanguis</i> (64).</li></ul>

