DENTAL CARIES

Dept. of Oral Pathology

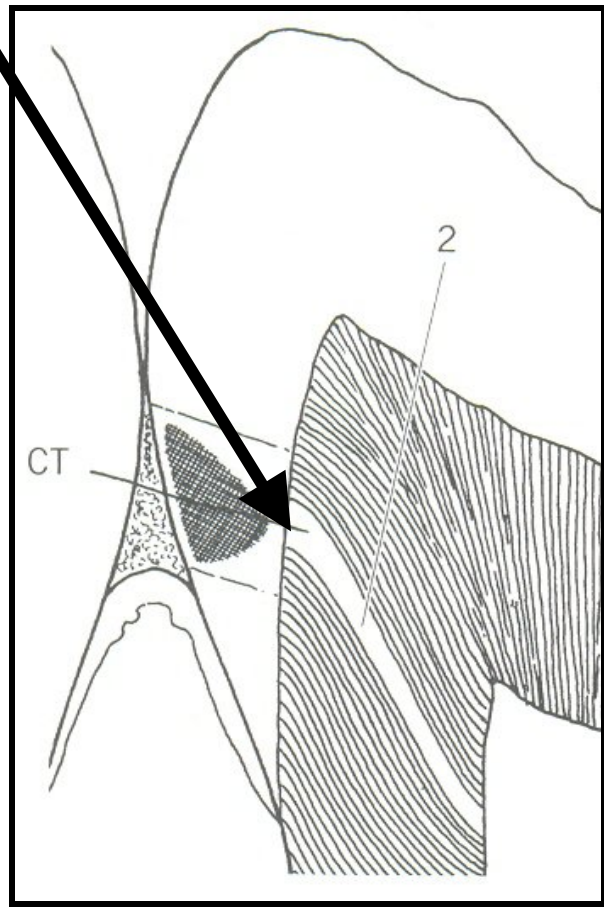
LEARNING OBJECTIVES

- At the end of the lecture student should be able to

– Describe and identify zones of dentinal caries

ZONE 1:Normal dentin

- Deepest area is normal dentin which has tubules with Odontoblastic process that are smooth and no crystals in the lumens.
- The inter tubular dentin has normal cross banded collagen and normal dense apatite crystals.

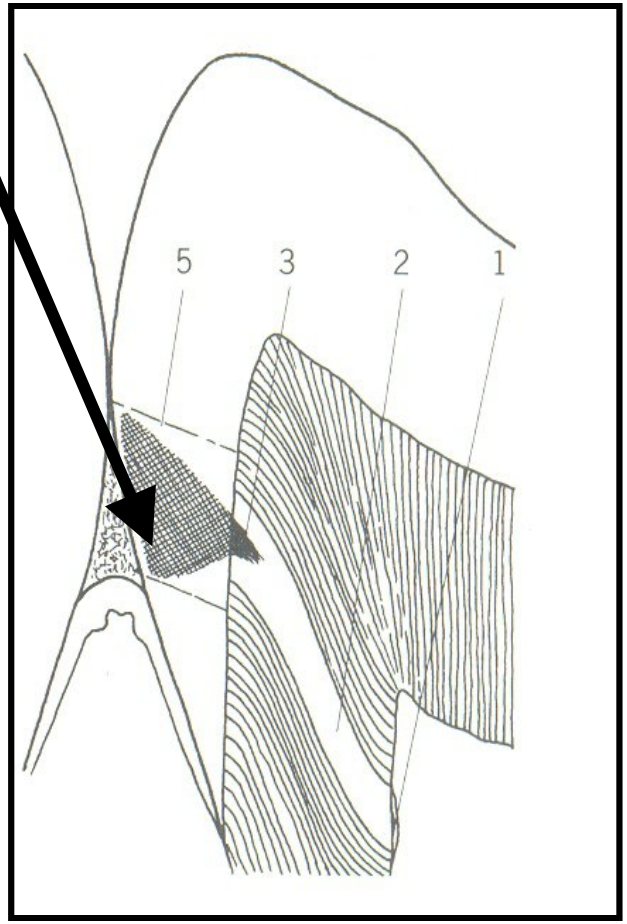


- No bacteria in the tubules.

- Stimulation of dentin (e.g.: by osmotic gradient, a bur, a dragging instrument or air blow) produces a sharp pain.

ZONE 2:Subtransparent dentin

- zone of demineralization of the inter tubular dentin and initial formation of very fine crystals in the tubule lumen at the advancing front.
- Odontoblastic process damage is evident.
- No bacteria are found in this zone.
- Stimulation of dentin produces pain.
- Dentin is capable of remineralization



- The initial penetration of caries in the dentinal tubules causes

  Firstly the fatty degeneration of the tomes dentinal fibres resulting in deposition of fat globules in the further end of dentinal tubules.

- It has been suggested that this fatty degeneration contributes to the:

  Impermeability of the dentinal tubule.

  Also sclerosis of dentinal tubule.

- Secondly as the caries penetrates there is a reaction of the vital dentinal tubules and vital pulp which lay down a CALCIFIC BARRIER thus protecting the dentinal tubules from further invasion of microorganisms.

  - This calcific barrier is termed as dentinal sclerosis / transparent dentin (as this zone appears transparent in polarized light and dark in reflected light).

- Even before the carious process becomes EVIDENT clinically a few bacteria are seen to be present in the dentinal tubules. These are termed as PIONEER BACTERIA. These bacteria are said to be present in the dentinal tubules prior to the occurrence of DECALCIFICATION.

- Close examination of the dentin behind the zone of dentinal sclerosis reveals a zone of decalcification of dentin. This decalcified zone occurs prior to bacterial invasion. The initial decalcification involves the walls of the dentinal tubules allowing them to distend slightly.

- The dentinal tubule packed masses of microorganisms (closer examination reveals adjacent tubules with different strains of microorganisms i.e. tubule with social organism adjacent with bacilli type.

- In the early stages of dental caries acidogenic organisms are responsible for decalcification of dentinal tubules as these organisms depend on the carbohydrate substrate present at the surface.

- As the carious lesion progresses deeper the carbohydrate source moves further away, the organisms found in the dentinal tubule are proteolytic in nature i.e. they depend on the proteins of dentinal tubules.

- Hence the organisms responsible for the initiation of the caries (ACIDOGENIC) are replaced by other organisms (PROTEOLYTIC) as the lesion progresses

ADVANCED DENTINAL CHANGES:

- Further decalcification of the individual dentinal tubule in their confluencing and increasing in diameter.

- The dentinal tubules undergo further packing with microorganisms.

- Tiny liquefaction foci form due to breakdown of dentinal tubule. These foci are ovoid area of destruction parallel to the course of the dentinal tubules.

- As areas of liquefaction foci undergo, expansion the adjacent dentinal tubule undergo. Distortion and their course is bent around liquefaction foci.

- In areas of globular dentin the decalcification process is said to be faster.

- In last stages destruction of dentin occurs through a processes of decalcification and proteolytic breakdown. These are numerous focal areas of destruction present and dentin, becomes LEATHERY in consistency.

- The caries extends at angular angles, along branches of DT thus resulting in clefts.

- These clefts account for the manner in which carious dentin can be excavated (as thin layers using hand instruments).

- Above this is the necrotic layer which histologically is structureless and granular in appearance and contains masses of bacteria

CARIES OF DENTIN

Spread of caries is more in dentin compared to enamel because of:

1.Decreased calcification (mineralization).

2.Existence of pathways (dentinal tubules).

Once the enamel caries reaches the dentino-enamel junction it spreads laterally along the DEJ with the rapid involvement of a great number of dentinal tubules. Each dentinal tubules acts as a tract along which microorganisms travel to the pulp.

Thus, there will be pulp response-which forms the sclerotic and secondary dentin.

- CARIES OF DENTIN: IN CHILDREN IS FASTER because:

- Dentinal tubules are shorter and wider.
- Less amount of mineralization.

• Thickness of enamel and dentin is less and pulp chamber is wider and large.

• In cases of caries spreading in an enamel lesion clinically only a small lesion may be present but the underlying dentin a large cavity may be formed.

• As the carious lesions progress is various zones of caries in dentin can be appreciated which assumes a triangular shape.

1. With BASE – towards dentino-enamel junction.

2. And APEX – towards the pulp.

The zones are:

- Zone of fatty degeneration.
- Zone of dentinal tubules.
- Zone of decalcification.
- Zone of bacterial invasion.
- Zone of decomposed dentin

SECONDARY DENTINAL INVOLVEMENT

- The carious process is the same as in primary dentin but here the process is much slower as:

- The dentinal tubules are fewer in number.

- More irregular in course.

- Hence, delaying the penetration of invading microorganisms but sooner / later the involvement of the pulp results.

  - Sometimes the caries process may spread laterally between primary and secondary dentin producing separation of the two layers.

Radiographic Features of Dental Caries

Radiographs should be used as an adjunct to the clinical examination in the diagnosis of dental caries !

SUMMARY

- zones of dentinal caries

BIBLIOGRAPHY

- Text book of oral pathology Shafer's, 5 & 6th edition
- Color Atlas of Oral Diseases Cawson, R. 2nd edition
- Oral and Maxillofacial Pathology Neville, Brad W. 2nd
- Lucas's Pathology Of Tumor's of the Oral Tissues Cawson, R. A., Bennie, W. H 5th edition

THANK YOU