A COMPARATIVE STUDY OF DENTINAL TUBULES IN ATTRITED AND NORMAL TEETH USING LIGHT MICROSCOPE AND POLARIZED LIGHT MICROSCOPE

Oral Pathology

Vaddadi Krishna Mohan*

PG Student, MDS, Department Of Oral Pathology, Srm Dental College, Ramapuram, Chennai, Tamil Nadu 600089. *Corresponding Author

Ramya R

MDS, Reader, Department Of Oral Pathology, SRM Dental College, Ramapuram.

Sudha

Gunasekaran

MDS, Department Of Oral Pathology, SRM Dental College, Ramapuram.

ABSTRACT

The aim of the study is to evaluate the dentinal changes in attrited and normal tooth & to correlate the relationship between attrition and age changes in dentin. In this study 30 extracted teeth were used. The teeth were categorised into two groups (attrited and normal teeth) and comparison was made between light microscope and polarised light microscopic findings. All the thirty freshly extracted teeth were fixed 10% formalin for 24-48 hours. The dentinal changes secondary to attrition such as dead tracts and dentinal sclerosis formation were studied under light microscopy and correlated with that of polarised light microscope. Samples analysed in polarised light microscope showed that dead tracts and dentinal sclerosis was highly significant ($p < 0.001$). The polarised light microscope is a powerful magnification tool which offers extremely high resolution.

KEYWORDS

Attrition; dead tracts, tertiary dentin, light microscope, polarised light microscope

INTRODUCTION:

Tooth wear is an inherent part of the aging process which occurs continuously but gradually throughout life. Loss & excessive wear of dental hard tissues is a permanent problem of the dentition, especially in modern man, encompassing almost all age groups. In some individuals tooth wear can be manifested to a greater extent thus leading to severe morphological, functional and vital damages to the dentition. Some of the regressive changes also known as the wasting diseases of teeth result from aging, and others occur due to chronic persistent tissue injury. Tooth wear is often multi factorial and the pattern and occurrence of tooth wear is related to dietary, occupational, cultural and geographic factors in a population. Other factors that can be considered include aging and occlusal relationship(1).

The main cause of tooth wear in population appears to have been due to some combination of friction of exogenous material forced over tooth surfaces and an increase in the number of power strokes during mastication when lesser fined, tougher foods are consumed. The light microscopic changes secondary to attrition and abrasion (due to the exposure of dentinal tubules) include dead tracts and sclerosis (2).

Sclerotic dentin is formed as a result of injury to dentin by caries or abrasion.

Also it is a normal manifestation of aging process. Dentin becomes translucent due to calcification of dentinal tubules as a result of injury or normal aging process. Sclerosis means hardening. Also called transparent dentin. Dentin that has become translucent due to calcification of the dentinal tubules as a result of injury or normal aging. It is formed so that the pulp is sealed and noxious bacterial products do not invade it.

It is formed as a response when pulp irritation occurs (viz. dental caries or wasting diseases). Sometimes can lead to irregular calcification of the coronal and radicular pulp. The light microscopic changes secondary to attrition and abrasion (due to the exposure of dentinal tubules) include dead tracts and sclerosis.

There are three types of dentin primary, secondary and tertiary. Secondary dentin is a layer of dentin produced after the root of the tooth is completely formed. Tertiary dentin is created in response to a stimulus, such as a carious attack. Primary dentin makes up most of the tooth. It is the thick bulk between enamel and pulp. Primary dentin is the type of dentin a tooth starts out with. It can also be called circumcuspul (surrounding the pulp) dentin. Mantle dentin is a separate, harder but thinner layer that separates primary dentin from the tooth crown(6).

Secondary dentin is made after a tooth has already appeared in the mouth. This type of dentin is made throughout life. Newly made dentin is found placed very close to the pulp. It is found between pulp and primary dentin. Tertiary dentin is only made when the tooth is damaged. The relationship between attrition and age changes in dentin were correlated. The dentin of a tooth is exposed as a result of attrition, abrasion and erosion the chronic exogenous irritation that occurs causes various responses on and in the tissue(7).

The present study was undertaken to evaluate the dentinal changes in attrited and normal tooth and to compare them under light microscope and polarized light microscope.

MATERIALS AND METHODS:

30 extracted permanent attrition and normal teeth (Group A: 15, Group B: 15) constituted the study material between age group of 40 to 50 yrs, 50 to 60 yrs, 60 to 70 yrs age group. After debridement and fixation in 10% formalin for 24-48 hours, ground section was done with arkansas stone, the section were mounted onto a glass slide using dpx and cover slip was placed and observed under light microscope and polarized light microscope.

Materials needed are extracted tooth, arkansas sharpening stone, light microscope and polarized light microscope. Carious tooth, resorbed tooth, fractured tooth and restored tooth were all excluded. The extracted tooth samples were grouped as follows:

GROUP A; Attrited teeth

Subgroup 1: 40-50 years [5 tooth]

Subgroup 2: 50-60 years [5 tooth]

Subgroup 3: 60-70 years [5 tooth]

GROUP B; normal teeth

Subgroup 1: 40-50 years [5 tooth]

Subgroup 2: 50-60 years [5 tooth]

Subgroup 3: 60-70 years [5 tooth]

STATISTICAL ANALYSIS:

Data is analysed by SPSS Software

RESULT:

Group A: Attrited (anterior & molars) - 15

Group B: Normal (anterior & molars) - 15

Table 1. distribution Of Dentinal Changes Seen In Group I Teeth Under Light Microscope

S.NO	AGE GROUP	DEAD TRACTS	SCLEROTIC DENTIN
1	30-40	100%	60%

2	40-50	100%	40%
3	50-60	100%	40%

Table 2. Distribution Of Dentinal Changes Seen In Group I Teeth Under Polarised Light Microscope

S.NO	AGE GROUP	DEAD TRACTS	SCELOTRIC DENTIN
1	30-40	100%	100%
2	40-50	100%	60%
3	50-60	100%	40%

Table 3. normal Tooth (light Microscope)

S.NO	AGE GROUP	DEAD TRACTS	SCELOTRIC DENTIN
1	30-40	0%	0%
2	40-50	0%	0%
3	50-60	0%	0%

Table 4. normal Tooth (polarised Light Microscope)

S.NO	AGE GROUP	DEAD TRACTS	SCELOTRIC DENTIN
1	30-40	0%	0%
2	40-50	0%	0%
3	50-60	0%	0%

Table 5. frequency Distribution Of Light Microscopic Findings Of Two Groups

Variable	Characteristics	Normal (n=15)	Attrited (n=15)	X ² Value	P Value
DEAD TRACTS	ABSENT	1(100.0%)	0 (0.0%)	15.00	0.002
	PRESENT	0 (0.0%)	15(100.0%)		
DENTINAL SCLEROSIS	ABSENT	15(100.0%)	8(70.0%)	10.00	0.001
	PRESENT	0(0.0%)	7(60.0%)		
TERTIARY DENTIN	ABSENT	15(100.0%)	1		p<0.00
	PRESENT	0(0.0%)	4(50.0%)	20.00	1

Table 6. frequency Distribution Of Polarised Light Microscopic Findings Of Two Groups

Variable	Characteristics	Normal (N=15)	Attrited (N=15)	X ² VALUE	P VALUE
DEAD TRACTS	ABSENT	15 (100.0%)	0(0.0%)	15.00	0.002
	PRESENT	0(0.0%)	15(100.0%)		
DENTINAL SCLEROSIS	ABSENT	15 (100.0%)	5(30%)	30.50	p<0.001
	PRESENT	0(0.0%)	10(90%)		
TERTIARY DENTIN	ABSENT	15 (100.0%)	7(60.0%)	23.04	p<0.001
	PRESENT	0(0.0%)	8(70.0%)

Fig 1 Light Microscope Attrited tooth

Fig 2 Light Microscope Normal Tooth

Fig 3 Polarized Light Microscope : Attrited Tooth

Fig 4 Polarized Light Microscope : Normal Tooth

DISCUSSION:

Dentin is a hard tissue of the tooth that surrounds the pulp and makes up the bulk and general form of tooth characterized by presence of tubules throughout its thickness. Odontoblasts are present in the pulp and are arranged in a layer lining the pulpal surface of dentin. Each cell gives out a long thin process which enters a hollow tube like structure within the dentin called as dentinal tubule.

In the normal teeth, the tubules have a diameter of 2-3 mm at the time they are formed. In the main bulk of the dentin the tubule is 1-2 mm in diameter. They house the odontoblast process, which remains after the matrix has formed as an extension of the odontoblast into the dentin. The presence of cytoplasm in the odontoblast process is a continuation of that in the odontoblast itself, but it is limited in extent to the most pulpal part of the process in newly erupted teeth(8).

The odontoblast process contains few organelles associated with matrix formation like endoplasmic reticulum, Golgi apparatus and mitochondria. In the dentin, the tubules contain remnants of the odontoblast process and tissue fluids which may be obtained by growth of the peritubular dentin as an age change or by mineral deposits. Complete occlusion of the tubules by mineral depositions may take place and then the dentin becomes impermeable and transparent(9).

The light microscopic findings revealed that all the attrited showed the formation of dead tracts and variable amounts of reparative dentin on the pulpal side. Normal teeth showed no evidence of dead tracts, dentinal sclerosis or reparative dentin formation(10). These areas of dead tract formation in relation to attrition, dark under transmitted light. This was in accordance with the features of reparative dentin which is deposited at sites of the pulpal aspects of primary or secondary dentin, corresponding to areas of external irritations and due to the absence of tubules, and appears bright in transmitted light(11).

Age changes of tooth structure are of great importance as it has clinical value for the practitioners. Age changes varies for each structure of tooth and plays a pivotal role in the treatment and prognosis. To conclude, in our study attrited tooth showed the formation of dead tracts, variable amount of reparative dentin under light microscopy and under polarised light microscope the predominant areas of dead tracts, dentinal sclerosis and tertiary dentin was seen.

CONCLUSION :

The polarised light microscope is a powerful magnification tool which offers extremely high resolution. In the present study, polarised light microscope complements the information available from the light microscope about the dentinal changes in attrited and normal teeth.

REFERENCES

- Shreedhar B, Kamboj M. Dentinal Tubules of Attrited, Abraded and Eroded Teeth-A Comparative Evaluation of Scanning Electron and Light Microscope. British Journal of Medicine & Medical Research. 2016;1-6.
- Faillace KE, Bethard JD, Marks MK. The applicability of dental wear in age estimation for a modern American population. American journal of physical anthropology. 2017 Dec;164(4):776-87.
- Ranjitkar S, Turan A, Mann C, Gully GA, Marsman M, Edwards S, Kaidonis JA, Hall C, Lekkas D, Wetselaar P, Brook AH. Surface-sensitive microwear texture analysis of attrition and erosion. Journal of dental research. 2017 Mar;96.
- Beust B. The reactions of dentinal fibril to external irritation. J. Dent. Kos. 1931;181060-1071.
- Richardson A. Dead tracts in human teeth. Br Dent J. 1966;560-563.
- Stanley HR, Pereira JC, Spiegel E, Broom C, Schultz M. The detection and prevalence of reactive and physiologic sclerotic dentin, reparative dentin and dead tracts beneath various types of dental lesions according to tooth surface and age. J Pathol. 1983;12:257-89.
- Abisi EG, Addy M, Adams D. Dentin hypersensitivity; the effect of tooth brushing and dietary compounds on dentin *in vitro*. A SEM Study. J. Oral Rehabil. 1992;19:101-110.
- Arola D, Ivancik J, Majd H, Fouad A, Bajaj D, Zhang XY, Eidelman N. Microstructure and mechanical behavior of radicular and coronal dentin. Endodontic Topics. 2009 Mar;20(1):30-51.
- Addy M, Abisi EG, Adam D. Dentin hypersensitivity I. The effects *in vitro* of acids and

- dietary substances on rootplaned and burred dentin. J This Periodontal. 1987;14:274-279.
10. Dreyfuss F, Frank KM, Cutmam B. La sclerosedentinaire, Bull. Grp. Int. Sci. Stomat. 1964;7:207-229.
 11. Linde A, editor. Dentin and Dentinogenesis. Florida: CRC Press. 1984;1.