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Evaluation of Association between Habitual Occlusion and Development of Cracked Tooth Syndrome and Craze Lines-A Retrospective Study

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ABSTRACT

Introduction: *Occlusion may be defined as the manner in which the teeth in opposing arches contact each other. An individual's habits of occlusion also play a crucial role. The continued use of a single side of the arch, also termed as habitual unilateral occlusion can have deleterious effects on the teeth in that particular arch. Cracking or breaking of teeth or development of craze lines on the enamel has often been observed.*

Aim: *To evaluate the association between habitual occlusion and the development of cracked tooth syndrome and craze lines during on-going endodontic treatment.*

Methodology: A total of 25 patients were included in the study. These patients had presented to the clinic with deep dentinal caries. Informed consents were obtained. All the included patients satisfied the inclusion.

Results: *15 out of 25 patients had cracked or craze lines on their latest. Crack lines were visible clinically among 13 patients and not visible among 2 patients. IOPA showed crack lines that were clinically visible were also visible on IOPA in 53.8%. 66.7% of patients cited pain as the reason 20% had no specific reason, 13% cited fear of pain as the reason for using only one side of occlusion. 80% of the defects were craze lines and 20% were in the form of cracked teeth.*

Conclusion: *Patients should be encouraged and counselled to not develop or continue with a habitual occlusion during endodontic treatment. This intern can improve the overall prognosis of the tooth.*

Key words: Cracked tooth, Craze lines, Endodontic treatment, Enamel cracks, Enamel fracture

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INTRODUCTION

Occlusion may be defined as the manner in which the teeth in opposing arches contact each other. Occlusion can hence be briefly classified into two forms. Dynamic occlusion and static occlusion. Dynamic occlusion often refers to the movement and position of teeth in opposing arches when the teeth are in articulation or in dynamic motion. However, Static occlusion is the final position of the teeth in opposite arches when the mouth is at rest. Occlusion is usually largely dependent on various factors. These factors include the Skeletal structure of the individual, the anatomy and positioning of the teeth, the condylar articulation etc. Apart from this an individual's habits of occlusion also play a crucial role. The manner in which the mouth is closed or teeth are held in position can also influence the occlusion and is often referred to as habitual occlusion.

Dental caries is one of the most common pathologies that patients present with to a dentist. It has been observed that a majority of the patients only report to the dentist after the onset of symptoms such as pain and swelling. These cases often present with a well-developed cavitated carious lesion with the involvement of the pulp. Such a tooth needs to be treated by root canal treatment so that the root canal can be disinfected and the source of the pathology can be eliminated. In the duration between the first initial carious lesion developments to the visit to the dentist patients often manage the tooth by self-medication. This might include over the counter analgesics, to use of other homemade remedies like clove, pastes etc. At the same time patients are known to disuse the side of the affected tooth. This internment leads to a masticatory stress burden on the teeth on the other side of the arch [1].

The continued use of a single side of the arch or what may be termed as habitual unilateral occlusion can have deleterious effects on the teeth in that particular arch. Cracking or breaking of teeth or development of craze lines on the enamel has often been observed. Such deformities can later propagate to cause more evident or non-restorable defects on those teeth leading to tooth loss

or necessitating further treatment. In either case it has a negative effect on the tooth.

Several methods have been studied and practiced for the detection of cracked tooth and craze lines. This ranges from the basic clinical observation with probing/ percussion etc. to use of dyes and Trans illumination. Radiographic examination also often helps to confirm the findings. Accessories such as tooth sloth are also used to confirm the findings. Previously our team has a rich experience in working on various research projects across multiple disciplines. Now the growing trend in this area motivated us to pursue this project.

The aim of the present study was to evaluate the association between habitual occlusion and the development of cracked tooth syndrome and craze lines during on-going endodontic treatment.

MATERIAL AND METHOD

The study was conducted in the Endodontic postgraduate OPD in Saveetha Dental College Chennai. The study was conducted on the prior clearance by the institutional ethics committee. A total of 25 patients were included in the study. These patients had presented to the clinic with Deep dentinal caries that needed endodontic intervention ie. Cries involving the enamel, dentin and the pulp [2]. All the patients included in the study were informed about the study and due written and video consents were obtained. All the included patients satisfied the inclusion criteria that were previously decided for the study.

Inclusion criteria

- All the patients should have visited the dental clinic at least 3 months earlier for any other treatment or for a routine check-up. During these visits routine check-up should prove that no teeth in the mouth should have any pre-existing fractures or craze lines.
- Patients should be of the age group 18-60.
- Patients should not have any pre-existing habitual occlusion that might cause bias to observations of the present study.
- Patients who report use only one side of the mouth for chewing and avoid brushing in the side of the dental arch with the tooth in question.

Exclusion criteria

- Patients who visited the clinic for the first time and there is no baseline case data available.
- History of habitual occlusion due to other pre-existing conditions.
- Patients below age of 18.
- Patients who are not capable of taking care of their oral hygiene due to certain disorders or conditions (eg. Patients with special needs) and patients who have habitual malocclusion etc.

When the patients reported to the clinic it was first seen that they satisfied all the inclusion criteria. The tooth in complaint was then accessed and radiographically by IOPAR (Kodak RVG 5200) for endodontic pathology. Next the teeth on the other side of the mouth were clinically evaluated by probing and percussion. Further Erythrosine dye was applied on all the surfaces of the tooth using a cotton palette and tweezers and any cracks or craze lines that were not visible to the naked eye were detected [3]. The tooth was then illuminated with UV light from a light curing unit (Woodpecker i-LED) and hence by trans illumination the findings were verified. The UV light source was placed over all the surfaces of the tooth. Any cracks or fractures will usually present as dark shadow like lines due to difference in the refractive index.

Radiographs were taken as an accessory means of confirming findings that were doubtful. The use of tooth sloth was also considered for cases that were difficult to diagnose. The patient's case sheets were now assessed and the same information was retrieved for a time duration that is at least 3 months older. Additionally the same details were also recorded at the end of the treatment. Thus three sets of data from three time intervals were obtained for analysis. The obtained data was then statistically analysed using the SPSS. 23.0 Student version for statistical significance. Data was interpreted and conclusions were drawn.

DISCUSSION

It was found that 15 out of 25 patients had cracked or craze lines on their latest appointment. Among those, crack lines were visible clinically among 13 patients and not visible among 2 patients. On subsequent comparison after taking IOPA it was found that crack lines that were clinically visible were also visible on IOPA in 53.8% (P=0.001). It was also observed that crack/craze lines were not appreciated in 2 out of 15 patients that were appreciated/visible on ultraviolet light and application of dye [4].

It was also observed that about 66.7% of patients cited pain as the reason for using only one side of occlusion followed by 20% who had no specific reason. About 13% cited fear of pain as the reason for using only one side of occlusion. 80% of the defects were in the form of craze lines and 20% were in the form of cracked teeth. There was no significant difference in the distribution of defects according to clinical visibility (P>0.05). Also there was no significant difference in the distribution of defects according to quadrants (P>0.4).

Occlusion is one of the most widely studied concepts in Dentistry. Occlusion may be defined as the manner in which the teeth in the opposing arches of the mouth interdigitate or come together. Occlusion in the resting position is known as static occlusion while occlusion in movement is termed dynamic occlusion. The study of occlusal patterns is of due importance. This helps dentists in the proper management of malocclusions, TMJ disorders, fabrication of dental prosthesis etc. A normal functional occlusion involves the use of both the sides of the dental arches [5]. Such an occlusion when biting has

two components namely the functioning side and the balancing side. It is this dynamic functioning that distributes the forces in an equal manner among all the teeth in the mouth and also breaks down the food for better digestion. The forces exerted during mastication have been studied by gnathodynamometer studies extensively. The normal masticatory forces range between 7--150 newton's. However, the maximum values have been recorded upto 5-700 newton's in certain individuals. Due to the generation of such high amounts of forces it is crucial that the forces are well distributed among all the teeth in both the arches in both sides of the mouth. Such a force distribution will avoid any negative effects to the tooth and the periodontium.

Whenever an unequal amount of force is delivered to the teeth in a particular region of the mouth, the periodontium usually cushions the impact of this force. This is the physiological function of the periodontium. However, when the forces exceed the threshold limits it leads to periodontal injury. When the soft tissue components can no longer cushion the impact of forces it is common for the hard tissue or the tooth structure to take the burden of the load. Low intensity repeated loading can cause wasting diseases such as attrition of the tooth. However, greater more sudden impacts of forces in an acute manner can cause the tooth to fracture. These fractures might be confined to the coronal portion or may extend to the radicular portion too. They may be clinically evident fractures/ cracks or might be micro fractures or craze lines that are confined only to the enamel.

The decay of the tooth that involves the pulp often necessitates root canal treatment. Several studies have shown that patients only report to the dentist on the onset of symptoms such as pain or swelling. Meanwhile patients manage the pain using either home remedies or over the counter analgesics. It is common for patients to stop using the side of the mouth that has the decayed or affected tooth. Hence all the brunt of occlusion and the occlusal loads are borne by the teeth on the other side of the mouth. Such an occlusion can in long term cause fractures of teeth or development of craze lines [6].

Over the years several methods have been used to diagnose cracked teeth, fractured teeth and craze lines. This ranges from clinical probing and percussion to IOPA radiographs. Crack marking stains such as erthryosin, India ink etc. have been routinely used to better detect crack lines. The Trans illumination of the tooth using a bright LED light has been used commonly in recent years. The crack line appears as a dark line due to the difference in the reflective index in that particular portion of the tooth. Tooth sloth is a wooden stick like device that is often used for diagnosis of cracked tooth syndrome. The patient is asked to bite on the tooth sloth and release the bite. Pain on release of the bite is a symptom pathognomic to cracked tooth syndrome. Our institution is passionate about high quality evidence based research and has excelled in various fields. We hope this study adds to this rich legacy.

In the current it was seen that a majority of the patients used only one side of the mouth ie. the side of the mouth opposite to the affected tooth side. Patients reported that this gave them comfort from the pain in the affected tooth. Most patients had no valid explanations for having delayed treatment of the affected tooth and they reported comfort on taking over the counter analgesic and hence delayed treatment. It is rather evident that negligence of oral hygiene and dental health was the reason for delaying treatment. Further, the majority of patients were not aware of the consequences of delaying treatment or of using a single side of the mouth for masticating. Adequate education on oral hygiene, oral health and diseases at a primary or a primordial level on a community basis is essential to make sure patients report to the dentist before the progression of dental caries to cavitated lesions. Further, patients who have already reported for treatment should be encouraged to eventually use both sides of the mouth in a balance [7].

CONCLUSION

Patients should be encouraged and counselled to not develop or continue with a habitual occlusion during endodontic treatment. This intern can improve the overall prognosis of the tooth.

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