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Pathology Question:

What are pathological consequences of a traumatic occlusion?

Report:

To start I must define what traumatic occlusion is. I will do this by comparing it to the desired occlusion type of physiologic occlusion. Physiologic occlusion is when the occluding maxiallary and mandibular dentition come together in a manner that produces opposing forces in a state of equilibrium. Physiologic occlusion will not have an effect on the dentitions supporting structures. Traumatic occlusion is when the occlusal forces are not in equilibrium producing undue stress on certain areas of the dentition. This will eventually lead to damage to the periodontal supporting structures. Trauma from occlusion (TFO) can further be broken down in to acute vs. chronic and primary vs. secondary. Acute TFO is a result of a single moment or traumatic incident, such as biting down on a seed. Chronic on the other hand is from uneven occlusal forces that cause stress over time, and can include parafunctional habits. Primary TFO refers to trauma on a healthy and intact periodontium. Secondary TFO, on the other hand, refers to TFO on a non-healthy periodontium. Chronic TFO is the most common, and most clinically significant. Thus is will be focused on here. It is important to note that parafunctional habits are the major etiologic factor of occlusal trauma. The following also may cause occlusal trauma though: loss of teeth, faulty dental restorations, poorly intact periodontium, TMJ disfunction, and faulty occlusal adjustments that further aggrevate an already traumatic occlusion.

When TFO is chronic it will lead to tissue damage that occurs in three stages. The stages are injury, repair, and adaptive remodeling of the periodontium. In the injury stage excess occlusal stresses applied along the fulcrum of a tooth will lead to areas of tension and pressure to the PDL and the adjacent aleolar bone. As the stresses progress the PDL fibers and vasculature will become damaged and lead to PDL space widening. This can be seen radiographically. As the cells and tissues within the PDL continue to breakdown due to the stresses the PDL tissue will progress towards necrosis. The repairitive stage of tissue damage due to TFO is really continuously occurring. As PDL tissue and adjacent alveolar bone are damaged from excess occlusal forces they are simultaneously being repaired. New PDL fibers are being laid down as well as new bone. “Forces will remain traumatic only so long as the damage produced exceeds the repairitive capacity of the tissues” (1). If repair cannot keep pace with the destruction due to occlusal forces then stage three of tissue damage occurs. Here the PDL is remodeled to become permanently widened and angular defects in the junctional epithelium occur. Furthermore, I have been told that pulpal necrosis can occur due to an occlusal trauma, although I have had difficulty finding evidence to support this. This process appears to be from an inflammatory response being triggered in the pulpal tissue due to occlusal trauma, which leads to root resporption and pulpal necrosis.

Trauma from occlusion results in periodontal damage to the affected dentition, as well as inflammation, leading to necrosis, of the pulpal tissue. These changes can be seen radiographically and clinically. The “cardninal manifestation of primary TFO is increased

mobility of the tooth" (1). This is due to the PDL widening and alveolar bone destruction. Clinically one may also see tilting and migration. One will also likely see radiographic PDL widening and adjacent lamina dura thickening. In the case of pulpal necrosis secondary to occlusal trauma one would expect to see signs and symptoms consistent with pulpal necrosis, such as intrinsic tooth coloration. The pulpal necrosis (although the evidence found is not very conclusive, and largely based on animal models) appears to be from a chronic TFO leading to an increase in blood flow to the teeth. This likely leads to an increase in pressure in the pulp chamber that then leads to pulpal death. There is also animal based evidence that supports the idea that occlusal trauma leads to an increase in substance P (a neurotransmitter in the peripheral nerves that sensitizes the pulpal nerves) (2).

References:

1) Singh, Dhirendrakumar, et al. "Trauma from Occlusion: The Overstrain of the Supporting Structures of the Teeth." *Indian Journal of Dental Sciences*, vol. 9, no. 2, 2017, p. 126., doi:10.4103/ijds.ijds_21_16.

2) Liu, H., et al. "The Biological Effects of Occlusal Trauma on the Stomatognathic System - a Focus on Animal Studies." *Journal of Oral Rehabilitation*, vol. 40, no. 2, 2012, pp. 130–138., doi:10.1111/joor.12017.