



The Relationship between Periodontal Disease and Pathological Tooth Migration

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Abstract

Periodontal disease increases periodontal pockets, tooth mobility and attachment loss, resulting in the destruction of periodontal tissue. In the clinical environment, it was frequently evident that periodontal disease caused tooth movement and displacement, as well as inducing occlusion trauma, breathing through the mouth, negative oral habits and systemic disease. For some time it had been thought that periodontal disease caused Pathologic Tooth Migration (PTM); however, it had proven difficult to clarify the exact nature of the relationship between periodontal disease and PTM. The mechanisms by which periodontal disease affected PTM were largely unknown and so the studies have focused on attempting to identify the relationship between periodontal disease and PTM in animals.

Keywords: Experimental periodontitis; Pathologic tooth migration; Occusal trauma; Tooth

Introduction

Periodontal teeth cause traumatic occlusion, tooth movement and tooth displacement due to the destruction of periodontal tissue. As results, patients with periodontal disease often complain of unusual tooth positions and dissociation of the anterior teeth [1,2]. The unusual positions were explained as Pathological Tooth Migration (PTM) [1-4]. Regarding PTM, Glickman [5], reported that when balance factors to keep the physiological positions of teeth were lost, teeth tended to move in many directions. Prichard [6] also reported this in a similar article. However, it was considered a hypothesis of clinical experience rather than being based on actual evidence.

This article [1,2] reported that PTM occurred only in the anterior teeth, but PTM has often been observed in all teeth in the clinical environment. Demetriou et al. [7] determined that, for about 37% of the subjects who had undertaken dental treatment with the chief complaint being that of tooth movement, these were indeed cases of PTM. Concerning the elucidation of mechanism between periodontal disease and tooth movement, there have been articles written which involved both human and animal subjects. We have summarized the studies targeting only animal subjects on the relationship between periodontal disease and PTM.

Study of the tooth extrusion due to experimental periodontitis

1) Tooth extrusion does or does not occur, if experimental periodontitis is experienced around the tooth [8].

- **Research purposes:** If experimental periodontitis occurs all around the tooth, does tooth extrusion also occur?

- **Research methods:** The subjects were 4 beagles. The experimental group: Experimental periodontitis induced around the left mandibular 3rd Premolar (P3). The control group: Periodontal tissue of the right P3 was maintained by tooth cleaning. The experiment period was 12 weeks.

- **Research results:** The experimental group (extrusion distance: 1.4 ± 0.5 mm, (Figure 1 and 2) demonstrated statistically significant increased tooth extrusion than that of the control group (extrusion distance: 0.4 ± 0.1 mm) (Figure 3 and 4).

- **Conclusion:** Tooth extrusion was affected by periodontal inflammatory conditions.

2) Study of tooth movement utilizing experimental localized periodontitis [9].

- **Research purposes:** If experimental periodontitis occurs in only the distal site of the

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Figure 1: Baseline of the inflammation group.



Figure 2: Completed experiments of the inflammation group.



Figure 3: Baseline of the control group.



Figure 4: Completed experiments of the control group.

tooth, does tooth movement also occur?

- **Research methods:** The subjects were 4 mongrel dogs. The experimental group: Experimental periodontitis induced at the distal site of the left P3. The control group: Periodontal tissue at the distal site of the right P3 was maintained by tooth cleaning. The experiment

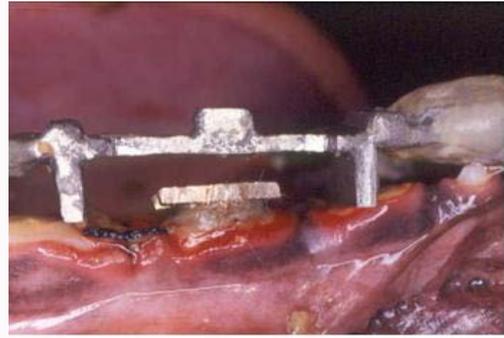


Figure 5: Base line of the local inflammation of the group.

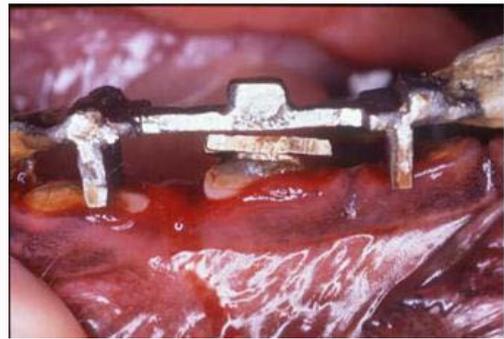


Figure 6: Completed experiment of the local inflammation of the group.

period was 8 weeks.

- **Research results:** The experimental group (extrusion distance: 1.3 ± 0.7 mm, horizontal distance: 0.5 ± 0.2 mm (Figure 5 and 6), results indicated a statistically significant increase in tooth movement than that of the control group (extrusion distance: 0.2 ± 0.3 mm, horizontal distance: 0.1 ± 0.3 mm).

- **Conclusion:** It was determined that periodontal teeth were moved and rolled by inflammation of the periodontal tissue. From these studies [8,9], tooth extrusion and movement were affected by periodontal inflammatory conditions and thus, it was suggested that periodontal disease was triggered by premature contact.

Periodontal disease teeth impacted PTM and tooth movement. In addition, X-Rays indicated an enlargement of periodontal ligament. As one of the causes of PTM, histological changes of the periodontal ligament influence the physical interaction of moving teeth [3].

Study of periodontal ligament displacement due to histological changes of periodontal tissue

1) The periodontal ligament displacement of healthy teeth [10].

- **Research purposes:** To examine the periodontal ligament displacement of healthy periodontal tissue.

- **Research methods:** The subjects were 5 mongrel dogs. Tooth displacement with vertical loading was measured using a laser displacement transducer at the left P3 in healthy tissue.

- **Research results:** When a balance weight of 100 g was placed on the tooth, a maximum of 346 μ m of subsidence was observed (Figure 7).

- **Conclusion:** The two-phase displacement pattern of viscoelasticity was observed in healthy teeth.

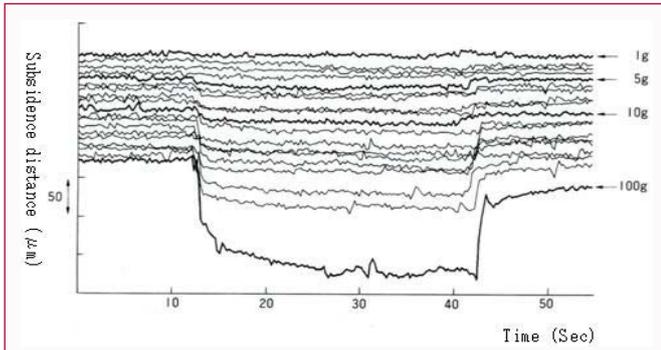


Figure 7: Subsidence distance by the time of the healthy group.

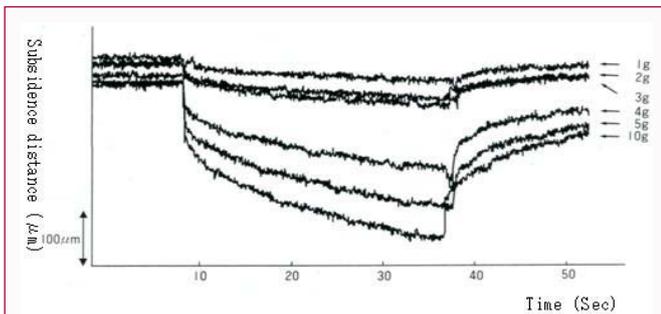


Figure 8: Subsidence distance by the time of the inflammation the group.



Figure 9: Baseline of the RP group.



Figure 10: Completed experiments of the RP group.

- **Research purposes:** Tooth extrusion does or does not occur, if experimental periodontitis teeth were treated with RP.
- **Research methods:** The subjects 4 beagles. The RP group: The left P3 was induced using experimental periodontitis, followed by RP at fourth and fifth weeks. The left P3 was maintained by tooth cleaning and the experiment period was 12 weeks.
- **Research results:** The RP group (extrusion distance: 1.4 ± 0.3 mm, (Figure 9 and 10) demonstrated a statistically significant increase in tooth extrusion than that of the control group (extrusion distance: 0.5 ± 0.2 mm). Vertical extrusion appeared to increase promptly after RP and decreased to a steady phase 2 weeks later.
- **Conclusion:** Premature contact induced tooth extrusion.

Conclusion

Experimental periodontitis studies have revealed that periodontal teeth do extrude and move. It was further suggested that inflammation of the periodontal tissue may cause premature contact and jiggling. In the future, if the relationship between teeth with periodontitis, PTM and occlusal trauma can be clarified, then teeth function evaluations will be even more important.

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References

1. Towfighi PP, Brunsold MA, Storey AT, Arnold RM, Willman DE, McMahan CA. Pathologic migration of anterior teeth in patients with moderate to severe periodontitis. *J Periodontol.* 1997;68(10):967-72.
2. Martinez-Canut P, Carrasquer A, Magán R, Lorca A. A study on factors associated with pathologic tooth migration. *J Clin Periodontol.* 1997;24(7):492-7.
3. Waerhaug J. The furcation problem: Etiology, pathogenesis, diagnosis, therapy and prognosis. *J Clin Periodontol.* 1980;7(2):73-95.
4. Manor A, Kaffe I, Littner MM. "Spontaneous" repositioning of migrated teeth following periodontal surgery. *J Clin Periodontol.* 1984;11(8):540-5.
5. Glickman I. *Clinical Periodontology.* Philadelphia: Saunders (W.B) Co; 1972.
6. Prichard JF. *The diagnosis and treatment of periodontal disease.* Philadelphia: Saunders Co; 1979.
7. Demetriou N, Parashis A, Tsami-Pandi A. Relationship between age and clinical symptoms of periodontal disease. *Stomatologia (Athenai).*1990;47(4):231-41.
8. Muraoka K, Kubota K, Tashiro Y, Yokota M. Effect of root planning on pathologic tooth migration in experimental periodontitis in beagles. *J Jpn*

- 2) Periodontal ligament displacement of periodontal teeth [11].
- **Research purposes:** To examine the periodontal ligament displacement under experimental periodontitis conditions.
 - **Research methods:** The subjects were 5 mongrel dogs. Tooth displacement with vertical loading was measured using a laser displacement transducer at healthy left P3 in cases of experimental periodontitis. The experiment was 4 weeks.
 - **Research results:** When a balance weight of 100 g was placed on tooth, a maximum of 616 µm of subsidence was observed (Figure 8).
 - **Conclusion:** The two-phase displacement pattern of viscoelasticity was evident in experimental periodontitis cases. From these reports [10,11], tooth displacement was represented using the Voigt model [12], and inflamed teeth reduced the sticky element.

The study of tooth extrusion in the periodontal treatment affected by experimental periodontitis

- 1) How tooth displacement is affected by Root Planning (RP) in experimental periodontal cases [8].

- Soc Periodontol. 2002;44(2):148-58.
9. Yokota S. Experimental study of influence of periodontitis on tooth migration. J Kyushu Dent Soc. 1996;50(1):223-36.
 10. Chen CC. The application of high accuracy laser displacement transducer on the measurement of vertical tooth displacement under very small loading. J Kyushu Dent Soc. 1998;52(1):200-9.
 11. Akiyoshi E. The measurement of tooth displacement under small loading on experimental periodontitis in dogs. J Kyushu Dent Soc. 1999;53(1):225-35.
 12. Picton DCA, Johns RB, Willis DJ, Davis WIR. The relationship between the mechanism of tooth and implant support. Oral Sci Rev. 1974;5(0):3-22.