



## **Occurrence of intermediate bifurcational ridges and attached cementicles on furcation area of Iraqi mandibular molars**

**Dr. Raed Aziz Badea. B.D.S. M.Sc. (Periodontology)**

### **Abstract**

Successful treatment of molar furcation defects remains a challenge in clinical practice. Knowledge of anatomic factors facilitates predictable management of furcation involvement lesions. Intermediate bifurcational ridge (IBRs) and cementicles are of those anatomical variations which considered as problems in progression treatment of the disease.

The present study was carried out to investigate the prevalence of IBRs and cementicles in Iraqi mandibular molars. The sample used in the study included 498 extracted mandibular molars. The results revealed that the prevalence IBRs was 306/498 teeth (61.44%), and that for the cementicles was 204/498 teeth (40.96%).

The total sample was allocated into two groups:

**Group 1** included 313 molars (165 mandibular first molar and 148 mandibular second molar) , The teeth of group 1 were extracted because of caries and pulpal lesions, while

**Group 2** included 185 mandibular molars ( 98 first molar and 87 second molar).

The reason of extraction of the teeth of group 2 was periodontal disease (different degrees of furcation involvement). For group 1 the results showed that 111/313 (35.46%) of mandibular molars had attached cementicles in furcation area and 185/313 (59.10%) were affected by IBRs. While in group 2 the percentage of both anomalies was higher than that of group 1. In group 2 the results revealed that 93/185

(50.27%) of the teeth had cementicles and 121/185 (65.4%) were recorded with IBRs.

These results give an indication that the prevalence of cem. and IBRs high enough to be of clinical importance.

**Key words: Prevalence, Cementicles, Intermediate bifurcational ridge, Furcation area.**

### **Introduction**

The progress of inflammatory periodontal disease, if unabated, ultimately results in attachment loss sufficient enough to affect the bifurcation and trifurcation of multirooted teeth<sup>(1-4)</sup>. The furcation is

an area of complex anatomic morphology that may be difficult or impossible to be debrided by routine periodontal instrumentation<sup>(6-10)</sup>. The presence of furcation involvement is one of clinical findings that can lead to

a diagnosis of advanced periodontitis and potentially to a less favorable prognosis for the affected tooth or teeth. Furcation area, therefore, presents both diagnostic and therapeutic dilemmas<sup>(11,12)</sup>.

Attached cementicles and IBRs are considered as variations or anomalies in tooth form, especially on subgingival root surface in furcation area<sup>(13, 14)</sup>. Cementicles are small globular masses that either present free in the periodontal ligament or adhere to a root surface. Through the active deposition of cementum, free cementicles adjacent to the tooth and eventually become embedded in cementum<sup>(15-18)</sup>.

Regarding the IBRs which is considered as another cemental anomaly appears as a distinct ridge, running across the bifurcation in a mesio-distal directing. This ridge, when present, originates on the mesial surface of the distal root about 2 mm from the height of the bifurcation, runs across the bifurcation, and ends high up on the mesial root, there blending into the concavity characteristic for the distal surface of the mesial root of this tooth<sup>(19-22)</sup>. Studies on the frequency with which cementicles and IBRs occurs on the root surfaces are few and contradictory. Such information is important for the clinician because of the problems that may face him during treatment and difficulties in dental plaque removal, so the purpose of the present study was to determine the prevalence of the cementicles and IBRs on furcation area of extracted mandibular molars in Iraq and if they are frequent enough to have clinical importance as risk factors for advancing and progression of periodontal destruction in furcation area.

## Materials and methods

The material of the study consisted of (498) extracted mandibular molars. The sample was divided into **2** groups, (**group 1**) included (313) mandibular molars (165) first and 148 second molars), the teeth of group1 were extracted for the reason of dental caries and pulpal lesions. While (**group 2**) consisted of (185) extracted mandibular molars (98 first and 87 second molars), these teeth were extracted because their furcation involvement with different degrees. The sample was collected from the dental clinics of Al-Mustansiriya teaching hospital / college of dentistry.

The soft tissues and debris were removed from the teeth by boiling them in water for 1 hour and then they were soaked in 6% solution sodium hypochlorite for 24 hours. Then they were stored in a solution of equal parts of glycerin and 3% hydrogen peroxide. Before examination the teeth were brushed with a soft tooth brush to remove residual debris and leave the teeth to dry and then were examined for detection of attached cementicles and IBRs with a dissecting microscope at a magnification of 20x.

Any adherent globular mass of cementum measuring 1 mm. or less in diameter was recorded as cementicle. A periodontal probe was used in measurement. The one millimeter size was chosen as a convenient cutoff point to distinguish between cementicles and nodules<sup>(15)</sup>.

## Results

**In group 1 cementicles** were detected in furcation area of 111 teeth (35.46%) of the 313 teeth examined. The mandibular first molar recorded the higher prevalence of cementicles than the mandibular second molars 63/165 teeth (38.18%), and 48/148 teeth (32.43%) respectively (**table1**).

**Table (2)** shows the prevalence of **cementicles in group 2** of the sample, cementicles were found in 93 teeth (50.27%) of the teeth examined. Also the mandibular first molars had a higher percentage of occurrence 51/98 teeth (52.04), while in mandibular second molars cementicles were found in 42/87 teeth (48.27%).

**IBRs in group 1** were recorded in **(table 3)** in which they were detected in 185 teeth (59.1%) of the 313 teeth examined. In furcation area of mandibular first molar IBRs were identified in 101/165 teeth (61.21%), while in second molars the percentage of affected teeth with IBRs was 84/148 teeth (56.75%).

**Table 4** demonstrates the occurrence of the **IBRs in group 2**, they were found in 121 teeth of the 185 teeth examined (65.4%). On the same trend, mandibular first molars reported a higher percentage of IBRs than mandibular second molars [70/98 teeth (71.42%) and 51/87 teeth (58.62%) respectively].

**Table 5** shows the prevalence of cementicles and IBRs in the total sample (group1+ group2). The results revealed that the prevalence of cementicles was 204/498 teeth (40.96%) and for the IBRs the prevalence was 306/498 teeth (61.44%).

The prominence or acuteness of buccal or lingual IBRs in affected molars is shown in **table 6**. The results showed that the buccal IBRs are more acute than lingual ones. For **group 1** the number of teeth with buccal IBRs was 94/185 teeth (50.81%) of the teeth affected by IBRs. The prevalence of lingual IBRs was 38/185 teeth (20.54%). While 57/185 teeth (30.81%) showed either no noticeable difference or presence of middle IBRs. Table 6 also demonstrates that in **group 2**, the number of teeth with

buccal IBRs was 60/121 teeth (49.58%). The number of teeth had

prominent lingual IBRs was 34/121 teeth (28.09%). The group 2 the number of teeth that had no noticeable difference between buccal and lingual IBRs or presence of middle IBRs. was 27/121 teeth (22.31%).

## Discussion

Furcation anatomy may influence the long term prognosis of the teeth by favoring the retention of the bacterial deposits and making oral hygiene procedures almost difficult or even impossible. Knowledge of a tooth's unique anatomic characteristics is a prerequisite for effective periodontal therapy<sup>(23)</sup>.

Successful treatment of furcation defects remains a challenge in clinical practice, so detection of anatomic variations and anomalies may facilitate predictable management of furcation involvement lesions<sup>(24)</sup>. Morphological analysis showed the high structural complexity of furcal area in molar teeth with the common observation of cemental crests to which cementicles and IBRs are belonged, these structures can offer a good receptacle to the subgingival dental plaque and can cause difficulties in debridement and therapeutical treatment of the molar furcal region involved by periodontal disease<sup>(25)</sup>.

The results of this study in relation to the prevalence of cementicles in group 1 (table 1) revealed that it is in agreement with the findings of Holton (1989)<sup>(15)</sup>.

The prevalence of cementicles is frequent sufficiently to have clinical considerations. Regarding the IBRs in group 1 (table 3) the findings of the present study showed that the percentage of IBRs (59.1%) is lower than that of Everette et al. (73%), and Dunlap & Cher (70%). These

differences in prevalence of those anomalies may be attributed to the ethnic, racial and national group variations. However, the prevalence of IBRs is also significant enough to be of clinical importance.

In group 2 of both types of anomalies (table 2 and 4), the prevalence of cementicles and IBRs was higher than that of group 1 and the presence of these anomalies may enhance the initiation and progression of periodontal disease in furcation area, because the increase of in percentages of these anomalies was accompanied by presence of furcation involvement.

The location of the IBRs is between the mesial and distal roots of mandibular teeth, and they were more acute buccally than lingually (table 6). This phenomenon may reduce the entrance to the furcation area and minimize the accessibility which in turn may exaggerate the problem of difficulty of mechanical debridement of furcation area. The presence of buccal and lingual IBRs creates a concavity between them in which dental plaque may be accumulated and hidden, so that removal of this plaque is also very difficult and may lead to more periodontal destruction. However, achieving of constant success of treatment is demanding for both the patient and the therapist, thereby, in such cases where the effectiveness of scaling & root planing is reduced, it is advisable to use antibacterial agents, usually in local and systemic manner, to overcome the limited efficacy of scaling & root planing<sup>(26)</sup>.

In conclusion the presence of cementicles and IBRs in furcation area may create a significant problem and the results of the present study proved that the prevalence of those cemental anomalies is quite enough to be of clinical importance in diagnosis and

treatment planning of periodontal disease in furcation area of molar teeth.

## References

- 1- Bower RC: Furcation morphology relative to periodontal treatment. Furcation root surface anatomy. J periodontol 1979; 50:366.
- 2- Bower RC: Furcation morphology relative to periodontal treatment: Furcation entrance architecture. J periodontol 1979; 50:23
- 3- Hou GL, Hung CC, Tsai CC, Weisgold AS.: Topographic study of root trunk type on Chinese molars with Class III furcation involvements: molar type and furcation site. Int J Periodontics Restorative Dent. 2005 Apr;25(2):173-9.
- 4- Santana RB, Uzel MI, Gusman H, Gunaydin Y, Jones JA, Leone CW.: Morphometric analysis of the furcation anatomy of mandibular molars. J Periodontol. 2004 Jun;75(6):824-9.
- 5- Mealy BL, Beybayer MF, Butzin CA, et al: Use of furcal bone sounding to improve the accuracy of furcation diagnosis . J Periodontol 1994; 65:649.
- 6- Tai H, Lemmer J : Furcal defects in dry mandibles. II. Severity of furcal defects. J Periodontol. 1982;53:364.
- 7- Lindhe J, Karring T, Lang NP : Clinical periodontology and implant dentistry 4<sup>th</sup> Ed Munksgaard, Copenhagen, 2003 pp 450,705.
- 8- Al-Shammari KF, Kazor CE, Wang HL: Molar anatomy management of furcation defects. J Clin Periodontol. 2001; 28(8):730-740.
- 9- Roussa E: Anatomic characteristics and root surfaces of molar teeth and their significance in the clinical management of marginal periodontitis.
- 10- Raed AB: prevalence of cervical enamel projections and enamel pearls on furcation area of Iraqi molar teeth.2005; Mustansiria DJ 2 :( 2)263-267.
- 11- Porciúncula HF, Zuza EP, da Porciúncula MM, de Toledo BE, Mendes AJ. Root trunk height as a risk factor for periodontal furcation involvement in maxillary first molars: an in vitro study. J Int Acad Periodontol. 2007 Jul;9(3):89-95.
- 12- MG. Neoman, H.H.Takei, F.A.Carranza :Carranz's clinical periodontology; Saunders ,10<sup>th</sup> edition. 2007; pp: 825-838.
- 13- Bensen, LA.: The surface of cementum. J Periodontol.1959; 30: 126.

- 14- Hou GL, Tsai CC: Cervical enamel projections and intermediate bifurcational ridge correlated with molar furcation involvements. *J Periodontol.* 1997;68(7):687-693.
- 15- Holton WL, Hancock EB, Pelleu GB, Jr : Prevalence and distribution of attached cementicles on human root surfaces. *J Periodontol.* 1986; 57(5):321-324.
- 16- J D Manson, B M Eley: Outline of periodontics, 4<sup>th</sup> Ed Wright 2000 pp 220.
- 17- Kodaka T, Debari K.: Scanning electron microscopy and energy-dispersive X-ray microanalysis studies of afibrillar cementum and cementicle-like structure. *J Electron Microscop.* (Tokyo). 2002;51(5):327-335.
- 18- Peter F Fedi, Arthur R, Vernino, John LGary: The periodontic syllabus, 4<sup>th</sup> Ed Lippincott Williams & Wilkins, 2000. pp9-10.
- 19- Everett FG, Ellis EB, Thomas DH, George CW.: The intermediate bifurcational ridge: A study of the morphology of the bifurcation of the lower first molar. 1958; *J D Res.* 37(1): 162-169.
- 20- Gottlieb, B.: Zementesxostosen, Schemlztropfen und Epithelnester. Ein weiterer Beitrag zur Biologie, *Oester . Ztschr. f. Stomatol.* 1921 ;19:515-526.
- 21- Orban B, : The development of the bifurcation of multirooted teeth, *J.A.D.A.* 1929; 16: 297-319.
- 22- Orban, B.: Oral histology and embryology. ed 4, St. Louis, 1957 ;The C.V. Mosbycompany.
- 23- Roussa E.: Anatomic characteristics of the furcation and root surfaces of molar teeth and their significance in the clinical management of marginal periodontitis. *Clin Anat.* 1998;11(3):177-86.
- 24- Kocher T, Gutsche C, Plagmann HC.: Instrumentation of furcation with modified sonic scaler inserts: study on manikins, part I. *J Clin Periodontol.* 1998 May;25(5):388-93.
- 25- Paolantonio M, Centobeni R, Scogna G, Di Murro C. :The anatomical characteristics of the root furcations in the molar teeth. *Minerva Stomatol.* 1992 Mar;41(3):105-20.
- 26- Nezh A, Gul A, Hanne L, Timo S,: The effect of subgingival controlled- release delivery of chlorhexidine chip on clinical parameters and matrix metalloproteinase-8 levels in gingival crevicular fluid. *J Periodontol.* 2002; 73(6):608-618.

Table (1): Shows the numbers and percentages of molar teeth with cementicles on furcation area (GROUP 1).

| Type of teeth          | No. of teeth examined | No. of teeth with cementicles | Percentage of teeth with cementicles |
|------------------------|-----------------------|-------------------------------|--------------------------------------|
| Mandibular first molar | 165                   | 63                            | 38.18 %                              |
| Mandibular first molar | 148                   | 48                            | 32.43 %                              |
| Total                  | 313                   | 111                           | 35.46 %                              |

Table (2): Shows the numbers and percentages of molar teeth with cementicles on furcation area (GROUP 2).

| Type of teeth          | No. of teeth examined | No. of teeth with cementicles | Percentage of teeth with cementicles |
|------------------------|-----------------------|-------------------------------|--------------------------------------|
| Mandibular first molar | 98                    | 51                            | 52.04 %                              |
| Mandibular first molar | 87                    | 42                            | 48.27 %                              |
| Total                  | 185                   | 93                            | 50.27 %                              |

Table (3): Shows the numbers and percentages of molar teeth with IBRs on furcation area (GROUP 1).

| Type of teeth          | No. of teeth examined | No. of teeth with cementicles | Percentage of teeth with cementicles |
|------------------------|-----------------------|-------------------------------|--------------------------------------|
| Mandibular first molar | 165                   | 101                           | 61.21 %                              |
| Mandibular first molar | 148                   | 84                            | 56.75 %                              |
| Total                  | 313                   | 185                           | 59.10 %                              |

Table (4): Shows the numbers and percentages of molar teeth with IBRs on furcation area (GROUP 2).

| Type of teeth          | No. of teeth examined | No. of teeth with cementicles | Percentage of teeth with cementicles |
|------------------------|-----------------------|-------------------------------|--------------------------------------|
| Mandibular first molar | 98                    | 70                            | 71.42 %                              |
| Mandibular first molar | 87                    | 51                            | 58.62 %                              |
| Total                  | 185                   | 121                           | 65.40 %                              |

Table (5): Shows the prevalence of cementicles and IBRs on furcation area of the total sample (GROUP 1+ GROUP 2).

| Type of anomaly           | No. of total teeth examined | No. of teeth affected (group 1+2) | Percentage of teeth affected(group 1+2) |
|---------------------------|-----------------------------|-----------------------------------|---|
| prevalence of cementicles | 498                         | 204                               | 40.96 %                                 |
| prevalence of IBRs        | 498                         | 306                               | 61.44 %                                 |

Table (6): Demonstrates the acuteness of buccal and lingual IBRs on affected teeth.

| Type of group | Buccal acuteness |        | Lingual acuteness |        | No difference noticeable |        |
|---------------|------------------|--------|-------------------|--------|--------------------------|--------|
|               | No. of teeth     | %      | No. of teeth      | %      | No. of teeth             | %      |
| Group (1)     | 94 / 185         | 50.81% | 38 / 185          | 20.54% | 57 / 185                 | 30.81% |
| Group (2)     | 60 / 121         | 49.58% | 34 / 121          | 28.09% | 27 / 121                 | 22.31% |