Journal of Dental Sciences (2016) 11, 405—410

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.e-jds.com

ORIGINAL ARTICLE

# A histological and radiographic study of pulpal calcification in periodontally involved teeth in a Taiwanese population

Liang-Gie Huang [a], Gin Chen [a,b,c*]

[a] Division of Endodontics and Periodontics, Department of Stomatology, Taichung Veterans General Hospital, Taichung, Taiwan
[b] School of Dentistry, National Yang-Ming University, Taipei, Taiwan
[c] School of Dentistry, Chun Shan Medical University, Taichung, Taiwan

Received 8 March 2016; Final revision received 11 May 2016
Available online 10 August 2016

**KEYWORDS**
age related;
dental pulp;
histological examination;
pulpal calcification;
radiographic examination;
systemic disease

**Abstract** *Background/purpose:* The prevalence of pulpal calcifications was widely studied in the past. The purposes of this study were to investigate the incidence of pulpal calcifications of periodontally involved teeth in a Taiwan Chinese population using radiographic and histological examinations, and to find out any association of pulpal calcification with systemic disease and dental conditions.
*Materials and methods:* A total of 197 teeth freshly extracted because of severe periodontal destruction were collected and prepared for histological and radiographic studies of the incidence of pulpal tissue calcifications. The occurrences of calcifications were recorded based on the different types of classifications proposed by Seltzer (1972). The number of examined teeth with pulpal calcifications was calculated, and they were statistically analyzed with the Chi-square test.
*Results:* The patient population ranged in age from 16 years to 85 years. Of them, 165 (84%) were male and 32 (17%) were female. The results show that the incidence of pulpal calcifications of periodontally involved teeth was 62% in histological and 30% in radiographic examinations. The occurrences were slightly higher than that reported in some previous studies and significantly different between the two examined methods. No significant association of pulpal calcification with age and systemic disease was found. Moreover, molars were observed to have more pulpal calcifications than bicuspids and incisors statistically ($P < 0.001$).
*Conclusion:* The true incidence of pulpal calcifications of periodontally involved teeth is likely to be higher in histological examination because pulpal calcifications with a small diameter may not be seen on radiographs. The prevalence of pulpal calcifications was found to increase

* Corresponding author. Division of Endodontics and Periodontics, Department of Stomatology, Taichung Veterans General Hospital, 1650 Taiwan Boulevard, Section 4, Taichung 40705, Taiwan.
*E-mail address:* kam@vghtc.gov.tw (G. Chen).

http://dx.doi.org/10.1016/j.jds.2016.05.001

significantly in molar teeth, and the results indicated that localized calcifications occur mostly in the radicular area of the pulp tissue.


## Introduction

Pulpal calcifications are fairly common in human dental pulps. They may occur in any one tooth or all teeth, including deciduous or permanent, unerupted or impacted, and healthy or diseased teeth, and in tooth-like structures of dermoid cysts.[2,3] Calcification may occur in the dental pulp in diffuse forms or as discrete calcified stones that may exist "freely" in the pulp tissue or become "attached" or "embedded" into dentin.[4,5] Calcification of tissues has been of interest for well over a century, but the factors related to dystrophic changes leading to calcifications are not absolutely known.[6] Pulp canal calcifications usually pose a challenge in both endodontic diagnosis and treatment.[7]

Earlier literatures report that calcified changes frequently occur because of dental caries, tooth abrasion, periodontal disease, pulp inflammation, and traumatic injury.[2,8,9] Cahn[10] first hypothesized that calcification within the pulp was a pathological process of deposition of calcium salts within the tissue.[4,11] Orban,[12] and Stenvik and Mjor[13] asserted that epithelial rests trapped in the pulp tissue initiated cellular activity, resulting in the formation of calcifications. Hill[14] expressed the opinion that the formation of pulpal calcifications was associated with certain stellate cells of the pulp, which are responsible for building an irregular dentin around calcific deposits. Calcifications might be caused by infolding of odontoblasts during the tooth development period, resulting in the formation of islands of dentin.[15] Anderson[16] suggested that the formation of pulp stones could be due to hypercalcemia of foreign bodies, such as dead cell or bacteria. Seltzer et al[5] in their study suggested that the etiology of pulpal calcifications was hemorrhage.

In 1965, Rubach and Mitchell[17] studied the microscopic variations of calcific alterations in the pulp and concluded that calcifications were generally not related to periodontal bone loss. Holcomb and Gregory[18] and Patterson and Mitchell[19] analyzed the incidence of calcific metamorphosis using radiographic techniques, and found a significant correlation between calcification and trauma. Although many studies have reported that the presence of mineralization is unrelated to age,[3,6,11,15] some studies purported to show that the incidence of mineralized bodies in the pulp increases with age.[5,20,21] A high incidence of calcified masses in pulps with carious lesions or in restored teeth was also reported.[22] Other possible factors such as microorganisms as well as various local or systemic diseases, including arteriolosclerosis, renal lithiasis, gout, osteitis deformans, hypercementosis, and torus palatinus, have been considered as the possible causes of pulpal calcifications.[23–25]

The prevalence or occurrence of pulpal calcifications in human teeth has widely been studied and reported to range from a low of 8% to a high of 90% (Table 1).[26–32] Many previous studies on pulpal calcifications in the dental pulp have been based on the radiographic method.[33–37] The true prevalence is believed to be higher in histological findings because calcified masses with a diameter smaller than 200 μm cannot be identified easily on radiographs.[35] It has been estimated that only about 20–25% of pulpal calcifications can be detected by radiographic observations.[2,3,6,36,37] Furthermore, the limited number of histological sections through each examined tooth during observations may result in under-reporting.[15]

**Table 1** Previous studies on the prevalence (or incidences) of pulpal calcification.[a]

| Methodology | Year | Investigators | No. of teeth | Prevalence (%) |
|---|---|---|---|---|
| Histological studies | 1933 | Stafne & Szabo[24] | 200 | 46 |
| | 1934 | Hill[14] | 132 | 66–90 |
| | 1934 | William[15] | 164 | 87 |
| | 1959 | James et al[26] | 159 | 52–57 |
| | 1965 | Langeland & Langeland[27] | 155 | 19 |
| | 1968 | Sayegh & Reed[20] | 591 | 8–90 |
| | 1968 | Sundell et al[22] | 470 | 11–18 |
| | 1970 | Stenvik & Mjor[13] | 95 | 25–50 |
| | 1983 | Moss-Salentijn & Klyvert[21] | 175 | 25 |
| | 1986 | Yaacob & Hamid[29] | 120 | 7 |
| | 1988 | Baghdady et al[2] | 515 | 19 |
| | 1993 | Arys et al[31] | 42 | 78 |
| | 1997 | Hillmann & Geurtsen[32] | 332 | 3–19 |
| | 2016 | Present study | 197 | 62 |
| Radiological studies | 1934 | William[15] | 164 | 14–15 |
| | 1967 | Holcomb & Gregory[18] | 881 | 4 |
| | 1982 | Tamse et al[28] | 1380 | 8–57 |
| | 1983 | Moss-Salentijn & Klyvert[21] | 175 | 25 |
| | 1988 | Baghdady et al[2] | 6228 | 19 |
| | 1990 | Kumar et al[30] | 120 | 6–25 |
| | 1998 | Hamasha & Darwazeh[3] | 814 | 22 |
| | 2002 | Ranjitkar et al[36] | 217 | 10 |
| | 2003 | Chandler et al[34] | 121 | 4 |
| | 2016 | Present study | 197 | 31 |

[a] Based on the study of Goga et al[6] in 2008.