



## STONES WITHIN THE DENTAL PULP: CLINICAL CORRELATIONS

### Dental Science

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### ABSTRACT

Pulp stones are radiopaque structures & calcified masses in pulp chamber. They can be freely embedded in the pulp chamber, can be attached to the dentine or can be embedded. Pulp stones are generally associated with systemic and genetic disorders including dentinogenesis imperfecta, Vander Woude Syndrome. They can possess hindrance during orthodontic, endodontic & aesthetic restorations by occluding the pulp space. The size of the pulp stones vary from minute particles to large masses & can be 1-12 in number in a single pulp. Pulp stones possess clinical difficulty during root canal treatment & in various other clinical procedures.

### KEYWORDS

Pulp stones, Pulp calcifications, Denticle

#### INTRODUCTION:

Pulp stones are the calcified bodies with an organic matrix which most frequently occur in the coronal pulp of the tooth. They are usually asymptomatic although neuralgic pain has sometimes been attributed to their presence.<sup>1</sup> Pulp calcification may be of microscopic size or large enough to be detected on a radiograph.<sup>2</sup> A study by Johnson and Bevelander<sup>3</sup> showed that stones ranging from 1 to 12 or even more with varying sizes can be present in a single tooth, these may sometimes be large enough to occlude the pulp space. Although, reduced capillary permeability, reduced blood supply, pyrophosphatase and uncontrolled mineralization, are thought to be a cause which may lead to calcifications<sup>4</sup> but despite these theoretical concepts and numerous histochemical and microscopic studies, the exact cause of such pulp calcifications still remains unknown. Pulp stones do not seem to be of much significance other than in few cases where they can impinge on a nerve tissue and cause pain or in cases where they can hinder access to root canals during endodontic procedures. In this review we focus basically on the pulp stones and what hindrances they can possess.

#### Incidence

Pulpal stones are not rare but their frequency is difficult to determine as in most of cases their size is so small to cause any symptom or problem during an endodontic procedure. Reported rates vary from 8% to 90%, but several investigators have documented a prevalence of approximately 20% in individual teeth reviewed radiographically. As radiographically detectable pulp stones typically exceed 200µm in diameter, the prevalence in a histopathologic review would be expected to be much higher.<sup>5</sup> In a study done by Willman<sup>6</sup> 164 teeth picked at random and examined histologically, 143 (or 87%) exhibited calcification in the pulp. Interestingly, only 15% of the areas of calcification were large enough to be seen on the dental radiograph.

Another investigator Hill et al.<sup>7</sup> reported that between the age groups 50 & 70 years, 90% of all teeth showed calcifications & in young persons between the age group of 10 and 20 years 66% of all teeth. There is no apparent difference in the frequency of occurrence either between the genders or among the various teeth in the dental arch.<sup>8</sup> Nayak et al.,<sup>9</sup> reported higher frequencies of pulp stones in maxillary arch as compared to the mandibular arch. A case of 13 year-old girl with generalized pulp stones with clinically normal crowns was reported by Ozkalayci et al.<sup>10</sup>

#### Possible factors for development

Many researchers have put forward a number of theories regarding the formation of the pulp stones, but despite these theoretical considerations their formation still remains an enigma. Although age is a factor that is associated with the presence of pulp stones and pulp calcifications as increase incidence of pulp stones is seen with increasing age, but a correlation of other factors such as irritation, inflammation of the pulp and other pulpal diseases is yet to be verified.

One of the theories for the formation of true denticles is attributed to interactions of the epithelial and mesenchymal components within the developing pulp. Here the strands of epithelium originating from the rootsheath, or cervical extensions, induce odontoblastic differentiation of the surrounding mesenchyme of the dental papilla which latter give rise to the core of the denticle. Odontoblasts deposit tubular dentin as they move away from the central epithelium and produce thimble-shaped structures surrounding the epithelium.<sup>5</sup>

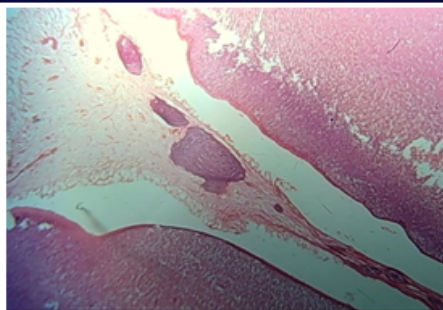
A central nidus of pulp tissue including ground substance, collagen fibres & necrotic cells results in the development of pulp stones. Central nidus made of regular calcified material extends in a concentric or radial pattern after the beginning of initial calcification.<sup>5</sup>

Studies done by Kretschmer and Seybold<sup>11</sup> tried to correlate microorganisms with pulp calcifications as they show an extremely high percentage of pulp stones yield a pure streptococci upon culture. Another study done by Sundell et al.,<sup>12</sup> attempted to determine the degree of pulp response elicited by cutting procedures and restorative materials was capable of increasing the incidence of pulp stone nidus and pulp stones but no significant results were obtained.<sup>13</sup>

#### Types

Depending upon their microscopic structure pulp stones have been classified as either true denticles or false denticles.<sup>8</sup> True Pulp stones are made of dentine and are lined by odontoblasts.<sup>14</sup> They are considerably more common in the pulp chamber than in the root canal.<sup>8</sup> Pulp stone False Formed from degenerating cells which mineralize.<sup>5</sup>

Pulp stones are also classified on the basis of their topographical relationship. They can be free, attached or embedded. Free pulp stones are surrounded by soft tissue & are not related to pulp space wall. Adherent pulp stones are not exposed by dentine & are attached to wall of pulp space.<sup>14</sup> Embedded Stone lie entirely within the dentin in case of formation of excessive secondary or tertiary dentin.<sup>15</sup>



**Figure 1 shows free pulp stone surrounded by pulp tissue**

#### **Histologically:**

True denticles are composed of restricted calcified tissue masses resembling dentin due to their tubular structure. False denticles do not exhibit dentinal tubules and are composed of localized masses of calcified material. Instead, the nodule appears to be made up of concentric layers or lamellae seems to be the basic composition of a nodule surrounding a central nidus.<sup>8</sup>

#### **Systemic conditions associated**

Pulp stones have been noted in patients with systemic or genetic diseases such as dentine dysplasia, Pulpal stones and calcifications have been noted in association with certain disease processes, which include, Dentin dysplasia type Id, Dentin dysplasia type II, Pulpal dysplasia, Tumoral calcinosis, Calcinosis universalis<sup>3</sup>, dentinogenesis imperfecta<sup>14</sup> Ehlers-Danlos syndrome and Van der Woude syndrome<sup>16</sup>

Stafne and Szabo<sup>17</sup> attempted to correlate pulp nodules with various local or systemic diseases including cholelithiasis, renal lithiasis, arteriosclerosis, gout, acromegaly, osteitis deformans, hypercementosis, and torus mandibularis or palatinus. Their data indicates that no clear-cut relation exists between any of these conditions and pulp calcification.

Saethre-Chotzen syndrome<sup>18</sup>, elfin facies syndrome<sup>19</sup>, familial expansile osteolysis,<sup>20</sup> Unusual cases of idiopathic generalized pulp stone formation have been reported.<sup>21,22</sup>

#### **Correlating clinically**

When we look across the literature to find the possible correlations of a pulp stone we basically end with two basic things, first of which is the pain and second is the obstruction caused by it within the root canal Pain There are numerous cases reported in which the pulp stone are known to cause variable amount of pain ranging from mild to severe excruciating pain.<sup>8</sup> Certain theories suggest that the impingement of a denticle over a nerve ending might be the reason for pain but it only seems to be a theoretical concept which still is to be proved with experimental evidences, and the pain in the tooth associated with the pulp stones is said to be idiopathic in nature. The presence of pulp stones or diffuse calcifications does not affect the threshold of electric pulp testing.<sup>24</sup> Few researchers have also compared the pulp stones to kidney stones or stones of the gall bladder, but if that would be the scenario then the pain would have been more of a severe nature.<sup>25</sup> In the absence of any additional signs or symptoms, pulp stones should not be interpreted as a disorder requiring endodontic therapy.<sup>14</sup>

#### **Obstructing the canal**

Presence of any calcification including a pulp stone presents with some amount of difficulty in the endodontic procedures. The size of the pulp stone may alter the normal known anatomy of the canal and if an attached stone is encountered it may deflect or engage the tip of exploring instruments, and prevent its easy passage down the canal.<sup>26</sup> Stones of large size may sometime obliterate the canal completely.

#### **Looking for solutions**

If an attached stones is encountered a file can be passed alongside the stone and it may be removed by careful instrumentation.<sup>27</sup>

If in case a large pulp stone is present it can be dissected by the use of endodontic burs, but ultrasonic instrumentation with the use of special tips makes their removal far easier.<sup>28</sup>

In case of narrow canals its ideal to use ultrasonics coupled with the dissolving action of sodium hypochlorite to produce asynergistic effect.<sup>29</sup>

Pulp stones may seem to be a problem during the endodontic procedures but with advancement in technology, magnification, good access and appropriate use of instruments<sup>14</sup> they do not present much of a difficulty for the endodontist.

#### **CONCLUSION**

The pulp stones appear as a normal physiological change that is more evident with an increasing age. When we reviewed the facts about the pulp stones we found that pulp stones are purely coincidental finding without much of a clinical significance. The only problem which a pulp stone can cause is the hindrance during the endodontic procedures only if the size is large enough to obliterate the canal or the pulp chamber

#### **REFERENCES**

1. J.v.Saomes and jc southam Oral Pathology - 4th Ed. (2005) OXFORD UNIVERSITY PRESS
2. Regzi.Oral Pathology: Clinical Pathologic Correlations, 5th ed. 2008 Saunders
3. Bevelander G, Johnson PL (1956) Histogenesis and histochemistry of pulpal calcification. J Dent Res 35: 714-722.
4. Calcified Canals – A Review IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) Volume 13, Issue 5 Ver. IV. (May. 2014), PP 38-43
5. Neville, Damm, Allen, Bouquot. Oral And Maxillofacial Pathology. 3rd edition. page: 126-127.
6. Wilman W (1934) Calcifications in the pulp. Bur 34: 73.
7. Hill TJ. (1934) Pathology of dental pulp. J Am Dent Assoc 21: 820.
8. Shafer, Hine, Levy. Shafer's Textbook Of Oral Pathology. In: Rajendra R, Sivapathasundharam B (eds.) (6th edn)
9. Nayak M, Kumar J, Prasad LK (2010) A radiographic correlation between systemic disorders and pulp stones. Indian J Dent Res 21: 369-373.
10. Ozkalayci N, Zengin AZ, Turk SE, Sumer AP, Bulucu B, et al. (2011) Multiple pulp stones: a case report. Eur J Dent 5: 210-214.
11. Kretschmer OS, Seybold JW. (1936) The bacteriology of dental pulp stones. Dent Cosmos. 78: 292.
12. Sundell JR, Stanley HR, White CL (1968) The relationship of coronal pulp stone formation to experimental operative procedures. Oral Surg Oral Med Oral Pathol 25: 579-589.
13. Orban's Oral Histology And Embryology. Editor: GS Kumar 12th edition page 128-129.
14. Pulp stones: a review R. Gogal, N. P. Chandler2 & A. O. Oginni3 International Endodontic Journal, 41, 457-468, 2008
15. Slootweg Dental Pathology A Practical Introduction Pieter J. Slootweg....2007 Springer
16. Kantaputra PN, Sumitsawan Y, Schutte BC, Tochraontanaphol C (2002) Van der Woude syndrome with sensorineural hearing loss, large craniofacial sinuses, dental pulp stones, and minor limb anomalies: report of a four-generation Thai family. American Journal of Medical Genetics 108, 275-80.
17. Stafne EC, Szabo SE (1933) The significance of pulp nodules. Dent Cosmos 75: 160.
18. Goho C (1998) Dental findings in Saethre-Chotzen syndrome (Acrocephalosyndactyly type III): report of case. ASDC Journal of Dentistry for Children 65, 136-7.
19. Kelly JR, Barr ES (1975) The elfin facies syndrome. Oral Surgery, Oral Medicine, Oral Pathology 40, 205-18.
20. Mitchell CA, Kennedy JG, Owens PDA (1990) Dental histology in familial expansile osteolysis. Journal of Oral Pathology and Medicine 19, 65-70.
21. Weiss LR (1927) An unusual case of pulp stones. Dental Cosmos 69, 750-2.
22. Hitchin AD (1936) Pulp-stones in every tooth in a girl of 13 years. British Dental Journal 61, 539-41.
23. Moody AB, Browne RM, Robinson PP (1989) A comparison of monopolar and bipolar electrical stimuli and thermal stimuli in determining the vitality of human teeth. Arch Oral Biol 34: 701-705.
24. Martin AP (2002) A radiographic assessment of the prevalence of pulp stones. Aust Dent J 47: 355-356.
25. Pashley DH, Walton RE, Slavkin HC (2002) Histology and physiology of the dental pulp. In: Ingle JJ, Bakland LK (eds.) Endodontics, (5th edn) Hamilton, ON, Canada: BC Decker Inc, 43-5.
26. Pitt Ford TR, Mitchell PJC (2004) Problems in endodontic treatment. In: Pitt Ford TR, (ed.) Hart's Endodontics In Clinical Practice, (5th edn) Edinburgh: Wright, 241.
27. Stamos DG, Haasch GC, Chenail B, Gerstein H (1985) Endosonics: clinical impressions. Journal of Endodontics 11, 181-7.
28. Cunningham 1980, Cunningham WT, Balekjian AY (1980) Effect of temperature on collagen-dissolving ability of sodium hypochlorite endodontic irrigant. Oral Surgery, Oral Medicine, Oral Pathology 49, 175-7.