

## Assessment of Pulp Stones in Patients with Diabetes Mellitus: An Observational Study

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### Abstract

**Background:** Calcification in dental pulp (pulp stone) is one of the most common pulpal pathologies that causes hindrance while performing endodontic treatment. Various causative factors have been suggested including local and systemic factors. However, there is a lack of confirmatory etiopathogenesis for the occurrence of pulp stones.

**Aim :** The present study aimed to assess the prevalence of pulp stones in patients with diabetes Mellitus.

**Materials and method :** Age and gender-matched, 50 patients who were advised extraction of teeth due to periodontal disease and gave their consent to participate were included in the study. The patient's periodontal status for the tooth to be extracted and medical history for the presence of Diabetes Mellitus was recorded before the extraction. Formalin was used to fix the extracted teeth for a minimum of five days. Subsequently, the teeth were notched, and their pulp tissue was excised for standard histopathology processing and staining procedures. Using a light microscope, each section was meticulously examined for any indication of calcified deposits within the preserved pulp tissue. The presence of tissue calcifications in at least two sections of a given pulp tissue was scrutinized. The distribution of pulp stones within the teeth was then assessed.

### Results

Out of the 50 extracted teeth, pulp stones were observed in 36 teeth, accounting for 72% of the sample. The calcifications observed predominantly appeared as the diffuse type, located within the radicular pulp.

### Conclusion

The study highlighted a notable prevalence of pulp stones in patients diagnosed with Diabetes Mellitus. Moreover, it suggested an association between this condition and a heightened incidence of pulp stones, particularly in teeth compromised by periodontal issues. These findings underscore the potential impact of diabetes on dental health, emphasizing the importance of comprehensive oral care for individuals with this systemic condition.

**Keywords:** Dental Pulp, Pulp Stones, Pulp Calcification, Diabetes Mellitus.

### Introduction

Pulp stones indicate calcifications found in the pulp of the teeth. They may be found due to various etiological factors.<sup>1</sup> Diabetes Mellitus is one of the most commonly seen conditions seen in countries like India. Since Diabetes Mellitus is associated with microangiopathy and atherosclerosis, this study was undertaken to assess the presence and type of pulp calcifications in teeth extracted for

periodontal reasons in individuals diagnosed with Diabetes Mellitus.

### Materials and methods

The sample consisted of 50 patients who were advised extraction of teeth due to periodontal disease and gave their consent to participate in the study. The patient's periodontal

status for the tooth to be extracted and medical history for the presence of systemic diseases like Diabetes mellitus were recorded before the extraction.

For a minimum of five days, the extracted teeth were fixed promptly with 10% buffered formalin. For the purpose of exposing the pulp tissue and improving tissue fixation, all teeth were made accessible to the action of fixatives by using a No. 4 diamond round bur via incisally or occlusally.

Further, the teeth were split with a sharp rongeur or chisel and incised longitudinally in the buccolingual direction using a tapered fissure diamond bur. An endodontic explorer was used to extract the pulp tissues from the tooth segments, the pulp tissues were embedded in paraffin and dehydrated using ethyl alcohol at increasing percentages. For histological analysis, three representative histological sections that were sectioned at a 5-micron thickness and cut in a plane perpendicular to the long axis were stained with eosin and hematoxylin.

A light microscope was used to inspect each segment to check for any signs of calcified deposits in the preserved pulp tissue. A minimum of two sections of a particular pulp tissue were examined for the presence of pulp calcifications. The data obtained was compared for the association of pulp calcifications with Diabetes Mellitus.

## Results

Among the samples, 25 teeth were from males and 25 from females. The age ranged from 40-60 years (mean = 52 years). Calcification was seen in 72 % of the teeth studied (i.e. out of the total of 50 extracted teeth studied 36 showed calcification). Out of the teeth showing calcification, diffuse calcification was seen in all the examined teeth (Fig 1). It was also found that all the teeth showed calcifications in the radicular pulp. No teeth in the current study showed true pulp stones or calcification in the coronal pulp.

## Discussion

Pulp stones are usually noticed on radiographic examination and appear as round or ovoid radiopaque lesions. Pulpal calcifications are common and can affect any tooth or all the teeth, permanent or deciduous, impacted or unerupted, and unhealthy or healthy teeth.<sup>1</sup>

There are two different kinds of calcified substances found in dental pulp: pulp stones, which are compact, degenerative masses of calcified tissues and denticles, which are formed from epithelial remnants and encircled by odontoblasts on the periphery. Diffuse forms of calcification or isolated calcified stones that can exist free in the pulp tissue or become attached or embedded in dentin can occur in the dental pulp. For more than a century, the calcification of tissues has piqued

attention, although the causes of the dystrophic alterations that result in calcifications are not fully understood. In most cases, pulp canal calcifications provide difficulties for endodontists to diagnose and cure. Additionally, people with genetic or systemic disorders including dentinogenesis imperfecta, dentine dysplasia, and some specific syndromes have been observed to develop pulp stones.<sup>2,3</sup> Dental caries, periodontal disease, tooth abrasion, traumatic injury, pulp inflammation, and mineralization of foreign materials, such as dead cells or bacteria, are common causes of calcified alterations.<sup>4</sup>

It is widely acknowledged that perturbations brought on by ageing, pathological alterations in dentinal architecture, tooth trauma or systemic illness are associated with the development of pulpal calcifications. Nonetheless, the study's findings are not always clear.

In a systematic review and meta-analysis, a low level of evidence was found to support the hypothesis that, cardiovascular disease patients are more prone to have pulp stones than non-cardiovascular disease patients.<sup>5</sup>

Stafne et al. discovered a strong correlation between osteitis deformans, arteriosclerosis and cardiovascular disease in the presence of pulpal calcifications.<sup>6</sup>

The current study evidently showed a positive association between the frequency of calcific changes in pulp of teeth compromised with periodontitis and the number of patients with Diabetes Mellitus.<sup>7</sup> This intriguing correlation may be secondarily attributed to changes in vascular response and degenerative processes associated with such teeth.<sup>6,8</sup>

Few studies have analyzed pulp samples from patients with Type 2 Diabetes and observed decreased cellularity and vascularity, thickened blood vessel walls, increased pulp calcification and elevated collagen deposition.<sup>8-11</sup> Similar findings have also been reported in animal models.<sup>12</sup>

Periodontitis, a common complication of Diabetes Mellitus is also known to worsen glycemic control hence the association of diabetes and periodontitis is interdependent and can worsen the other.<sup>13</sup>

Recent studies highlight the effect of decreased melatonin and antioxidant levels caused a loss of protective effects on human dental pulp tissue in patients with Type 2 diabetes.<sup>14,15</sup>

The findings from the above-mentioned studies support the results and the possible mechanisms suggested in the present study.

## Conclusion

Diabetes Mellitus is linked to a heightened occurrence of pulp stones in teeth affected by periodontal issues. This

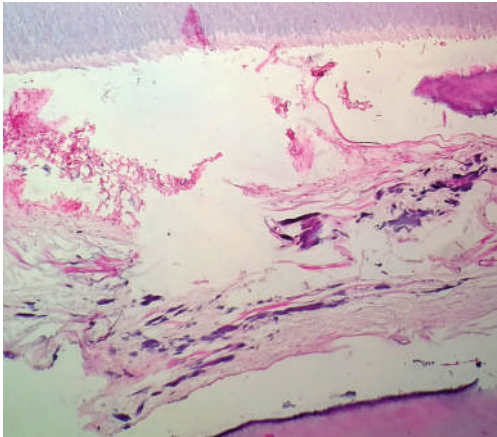


Fig.1 Photomicrograph showing diffuse calcification (Haematoxylin & Eosin stain, 10x magnification)

association likely stems from several factors, including microangiopathy, inflammation, and degenerative changes. The impact of diabetes on vascular health may disrupt the microcirculation within the dental pulp, promoting calcification. Additionally, the chronic inflammatory state characteristic of diabetes can exacerbate pulp tissue damage, fostering the formation of calcified deposits. Future research is needed to explore the precise mechanisms underlying this relationship, potentially offering insights into novel preventive and therapeutic approaches for managing dental complications in individuals with diabetes.

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