

# Dental Pulp Calcification in Patients with Cardiovascular Diseases: A Review

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**Abstract:** Introduction: When it comes to pathological calcification one cannot avoid the fact that the extensive calcification in the plaque of the arteries is of special interest since it is considered to be one of the most threatening diseases. Purpose: The intention of the study is suggest through a review of the importance of denticles in patients with cardiovascular diseases. Materials and methods: The study included material and methods of only authors. The systematic literature review was completed using the electronic databases: Pubmed, Medpilot and Medline. The main notions for search were: dental pulp stones, cardiovascular diseases, pathological calcification. Studies which met the inclusion criterion were studies conducted between 1990 to 2012 and which were retrospective or prospective controlled studies. Results: The message of the study is that when a dentist enters the dental cavity with their instrument or the dental pulp in the root canal in patients with confirmed heart diseases, they may be susceptible to heart attacks. Discussion: One of the reasoning is that they have "sand" in the dental pulps, comprised of calcium phosphate crystals. Conclusion: The conclusion from this study is that these calcium phosphate crystals are released in the blood during the repairing of the dental cavity thus provoking heart problems in patients already suffering from heart diseases.

**Keywords:** dental pulp calcification, the dental cavity, the pathological calcification, the calcium phosphate crystals, the arteries, cardiovascular diseases.

## 1. Introduction

Denticles, as a separate entity in the pathological calcification can appear as a result of degenerative changes of the pulp, when mineral substances gather around an ossification centre. They can be necrotic cells that can either resorb or calcify [1]. Collagen fibres, an altered basic substance, a hyaline degenerated pulp tissue and alike can also be ossification centres [2].

It is considered that the formation of the dental calcifications can also occur from the wall of pulp cavum where accumulation can be initiated due to the increased creation of dentine [3].

Specific antibodies of type I collagen and non-collagen proteins (osteopontin, osteonectin and osteocalcin) have been found in the calcified matrix since the cells of the dental pulp generate osteopontin in vitro.

After the demineralization of the denticles, which have undergone series of sections, they are stuffed and subjected to immunohistochemical procedures.

Type I collagen – osteopontin is localised even in the denticle, indicating thus to be the major component of the denticle's matrix.

It has been confirmed that strong immuno-coloured spots appear in the peripheral area of the denticle, unlike the osteonectin and osteocalcin which are absent.

The Osteopontin is very often found in other pathological calcifications as well [4,5,6], such as urinary stones, osteosclerotic plaque.

All these findings suggest that osteopontin, generated by the cells of the dental pulp, is possibly connected to the calcification of the denticle.

The arrangement of the extracellular molecules of the matrix, especially collagen type I, III, and VI, in the extracellular matrix of the connective tissue of the dental pulp at different age, is studied by polarization and with indirect immunofluorescent microscopy using a conventional fluorescent microscopy and confocal laser scanning microscopy.

The polarizing and the immunofluorescent microscopy of the paraffin parts show heavy thick fibres of collagen type I, that represent a main component of the matrix of the dental pulp's connective tissue.

Indirect and immunofluorescent microscopy confirms that the thin fibres and small clusters of collagen type III are one of the main fibril elements present in the matrix of the dental pulp.

Collagen type IV has been discovered by clear and intensive staining of the basic – lower membrane of the blood vessels in examinees of all ages.

These fibres are located around the blood vessels and they seem to be in a far greater number in the sub-odontoblastic layer. Researches using confocal laser scanning microscopy have revealed existence of fibres of collagen type IV, spirally set between the completely differentiated odontoblasts, all the way to the pre-dentic layer. It has been observed that different types of collagen enter the compound of the denticles [4].

Long-lasting irritations such as: a cariogenic process, deep restorations, chronic inflammations of the pulp, traumatic

injuries of the tooth, orthodontic interventions, are all related to this phenomenon [3].

Research at the level of fluor application and abnormal dental pulp calcification indicate certain correlation between the fluor-prophylaxis and the special form of pulp calcification and dental ankylosis [7,8].

The relation between the dental calcificates and certain vascular disruptions, which has been statistically proven [3], suggests that sometimes a blood vessel or a thrombus can become an ossification centre that later calcifies and turns into this sort of formation.

It has been proven that denticles may also have bacterial aetiology. Nanobacterium sanguineum/calcifying nanopartilces are mentioned as possible causes for the creation of dental calcifications [9,10,11,12].

The first step in proving this has been made by fluorescent monoclonal direction of antibodies against the cellular wall of Nanobacterium sanguineum, a process during which the stones have been de-calcified with HCL.

Observation under electronic microscopy indicates that healthy teeth appear fine, whereas those with denticles have uneven surfaces, calcified deposits that are of similar size and shape to Nanobacterial colonies, fused in the connective tissue.

Eventually the healthy tooth is incubated with lab reserves of Nanobacterium sanguineum. After a month the healthy tooth is not in such good shape. Now this tooth has numerous cavities, colcospherile, identical to Nanobacterial in a tissue or “covered“ with “ kidney stones“.

The denticles contain Nanobacterium sanguineum, which goes to prove that the nanobacterium an cause the creation of apatite denticles on the dental surface. They are assumed to have developed while inoculating the teeth which further goes to prove that Nanobacterium sanguineum is dependant on calcium.

Observing the growth of the Nanobacterial it can be noticed that it contains a raised level of calcium. Using electronic microscopy the presence of “grains“ of Nanobacteria that energetically grows on the calcium is proven. This bacterium can find its way into the organism orally as an addition to travelling parenterally and transplacentally. These forms of diseases in teeth result in the loss of a tooth due to the osteolytic process. The denticle-forming bacteria tested are actually more often known for their cariogenic ability [13]. When it comes to pathological calcification one cannot avoid the fact that the extensive calcification in the plaque of the arteries is of special interest since it is considered to be one the most threatening diseases [14].

## 2. Discussion

As yet many doctors look at calcification in the arteries as something that comes as the result of the disease, contrary to the evidence confirming that calcium phosphate crystals generate the very type of inflammation, which has been

confirmed by cardiologists and that it plays a major role in heart attacks [15,16].

Surprisingly, despite all the advanced techniques for detection, there yet has not been made a breakthrough in finding the calcium deposits that start in billions of capillaries in the human body [17]. But not to make a mistake – calcification is present and it is merely a medical misunderstanding [18].

Detecting it does not show where it originates from, neither is it known in what way it can be prevented or removed, except surgically.

Now, with the help of all scanning technologies, calcified spots that start in the capillaries of the organism have been found, though formerly it was looked at distrustfully [19].

Only in the latest years of the scientific research it has been made quite clear that this was no coincidence; it is thus a fact of matter that the base is made up of calcium phosphate crystals which are the basic compound of the calcification – the first of all reasons and causes of acute inflammation [20,21,22,23]. This also causes an acute immunological response of the human organism.

Circulation Research 2005;96:1248, a magazine published by a leading group of researchers in London, proves that calcium phosphate crystals are the cause of inflammation in heart diseases: pro-inflammatory activation of the macrophages of the basic calcium phosphate crystals through Protein Kinase C and Map Kinase, which in turn is a harmful cycle of inflammatory irritation and arterial calcification.

This only goes to confirm that instances are now discovered in arthritis and other diseases for which doctors learn that the calcium generates this type of inflammation. This is highly significant since inflammation is the cause of many diseases.

Also, ineffective therapies for or the prevention of calcification have been periodically published – for small surgical interventions such as physical removal or bypass deposits. It is worth noting that calcium, together with phosphorus, is one of the main compounds in the forming of pathological calcifications that needs to be paid greater attention.

The riskiest infiltrated plaque is the one in heart diseases, including cases with bypass and stent, used for the purposes of improving the inner intake.

The American national library of medicine contains thousands of scientific and research data that suggest calcification, and various medical magazines which cover this issue in depth.

Calcium phosphates make up around 20% of the entire plaque in the arteries, so called “hard plaque”. But on the inside they are present in a greater percentage, so many people are not aware that that is the “soft plaque” and that it is vulnerable and as such identified as a leading cause for

heart attacks. This can be observed by taking a sample tissue with special colouring that reveals these small calcium phosphate crystals.

They are of hard nature and located in the skin and arteries. It has been proved that very patient with a heart disease has pathological calcification. Pathogenesis is the cause of calcification in heart disease and heart diseases per se, but heart attacks are permanent subjects of interest and the aim of the research is to reduce the number of heart attacks [24].

It is clear that all infectious diseases, especially Chlamydia, Herpes, Hepatitis, are to be immediately removed so that they do not affect the heart diseases. In the year of 2004 it was made known that calcification in heart diseases is reversible. The studies that show readiness of the researchers to improve the coronary arterial calcification using medical treatment are considered to be good news.

Their results already speak of reductions of heart diseases by 50% [25]. COX A.B. et al. have determined the relation and presented denticles and anamnesis of cardiovascular diseases, as well as family histories of cardiovascular diseases.

This research was made with 55 examinees at the age of 20-55 who filled out questionnaires containing questions regarding cardiovascular diseases and family anamnesis. The criterion used was teeth with minimum restorations, non-cariogenic molars and broader anamnesis, renal inflammations and renal lithiasis, as well as the content of the periapical X-ray results that prove the denticle. The results indicate that there is a 95% connection between the denticles and personal anamnesis, whereas there is no such connection between the denticles and the family anamnesis. 74 % of registered patients with cardiovascular complaints had denticles, 39 % of patients who had not complained of having heart problems also had denticles [26].

The author T. Kodaka et al. worked on comparisons between denticles in the pulp of human teeth and animal teeth, more precisely, cow teeth. According to them, the denticles in the pulp of human teeth contain biological apatite. They have conducted their research on a cow of 12 years of age observing "spherulitic" stones of up to 200 gm in diameter, that contained radially set crystals with using several types of light microscopy and scanning electronic microscopy, including a side electron, as well as reverse signals.

These authors claim that the crystals spread in a fan-like fashion, moving towards the peripheral part and marking a rectangular restriction with long sequel of crystals and fine cuts of NaOCl-soluble substances.

They probably include organically dependant and amorphous minerals, emphasise these authors. Using dispersal X-rays for microanalysis they have discovered that the stones contain huge quantities of Ca and P and traces of Na, Mg, Cl and Fe.

The crystals of the calcium phosphate have been identified as biological brushite (DCPD) with boarders, Ca/P molar

correlation, as well as an electronic diffraction, i.e., refraction.

The mid part of the stone, according to them, contains granulated structures, probably erythrocytes that are always present in blood vessels and so-called rectangular crystals that often enter the blood vessels.

The authors claim that these-called "nidi" were completely or partially solvent, but the peripheral parts depict a radial order of the erythrocytes. These "nidi" can be thrombi or necrotic blood with erythrocytes.

The authors conclude that such "calcospherulites" in the dental pulp of a cow are similar to the "spherulitic" dental stones in humans, except that their "nidi" could be present in different parts [27].

In order to find the possible cause for the formation of dental calcificates, some endogenous factors have been researched and the findings in some patients with denticles indicate an increased process of calcification not only in the pulp of the tooth, but rather in other organs as well.

It safe to say that the general factors for vascular disorders, especially the calcification of the blood vessels, deserve to be paid great attention [26,28,29].

### 3. Conclusion

The message of the study is that when a dentist enters the dental cavity with their instrument or the dental pulp in the root canal in patients with confirmed heart diseases, they may be susceptible to heart attacks. One of the reasoning is that they have "sand" in the dental pulps, comprised of calcium phosphate crystals. And these calcium phosphate crystals are released in the blood during the repairing of the dental cavity thus provoking heart problems in patients already suffering from heart diseases [26].

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