

# Some Gleanings on the Origin, Etiology, Nature and Development of Pulp Stones – 100-year Perspective

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## Introduction

This historical journey will focus on a specific issue about a little tissue that most contemporary authors have passed off as a mysterious, unknown entity – **the Pulp Stone/Nodule**.

Pulp stones, pulp nodules, denticles and endoliths, are various terms used for arguably one of the most common intra-dental findings throughout the dentition at all stages of life.

From 1969 to 2021, there have been over 100 publications or more that have addressed pulp stones purely from an epidemiological or management standpoint, **with minimal to no effort to identify their true source or etiology**.

*“The mystery which shrouds these formations as well as the difficulties in both diagnosis and treatment, are simply what an Irishman would call a ‘holy terror.’”*

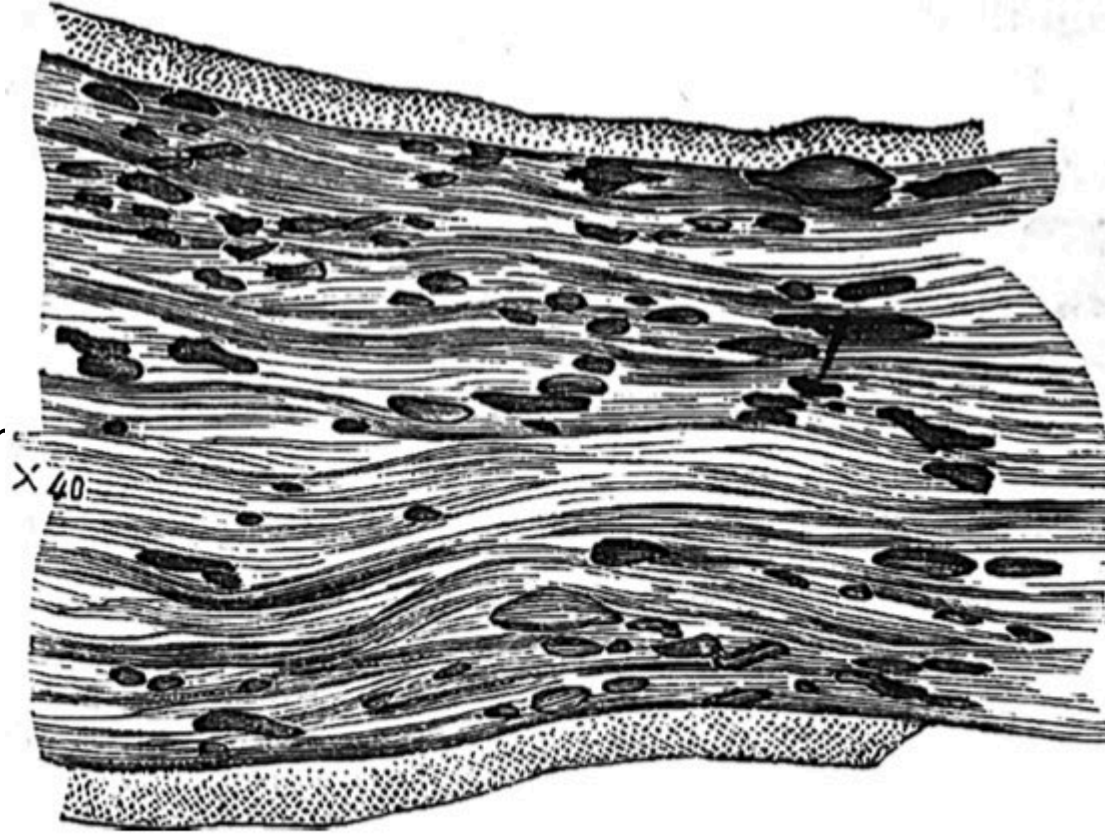
-Dr. H.H. Fitch 1889

## 1874- Calcification Islands and Irritation

In 1874 Salter attempted to describe the method by which intrinsic calcifications in the pulp occurred. He referred to “calcification islands” – and the development of calcific changes that occur early in the pulp’s response to irritation, i.e., caries

*“Running along the pulp...are multitudes of small bodies, for the most part of the lenticular form, with a very decided and dark boundary outline, lightening off to a brilliant centre, the long axis being that of the pulp. These are the ‘calcification islands’”*

*“The calcification islands are very numerous among the nerves; the nerve-fibres do not seem in any way pushed aside by their presence...”*



Calcification islands as described by Salter as early as 1856.

## 1886- First Classification System

In 1886, GV Black attempted to classify calcific changes that occurred in the dental pulp in his observations on the pathology of the dental pulp, classifying them as:

1st. Secondary Dentine – A new growth of dentin, or less regular in formation, excited by abrasion, decay or other injury by which the dentinal fibrils are subjected to irritation at their distal ends.

2d. Dentinal Tissue with the Pulp-Chamber – An erratic growth of dentine into the pulp-chamber united to the wall by a pedicle. The structure is usually very irregular.

3d. Nodular Calcifications among, but not of, The Tissues of the Pulp

4th Interstitial Calcifications of the Tissues of the Pulp

5th Cylindrical Calcifications of the Pulp, the tissue of which are probably in the state of fibrous degeneration. Usually seen in the pulp canals.

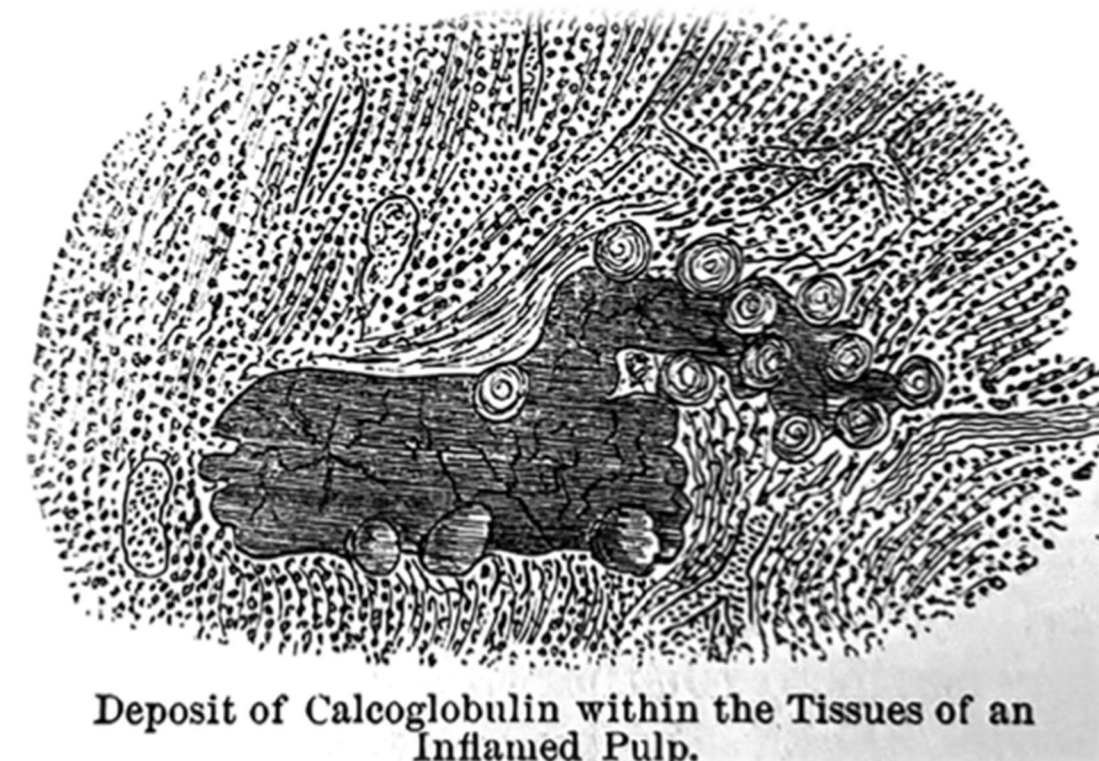
6th Osteo-dentine – Erratic formation showing both the lacunae of bone and dentinal tubules.”

## 1893- Calcoglobulin and Inflammation

GV Black also referred to “calcoglobulin”, which seemed to be a forerunner or substrate for the formation of dentinal nodules.

*“Deposits of calcoglobulin are found associated with inflammation in a considerable number of cases. I have not seen this deposit mentioned in any writings on this subject, yet it is so prominent that I fail to understand how it could have been overlooked. To my mind, this formation is associated with the formation of what are known as pulp-nodules. It possesses the same form of elements common to the pulp-nodule...however, it is soft enough to be readily cut with a knife.”*

*“The pulp-nodule is very hard...always in the inflamed portion of the pulp...Yet in all my examinations I have never found a pulp-nodule in a soft shell or with a softer portion on the outside...”*



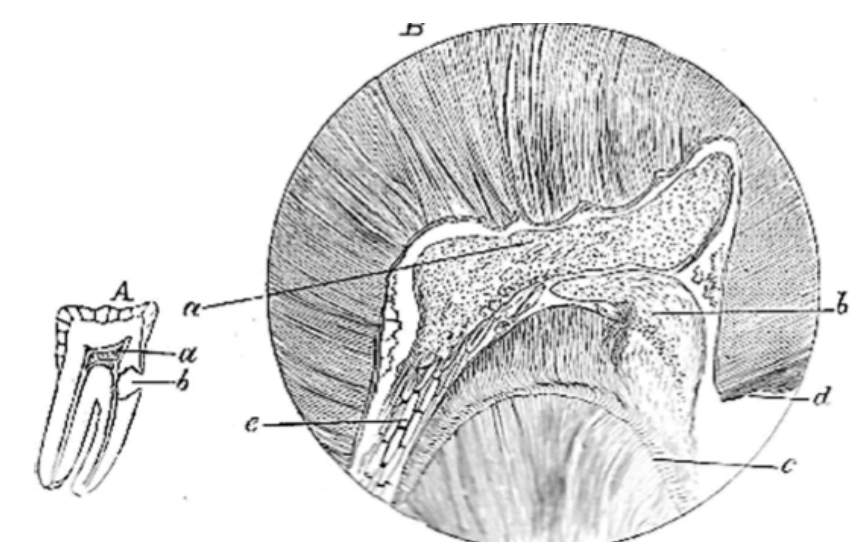
Deposit of Calcoglobulin within the Tissues of an Inflamed Pulp.

## 1912-Prime Location and Pain... Again

Burchard and Inglis, in 1912, identified the prime location for pulp nodules as being coronal portion of the pulp, with occasional findings in the root portion of the pulp, either free or embedded in the secondary dentin.

They indicated if the nodules obstructed the lumen of the canal and interfere with vascular circulation, they may be the source of “great pain.”

Here again, the concept of nodules/stones causing pain is brought to the forefront.



Picture from Burchard & Inglis (1912)<sup>18</sup> that was depicted by Black in 1886;<sup>11</sup> note ‘a’ indicates the presence of a large coronal pulp nodule; ‘e’ indicates the tubular formation of pulp nodule formation within the distal pulp canal of a mandibular molar as indicated by Salter’s dense opaque islands

## 1929-True or False?

Orban, in 1928, espoused the idea that there ought to be a distinction among denticles according to their microscopic structure in addition to asserting his belief as to their etiology.

*“the epithelial rests in the pulp deserve attention. I have observed epithelial rests in the pulp chamber of teeth in different cases, divided into two principal groups. In one group the pulp is in normal condition and possesses functioning odontoblasts. In the other group the pulp has no odontoblasts in the neighborhood of the epithelial rests”.* It is based on these two distinctions that Orban writes of true and false denticles.

*“A true denticle has a true dentinal structure, in that it possesses real dentin with dentinal tubuli and dentinal fibers (tomes fibers) and are built by odontoblasts...”*

*“...The false denticles have only the matrix of dentin without dentinal tubuli. This type of denticle is much like secondary dentin which is laid down by the fibers of the pulp and not by odontoblasts”.*

## 1934-Same, But Different

In 1934, Hill asserts there is a nidus preceding the intrapulpal calcification in that “pulp calcification may be caused by an infolding of the odontoblasts during the developmental period. This infolded region subsequently becomes separated from the main body of the odontoblasts and islands of dentin are formed. Most of the larger calcifications contain dentinal tubules and at their margins odontoblasts are found.”

This is very similar to previous writings.

**BUT...**

Hill continued to write about the calcific process being the causative factor of the neuralgias faced by many before him: “Calcification of the pulp is usually associated with connective tissue which, in the pulp, is largely perivascular and perineural. Aside from this anatomic relationship, there is no evidence that calcification per se interferes with the blood supply to the pulp or with the nerves to cause neuralgia...the degenerative processes preceding the calcification is independently the cause of the neuralgia which is sometimes relieved by the removal of teeth”.

## 1936-Focal Infection Theory

In 1936 Kretschmer and Seybold attempted to identify a bacteriological etiology for the formation of pulp stones. Over 90% of the cases in which pulp stones were cultured indicated the presence of “a pure culture of streptococci.” This finding led to a strong endorsement of the focal infection theory that permeated the minds of both the dental and medical profession at that time and resulted in wholesale tooth extraction.

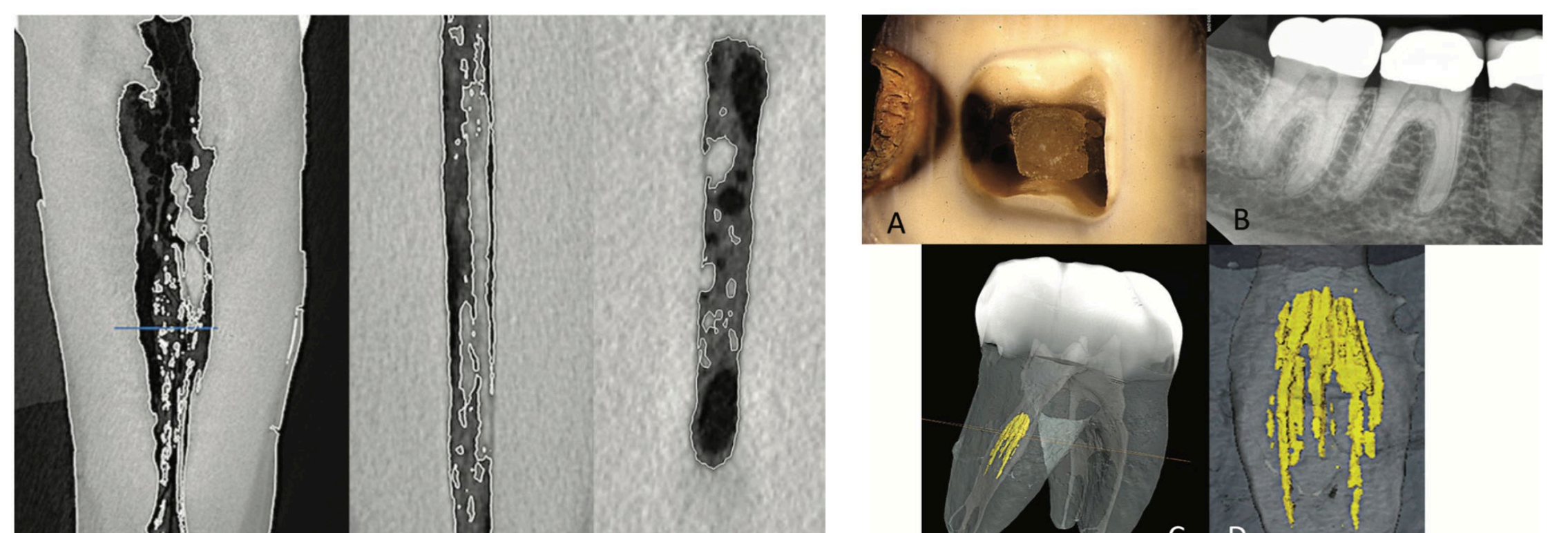
However, there was much criticism regarding the culturing of extracted teeth as a diagnostic technique and attention was called to the possibility of culturing normal mouth organisms, which contaminated the tooth during extraction, rendering this approach invalid.

## Contemporary

Pulp stone formation and its implications have not changed since history began recording this finding.

In fact, it is entirely possible that there is no one exact cause for this affliction, but rather, a conglomeration of different factors, such as trauma, caries, chemical imbalance, genetic predispositions, unusual cellular signaling and anatomical abnormalities, each contributing to the formation of pulp stones/nodules.

Rather noteworthy is that pulp nodules are no longer seen as the “holy terror” they were once described. Today, they are seen as no more than a nuisance during routine root canal procedures when “these calcifications preclude instrumentation of all or part of a root canal”.



A series of contemporary microCT photos that provide verification of Bödecker’s description in 1894 of pulp stones that “may be found either connected with the dentine proper by means of a peduncle, or loosely embedded in the connective tissue of the pulp...”

A pulp stone is located directly in the middle of the pulp chamber in a mandibular molar – note on the left the decay that had penetrated the dentin and most probably initiated the formation of the calcification; B. a radiograph that shows pulp stones occluding the majority of the pulp chamber in both molars, similar to what was seen in the diagram in Figure 15; also note there is the presence of calcification in the central portion of the distal canal; C. a microCT of a mandibular molar with a delineation of the cylindrical pulp stone formation in the distal canal reflective of what is seen in Figure 15; D. enlarged perspective of the calcifications from the distal in the mandibular molar depicted in “C”; (C & D courtesy of Stephen Rigby, Dentistry Siroma)

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