

Hidden vegetable matter in tissue sections – A case series

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Abstract

Food particles get frequently impacted in the oral cavity in varying sites. Oral pulse granuloma develops as a consequence of implantation of food particles of plant or vegetable origin in oral tissues. The lesion might be central or peripheral. It has a differing histological picture and may be confused with many other lesions including parasitic infection. Impacted vegetable matter is rarely associated with multiple myeloma, bacterial and fungal osteomyelitis, and squamous cell carcinoma and has never been reported in the literature before. Thus, in the present case series, we have discussed about the above three rare associations along with pulse granulomas associated with periapical granuloma and periapical cyst. The paper aims to discuss the clinical, histological, and polarising microscopic features of the cases and theories substantiating aetiology and in general about the differential diagnosis.

Keywords: Granuloma, hyalin, vegetables

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INTRODUCTION

The term oral pulse granuloma (OPG), also known as oral pulse or hyaline ring granuloma (OPHRG) or oral vegetable granuloma (OVG), is a foreign body reaction to implanted plant or vegetable material entering in to the oral cavity through various portals like extraction sockets, inter-dental areas of teeth, deep periodontal pockets, sites of surgical incisions, periapical or the sulcus area, space associated with operculum, gross dental caries or open root canal, deep crevices within tumour growth, and lodgment of food particles under an atrophic mucosa of an edentulous ridge and maintained by the pressure of the overlying denture. The implantation of plant or vegetable matter can also occur without gross trauma to the tissues.^[1-4]

Pulse granuloma can occur centrally or peripherally in the oral cavity, and it can also occur in extra-oral

sites [extra-oral pulse or HR granuloma (EOPHRG)].^[2,3] It is most commonly seen associated with inflammatory odontogenic cyst and in granulomas involving carious teeth. It is also found to be reported in association with nasopalatine cyst, dentigerous cyst, residual cyst, keratinising cystic odontogenic tumour, and ameloblastoma uncommonly. EOPHRG occurs in the lungs, skin, gallbladder, gastro-intestinal tract, fallopian tubes, mesenteric lymph nodes, fat, prostate, buttocks, infants, and severely debilitated persons.^[1-9]

Implanted food material is rapidly digested and altered by host responses. The starch material gets easily digested, while the cellulose part is indigestible and invokes a chronic granulomatous response.^[10] Microscopically, PG appears as eosinophilic hyaline masses with chronic inflammatory cells and multi-nucleated giant cells, and the stroma may

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or may not be fibrosed.^[2,11] Here, we report six cases of impacted vegetable matter associated with different pathological lesions.

CASE SERIES

Case 1

A 42-year-old male reported to the department of oral pathology, TNGDCH, with the chief complaints of pain in the upper back tooth region and difficulty in mastication and speech for the past 2 weeks. His past medical history revealed that the patient had uncontrolled diabetes mellitus and was under irregular medication. His past dental history revealed that the patient had undergone extraction of 26, 27, and 28 3 months back. On intra-oral examination, an exposed necrotic bone in relation to edentulous 26, 27, and 28 regions was noted. Foul breath was present. Under LA, the entire segment (sequestrum) of the bone was removed for histopathological analysis. The decalcified, H & E-stained section showed a necrotic bone with empty lacunae, bacterial colonies resembling actinomycotic colonies, and mucormycotic hyphae in a necrotic background, suggestive of fungal and bacterial osteomyelitis. A few impacted eosinophilic materials resembling vegetable matter with a double-layered refractile hyaline membrane appearing as polygonal or hexagonal structures enclosing starch-like material were noted. The vegetable matter brightly polarised under a polarising microscope [Figure 1a-d].

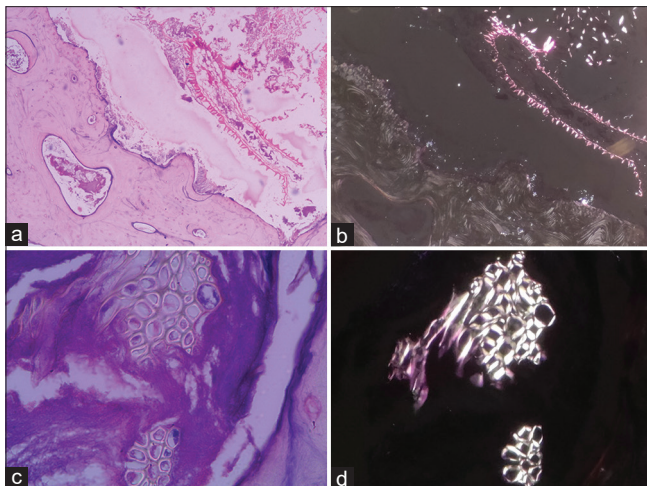


Figure 1: (a) Histopathological image shows vegetable matter in bone marrow resembling seed coat or testa (H & E stain, x100) (b) Vegetable matter presenting as a birefringent refractile material under a polarising microscope (H & E stain, x100) (c) Histopathological image shows vegetable matter with a double-layered refractile hyaline membrane appearing as polygonal or hexagonal structures (H & E stain, x100) (d) Vegetable matter presenting as a birefringent refractile material under a polarising microscope (H & E stain, x100)

Case 2

A 22-year-old male reported to the department of oral pathology, TNGDCH, with the chief complaints of pain in the lower back tooth region for the past 1 month. Intra-oral examination revealed grossly decayed 36 and 37. Histopathology revealed granulation tissues composed of mixed inflammatory infiltrate, blood vessels, and collagen fibres. The features correlated with the clinical diagnosis of peri-apical granuloma. In addition to the above findings, an area revealed an irregular brownish undigested plant remnant with a refractile membrane, resembling a seed coat or testa adjacent to which hyaline rings and multi-nucleated giant cells were noted. The irregular structure partially polarised under a polarising microscope [Figure 2a and b].

Case 3

A 60-year-old female reported to the department of oral pathology, TNGDCH, with the chief complaints of pain in the right upper front teeth region for the past one and a half years. On intra-oral examination, generalised attrition and multiple grossly decayed tooth were noted. Root stump was noted in 11 and 12 regions, and on percussion, 11 and 12 were tender. Mild swelling was present in the right labial vestibule in relation to 11 and 12. An intra-oral peri-apical radiograph revealed diffuse radiolucency in relation to 11 and 12. A provisional diagnosis of peri-apical cyst associated with 11 and 12 was given. Histopathology revealed a cystic lesion lined by a non-keratinised stratified squamous epithelium in an arcading pattern. The underlying densely inflamed connective tissue wall showed giant cells and blood vessels. The histopathological diagnosis correlated with the clinical diagnosis of peri-apical cyst. One of the sections revealed a cluster of eosinophilic hyaline rings resembling a gram. This plant structure weakly polarised under a polarising microscope [Figure 3a and b].

Case 4

A 90-year-old male reported to the department of oral pathology, TNGDCH, with the chief complaints of inability to open the mouth for the past 6 months.

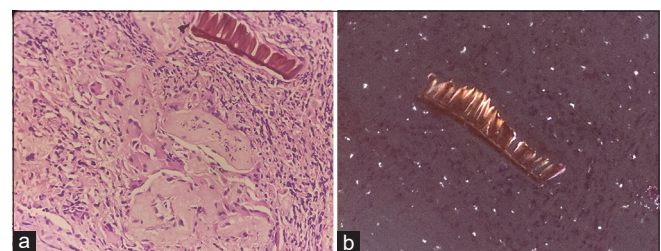


Figure 2: (a) Histopathological image shows irregular brownish undigested plant remnant with a refractile membrane resembling a seed coat or testa. Adjacent to it, hyaline rings and multi-nucleated giant cells are noted (H & E stain, x100) (b) The irregular plant structure partially polarising under a polarizing microscope (H & E stain, x100)

The patient gave a history of tobacco chewing for past 30 years and smoking for 2 years. On intra-oral examination, fibrotic bands were palpable on the bilateral buccal mucosa. Restricted mouth opening was present, and the left buccal mucosa was erythematous, showing specks of white patches. The left submandibular lymph node was palpable. Histopathology revealed a dysplastic epithelium. A few malignant squamous epithelial cells were found to infiltrate the underlying superficial connective tissue in the form of nest. The deeper connective tissue showed fibrosis. The histopathological features were suggestive of squamous cell carcinoma. One of the sections revealed many honeycombed structures resembling the xylem and phloem of the plant structure. Though many plant structures were visible under a light microscope, only a few areas polarised under a polarising microscope [Figure 4a-c].

Case 5

A 45-year-old male reported to the department of oral pathology, TNGDCH, with the chief complaints of growth in the lower lip for the past 1 month. The patient gave a history of working in a leather factory for the past 25 years. On examination, depigmentation of the upper lip and the lower lip was noted. Also, a hyperkeratotic plaque of size 2.5 to 3 cm with crusting was noted in the lower lip. Histopathology revealed a hyperkeratotic severely dysplastic squamous epithelium with parakeratin plugging. The dysplastic epithelium invaded into the inflamed connective tissue in the form of a few malignant squamous epithelial islands. The histopathological features were suggestive of squamous cell carcinoma. One of the sections revealed multiple hexagonal or polygonal hyaline rings enclosing eosinophilic amorphous material resembling degenerated starch within it. The hyaline rings partially polarised with a polarising microscope [Figure 5a and b].

Case 6

A 55-year-old female reported to the department of oral pathology, TNGDCH, with the chief complaints of pain in the lower left jaw region. The patient gave a history of coronary artery disease, SLE, DM. The patient was a known case of multiple myeloma and gave a history of bisphosphonate therapy for the same few years back. The patient was treated for osteoradionecrosis a year back. The patient also gave a history of sequestromy in the left posterior maxilla 1 year back and sequestromy in the right posterior mandible in relation to 46, 47, and 48 2 years back. Now in the same sight, that is, in the posterior mandible, the patient has developed tenderness. All the three times, the provisional diagnosis was bisphosphonate-induced osteoradionecrosis (BRONJ). All

the three times, histopathology revealed a necrotic bone with necrotic marrow spaces and the clinician was asked to correlate clinically. In addition, a few areas revealed eosinophilic material containing rectangular to polygonal cells with a refractile double membrane arranged in layers. Accompanying it, irregular amorphous eosinophilic hyaline structures were also noted. All of them brightly polarised under a polarising microscope [Figure 6a and b].

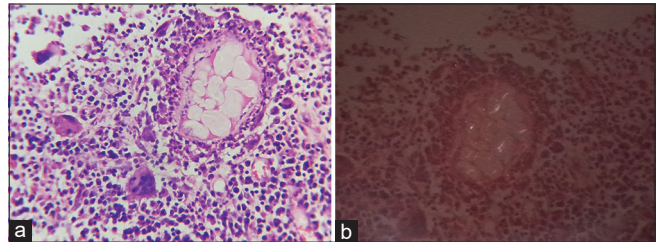


Figure 3: (a) Histopathological image shows a cluster of eosinophilic hyaline rings resembling a gram (H and E stain, x100) (b) The hyaline rings of the plant structure weakly polarising under a polarising microscope (H and E stain, x100)

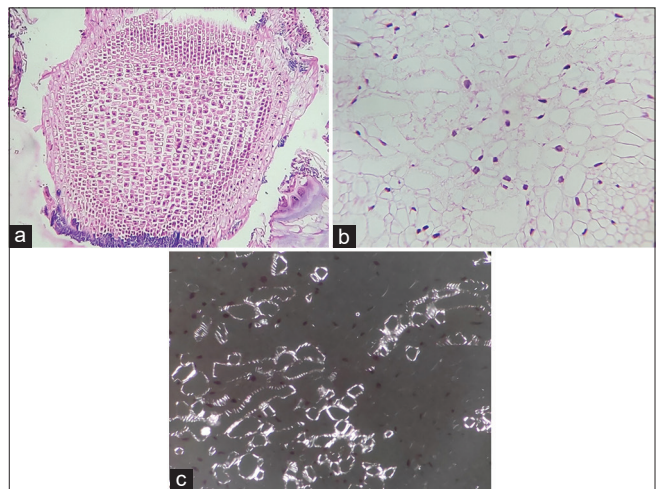


Figure 4: (a) Histopathological image shows many honeycombed structures resembling the xylem and phloem of the plant structure (H & E stain, x100) (b) Histopathological image shows many honeycombed structures resembling the xylem and phloem of the plant structure (H & E stain, x400) (c) The plant structure partially polarising under a polarising microscope (H & E stain, x400)

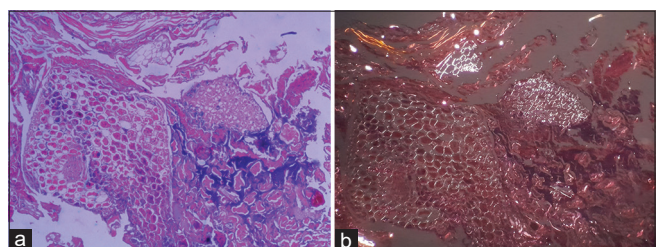


Figure 5: (a) Histopathological image shows multiple hexagonal or polygonal hyaline rings enclosing eosinophilic amorphous material resembling degenerated starch within it (H & E stain, x100) (b) The hyaline rings partially polarising with a polarising microscope (H & E stain, x100)

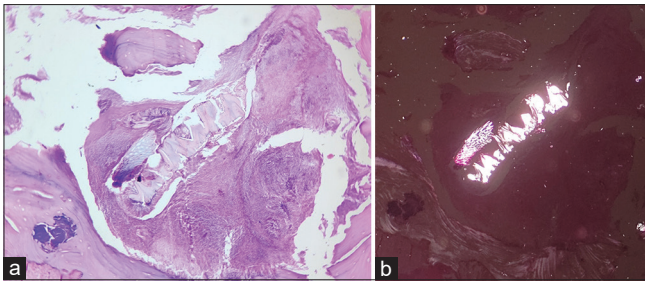


Figure 6: (a) Histopathological image shows eosinophilic rectangular to polygonal cells in layers with a refractile double membrane along with irregular amorphous eosinophilic hyaline structures beneath it (H & E stain, x100) (b) The plant structure brightly polarizing under a polarising microscope (H & E stain, x100)

DISCUSSION

OPG is a localised lesion and is a granulomatous response to implanted food material of plant or vegetable origin. In the literature, several terminologies like giant cell hyaline angiopathy, chronic mandibular periostitis, oral vegetable granuloma, hyaline ring granuloma, pulse granuloma, food-induced granuloma, and oral pulse or hyaline ring granuloma (OPHRG) have been used to refer this entity.^[12] It might be intra-osseous or extra-osseous. Intra-osseous pulse granuloma radiographically presents as an irregular radiolucent lesion, while extra-osseous pulse granuloma presents as an ill-defined crestal erosion of the alveolar ridge.^[1]

It is mainly a histopathological diagnosis and is rarely diagnosed clinically. Histologically, they present as an eosinophilic hyaline matrix or hyaline rings surrounded by giant cells and chronic inflammatory cells.^[2,5,11] The hyaline rings are of different shapes, sizes, and thicknesses. They may be ovoid, circular, or rod-like and enclose starch. The starch component of the plant material is digestible, while the cellulose component is indigestible. The collagen is laid down at the periphery of the cellulose components, and with time, it forms thick hyaline rings. In earlier lesions, more giant cells are present, while in older lesions, small droplet calcifications and collagen deposition are noted.^[1,3,13]

The hyaline rings are periodic acid-Schiff (PAS) positive due to the cellulose content of the vegetable matter and Van Gieson negative. The carboxyl groups of vegetable cell walls are stained by Alcian blue.^[10] The vegetable matter appears as birefringent particles under a polarising microscope.

Two theories have been proposed for the origin of pulse granuloma: the exogenous theory and the endogenous theory. The exogenous theory states that the hyaline rings

are residues of plant material, while the endogenous theory states that the hyaline rings represent degenerative changes in the blood vessels, degenerated collagen fibres, or fibrosed extravasated serum proteins.^[1,11]

Throughout the literature, both thick convoluted hyalinised collagen fibres and the thin refractile double-layered polygonal or hexagonal plant cell walls were referred to as hyaline rings, and thus, the term is little confusing and is overlapping between the two. The hyalinised collagen fibres are referred to as hyaline rings by some authors based on the host response to foreign material, thus supporting the endogenous theory,^[12-16] while the distinct cell walls of the plant material are referred to as hyaline rings by some others based on the foreign origin of the plant material, thus supporting the exogenous theory.^[2,6,9-11,15,17,18] According to El-Labban and Kramer, the hyaline rings are formed due to the degradation of collagen fibres by the enzymes secreted by the macrophages and giant cells exposed to the plant material. The enzymes alter the collagen structure and thereby impart a hyaline appearance to it. Thus, according to them, it is a tissue sequelae rather than due to an exogenous component.^[14]

In the present case series, the hyaline rings noted in case 2 did not polarise under a polarising microscope, while the adjacent vegetable matter polarised. Thus, the origin of these hyaline rings could have been due to altered collagen fibres favouring endogenous theory. To confirm it through special stains, we made further sections, but the pulse granuloma was not detected in the further deeper sections. The hyaline rings in case 3 weakly polarised under a polarising microscope, but the histological picture was classically as that of a legume (Turkish gram) and hence confirming the exogenous origin. Moreover, not all the components of plant or vegetable origin polarised under a polarising microscope, which is evident from the past literature^[1,11] as well in the current case series (case 4) in itself. The hyaline rings in the other four cases (cases 1-6) polarised with a polarising microscope, thus supporting the exogenous origin of the rings.

Giant cells were noted only in cases 2 and 3. Elsewhere, only chronic inflammatory cells were found to be associated with the impacted vegetable matter. This could be substantiated by the fact that the length of time the vegetable matter was present in the tissue could have been short to elicit or provoke a granulomatous response.

In the current case series, in case 1, the vegetable matter was found to be associated with actinomycotic and mucormycotic osteomyelitis; in cases 4 and 5, it was found

to be associated with oral squamous cell carcinoma; and in case 6, it was found to be associated with BRONJ in a multiple myeloma patient. All the above four are rare associations of various cases with impacted vegetable matter and have never been reported in the literature before. Case 2 was a pulse granuloma associated with a peri-apical granuloma, while case 3 was a pulse granuloma associated with a peri-apical cyst and has been reported commonly. In all the above six cases, the histological presentation was unique. Thus, overall, the current case series is a significant one and noteworthy.

Differential diagnosis includes hyaline vascular disease of hypertension, bacterial (tuberculosis and sarcoidosis), fungal (coccidioidomycosis), and parasitic infection; amyloidosis; and Wegener granulomatosis. Hyaline vascular disease of hypertension is a hyalinised endothelial lesion, and multi-nucleated giant cells are not seen in it. Amyloids show apple-green birefringence in polarised light when stained with Congo red stain, while vegetable matter does not. Wegener granulomatosis shows a normal C-reactive protein, negative antineutrophil cytoplasmic antibody tests, and a normal erythrocyte sedimentation rate. Special stains like Grocott methenamine and Grams and Ziehl Neelsen staining help to rule out fungal and bacterial aetiology.^[6,14]

Granulomas due to glove powder can resemble a pulse granuloma, but it can be ruled out by noting the uniform small and round crystalline structure of the powder. The hyaline rings can mimic eggs of helminth, but the parasite eggs measure less than 100 microns, while the hyaline rings are larger than it, and moreover, there is no nucleus in a hyaline ring.^[19] The pericarp (fruit coat) can resemble the cuticle or mouth apparatus of a maggot, while the vegetable albumin cells can mimic fat bodies of a maggot.^[2,13]

To conclude, oral pulse granuloma or impacted food material, though inert in many cases, may prove to be notorious under a few circumstances and culminate in a disease. Thus, its importance cannot be neglected. As a pathologist, it is mandatory to get familiar with various histopathological presentations of vegetable matter so that it is not confused with any other overlapping pathologies and thereby wisely manage the patients accordingly, thus preventing unnecessary wrong interventions. The mere presence of vegetable matter in the tissue sections whether producing an active clinical lesion or not gives a hint of the patient's oral hygiene status. In that case, a proper oral hygiene practice and post-operative wound care can be emphasised to the patient to prevent developing further complications. Complete surgical excision is the treatment of choice to avoid unnecessary recurrence.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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