An Insight into Diagnosis of a Hidden Entity: Impacted Food Material

Abstract

Introduction: Foreign bodies and tissue reactions to foreign materials are commonly encountered in the oral cavity. Exogenous materials causing foreign body reactions may be metallic (amalgam) or nonmetallic (suture materials, vegetable matter). Implantation of food particles in the oral tissues has been known to cause reactive lesions such as oral pulse granuloma. Implantation could be through extraction sockets, deep periodontal pockets, associated with tumor growth, interdental areas of teeth, unfilled root canals, and grossly decayed teeth. These get rapidly digested and altered by host responses. Cellulose persists as hyaline material and invokes chronic granulomatous response. This change may mimic other pathologies. Materials and Methods: Representative specimens from commonly consumed food groups were selected, fixed in 10% neutral buffered formalin, processed, sectioned, stained with hematoxylin and eosin stain and observed under light microscope. Results: Each specimen unveiled unique, distinct histology of each food type. The plant materials had a characteristic appearance of rigid double cell wall while rigid regular partitions containing nutrient material were revealed in seeds and beans. Starch-contained lentils exhibited clear spaces. Following is a brief description of some of the significant histological findings of each of the specimens processed and stained. Conclusion: Thus, the study of histological structure of vegetables and legumes will enable their easy recognition in oral biopsy samples and help in distinguishing them from other pathologies and artifact.

Keywords: Foreign body, hyaline material, reactive lesions, pulse granuloma.

Introduction

Foreign bodies implanted in tissues can often masquerade as different pathologies and can baffle both the clinicians and pathologists alike. The oral cavity has been reported to be susceptible to many foreign body implantations which may be metallic like amalgam restorations or nonmetallic like vegetable matter.[1]

The various morphological features provided by the teeth and soft tissues render many vulnerable sites for such foreign body implantations including extraction sockets, space associated with operculum, periapical sites of teeth associated with prolonged open drainage during endodontic therapy, deep periodontal pockets, and deep crevices within tumor growth.[1,2]

The implanted organic matter can be partially digested and altered by action of the host response and the residual cellulose, and hyaline matter may act as a stimulus and trigger a reactive phenomenon.[1] These foreign body remnants can often mimic many human tissues and can cause erroneous interpretations in histological sections.

Thus, it is of paramount importance to be familiar and aware of the histological appearances of foods that are frequently encountered as impacted in oral tissues.[3]

With this background in mind, the aim of our study was to observe the characteristic histologic structures of commonly impacted food materials.

Materials and Methods

Representative specimens from commonly consumed food groups were selected. Leafy vegetables such as spinach and fenugreek, beans including ground nut, winged beans, Turkish grams, African spinach, cabbage, and papaya were included in the study.

All the specimens were fixed in 10% neutral buffered formalin, routinely processed, sectioned, and stained with hematoxylin and eosin stain.

All the slides were observed under light microscope.

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Results

Each specimen revealed unique, distinct histology of each food type. The plant materials had a characteristic appearance of rigid double cell wall while rigid regular partitions containing nutrient material were revealed in seeds and beans. Starch-contained lentils exhibited clear spaces.

Following is a brief description of some of the significant histological findings of each of the specimens processed and stained.

Groundnut

Arachis hypogaea, i.e., ground nut is a seed and consists of endosperm and cotyledon. The endosperm and cotyledon consist of parenchymal cells and nutrient material within the parenchymal cells. The amount of nutrient material within the cells of endosperm or cotyledon depends on the maturity of the seed.[4]

The hematoxylin and eosin-stained slide of groundnut revealed darkly stained parenchymal cells with nutrient material in the endosperm and comparatively lightly stained epidermal cells as well as the nutrient material in the cotyledon [Figure 1].

Winged beans

Winged beans, i.e., Psophocarpus tetragonolobus, is a fruit. Microscopically consists of parenchymal cells with nutrient material.[5-7] The hematoxylin and eosin-stained slide of winged beans in our sections revealed eosinophilic epidermal layer, few cells with indistinct cell wall, and others with nutrient material which take a darker hue of eosin [Figure 2].

Turkish gram

Turkish gram, i.e., Vigna aconitifolia, microscopically consists of parenchymal cells revealing the nutrient material, plastids, or empty spaces depending on the amount of mature cotyledon.

It also consists of epidermal layer on the outer portion of parenchymal cells.[6-7]

The hematoxylin and eosin-stained slide of Turkish gram in our section revealed few cells with nutrient material and other areas with clear spaces surrounded by the cells filled with nutrient material in the cotyledon, whereas the endosperm revealed epidermal layer and plastids [Figure 3].

Fenugreek

Fenugreek, i.e., Trigonella foenum graecum, histologically shows collenchyma cells, sieve tubes within the cluster of cells for the transport of nutrients, and nitrogen fixation nodules for nitrogen fixation.[6-7]

The hematoxylin and eosin-stained slide of fenugreek in our section revealed all the structures such as collenchyma cells, sieve tubes, and nitrogen fixation nodules [Figure 4].

African spinach

Synonym of African spinach is Amaranthus cruentus.[6-7] The hematoxylin and eosin-stained slide of African spinach in our section revealed both the collenchyma cells and sieve tubes within the cluster of cells [Figure 5].

Chickpea

Chickpea, i.e., Cicer arietinum[6,7] microscopically in the hematoxylin and eosin-stained section revealed seed coat and epidermal layer. Few cotyledonal cells containing nutrient material and others have empty spaces [Figure 6].

Cabbage

Cabbage, i.e., Brassica oleracea variant capitata microscopically reveals the mesophyll layer, empty cells, and sieve tubes in the hematoxylin and eosin-stained slide [Figure 7].[6,7]

Papaya

Papaya, i.e., Carica papaya is a fruit microscopically showing the parenchymal cells.[6-7] The hematoxylin and

Figure 1: A: Endosperm B: Cotyledon a: Parenchymal cells b: Nutrient material (hematoxylin and eosin-stained section of groundnut under ×10)

Figure 2: a: Epidermal layer b: Nutrient material c: Indistinct cell walls (hematoxylin and eosin-stained section of winged beans under ×10)
Figure 3: a: Nutrient material b: Clear spaces containing starch c: Epidermis d: Plastid (hematoxilin and eosin-stained section of Turkish gram under x40)

Figure 4: a: Collenchyma cells b: Sieve tubes c: Nitrogen fixation nodules (hematoxilin and eosin-stained section of fenugreek under x10)

Figure 5: a: Collenchyma cells b: Sieve tubes (hematoxilin and eosin-stained section of African spinach under x10)

Figure 6: a: Seed coat b: Cotyledon cells c: Nutrient material d: Epidermal layer (hematoxilin and eosin-stained section of chick pea under x40)

Figure 7: A: Mesophyll layer B: Sieve tubes (hematoxilin and eosin-stained section of cabbage under x10)

Figure 8: a: Parenchymal cells (hematoxilin and eosin-stained section of papaya under x40)
Kinblich stated that leguminous cellulose compared to that of other vegetable food stuffs is particularly noxious because of its high resistance to digestion by tissue macrophages. Legumes and pulses are rich in phytohaemagglutinins, which have been shown to have granuloma enhancing properties.

As can be seen in our slides, many of the sections can resemble normal or pathologic conditions. For example, winged beans can resemble columnar epithelium and hemorrhagic areas. Turkish gram and papaya can resemble adipocytes. Fenugreek can resemble fungal infection and helminthic infection. Cabbage can resemble cyst wall whereas chickpea can resemble atypical cells.

Oral pathologist may be well served by a general knowledge of commonly impacted food histology. Many a times, the patient may or may not recollect history of trauma or impaction of a foreign vegetable matter in the oral cavity. One significant factor to be taken into consideration is a documented difference between tissue responses in oral cavity compared with those at other body sites such as lungs and gut. Characteristically oral lesions often show the absence of starch cells as they are quickly digested, as well as the presence of giant cells compared to other intraoral sites.

An important confounding factor is that the histologic aspects may vary with the time of evolution and location. Stomatologists’ lack of experience of knowledge about these structures and consequence body responses may lead to inaccurate diagnosis and confusion. In such cases, the pathologist can greatly assist the clinician in making the correct diagnosis by identifying the impacted vegetable matter in the sections.

Awareness and familiarity of this entity help in avoiding an erroneous diagnosis of systemic inflammatory disease or infectious disease such as Crohn’s disease or Sarcoidosis. The extraoral locations reported in the literature are lung, peridiverticular areas, gall bladder, fallopian tube, periosteum, skin, appendix, colon, and rectum.

This article highlights the histological aspects of some of the commonly encountered food impactions in the oral cavity. Further studies can be undertaken to unveil histology of other types of foods that may be encountered as foreign objects in oral tissues. The recognition of this vegetable matter is largely a microscopic diagnosis. The infrequency of this diagnosis may be attributed to sampling phenomenon. Another reason for the underdiagnosis may be that the tissue response to particular vegetable matter may be trivial, and in most cases, it does not lead to gross clinical lesion. To sum-up, experienced dental specialists should link together and provide guidance for the research studies using different impacted food material, special stains, different microscopic techniques, and histochemical analysis which will improve the precision for identification of such food materials.

A documented reference atlas of the commonly impacted food material is currently being undertaken by us. This will be greatly useful to all the pathologists as a reference to avoid misinterpretation of the impacted food material and thus aid in accurate identification and definitive diagnosis.
Conclusions

In summary, foreign body impaction may present a diagnostic challenge for clinician and pathologist alike. Therefore, it must be included in the differential diagnosis when a patient has a history of recurrent lung disease or acute apnea. Furthermore, a pathologist in surgical or postmortem practice may be well served by a general knowledge of commonly impacted food histology. Through awareness and familiarity, the pathologist may play a crucial role in diagnosis and aid in subsequent patient management.[12]

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Conflicts of interest
There are no conflicts of interest.

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