



## Review Article

## Relatable patterns in diagnostic pathology

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## ABSTRACT

Histology and histopathological knowledge are the basis for clinching an appropriate diagnosis. The characteristic features presented by tumours or tumour like conditions have a distinct picture of their own, and can be distinguished if viewed with an eagle's eye. The aim of this review is to take an appearance-oriented approach for ease of correlation with day to day objects and thus helping in mastering the art of diagnosis. This paper aims to provide a single, concise source of recognition for majority of head and neck tumours or tumour like conditions. Review emphasises on radiologic and histopathologic appearances.

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## 1. Introduction

Oral pathology represents the confluence of basic sciences and clinical dentistry.<sup>1</sup> Basic knowledge of histology and histopathology predict early learning of diagnostic pathology.<sup>2</sup> Classical clinical presentations along with characteristic radiological and histopathological patterns are suggestive of a particular tumour or group of tumours; thereby aid in providing a correct histopathological diagnosis.<sup>3</sup> Collective clinical, radiological and histopathological analysis helps in formulating a list of differential diagnosis, and reaching a final diagnosis.<sup>4</sup>

Both histology and diagnostic pathology rely heavily on microscopic images.<sup>2</sup> Various characteristic patterns have a peculiar picture which resembles with things present in our surrounding environment. These patterns can hence be easily memorised, correlated to reach a proper diagnosis and deliver appropriate treatment. Every pattern is unique and exquisite. However, these patterns cannot be relied upon alone for reaching a diagnosis, as they are subjective and can differ from one eye to another.

The reason behind such patterns is thought to be due to epithelial mesenchymal transition (EMT). EMT has been postulated as a versatile mechanism that facilitates cellular repositioning and redeployment during embryonic development, tissue reconstruction after injury, carcinogenesis and tumour metastasis. Many signalling pathways, transcription factors have implicated a significant role in causing EMT in development, pathology and tumour metastasis. But there is no convincing evidence that supports the postulated involvement of EMT in induced and naturally occurring tumours. The origin and basis for the different patterns still remains a subject of research.<sup>3</sup>

In the present article, clinical presentation for numerous developmental malformations, radiographic pictures and histopathological patterns for pathological tumours have been enlisted below.

## 2. Review

## 2.1. Taurodontism (Bull teeth) (Figure 1 a)

The term 'bull-like teeth' is used as it is similar to those of cud chewing animals. Taurodontism affect mostly permanent teeth, invariably molars – single or multiple.

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Hammer et al. (1964) proposed that the taurodont is caused by failure of Hertwig's epithelial sheath to invaginate at the proper horizontal level.<sup>5</sup>

## 2.2. Hare lip (Cleft lip) (Figure 1 b)

Clinical feature: Cleft lip also known as hare lip (as it resembles hare's lip) is a common congenital malformation occurring during development of face. This disorder can result in feeding problems and speech problems. The defects occur because of both genetic and environmental factors.<sup>5</sup>

## 2.3. Shell teeth (Figure 1 c)

Radiographic appearance: This rare abnormality has been seen most frequently in deciduous teeth in the presence of dentinogenesis imperfecta. Shell teeth demonstrate normal thickness of enamel in association with extremely thin dentin and dramatically enlarged pulps.<sup>5</sup>

## 2.4. Thistle tube (Figure 1 d)

This is seen in Type 2 Dentin Dysplasia. Radiographically, the pulp chambers exhibit significant enlargement and apical extension and resemble a thistle tube. This appearance is seen in permanent teeth.<sup>6</sup>

## 2.5. Lava flowing around boulders (Figure 1 e)

This is a histopathological feature seen in Dentin Dysplasia Type 1. The coronal enamel and dentin are normal but radicular dentin is disorganized. Apical to the point of disorganization, the central portion of root forms whorls of tubular dentin and atypical osteodentin. These whorls exhibit a peripheral layer of normal dentin, giving the root the appearance of a "stream flowing around boulders".<sup>6</sup>

## 2.6. Ghost teeth (Figure 1 f)

This is a radiographic appearance seen in regional odontodysplasia. Involvement of the deciduous dentition is typical with maxillary predominance. The altered teeth demonstrate extremely thin enamel and dentin surrounding an enlarged radiolucent pulp, resulting in a pale wispy image of a tooth.<sup>6</sup>

## 2.7. Hairy tongue (Figure 1 g)

Clinical feature: Hairy tongue (lingua villosa) is a commonly observed condition of defective desquamation of the filiform papillae. It occurs in individuals with poor oral hygiene and lack of mechanical debridement of dorsal surface of the tongue. Reported in patients infected with human immunodeficiency virus (HIV), and also in those who are HIV negative but use intravenous drugs.<sup>6</sup>

## 2.8. Geographic tongue (Figure 1 h)

Geographic tongue is also called Benign Migratory Glossitis. It is psoriasiform mucositis of the dorsum of the tongue. De-papillated areas are similar to continental outlines on a globe, hence the use of the popular term geographic tongue. Etiology is unknown but seems to become more prominent during conditions of psychological stress, Psoriasis, Lichen planus and Vitamin B deficiency.<sup>6</sup>

## 2.9. Fissured tongue (Figure 1 i)

Clinically, Fissured tongue is also called scrotal tongue and lingua plicata. It is characterized by grooves that vary in depth and are noted along the dorsal and lateral aspects of the tongue. Definitive etiology is unknown; it may partly be a genetic trait. Fissured tongue is also seen in Melkersson-Rosenthal syndrome and Downs syndrome.<sup>5</sup>

## 2.10. Screw driver incisors / Hutchinson's incisors (Figure 2 a)

Sir Jonathan Hutchinson described the changes found in congenital syphilis and hence named after him. Hutchinson's incisors exhibit their greatest mesio-distal width in the middle third of the crown. The incisal third tapers to the incisal edge, and the resulting tooth resembles a straight edge screwdriver.<sup>6</sup>

## 2.11. Mulberry molars/ Fournier's molars/ Moon's molars (Figure 2 b)

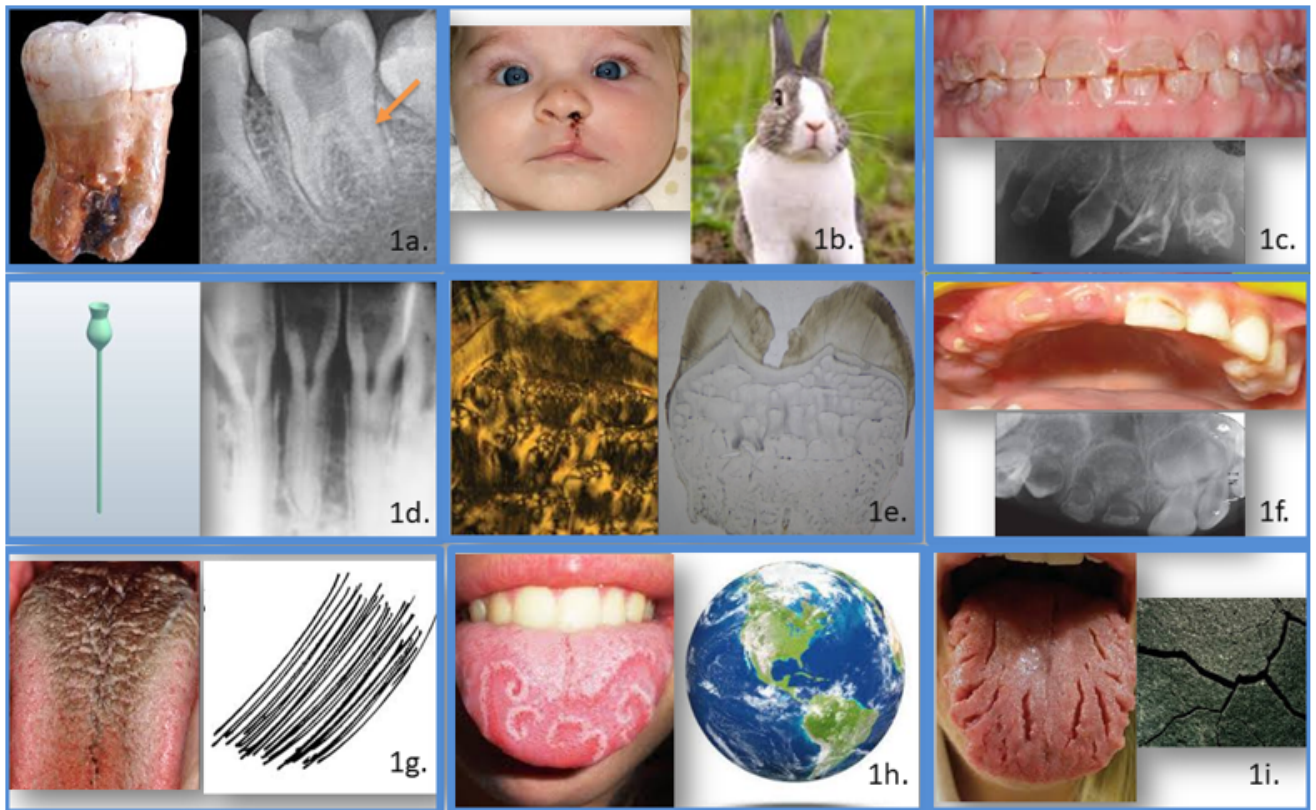
Clinically, Mulberry molars are physically defective permanent molars. The deformity is caused by congenital syphilis. Mulberry molars taper toward the occlusal surface with a constricted grinding surface. The occlusal anatomy is abnormal, with numerous disorganized globular projections that resemble the surface of a mulberry.<sup>6</sup>

## 2.12. Peg lateral (Figure 2 c)

Peg lateral is one of the common forms of localized microdontia, it affects maxillary lateral incisor. The sides of maxillary lateral incisor tooth converge or taper together incisally, forming a peg-shaped or cone-shaped crown. The root of such a tooth is frequently shorter than usual.<sup>6</sup>

## 2.13. Submerged tooth (Figure 2 d)

Submerged tooth is a clinical presentation of deciduous teeth, most commonly mandibular second molars that undergo a variable degree of root resorption and become ankylosed to the bone. Hence appear at lower level when compared to adjacent permanent teeth.<sup>5</sup>



**Fig. 1:** a. Taurodontism(Bull teeth), b. Hare lip(Cleft lip), c. Shell teeth, d. Thistle tube, e. Lava flowing around boulders, f. Ghost teeth, g. Hairy tongue, h. Geographic tongue, i. Fissured tongue.

#### 2.14. *Abtropfung dropping off* (Figure 2 e)

Abtropfung or 'dropping off' effect is histopathologic feature of junctional nevus. Junctional nevus is one of the three categories of oral nevi classified on basis of histological location. Dropping off effect is when overlying epithelium is usually thin and irregular and shows cells apparently crossing the junction and growing down into the connective tissue.<sup>5</sup>

#### 2.15. *Sunburst appearance* (Figure 2 f)

Sunburst appearance is seen as radiographic feature of osteosarcoma. The "classic" sunburst or sun ray appearance is caused by osteophytic bone production on the surface of the lesion.<sup>5</sup>

#### 2.16. *Honey comb appearance* (Figure 2 g)

Honey comb appearance is a radiographic presentation seen in central hemangiomas, calcifying epithelial odontogenic tumour (CEOT), odontogenic myxoma and aneurysmal bone cyst and ameloblastoma. Ameloblastoma radiographically presents as a multilocular radiolucent lesion, compartmented by septa of bone giving a honeycomb appearance.<sup>6</sup>

#### 2.17. *Stag horn* (Figure 2 h)

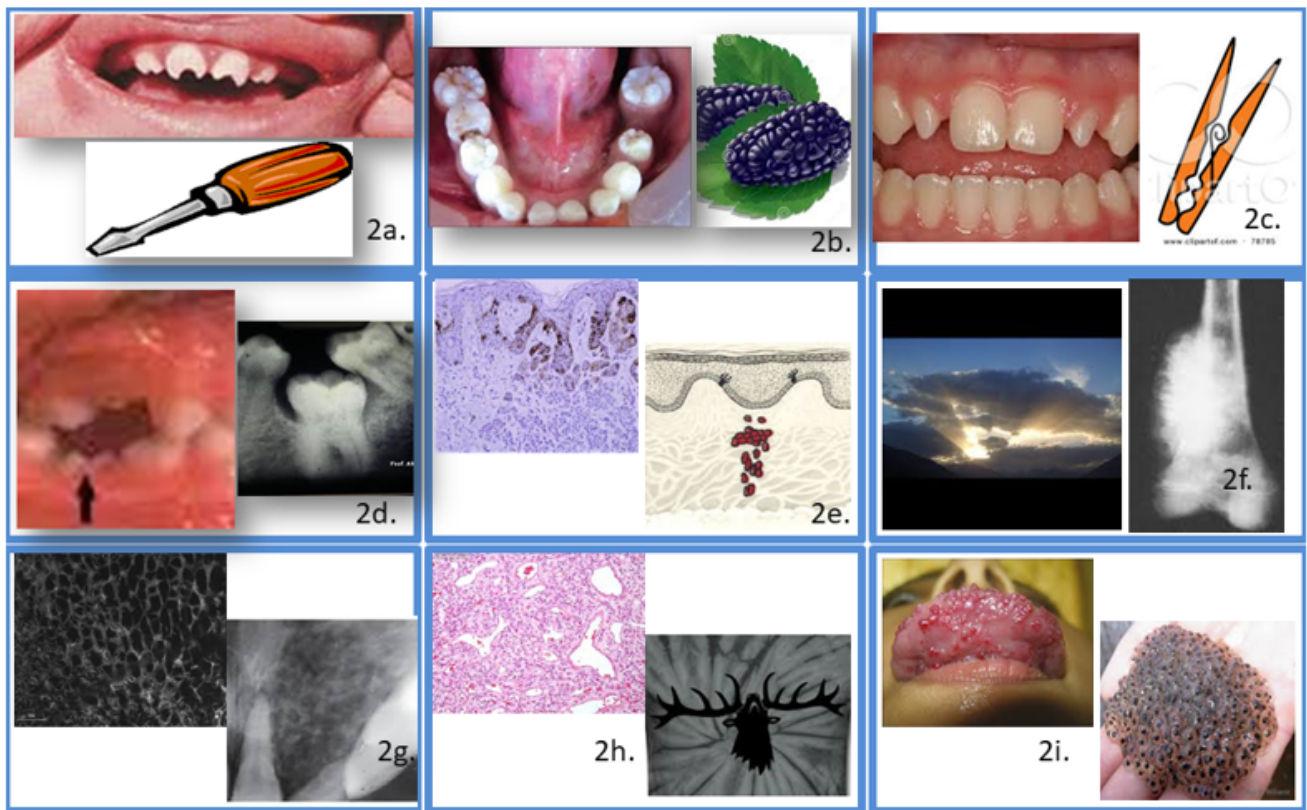
Stag horn is a histopathologic feature of hemangiopericytoma, where in blood vessels often show irregular branching, which results in a characteristic "stag horn" and "antlerlike" appearance. Hemangiopericytoma is a type of soft tissue sarcoma that originates in the pericytes in the walls of capillaries. It occurs in the nasal cavity and paranasal sinuses. Usually results in symptoms of nasal obstruction or epistaxis.<sup>6</sup>

#### 2.18. *Frog egg appearance* (Figure 2 i)

Frog egg appearance is a clinical feature of Lymphangioma. Usually, the tumor is superficial in location and demonstrates a pebbly surface that resembles a cluster of translucent vesicles. Lymphangiomas are benign, hamartomatous tumors of lymphatic vessels, having a marked predilection for the head and neck.<sup>5</sup>

#### 2.19. *Onion ring appearance* (Figure 3 a)

A common characteristic radiographic feature seen in Ewing Sarcoma is the formation of layers of new subperiosteal bone producing the so-called 'onion skin' appearance on the film. This thickened cortex is usually



**Fig. 2:** a. Screw driver incisors, b. Mulberry molars, c. Peg lateral, d. Submerged tooth, e. Abtropfung dropping off, f. Sunburst appearance, g. Honeycomb appearance, h. Stag horn, i. Frog egg appearance.

infiltrated by tumour.<sup>5</sup>

#### 2.20. Starry sky appearance (Figure 3 b)

Starry sky appearance is a histologic feature of Burkitt's lymphoma (also called African Jaw Lymphoma). A characteristic starry sky appearance is imparted by scattered macrophages with an abundant clear cytoplasm, often containing phagocytic cellular debris.<sup>5</sup>

#### 2.21. Punched out appearance (Figure 3 c)

Multiple well-defined "punched out" radiolucencies or ragged radiolucent lesions may be seen in Multiple Myeloma. These are all sites of abnormal plasma cell proliferations. Jaws have been reported to be involved in as many as 30% of cases.<sup>6</sup>

#### 2.22. Herring bone pattern (Figure 3 d)

Fibrosarcoma is a tumour of mesenchymal cell origin that is composed of malignant fibroblasts in a collagenous background. They vary in histologic grade. Intermediate grade tumours are cellular and have the typical herringbone pattern showing the diagnostic parallel sheets of cells arranged in inter-twining whorls.<sup>6</sup>

#### 2.23. Cherry blossom appearance (Figure 3 e)

This is a radiographic feature seen in Sjogren's syndrome. Sialographs demonstrate the formation of punctate, cavitory defects which are filled with radiopaque contrast media. These filling defects have been said to produce a 'cherry blossom' or 'branchless fruit-laden tree' effect.<sup>5</sup>

#### 2.24. Swiss cheese pattern (Figure 3 f)

It is a histopathologic feature seen in adenoid cystic carcinoma. The cribriform pattern is the most classic and best recognized appearance, characterized by islands of basaloid epithelial cells that contain multiple cylindric, cysts like spaces resembling Swiss cheese. The lumina of these spaces contain periodic acid-Schiff (PAS) positive mucopolysaccharide secretion.<sup>5</sup>

#### 2.25. Picket fence/tomb stone appearance (Figure 3 g)

The odontogenic keratocyst lining epithelium is parakeratinized surface which is typically corrugated, rippled or wrinkled. A remarkable uniformity of thickness of the epithelium, usually ranging from 6 to 10 cells thick is seen. A prominent palisaded, polarized basal layer of cells often described as having a 'picket fence' or 'tombstone'

appearance is characteristic of odontogenic keratocyst.<sup>5</sup>

### 2.26. Snow driven appearance (Figure 3 h)

It's a characteristic radiographic picture seen in CEOT. Scattered flecks of calcification throughout the radiolucency have given rise to the descriptive term of a 'driven snow' appearance.<sup>5</sup>

### 2.27. Pink tooth of mummery (Figure 3 i)

The first clinical symptom of internal resorption is the appearance of a pink-hued area on the crown of the tooth, which represents the hyperplastic, vascular pulp tissue filling the resorbed area and showing through the remaining overlying tooth substance.<sup>5</sup>

### 2.28. Strawberry tongue (Figure 4 a)

The tongue in scarlet fever clinically exhibits a white coating and the fungiform papillae are edematous and hyperemic, projecting above the surface as small red knobs. This phenomenon has been described clinically as "strawberry tongue". This is seen in the initial phase; it later turns into "raspberry tongue".<sup>6</sup>

### 2.29. Butterfly rash (Figure 4 b)

Systemic lupus erythematosus is a serious cutaneous-systemic disorder which characteristically manifests repeated remissions and exacerbations. The cutaneous lesions consist of erythematous patches on the face which coalesce to form a roughly symmetrical pattern over the cheeks and across the bridge of the nose in a so-called butterfly distribution. These lesions may present itching or burning sensations as well as areas of hyperpigmentation.<sup>6</sup>

### 2.30. Café-au-lait spots (Figure 4 c)

Cutaneous pigmentation is the most common extra skeletal manifestation in fibrous dysplasia polyostotic form. They appear ipsilateral to the side of bony lesions. The pigmented macules or café-au-lait spots are related to increased amounts of melanin in the basal cells of the epidermis. They have been termed so as they resemble "coffee in milk".<sup>6</sup>

### 2.31. Claw hand (Figure 4 d)

CREST syndrome is a mild variant of systemic sclerosis. The fingers become stiff and the skin takes on a smooth, shiny appearance. Often the fingers undergo permanent flexure resulting in a characteristic "claw deformity". This change is due to abnormal deposition of collagen within the dermis in this area.<sup>5</sup>

### 2.32. Cotton wool appearance (Figure 4 e)

The radiographic feature of Paget's disease presents with the osteoblastic phase. The osteoblastic areas, which appear as opacities, tend to be patchy in distribution, eventually becoming confluent, but often still showing minute areas of variation in radiodensity. This patchiness has been termed as 'cotton-wool' appearance and is well demonstrated in the skull and jaws.<sup>5</sup>

### 2.33. Hair on end/crew cut appearance (Figure 4 f)

The skeletal changes in Thalassemia are most striking and have been thoroughly described by Caffey. On radiographs the trabeculae between the plates become elongated, producing a bristle like crew cut or hair-on-end appearance of the surface of the skull.<sup>5</sup>

### 2.34. Cupids bow (Figure 4 g)

Clinical Feature- The central third of the upper lip presents with two raised peaks at the end of the philtral columns to create a double bow effect. This lip feature is well known and has the Cupid's bow name because its shape resembles that of the bow of Cupid the Roman god of love.<sup>5</sup>

### 2.35. Dilapidated brick wall appearance (Figure 4 h)

This is the histologic appearance of the epithelium in familial benign chronic pemphigus. One of the characteristic feature of this disease is that occasional intercellular bridges persist so that adjacent epithelial cells still adhere to each other. This appearance has been given the classic description of the dilapidated brick wall effect.<sup>5</sup>

### 2.36. Ground glass appearance (Figure 4 i)

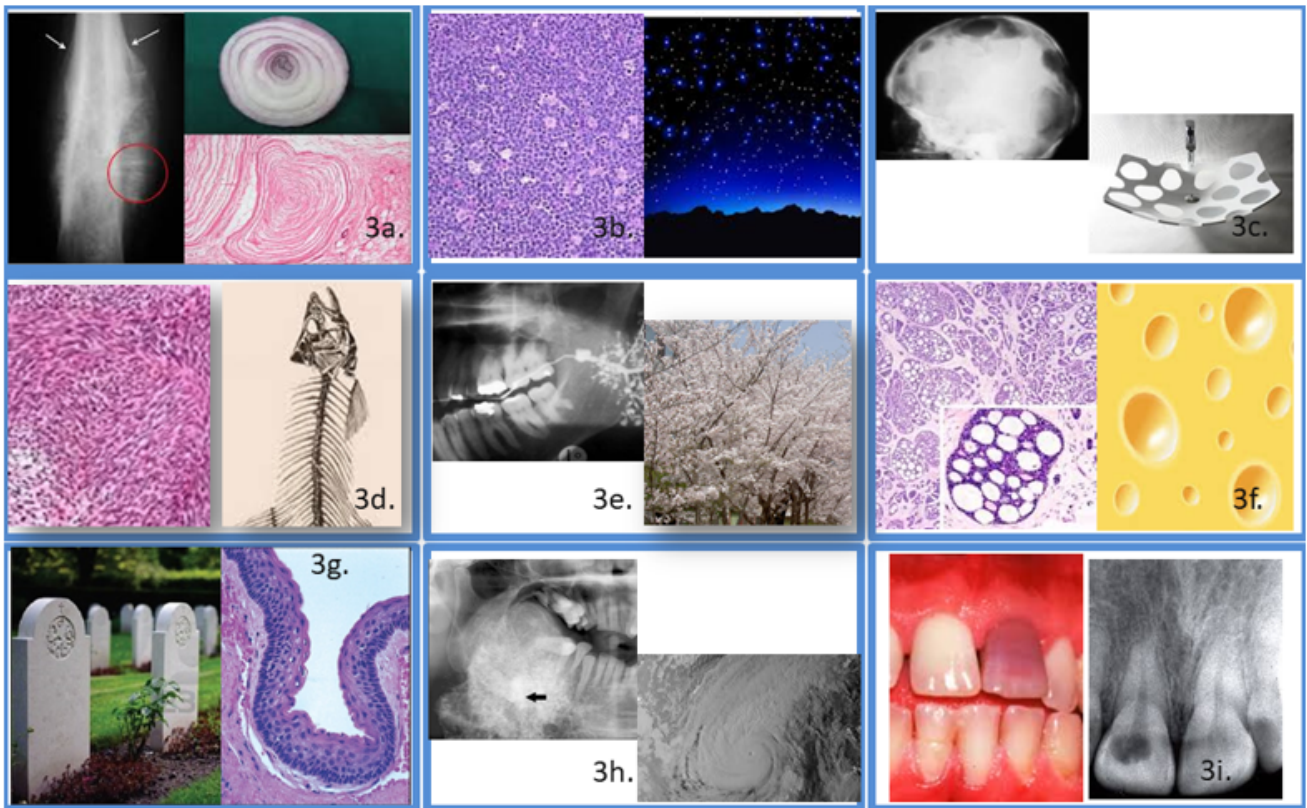
In fibrous dysplasia, the medullary bone is replaced by fibrous tissue, which appears radiolucent on radiographs, and is classically described as ground-glass appearance. Fibrous dysplasia is a skeletal developmental anomaly of the bone-forming mesenchyme that manifests as a defect in osteoblastic differentiation and maturation.<sup>6</sup>

### 2.37. Raspberry tongue (Figure 5 a)

In scarlet fever after the appearance of strawberry tongue, the coating of the tongue is lost; beginning at the tip and lateral margins. The tongue becomes deep red, glistening and smooth except for the swollen, hyperemic papillae. The tongue in this phase has been termed as the 'raspberry tongue'.<sup>5</sup>

### 2.38. Ray fungus (Figure 5 b)

Actinomycosis shows histopathologically agranulomatous lesion which shows central abscess within which are seen characteristic colonies of microorganisms. Each colony



**Fig. 3:** a. Onion ring appearance, 3b. Starry sky appearance, 3c. Punched out appearance, 3d. Herring bone pattern, 3e. Cherry blossom appearance, 3f. Swiss cheese pattern, 3g. Picket fence appearance, 3h. Snow driven appearance, 3i. Pink tooth of Mummery.

appears round or lobulated and is made up of a meshwork of filaments that stains with hematoxylin, but shows eosinophilia of the peripheral club shaped ends of the filaments. This appearance, with the peripheral radiating filaments, gives the term “ray fungus”.<sup>5</sup>

### 2.39. Sulfur granules (Figure 5 c)

Actinomycosis is a chronic granulomatous suppurative and fibrosing disease caused by anaerobic or microaerophilic gram-positive nonacid fast, branched filamentous bacteria. It is characterized by contiguous spread, suppurative and granulomatous inflammation, and formation of multiple abscesses and sinus tracts that may discharge sulfur granules.<sup>5</sup>

### 2.40. Risus sardonicus (Figure 5 d)

One of the symptoms of generalized tetany wherein there is sustained contraction of facial muscles which results in a grimace or sneer called as risus sardonicus. Tetanus is an acute infection of the nervous system. It is caused by *Clostridium tetani*.<sup>5</sup>

### 2.41. Target lesion (Figure 5 e)

Target lesions are skin lesions that are highly characteristic for erythema multiforme. These lesions appear as concentric circular erythematous rings resembling a target or bull’s-eye.<sup>6</sup>

### 2.42. Salt and pepper appearance (Figure 5 f)

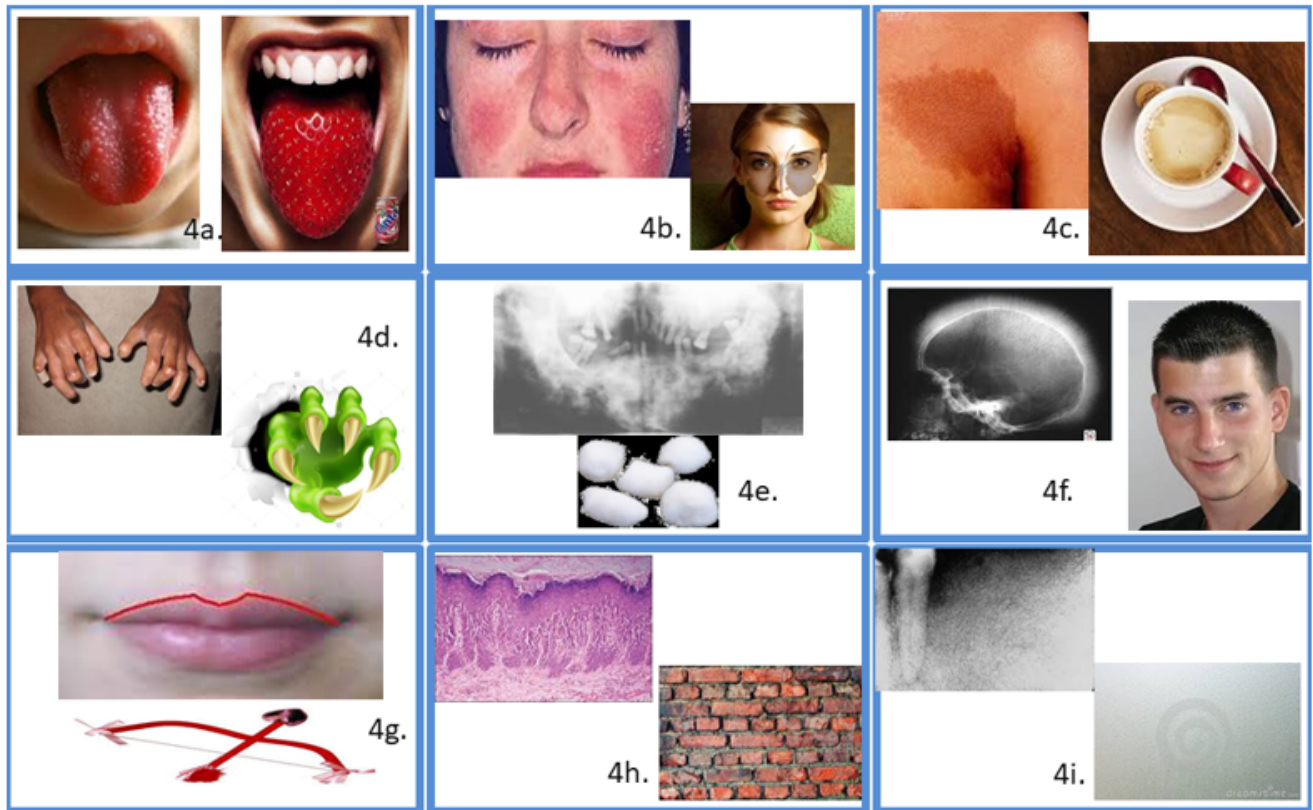
A peculiar trabecular pattern of the maxilla and mandible, seen in thalassemia, characterized by an apparent coarsening of some trabeculae and the blurring and disappearance of others, resulting in a salt and pepper effect.<sup>5</sup>

### 2.43. Safety pin cells (Figure 5 g)

Safety pin cells, a characteristic feature of laboratory finding in thalassemia. These cells resemble a safety pin, hence the term is used.<sup>6</sup>

### 2.44. Rubber man syndrome (Figure 5 h)

Ehlers-Danlos syndrome is a heterogeneous group of inherited connective-tissue disorder. Characteristic clinical



**Fig. 4:** a. Strawberry tongue, b. Butterfly rash, c. Café-au-lait spots, d. Claw hand, e. Cotton wool appearance, f. Hair on end appearance, g. Cupid bow, h. Dilapidated brick wall appearance, i. Ground glass appearance

feature of this disease is the hyperelasticity of skin, (skin can be stretched like a rubber band) hyperextensibility of the joints, and fragility of the skin and blood vessels resulting in excessive bruising as well as defective healing of skin wounds.<sup>5</sup>

#### 2.45. Saw tooth rete pegs (Figure 5 i)

It's a characteristic histopathologic feature of Lichen planus. The rete ridges may be seen in skin histopathology, classically have a pointed or "saw toothed" shape.<sup>6</sup>

#### 2.46. Chinese letter pattern (Figure 6 a)

Histologic feature of monostotic fibrous dysplasia is C-shaped, Chinese character shaped bony trabeculae.

#### 2.47. Owl eye cell (Figure 6 b)

Characteristic malignant cells of Hodgkin's disease are large cells known as Reed–Sternberg (RS) cells. These cells are amphophilic with finely granular/homogeneous cytoplasm; two mirror-image nuclei (owl eyes) each with an eosinophilic nucleolus and a thick nuclear membrane (chromatin is distributed at the cell periphery).<sup>6</sup>

#### 2.48. Popcorn cell (Figure 6 c)

The malignant cell in nodular lymphocyte-predominant Hodgkin's lymphoma is the "kernel of popped corn cell," which is so named because of the resemblance of the nucleus to a popcorn.<sup>5</sup>

#### 2.49. Camel foot appearance (Figure 6 d)

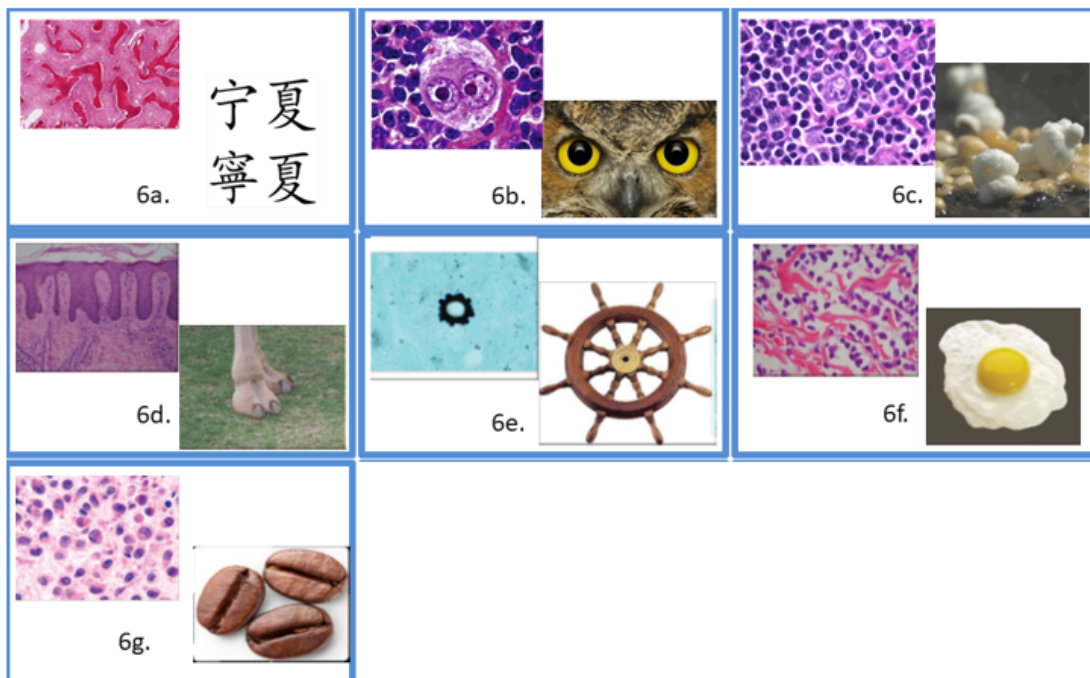
It's seen in histopathology of plaque type psoriasis. To accommodate the increasing basal cells which are in proliferative state, retepegs take a plunge in the dermis in the form of regular elongation of rete ridges, giving the camel foot appearance.<sup>5</sup>

#### 2.50. Mariner's Pilot Wheel Appearance (Figure 6 e)

It is also called "Mickey mouse" appearance. It is description of the tissue phase of paracoccidioidomycosis. In biopsy specimens, the tissue phase of the fungus is seen as multiple buds surrounding the whole surface of the mother yeast cell. This configuration is described as "Mariner's pilot wheel".<sup>5</sup>



**Fig. 5:** a. Raspberry tongue, b. Ray fungus, c. Sulfur granules, d. Risus sardonicus, e. Target lesion, f. Salt and pepper appearance, g. Safety pin cells, h. Rubber man syndrome, i. Saw tooth rete pegs.



**Fig. 6:** a. Chinese letter pattern, b. Owl eye cell, c. Popcorn cell, d. Camel foot appearance, e. Mariner's Pilot wheel appearance, f. Fried egg appearance, g. Coffee bean nucleus.



### 2.51. Fried egg appearance (Figure 6 f)

Mast cells are found in small numbers (up to 10 mast cells per 40X field) in a perivascular location in the dermis. In cases of Neurofibroma, these cells are oval with a centrally located dark round nucleus, giving a fried egg appearance.

### 2.52. Coffee bean nucleus (Figure 6 g)

It's seen in Langerhans cell histiocytosis. Clefted nuclear membranes resulting in nuclear grooves are seen.

## 3. Conclusion

This paper gives an overview of the diversity of clinical, radiologic and histopathologic appearances of various head and neck tumours and tumour like conditions along with a few typical features of the conditions.

## 4. Source of Funding

None.

## 5. Conflict of Interest

No conflict of interest.

## References

- Ramakrishnan R. Histological patterns and differential diagnosis of common inflammatory dermatoses. *Egypt J Pathol*. 2014;34:1–4.
- Nivala M, Lehtinen E, Helle L, Kronqvist P, Paranko J, Säljö R. Histological knowledge as a predictor of medical students' performance in diagnostic pathology. *Anatomical Sci Educ*. 2013;6(6):361–7. doi:10.1002/ase.1352.
- Mishra MS, Upadhyaya N, Dive AM, Bodhade AS. Histological patterns of head and neck tumors: An insight to tumor histology. *J Oral Maxillofac Pathol*. 2014;18(1):58–68. doi:10.4103/0973-029x.131912.
- Al-Nafussi AI, Al-Nafussi AI. Tumor diagnosis: Practical approach and pattern analysis. Common histological patterns and cell types of tumors. 2nd ed. London: Hodder Arnold; 2005.
- Neville BW, Damm DD, Allen CM, Bouquot JE. Oral and Maxillofacial Pathology. 2nd ed. Saunders; 2004.
- Rajendran R, Sivapathasundaram B. Shafer's Textbook of Oral Pathology. 5th ed. Elsevier; 2006.

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