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Inclusion Bodies

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ABSTRACT

The pathology studies widely deal with many cellular and nuclear altered structures other than these one of the important and interesting features is the observation of various histopathological bodies. These inclusion bodies is an important diagnostic-aid in identifying the underlying disease. Therefore in this article present different inclusion bodies seen in various diseases.

Key words: Inclusion, bodies, various diseases, diagnostic-aid.

INTRODUCTION

Inclusion bodies are nuclear or cytoplasmic aggregates which are stainable substances, usually proteins, and formed due to viral multiplication or genetic disorders in human beings these bodies are either intracellular or extracellular abnormalities and they are specific to certain diseases. When a foreign gene or the infectious agent is injected into a cell, the complementary DNA translated from a messenger RNA may code for a protein, which are fails to undergo further modification, transport, condensation of the cell, result in inclusion body. In some diseased conditions, cells modified and may become pathognomonic for that particular disease.

Classification of inclusion bodies[1]

1. Physiological inclusion bodies
2. Infection inclusion bodies

A. Inclusion bodies in viral condition

i. Intra cytoplasmic inclusions

ii. Intra nuclear inclusions

B. Inclusion Bodies seen in bacterial infections.

C. Inclusion Bodies seen in fungal infections.

3. Inclusion bodies in neoplasms.
4. Inclusion bodies in autoimmune diseases.
5. Inclusion bodies seen in blood dyscrasias.
6. Inclusion bodies seen in cystic lesions.
7. Physiological inclusion bodies

Odland bodies

In Keratinized stratified squamous epithelium is shows membrane-coating granules called Odland bodies. It is also called as lamellar bodies, keratinosomes. These are seen in the upper stratum spinosum and stratum granular cell layers which are rich in glycolipids. These lipids are discharged extracellularly to form a permeability barrier that prevent absorption of aqueous fluids.[2]

Weibel Palade bodies

They are Storage granules of endothelial cells, von Willebrand factor and P-selectin are two principal molecules are stored in the bodies released when needed. Thus its play important role in haemostasis and inflammation. Infection inclusion bodies.[3]

Infection inclusion bodies

Inclusion bodies in viral condition

Intra cytoplasmic inclusions

Councilman Bodies[6]

a) Describedà → they were named by an American Pathologist William T. Councilman

as they called by his name 'Councilman Bodies'.

b) Typeà→acidophilic inclusion bodies

c) Morphologyà →cytoplasm of hepatocytes, with ballooning degeneration. This is due to hepatocytes undergoing apoptosis.

d) Diseasesà → viral infections such as viral hepatitis and yellow fever.

Henderson Peterson bodies[7]

a) Type → intracytoplasmic inclusions

b) Diseases → Molluscum Contagiosum disease caused by Pox viruses spinous and corneum of the infected epithelium

c) Morphology → large ellipsoid, homogenous, which are nuclear and cytoplasmic aggregates bodies.

Intra nuclear inclusions

Cowdry Type- A[8,9]

a) Diseases → gingivostomatitis and conjunctivitis caused by herpes simplex and also chicken pox caused by varicella zoster. These bodies

b) Morphology → acidophilic material of droplet-like masses surrounded by clear halos within nuclei.

Lipschutz bodies[10]

a) Type → eosinophilic nuclear inclusions

b) Morphology → enlarged nuclei and clear halo

c) Diseases → varicella zoster and herpes simplex

Cowdry Type- B[11]

a) Type → intranuclear eosinophilic without any nuclear change

b) Morphology → amorphous or droplet like bodies surrounded by clear halo in diseases like amorphous or droplet like bodies surrounded by clear halo infection.

'Owl's eye'[12]

a) Type → they are large intranuclear viral inclusion bodies with thickened nuclear membrane

b) Morphology → appear owl's eye

c) Diseases → Hodgkin's lymphomas

Inclusion Bodies seen in bacterial infections

Dohle bodie[4,5]

a) Morphology → light blue-grey, oval, basophilic staining areas in the cytoplasm of neutrophils shows defect in maturation of neutrophils.

b) Diseases → typhoid, diphtheria, and tuberculosis.

c) Stain → Leishman-Giemsa stain and Romanowsky stain.

Inclusion Bodies seen in fungal infections

Asteroid bodies[13,14]

a) Morphology → stellate shape with numerous rays radiating from the central core.

b) Diseases → Sporotrichosis

Toto bodies

a) Morphology → homogeneous, eosinophilic pools of material seen in superficial spinous layer of the surface epithelium

b) Diseases → epulis fissuratum.

Inclusion bodies in neoplasm

Wagner- Meissner body[15,16]

a) Morphology → oval aggregates of eosinophilic globules containing parallel slits

b) Diseases → von Recklinghausen's disease of skin, neurofibroma

Verocay bodies

a) Morphology → arranged spindle shaped cells with a palisading pattern

b) Diseases → benign nerve sheath tumor, Schwannoma

Psammoma bodies[17,18]

a) Morphology → spherical, concentrically laminated mass of calcified material these bodies are formed due to necrosis followed by dystrophic calcification.

b) Diseases → numerous benign and malignant epithelial and connective tissue tumors such as psammomatoid meningioma, psammomatoid juvenile ossifying fibroma, psammomatoid melanotic schwannoma, cystadenocarcinoma.

c) Stain → H&E stain

Russell bodies

a) Described → Michaels (1935)
b) Diseases → chronic inflammatory granulomata, multiple myeloma, plasmacytoma, helicobacter pylori infection, periapical granuloma.
c) Stain → GrunwaldGiemsa stain, fibrin, periodic acid Schiff

Pustulo- Ovoid bodies[19-21]

a) Type → eosinophilic inclusions
b) Morphology → round by aggregation coalescing granules
c) Diseases → granular cell tumors

Kamino bodies

a) Type → eosinophilic inclusion bodies
b) Morphology → globules
c) Diseases → pigmented spindle cell nevus, Spitz nevus
d) Stain → trichrome stains and periodic Acid-Schiff's

Dutcher bodies

a) Described → Dutcher and Fahey
b) Type → intranuclear inclusions
c) Morphology → smooth, membrane-bound and surrounded by clumped chromatin, immunoglobulin protein.
d) Diseases → chronic synovitis and large B-cell lymphoma and multiple myeloma.
d) Stain → Wright- Giemsa stains and periodic acid Schiff's

Inclusion Bodies in autoimmune diseases.[1]

Civatte bodies

a) Type → eosinophilic
b) Morphology→ waverly arranged fine filaments entangled with desmosomes, melanosomes, and other organelles.
c) Diseases → discoid lupus erythematosus and lichen planus
d) Formation → due to basal cell liquefaction degeneration and hypergranulosis
e) Derivation → basal cells and connective tissue elements from the basement membrane zone
f) Stain → for keratin

Hematoxylin bodies

a) Type → basophilic extracellular aggregation
b) Morphology → ovoid in shape, necrotic loci and contain dense chromatin
c) Diseases → systemic lupus erythematous 'Schaumann bodies
d) Described → Jorge Schaumann in 1941
e) Morphology → large concentrically lamellated structure seen in the cytoplasm of the giant cells, presence of calcium and phosphorus and small quantities of iron in Schaumann bodies
f) Diseases → Sarcoidosis, tuberculosis, hypersensitive pneumonitis

These inclusion bodies enlarge within the and giant cells and macrophages later rupture the cytoplasmic membrane of cell appear in extracellular matrix excluded crystals underwent further deposition of minerals leading to extracellular calcifications.

Inclusion bodies seen in blood dyscrasias[1]

Heinz bodies

a) Described → Robert Heinz in 1890
b) Morphology → irregular, small, deep purple granules in red blood corpuscles
c) Diseases → Glucose-6-phosphate dehydrogenase deficiency, haemolytic anemias, hemolytic anemias
d) Stain → Wright's stain and crystal violet
e) Formation → oxidative damage of DNA or change in aminoacids morphology in RBC

Howell- Jolly bodies

a) Described → William Henry Howell and Justin Marie Jolly
b) Morphology → dark staining small round inclusions and ring like appearance in the red blood corpuscles - mimics parasites
χ) It is presented as remnant of DNA during its maturation in bone marrow
d) Diseases → Pernicious anemia and Leukaemia with megaloblastic anemia

Inclusion bodies seen in cystic lesions[1]

Rushton bodies/ Hyaline bodies

a) Two Types → eosinophilic granular core and concentrically lamellated some hyaline

bodies are partly lamellar and partly granular

b) Morphology → various shape linear, curved, hairpin shaped, straight, circular or polycyclic forms. Mostly seen in the epithelial lining and rarely in fibrous capsule

c) Ultrastructure → two forms- lamellated and homogeneous is composed of outermost electron dense and electron lucent layers

d) Stainà Mallory aldehyde fuchsin, periodic acid-Schiff, Gomori stains, Papanicolaou and Orcein.

e) Diseases → Plexiform Ameloblastoma, Residual Cyst and Radicular Cyst.

CONCLUSION

Disease progression occurs with biochemical and cellular changes. Presence of inclusion bodies indicates disease. Absence of them indicates the disease subsidence. Inclusion bodies in the course of the disease at various stages is used in staging the diseases and for their treatment planning.

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