

Splendor-Hoepli phenomenon in Actinomycosis

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Abstract

Actinomycosis is an uncommon and chronic granulomatous bacterial infection characterized by suppuration. It is usually slowly progressing with non-specific symptoms bearing close resemblance to other pathologies such as solid tumours, Mycobacterium tuberculosis infections, nocardiosis, fungal infections etc making the clinical diagnosis difficult. The fastidious, slow-growing nature of the pathogens and non-specific nature of the histopathological phenomenon i.e. Splendor-Hoepli phenomenon provide further challenge in promptly and accurately diagnosing the condition and have resulted in clinicians and microbiologists significantly downplaying its medical significance.

Key words: Actinomycosis, Splendor-Hoepli Phenomenon, Infection.

Introduction

Actinomycosis was recognized as a clinical condition more than a century ago, with its initial occurrence in humans was documented by Von Langenbeck in 1845, and he attributed it to a fungus. In 1891, Israel and Ponflick described its anaerobic characteristics and successfully isolated it in humans. Later, in the 1960s, Waksman demonstrated that actinomycosis is caused by gram-positive bacteria^(1,2).

The primary cause of infection is typically *Actinomyces israelii*, although less frequently, other causative species like *A. naeslundii*, *A. odontolyticus*, *A. propionica*, and *A. viscosus* may be involved^(2,3).

These bacteria typically inhabit the mucous membranes of humans or animals, displaying significant specificity to their hosts. In humans, they are frequently present in the oral cavity but can also be found in the gastrointestinal and female genital tract⁽⁴⁾.

Epidemiology and clinical presentation

Actinomycosis is an uncommon bacterial disease characterized by its chronic and invasive nature, occurring globally at a yearly rate of 0.00003%⁽⁴⁾.

Actinomyces infections primarily affect individuals aged 20 to 60 years, and shows higher incidence among males (with a male-to-female ratio of 3:1), reaching a peak between 40 and 50 years of age^(4,5,6). From an anatomical perspective, *Actinomyces* infections can be categorized into cervicofacial, abdominal, thoracic, pelvic, and cutaneous infections. Among these, cervicofacial infections, also known as 'lumpy jaw syndrome,' are the most commonly observed type in clinical practice^(4,6-9).

Actinomycosis is a granulomatous lesion that eventually shift towards a suppurative state. Clinically, the lesion can be

divided into three stages. Initially, in stage 1, there is a localized swelling typically involving the soft tissue of the peri-mandibular area, but no sinus tracts are present. In Stage 2, the swelling becomes tough and extends to adjacent tissues followed by the appearance of fistulas and sinus tracts. These sinus tracts may discharge purulent material containing granules with a sulfur-like appearance known as sulfur granules. This phase represents the typical presentation of cervicofacial actinomycosis. Progression beyond this stage leads to Stage 3, characterized by widespread dissemination. The infection commonly spreads to the lungs, brain, and abdominal cavity⁽¹⁰⁾.

Clusters of microorganisms combined with inflammatory debris, known as sulfur granules, are commonly linked to actinomycosis but are not confined exclusively to this condition. Sulfur granules may also be seen in conditions such as botryomycosis, nocardia brasiliensis, and some species of *Streptomyces*. These granules display diversity in color, ranging from white to yellow, and in size, with diameters ranging from 0.25 to 2 mm. It should be emphasized that in some cases of actinomycosis, sulfur granules may be either absent or poorly organized⁽¹¹⁾.

Histopathological features

On a histological level, sulfur granules consist of aggregated suppurative and granulomatous infiltrates, accompanied by the presence of bacteria. Surrounding these granules, there may be brightly eosinophilic areas, a phenomenon known as Splendore-Hoepli Phenomenon.⁽¹²⁻¹⁴⁾

In 1908, in Brazil, Splendore documented this event for the first time and initially believed it to be a new species of *Sporotrichum*. In 1932, Hoepli observed comparable ray-like eosinophilic structures surrounding schistosomal ova in rabbit tissue⁽¹²⁾.

Splendore-Hoepli Phenomenon is a rare occurrence marked by the presence of eosinophilic material. This material, primarily visible with H&E staining, forms a surrounding halo around amorphous structures comprised of clustered microorganisms such as Actinomyces, Nocardia, and Botryomycosis-associated bacteria [Figure1].

It is also observed with various other agents including fungi (e.g., aspergillus, blastomyces, candida), parasites (e.g., schistosoma, strongyloides, filaria), inert bodies like surgical sutures, and specific cellular structures like allergic granulomas^(13,14).

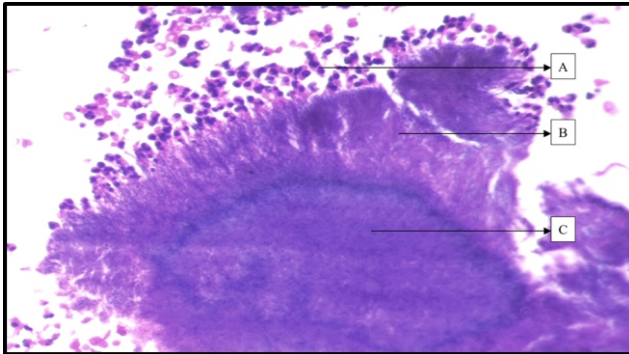


Figure - 1

Figure-1: Photomicrograph demonstrating Splendore-Hoepli phenomenon in the form of a granulomatous response (Haematoxylin & Eosin, X10)

- A) histiocytes and inflammatory cells
- B) strongly eosinophilic star like asteroid arrangement
- C) microbial aggregates

While the precise character of this phenomenon remains unclear, the most likely interpretation suggests that the eosinophilic material surrounding the central amorphous material is made up of protein deposits arising from an antigen-antibody interaction. This material also incorporates fragments from nearby inflammatory cells, including lymphocytes, eosinophils, and histiocytes. The material can take on various configurations, such as a layer with variable thickness and a consistent appearance, forming radiating star-like or club-shaped projections [Figure 2]⁽¹⁵⁾.

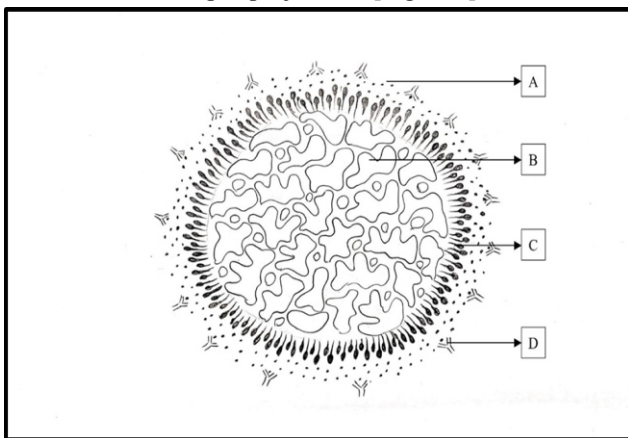


Figure - 2

Figure-2 : Hand drawn figure showing Splendor-Hoepli phenomenon mechanism

- A) host inflammatory cells
- B) central microbial colonies
- C) radiating star like configuration
- D) antigen-antibody complexes deposition.

The Splendore-Hoepli phenomenon signifies a localized immunological response to antigens from various infectious and non-infectious agents. The specific nature of the phenomenon and the process leading to their formation remain unknown. This reaction serves as a distinctive marker for a range of infections and reactive conditions. However, the overlap in manifestations can pose diagnostic challenges⁽¹⁶⁾.

Conclusion:

Actinomycotic infections in the cervicofacial area are not frequently encountered; however, they hold significance in dental practice due to their potential to resemble more prevalent oral conditions, especially those associated with dental infections. Additionally, they may exhibit symptoms closely resembling malignant diseases. Diagnosing these infections can be challenging, relying on the identification of sulfur granules in the exudate, the distinctive appearance of the organism in culture, and the examination of tissues through histological analysis. Future research focusing on potential molecular pathways contributing to the development of the Splendore-Hoepli reaction could provide insights into its pathogenetic mechanisms. Recognizing reactive conditions associated with the Splendore-Hoepli reaction may help avoid unnecessary administration of combined antifungal, antibacterial, or antiparasitic therapeutic agents.

Conflict of Interest: Nil

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