REVIEW

"ACTINOMYCOSIS"—A REVIEW—WITH A CASE REPORT

By

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Actinomycosis is a chronic granulomatous suppurative disease caused by Actinomyces (ray fungus) in the tissue. Though there were many other names suggested by various workers e. g. Discomyces, Coniomycetes, Oospora, Nocardia, Streptothrix and Cohnistreptothrix, but the most agreed term is Actinomyces.

Bollinger was the first man to detect the branching mycelium from the material obtained from the diseased jaw of a cow and published the first definite description in 1877.

Ponfick was the first man to diagnose the condition in a living patient in 1879.

J. Israle, independently at the same time noted the granules containing mycelium similiar to that described by Bollinger and published the first good clinical account in 1885.

Bostroem in 1890 described that Actinomyces grows under aerobic conditions at room temperature, but Wolff who was working with Israle claimed that the disease was produced by anaerobic organism which grew at body temperature only. Homer Wright in 1905 published his paper on the subject and agreed with Wolff. Hence the organism was known as Wolff-Israle type. Now every one agrees that there are both aerobic as well as anaerobic strains existing in the nature.

Etiology—There is no doubt about the fact that the disease is caused by fungi. A number of pathogenic specieses are known, but all of them cause more or less similiar lesion possessing similar course and prognosis, obviously with little differences.

Due to presence of large number of synonyms, there is no single standard classification but from time to time it has been put in different ways.

Primarily there are two groups. One prefers to grow in anaerobic conditions and pathogenic species belonging to this groups is Actinomyces bovis. Second one prefers to grow in aerobic condition and this group contains many pathogenic species, of which N. asteroides, N. madurae, N. brasiliensis and N. paraguayensis are important.

Recently the term Nocardia has been reserved for semi Acid fast species but they are definitely Grams positive.

Chalmers and Archibald in 1916 classified the pathogenic fungi in two groups :

1. Actinomycetis—possessing grains composed of very slender, non-septate hypae and causes Actinomycosis.

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2. Maduromycetis—possess grains composed of coarse septate mycelium and causes Maduromycosis.

Beneke. E. S. in 1958 divided the order Actinomycetales into three families. They are:

1. Mycobacteriaceae (Genus-Mycobacterium)
2. Actinomycetaceae—consisting of two genera :
   (a) Actinomyces (b) Nocardia.
3. Streptomycetaceae (Genus-Streptomyces).

Recently the trend has changed. Mycetoma is the word indicating tumour like growth caused by various fungi. And these Mycetomas have been put into six groups :

I. Carter's Black Mycetoma—caused by Madurella mycetomi which produces black grains.
II. Vincent's White Mycetoma (Madura Foot)—caused by A. madurae.
III. Yellow Grained Mycetoma—caused by S. somaliensis.
IV. Red Grained Mycetoma—caused by S. pelletieri.
V. Mycetoma caused by Nocardia Brasiliensis.
VI. Mycetoma caused by Nocardia Asteroides.

The disease is prevalent in Africa, India, Madagascar, Cochin China, Italy, United States and South America, though no part of the world enjoys complete immunity. In India the most affected district is Madura (hence the name Madura foot), but sporodic cases are seen in Delhi, Punjab, Kashmir and Rajputana. It appears te be the disease of rural areas. No age is exempted but disease mostly involves persons between third and fourth decade. Males are more involved, as compared to females, the ratio being approximately two to one. Probably the reason being that the males are more exposed to infection and trauma.

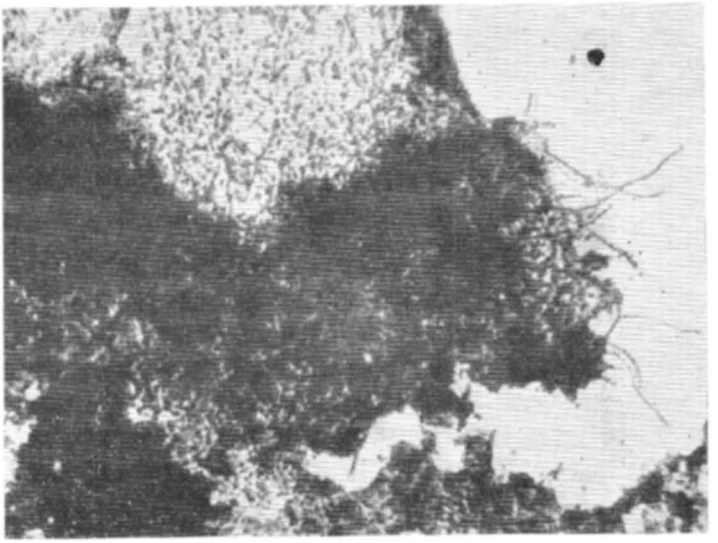
Actinomyces bovis has been isolated from the mouth, tonsils and throat of healthy persons. Probably it occurs in alimentry canal as well. Then why one gets the disease and others not, attracts one's mind. The probable explanation and the contributary factors may be as follows :

i. It is a frequent finding that the disease occurs usually after extraction of infected tooth, or a fracture (commonly of Mandible), or some trauma which gives in way to the fungus where it grows in devitalized tissue which gives necessary anaerobicity and leads to production of disease.

ii) Chronic diseases which lower the general body resistance might be lowering tissue resistance for Actinomyces and help in the production of disease.

iii) It is considered that the symbiotic action of the bacteria and the fungus is important factor in production of the disease. By artificial innoculation of the A. bovis, the disease could not be produced. It indicates that a

pathogenic fungus remains non-pathogenic in absence of bacteria. It gives a clue that while treating this fungus disease, secondary infection must be irradicated promptly.



Crushed granules of A bovis from Pus after staining with Grams method. (Grami+ve) Magnification (520 X)

Pathogenic aerobic strains are found in soil only and not in healthy persons. They commonly infect lungs by inhalation of the infected dust or by contamination of wounds in foot in those who walk bare footed. Here too, the symbiosis of bacteria is important to render pathogenicity to the fungus, otherwise the disease would have been very common specially on country side.

The portals of entry may be: 1. The alimentary Canal. 2. The respiratory tract. 3. Skin.

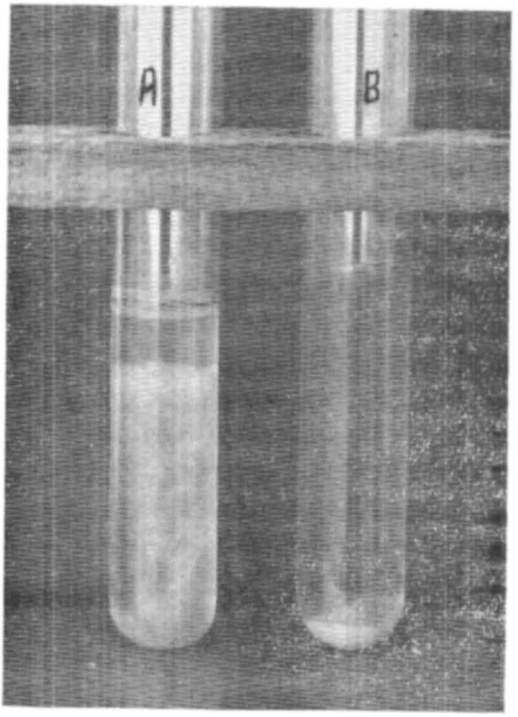
These are common ones. Rare one may be female genital organ.

Clinical Pathology: Infection by the Actinomyces has a tendency to spread either subcutaneously, submucuously or subperitoneally. Even if it breaks through surface, the sinus quickly heals but the active lesion goes on spreading in connective tissue or fatty layer. Muscles are either pushed aside or infiltrated. Nerves may or may not be irritated by the process, hence the intensity of pain varies. Peritoneum is resistant to attack. The Plura does not possess the same resistence, and plural cavity may be involved. The infection has a tendency to travel leaving a mark of its journey in form of puckered scar. The infection can metastatise via blood stream specially from a lung focus, and produce disease in any part of body including brain, kidney and liver.

Grossly the lesion may present in any of the following forms viz. fibrous indurated swelling, abscess softening, suppurative sinus formation, and healing sinuses.

Microscopically the lesion gives the picture of an abscess, containing large actinomycotic granules surrounded by polymorphonuclear cells. This area is surrounded by a zone of granulation tissue containing histiocytes filled with lipoid. Hematoxylin and Eosin stain reveals a basophilic central zone which is composed of closely packed branching mycelium. This zone spreads peripherally into an acidophilic zone which is composed of radiating filaments of the fungus, many of them showing clubs at their tips.

Clinical Features: Actinomycosis can occur any where in the body, but there are many well defined clinical forms, the important ones being Cervicofacial Actinomycosis, Abdominal Actinomycosis, Thoracic Actinomycosis and Mycetoma. As the reported case is of a Mycetoma it needs more attention.



A bovis culture in liq. medium :—A. Thioglycholate medium.
B. Glucose heart infusion Broth.

Maduromycosis, Mycetoma or Madura Foot are all synonymous. These terms are applied to chronic, deep infections of extremity caused by wide variety of fungi. The disease in general resembles classic description of Actinomycosis. The disease usually occurs after puberty and the infection is acquired by way of abrasion or punctured wound or thorn prick. Subcutaneous swelling develops extending to produce massive firm induration in which abscessess form slowly and periodically becomes fluctuent, rupture and leave chronic sinuses draining pus and bloody

fluid. This fluid may or may not contain granules. The granules may be of various colours—white, red or black, the typical yellowish clumps of A. bovis being the commonest.

Immunology: Extensive studies have been done but definite conclusions could not be drawn, though agglutinins, complement fixing antibodies and precipitins have been demonstrated but not consistently or with enough specificity so that any of these can be used for diagnostic or prognostic purposes. So immunology of the fungi needs more research.

Differential Diagnosis: In general Actinomycosis should be differentiated from all granulomas—tuberculosis, leprosy, other deep fungus infections, syphylis and infective granulomas—neoplasms, septic ulcers, osteomyelitis. Cervicofacial forms should be differentiated from glanders or bacterial infections derived from dental lesions or osteomyelitis of jaw. Abdominal Actinomycosis may simulate chronic appendicitis, amoebiasis, pyelonephritis, liver abscess or salpingitis according to the organ involved. Pulmonary Actinomycosis must be differentiated from Tuberculosis, neoplasm and bacterial lung abscess.

Techniques to demonstrate the granules: In some cases the pus contains fair number of granules, of the size easily visible to nacked eyes. In cases where they are not easily detected in pus, special techniques are applied to demonstrate them.

(a) Let the pus flow on a slide kept at some angle. As the pus flows down, the granules adhere to the surface of the slide.

(b) Take pus in a big test tube and dilute it with water. Shake well, and throw the supernatent gently. Repeat this procedure two–three times. If the granules are present, they will be seen at the bottom of the tube.

(c) Apply a piece of gauze over discharging sinuses. On removal of the gauze piece after two–three days, the granules are often seen entangled in the messes of the gauze piece.

Prognosis: Cervicofacial form enjoys the best prognosis, and it is worst in abdominal forms. Madura foot, though does not shorten the life but frequently necessitates the amputation of limb.

Now it is considered that presence of well formed clubs in the granules indicates high degree of immunologic host resistance and hence indicates a good prognosis.

Treatment: There is no specific treatment of actinomycosis till now. A number of therapies have been advocated by various workers, but none of them is satisfactory in all the cases. Few cases are known to undergo spontaneous cure. For convenience, the available remedies for Actinomycosis can be grouped as follows:

1. Drugs.
2. Radiation.

3. Vaccines.
4. Constitutional treatment.
5. Surgery.

The drugs tried so far are Iodine, Copper salts, Yatren, Formaline, Salvarsan, Gold salts, Sulphonamides, Antibiotics, Isoniazide and Sulphones.

Iodine as its Potassium salt has been used orally in heavy doses. It has been used parentrally as well as its injection in the lesion itself has been tried. Its results are quite convincing but it cannot be labelled as specific drug.

Copper salts, Yatren, Formaline injection in the lesion, Salvarsan, Gold salts, all need to be mentioned only for historical importance.

Sulphonamides and Antibiotics have improved the prognosis of the actinomycosis. Probably they act by only breaking the symbiotic action of the fungus and bacteria by destroying the latter. Nocardiosis responds better to sulphonamides than antibiotics, but high doses are required which lead to serious side effects. S. Vipulyasekhs and S. Vathanabhuti (1960) have reported that Sulphamethoxypyridazine (Midikel) in relatively low doses (1. 5 Gm. daily for 4 months) gives good result. This produced no side effects.

Griseofulvin, the new antifungal antibiotic has been tried by F. Latapi in 1960. The results are not very satisfactory. Eight cases of mycetoma were tried. They were given 1–2 Gm. of Griseofulvin for 1 to 6 months. Initial improvement was noted in all the cases of mycetoma. Two cases without bone involvement were clinically cured. Apart from one case which was caused by S. Madurae, all were caused by N. brasiliensis.

Aureomycin and Isoniazide have been recommended for A. bovis infection by Mc Vay and Sprunt (1950 and 1953).

For N. biasiliensis, Gonzalez ochoa advise 4, 4–diamino diphenyl sulphone.

Vaccine therapy is out of date these days.

X–Ray exposures have given good results. It is of special value in pulmonary actinomycosis. Radio–active substances have also been tried.

In those cases, who suffer from general debility, it must be cured to increase the general resistance of the body. If patient is anaemic, he should be given antianaemic treatment. If the disease is not responding to the drugs and radiations, surgery comes to rescue. Actinomycotic abscess are not suitable for aspiration. They should always be surgically drained. In skin actinomycosis, the affected area should be excised, scrapped and replaced by skin graft. In very extensive lesions amputation is the only answer. Surgery must be preceded and followed by antibiotics.

REPORT OF A CASE

M. S. 30 years, Hindu male, resident of village Nigohi, District Bihar, had a thorn prick in the lateral margin of left fourth toe about four years back. He could

not take out the thorn completely and a bit of it remained inside the skin. He had no trouble, till after one year he developed itching at the spot of thorn prick and developed a small swelling. The swelling gradually increased in size. When it reached a size of three fourth of an inch, it started oozing serous fluid from minute sinuses. On admission, the swelling was situated on the dorsal surface of left foot on the distal outer corner (see figure) and has reached a size of $2\frac{1}{2}''x2\frac{1}{2}''$

Photograph of left foot showing Naked eye appearence of the Lesion.

in three years time. It was irregular in shape, surface was smooth, but appeared to be consisted of a number of soft cystic sweilings which were soft to touch and fluctuent. On pressing them purulant bloody fluid exuded out from minute sinuses. The patient was admitted on 12-3-62, and transferred to surgical side on 12-5-62.

LABORATORY DATA

Pus examination was positive for sulphur granules as well as for the fungus. Fungus could be cultured on thioglycolate media, and it was identified as Actinomyces bovis. Tissue biopsy revealed invasion by fungus Actinomyces. X-Ray foot revealed no boney involvement. Blood picture was within normal limits.

COURSE

The patient was throughout afebrile and had no constitutional symptoms. He did not receive any treatment for three years, till he was admitted to the hospital. In the hospital he was given massive doses of sulphathiazole and penicillin G sodium, but no benefit was observed. Then he was put on high doses of Potasium Iodide, and this too was found to be ineffective. He was then given deep ray exposures over the affected foot. This could slighly retrogress the lesion in the way that it dried and became indurated. The patient was then subjected to surgery. The affected part was excised and replaced by a skin graft. The wound healed in due time and patient was discharged in cured condition.

DISCUSSION

Actinomycosis is known to occur in India, but it is not very commonly seen, probably because it occurs more towards the countryside, and only few of those

who suffer come to bigger hospital or institutions where the condition can be diagnosed. Madura foot is seen more commonly in Madras. Cases of Actinomycosis are seen all over India. The present case came from village Negohi, District, Bihar. An interview with him revealed that a number of persons in his village suffer from similar disease. The patient presented with a chronic granulmatous suppurative lesion on the dorsum of left foot which developed after a thorn prick. Diagnosis of infection by Actinomycosis bovis was confirmed by smear examination, culture of pus, and histology.

Medical treatment of Actinomycotic infection is very unsatisfactory. In literature, there is a big list of drugs used for Actinomycotic infections. Cases have been reported to be cured by sulpha drug, Iodine, broad spectrum antibiotics, antifungal antibiotics (Griseofulvin) and Deep Rays. None of these can be labelled as specific cure for the disease. Surgery still stands at best place. In the present case, sulphathiasole, Fenicilline G sodium, Iodine, and Deep rays were tried but none benefitted the patient. Surgery enjoyed the claim of cure in this patient.

SUMMARY

A case of chronic granulomatous suppurative lesion of foot is reported. Smear examination, culture of pus and histology revealed the diagnosis of Actinomycosis. Causative fungus was Actinomyces bovis. No improvement was noticed by medical treatment. Patient was cured of the condition by excision of the affected part, and a skin graft.

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