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Research Article

Tuberculosis and it's Variations; Spinal Tuberculosis Treatment by Using Isoniazid First Line Drug of Anti-Tuberculosis

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Abstract

A disaster disease "Tuberculosis" in another word we pronounced TB and Consumption that was very serious bacterial disease which effect the lungs or specially effect the respiratory system. It is spread when person is coughing and sneezing. Various sign and symptoms should be seen like pain in chest, coughing, vomiting, bleeding from eye, nose or internal parts. Tuberculosis is treatable disease by medical professionals, lab tests, proper medical diagnosis, imaging, these thing required before any treatment. Immune system play great role in tuberculosis at the time of *Mycobacterium tuberculosis* bacteria enter into body those have weak immune system their is higher chance of lungs damage or mortal rate due to tuberculosis. If proper treatment, DOT Therapy Continue within 3 - 4 month's Management of tuberculosis is possible. When tuberculosis is not effect lungs apart from that it also target other internal organs as well which is directly related to latent tuberculosis where no symptoms is shown. The epidemiology of tuberculosis in Asia is about 12% of total population and world 5% of total population, India about 76k Cases registered every year. The Spinal tuberculosis is rare around 1 - 2% only it shown it is indirectly related to neurological deficit because of compression of adjacent neural structures and significant spinal. In this manuscript we are focusing everything about tuberculosis, spinal tuberculosis and their treatment.

Keywords: *Tuberculosis; DOT Therapy; Drug Isoniazid; Chest Pain; Spinal; Neurological Structure Disturbance*

Introduction

Miles typically called intake, it is infectious diseases it may spread to different components of your body like your Brain and spine. A sort of microorganism referred to as *Mycobacterium tuberculosis* reasons it. Inside the Early twentieth century, TB changed into a main reason of Demise inside the united states of America. Although the first documented spinal Tuberculosis (TB) cases date again to 5,000-year-Antique Egyptian mummies, the primary cutting-edge case of Spinal TB become defined in 1779 by means of Percival Pott. Spinal involvement takes place in less than 1% of Patients with TB however the increasing frequency of TB in both evolved and developing countries Has persevered to make spinal TB a fitness Trouble [2,4]. Spinal TB (Pott's sickness) is the Most commonplace as well as one of the most risky varieties of skeletal TB and bills for 50% of all cases of skeletal TB. Even though the Thoracolumbar junction appears to be the most Commonplace site of the spinal column involvement In spinal TB, any a part of the backbone can be affected and recently data shown for spinal tuberculosis around 12% to 47% are in category of neurological complications. The Multiple drug resistance of

tuberculosis also effect the immune system accurate Imaging modalities, and advances in spinal Reconstruction strategies have all modified the Control of Pott's disorder. Superior Imaging techniques including magnetic resonance Imaging (MRI) make the early prognosis of Spinal TB simpler and a considerable number of Sufferers with spinal TB are identified earlier And dealt with extra efficiently earlier than full-size Neurological deficits broaden Tuberculosis is a form of bacterial contamination that's unfold with the aid of *Mycobacterium tuberculosis*. Pulmonary tuberculosis is a type of tuberculosis wherein the contamination is present inside the lungs where the active TB organism grows and is living in the lungs and spreads thru the cells. on this one inflamed cellular in the direction of wholesome cells are destroyed with the aid of the bacteria [1]. That is recognized with the aid of the signs like fever, nausea, shortness of breath, vomiting, chest pain, cough, sputum and many others [2]. Potts backbone (tuberculosis spondylitis) that's a very rare sort of tuberculosis is caused when the organism begins to spread from the tissues to the bones where they reason a totally painful circumstance which is also associated with the arthritis and osteomyelitis which cases lots painful backache and deformities. that is commonly an air born disorder which spreads because of air or because of sharing of liquids with the infected individual [4]. Nowadays Various Medical Professional using Antibiotics for treatment of tuberculosis including Asia Pacific Region India, Pakistan, Bhutan, Nepal, China etc. The antibiotics treatment process is quite slow because it take time approximately 4 months to 7 months. Tuberculosis is also under top 10 global series disease In 2015 approximately 1.3 million people mortal and more than 8 million people dealing with this disease this disease is boosting since 18th - 19th Century various microbiologist working on tuberculosis from ancient time like kotch Discovery and drug treatment of tuberculosis but now current situation is quite good lots of drugs is there various therapy by properly using these easily treatment is possible.

According to World Health Organization, more than 10 million in year sick with tuberculosis with approximately more than 2 million cases will be missed by health authority these data collected from every country CRO's and Pharmacovigilance departments.

1. Tuberculosis is listed on 3rd position which causes the death and for women aged 14 to 47.

2. Tuberculosis symptoms (cough, fever, sneezing, chest pain, and weight loss, etc.) may be mild for several months or people suffering with Tuberculosis infect up to 12 - 18 other persons through close contact over the duration course of a year.

3. Tuberculosis is an airborne pathogen, meaning that the bacteria that cause tuberculosis can spread through the air from person to person it is categorized under the infected disease.

Tuberculosis

Tuberculosis is infectious disease caused by MTB *Mycobacterium tuberculosis* bacteria. Tuberculosis also effect the others organ apart from lungs. Tuberculosis spread person to person by sneezing, coughing person can infected if he/she not following or avoid distancing. There are two types of tuberculosis latent tuberculosis and Active Tuberculosis:

- Causative Agent - *Mycobacterium tuberculosis*
- Site of infection - Pulmonary Alveoli
- Immune Response - Cell Mediated Immunity.

The *Mycobacterium* gets into lungs and reside the alveoli of lungs while it start from primary infection or immune system fails to eliminated there are three case scenario of *Mycobacterium* in the alveoli:

1. Elimination: In this Phase our immune system completely eliminate the infection

2. Retention: In the Retention case the immune system suppresses the infection but bacteria remain variable in this case we can say Latent Tuberculosis which is mostly the symptomatic tuberculosis

3. Active Infection: While in the active Phase the *Mycobacterium* evates the immune response and separate the infection into lungs tissue and that time when active separate of infection we say it's Active Tuberculosis.

Pathophysiology of tuberculosis

The first step is entry of mycobacteria into pulmonary alveoli and towards defense pathogens immune system as enlarge macro Phase in alveoli which we call as Macrophage Alveoli. When the macrophage detect the pathogens it captured the phagocytises the *Mycobacterium* into the cell process called Phagocytosis. The vesicle beat encapsulates the *Mycobacterium tuberculosis* "Phagosome" and the macrophage is called Lysosome as hydrolytic enzymes and under normal immune response Lysosome fuses the phagosome to form Phago-Lysosome in which the pathogens is dissolve acids and finally gets eliminated but here in cases of tuberculosis phagosome is not form phago-lysosome So in this case the fusion is inhibited and *Mycobacterium tuberculosis* is protected inside the macrophage which means not detect by immune system so ultimately the bacteria replicate in macrophage and is the primary infection is that time.

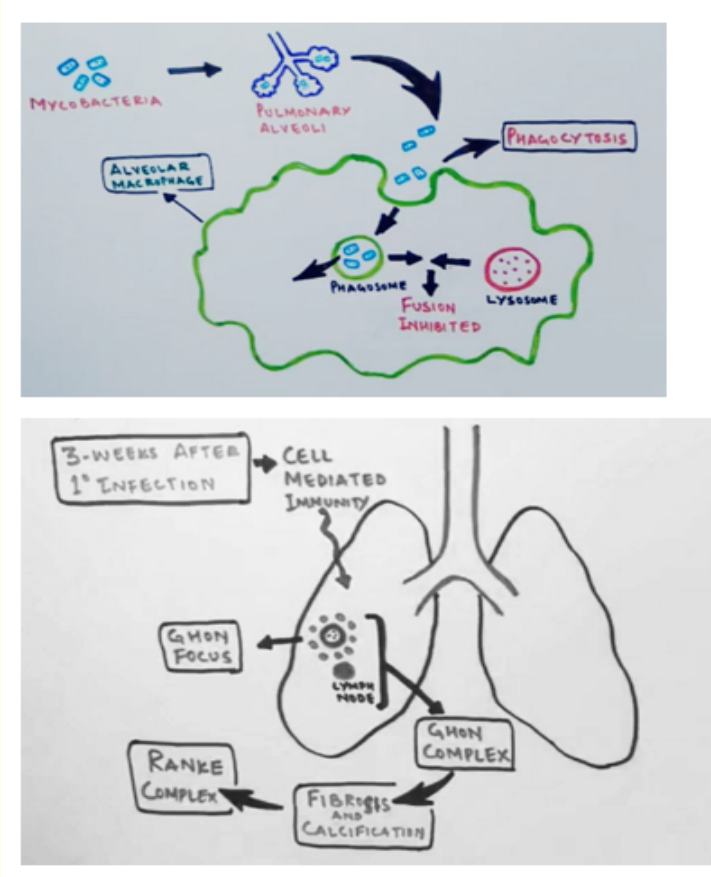

Figure A

Three weeks after primary infection the cell mediated immunity kick cell and immune cell surrounds the infection and form Granuloma and the formulation of Granuloma there is necrosis of tissue at the site of infection and that time is thermodiazed Ghon Focus and where Ghon Focus involve nearby lymph nodes is called Ghon Complex then gradually is there fibrosis which thermodiazed Ranke Complex so at this Stage there is complete elimination of tuberculosis or it goes into Quesent Stage Which is called Latent Tuberculosis.

Molecular mechanism of tuberculosis: Immune Suppression by Mycobacterium tuberculosis has various mechanisms:

1. Inhibition of phagosome maturation: Which involves the Phagosome Acidification.
2. Inhibition of phago-lysosome formation: There is inhibition of phagosome with lysosome mycobacteria does not allowed this fusion.
3. Inhibition of interferon production: These Drives cGAS Molecular Fusion by Mycobacteria of Macrophage.

Symptoms

At some stage in a latent level, TB has no signs. while TB is active TB, the cough, fever, and different symptoms can appear. even as TB typically impacts the lungs, it may also have an effect on different components of the body, and the symptoms will vary for this reason. without remedy, TB can spread to other parts of the frame thru the bloodstream:

- **The bones**: There can be spinal ache and joint destruction.
- **The brain**: It can result in meningitis.
- **The liver and kidneys**: It could impair the waste filtration capabilities and cause blood within the urine.
- **The coronary heart**: It could impair the heart's ability to pump blood, resulting in cardiac tamponade, a situation that may be deadly.

Tuberculosis causes and how TB is unfold Tuberculosis is because of bacteria that unfold thru the air, similar to a cold or the flu. while a person who has it coughs, sneezes, talks, laughs, or sings, tiny droplets that comprise the germs are launched. If man or woman breathe in those germs, man or woman can get it. TB can spread from individual to individual, however it isn't easy to trap. normally ought to spend loads of time round someone who has lots of bacilli of their lungs.

Tuberculosis diagnosis

There are common tests for tuberculosis, however they don't inform confirmed whether you've got latent or lively TB. Pores and skin check that is additionally known as the Mantoux tuberculin pores and skin check. A fitness care employee injects a small quantity of fluid into the skin and decrease arm. After 2 or three days, they will take a look at for swelling in arm to determine results. If effects are high quality, likely were infected with TB bacteria. However, the effects may be false fine. If gotten tuberculosis vaccine referred to as bacillus Calmette- Guerin (BCG), the test ought to say have TB while truly don't. The effects also can be false poor, announcing that don't have TB when in reality do, if infection is current. would possibly get this test more than as soon as.

Blood test

Blood check these checks, additionally known as interferon-gamma launch assays or IGRAs, measure the reaction whilst TB proteins are mixed with a small quantity of blood. The maximum commonplace diagnostic test for TB is a skin take a look at wherein a small in-

jection of PPD tuberculin, an extract of the TB bacterium, is made just underneath the inside forearm. The injection web site ought to be checked after 2-three days, and, if a hard, crimson bump has swollen up to a specific length, then it's far probable that TB is gift. regrettably, the pores and skin take a look at is not one hundred percent correct and has been acknowledged to provide incorrect advantageous and negative readings. But there are different tests which can be available to diagnose TB. Blood exams, chest X-rays, and Multidrug-resistant TB (MDR-TB) is extra difficult to diagnose than normal TB. it is also difficult to diagnose everyday TB in children.

Treatment

Tuberculosis is treatable disease but when medication should be given right, administered right way or correctly length and type of antibiotic treatment depends upon person morphology like age, weight, gender, immunity, metabolism, potential resistance to drug, what type of tuberculosis patients is carry latent or active, location of infection lungs, kidney, brain everything depends upon patients conditions. Those Patient have Active Tuberculosis they required multiple drug therapy, DOT therapy whereas those patients have latent Tuberculosis only single dosage is sufficient for that. Antibiotic are usually required and used for tuberculosis patients for longer duration of time the standard duration for tuberculosis patients was 4 - 7 month's depends upon condition of patient. Tuberculosis also show toxicity in internal organs liver, Kidney and others Adverse drug reaction, Side effects are very uncommon like Dark Urine, High Fever, Chest Pain, Coughing, Sneezing, Loss of appetite, Jaundice, Nausea Vomiting also. The treatment cycle should be completed without skip till then completely tuberculosis gone away from body. Those Bacteria survive after treatment they Crete resistance into the body that dosage should be increase next cycle mainly first or second line anti tuberculosis drug (Antibiotics) make resistance into the body due to this hard to treat tuberculosis this condition is serious for HIV, Diabetes Patient their immune system is weaken. Sometimes DOT (Direct Observed Therapy) may be suggested. This includes health professionals dealing with tuberculosis to ensure that the course of treatment is completed.

First line drug isoniazid anti-tuberculosis drug profile

Isoniazid is first line anti- tuberculosis drug this drug main work to stop growth of bacteria, this is also used with combination therapy as well for treatment of tuberculosis. This drug single used for Active tuberculosis, those are infected by bacteria (Patient with Positive Tuberculosis Skin Test).

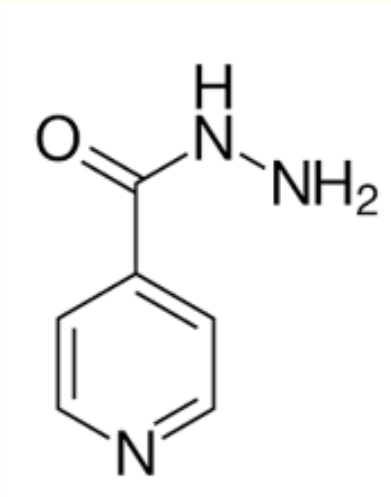

Figure B

Uses of isoniazid (Isonicotinic acid hydrazide, H) used

- Highly Effective for Anti-Tuberculosis Drug mainly for Latent Tuberculosis.
- Effective Both intercellular and extracellular bacilli
- First line Drug
- Cheap and oral
- Used for also Chemoprophylaxis of tuberculosis.

MOA: Inhibition of synthesis of mycolic acids which are components of mycobacterial cell wall. Isoniazid inhibit bio synthesis of mycolic acid which are essential constituents of mycobacterial cell wall.

Isoniazid-H, INH-Pharmacokinetics PK:

- Oral
- Distributed all over body, cavities and CSF
- Cross placenta
- Metabolized in liver, Out from urine [6-18].

Materials and Methods

In this Article we are focusing on Spinal tuberculosis Patient X which is indirectly related to neurological complications in figure 1 The X rays reports, figure 2 Effect of lungs by tuberculosis, figure 3 ECG Reports of spinal tuberculosis patient respectively.

Figure 1: *Spinal tuberculosis CT scan reports.*

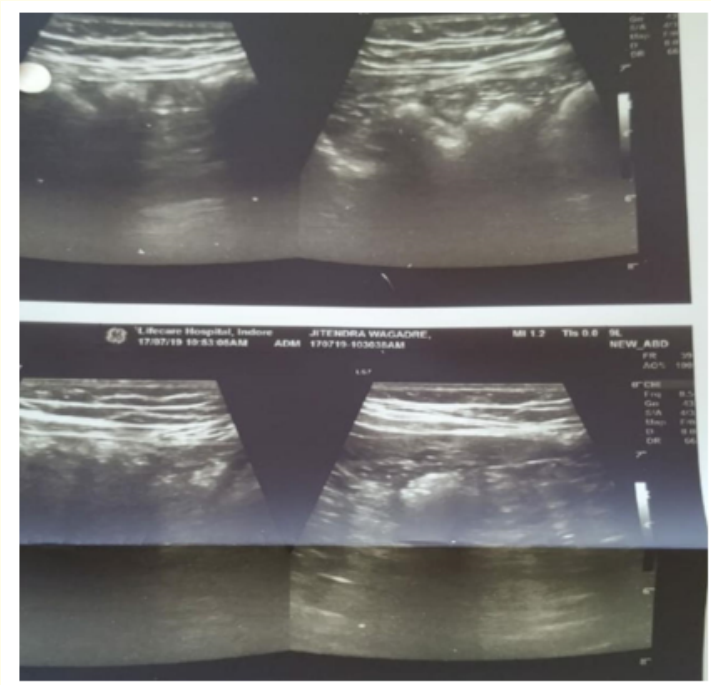

Figure 2: *Effect of lungs by tuberculosis.*

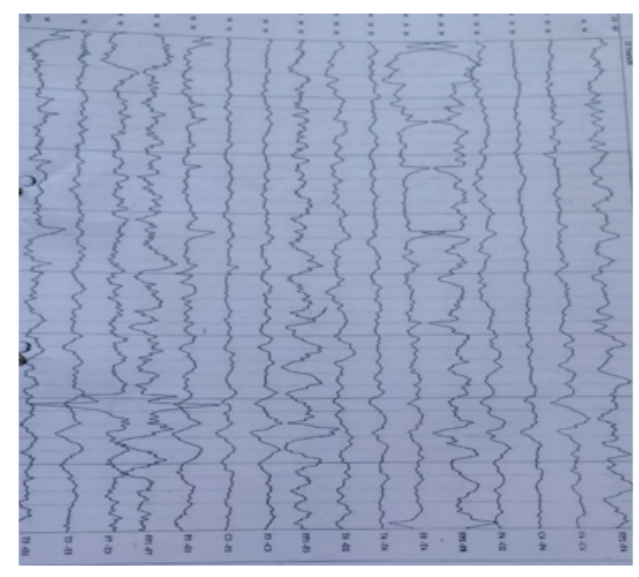

Figure 3: *ECG of spinal tuberculosis patient.*

Biochemistry

Total Bilirubin	2.08 mg/dl	0.6 - 1.6 mg/dl
Direct Bilingual	0.97 mg dl	0.4 - 06 mg/dl
Indirect Bilingual	1.2 mg/dl	0.0 - 0.70 mg/dl

Therapy

Combined Drug Therapy (DOT), Twice a day Isoniazid is recommended For the treatment of Active Tuberculosis.

MRI- Brain with contrast

Techniques

Brain MRI was Performed using T1, T2, Flair, diffusion weight sequence in focus planes. T1W sequence various planes for Post Contracting Study.

Imaging findings

The properly described ring decorate lesion measuring approximately 12.0× 10.0 mm visible inside the area of posterior limb of inner pill on proper aspect with moderate perifocal edema that isointense to grey rely on T1, T2 together. two similar morphology lesions observed in axial or cortical place of left frontal and similar lesion in left basifrontal vicinity and bilateral areas.

Results and Discussion

In a Patient X of pulmonary tuberculosis presented with seizures, above MRI Findings of Multiple Ring enhancing lesions with perifocal edema Suggest possibility of tuberculosis.

Conclusion

Spinal tuberculosis is very serious disorder Overall Discussion and as Per X Ray, MRI, CT Scan Reports, and overall findings of patient Edema suggested possibility of tuberculosis. In this Article We discussion about tuberculosis and it's variations latent and active, Isoniazid first line drug, other pharmacokinetics property after overall discussion the final conclusion as per CT Scan, MRI, ECG Report clearly shown that Patient X condition is Sever fundings suggested Edema, possibility of tuberculosis. Patient X symptoms also concluded Chest pain, coughing, Pain in Spinal cord direct related with neuro disturbance. The DOT Therapy treatment is suggested for 4 - 7 month's including Isoniazid if Patient X not going to recover within month then combined therapy is suggested with first line or second line Anti-tuberculosis Drug.

Consent

As per international standard or university standard, Patient's written consent has been collected and Preserved by the author(s).

Ethical Approval

It is not applicable.

Conflict of Interest

Authors declared that there is no conflict of interest.

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