Chapter-18

AN APPROACH TO THE PREVENTION AND MANAGEMENT TETANUS

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ABSTRACT

Tetanus still is a silent killer in low hygienic and poor families. However now a days it is a vaccine preventable disease. Causative agent of Tetanus is a toxin bacterium name Clostridium Tetani which is responsible as muscle spasm and autonomic nervous system dysfunction. The target of tetanus treatment to reduce spasm and cardiovascular instability and specially wound debridement is must in the affected patient antibiotics also help for supportive care. Now days IV magnesium sulphate and antitoxin administration for spasm control is very effective for ventilator support. If treatment is not given so fast then the mortality rate is very high and such patient remain in hospital for a prolonged period after the generate of secondary problems. Tetanus complications as cardiovascular problems are creating fatal problems for life.

Keywords: *Microbiology, vaccination, pathophysiology, clinical features, Diagnostic test evaluation, Treatment with management, complications*

1. INTRODUCTION

Tetanus infections are a generalized infection with hypertonic convulsions with painful muscle spasm and indicate with locked jaw and teeth with severe respiratory problems. Infection become more severe when patient is not vaccinated or overage above 50 years and low immunity patient. The spasm may go on from minutes to weeks. Spasm begins from face and descending to the body. According to clinical features tetanus are four types as follows

- Generalized tetanus
- Neonatal tetanus
- Localized tetanus
- Cerebral tetanus

Estimated death from tetanus is near about 1million in reports (Dietz et al. 1996).

2. MICROBIOLOGY

As we know Clostridium tetani remain in soil and it is a ***gram-positive bacterium***. It is isolate from human stool and animals (Wilkins et al. 1988). This is a anaerobe, motile and spored bacteria and it is complete destroy after the boiling. Clostridium tetani perform in body via a strong exotoxin released in body. The role of exotoxin is still unknown (Mellanby, J., & Green, J.1981). Clostridium tetani enters in human body via open wound, infected syringe, soil and infected blood. The common source of infection of tetanus is touch of open wound with metal or wood.

Immunosupressed persons and intravenous users are also in high risk for the bacteria clostridium tetani. Many other causes are dog bites, dental infections, infected syringe user and from bone fractures (Dong et al. 2019). Tetanus spores are highly survival for prolonged period. Tetanus also develops after as the result of gangrene and toxemia conditions. Burn patients also may develop in tetanus. Diabetic persons with low immunity is also responsible for develop into tetanus (Pascual et al.2003). Neonatal tetanus may also develop with such risk factors as unvaccinated mother, unsafe home delivery, unhygienic cutting umbilical cord and other factors.

3. PATHOPHYSIOLOGY

Clostridium tetani secrete two exotoxin one is tetanospasmin and one is tetanolysin which causes the muscle spasm and body contraction. Tetanospasmin works on the motor nerve and create muscle rigidity and on other hand tetanolysin damage the tissues. Tetanospasmin work on autonomic disability at the site of open wound tetanus spores germinate into the wound (Cardinal et al. 2020). Tetanus Spores germinate in particular anaerobic conditions and the cause is wound devitalised tissues has low oxidation which react for proper conditions to release tetanospasmin into the bloodstream (Sanford, 1995). Tetanospasmin toxin enters at the terminal of motor neurones and destroys the synaptic membrane which damages the protein of neuron and inactivates the motor transmission which suppresses the muscular activity and in the result of this activity the particular muscular area has been paralyzed and all muscle fibres at particular area also paralyzed. After this action when locally neuron affected all axonal ***parts,*** it enters into central nervous system where it also ***attacks*** on other peripheral neurons the period of this action is near about 2 to 14 days when glycine and Gaba are involved. Because glycine and Gaba neurotransmitters are the major neurotransmitters so this is caused the neuron cells damage and it fails to motor neuron activity and the such particular area act as a complete paralyzed area and patient not sensitize the moments and particular area have severe pain. This activity also produced Titanic spasm and this spasm is so strong that it contracts the muscles so powerful that can produce the bone fractures and many other complications. In some conditions it results muscle tears in some cases. The prolonged period of this action is near about 1 to 60 days and on average near about 7 to 10 days. The severity of this action depends on the toxin that how many times reaches from motor neuron to central nervous system. when neurotoxins which remain in bloodstream enters into the brain it results autonomic dysfunction of human body the action of this activity is near about second week of infections after the damage of brain tissues heart rate increased and hypoxic conditions also generate. The mortality rate of infection is higher which have not prior

vaccination however near about 20% patients are recovered on the immunity of patient and the severity of infection (Yeh et al. 2010).

4. CLINICAL FEATURES

The incubation period of tetanus is 4 to 14 days and severity of tetanus depends on the wound conditions. It goes worst when injury is unnoticed. As we all know the major symptoms of tetanus is locked jaw and facial expression which is called Resus Sardonicus. On other symptoms muscles pain due to the muscle spasm, uncontrolled urination due to the urethral spasm and the lungs distress which causes uncontrolled respiratory conditions. Slowly-slowly these muscle spasms enter into the rest of body which create body convulsions. After this reaction patient react against the light, sound and noise. Classification of tetanus based on four types generalized tetanus, neonatal tetanus, localised tetanus and cerebral tetanus. ***Generalized tetanus*** is common type of disease and it presents near about in 80% of cases. The first indication of generalized tetanus is clearly ***indicated*** by the locked jaw and patient have rigid smile due to the contraction of facial muscles it is called Resus Sardonicus. Due to the rigidity of facial ***muscles,*** it may lead stiff neck and difficulty in swallowing. The spasm of generalized tetanus can go usp to four weeks and after proper medication the patient can recover in 6 months. Many other symptoms are also produced as high fever, increase heart rate, respiratory problems and sweating. Early death may be possible in some cases. ***Neonatal tetanus*** produced in the conditions of immunized mother or by infection, any metal instrument used in septic conditions when doctor cuts the umbilical cord such like instruments. Newborn babies have not the infection of tetanus due to the passive immunity of newborn child against the infected mother and if newborn baby have tetanus the recovery of infection is to be seen more higher due to neural impairment. ***Cerebral tetanus and Localized tetanus*** are the rare form of disease. In localized tetanus the muscle spasm can go up to many weeks and it depends on the severity of wound conditions. This type of infection is not fatal and patient may recover with proper treatment. However generalized tetanus is life threatening tetanus. Cerebral tetanus attacks on the nerves of head and limit works on the muscles it is most commonly found in traumatic conditions where the head injury ***is*** involved as in skull fracture, dental infection, otitis media, eye infection and on other injuries which can be related to the neck or the head the symptoms of cerebral tetanus are stiffed neck, eye retraction. In this type of ***tetanus,*** the facial muscles are involved and cranial nerves involvement may be seen. Some other complications are also found as broncho laryngeal respiration problem and respiratory muscle distress. In the examination test of ***tetanus, the*** one most trusted test is spatula test which is very perfect to confirm the diagnosis of tetanus. This test ***consists*** to examine the masseter muscles and posterior pharyngeal muscle wall to

determine the diagnose of tetanus. Hypertension may be present due to autonomic dysfunction and this may lead to tachycardia and bradycardia and Cardiac Arrest may also present. Abdominal tenderness also found with due to respiratory problems. In **Cerebral tetanus** the most common nerve is to be affected is 8th cranial nerve.

5. DIAGNOSTIC TEST EVALUATION

In the tetanus disease there is no particular laboratory test however some clinical features all physical examination are most reliable to diagnose the tetanus wound culture are also helpful to find the tetanus disease in near about 30% of cases. The most common features are muscular spasm, facial rigidity and locked jaw. Although not easily accessible, an antitoxin level assay could aid in ruling out tetanus. Tetanus risk decreases with a serum antitoxin level of 0.01 IU/mL or greater, which is typically regarded as protective. The previously established spatula test has a high specificity and sensitivity for tetanus clinical diagnosis. In order to do this, the posterior pharyngeal wall must be touched with a soft-tipped device. Instead of the expected gag reflex, an involuntary jaw contraction indicates a successful test.

6. TREATMENT WITH MANAGEMENT

Treatment of tetanus disease however based on the severity but there are some following goals to treat the disease as hygiene of wound, supportive management, to open neuromuscular blockade, early immunization and managing the complications. The first line treatment of tetanus is human tetanus immunoglobulin (HTIG) which is highly applicable to remove the toxin tetanospasmin and already work on central nervous system. Human tetanus immunoglobulin (HTIG) is also highly applicable to shorten the severity of illness. A dose of 500 unit of human tetanus immunoglobulin (HTIG) is very sustainable against disease. In case of generalized tetanus therapeutic doses (3000-6000 U) are also recommended. It is necessary tetanus disease to clean the devitalized tissues of wound. This controls the production of toxin into the wound (Centers for Disease Control and Prevention 2002). Toxins are the main cause for spread of disease and metronidazole show progressive response to control the tetanus. This medicine also shows for decrease mortality rate in tetanus (Ahmadsyah, I., & Salim, A., 1985). In the era of 1980 penicillin shows best result Ek Lori sunao against tetanospasmin. Other antispasmodics such as benzodiazepines, baclofen, vecuronium, pancuronium, and propofol effect on muscle spasm and to control muscle rigidity (Petitjeans et al. 2009). In the tetanus severity patient must be hospitalized in the hospital at ICU. If tetanus diagnosed early the patient life is secure and the treatment is not done it can be fatal. Tracheostomy can be done due to muscle spasm and for respiratory

problems. Benzodiazepines are also used for reduced the muscle spasm. Diazepam reduced the anxiety of patient. In the tetanus severity patient must be hospitalized in the hospital at ICU. if tetanus diagnosed early the patient life is secure and the treatment is not done it can be fatal. Tracheostomy can be done due to muscle spasm and for respiratory problems.

Benzodiazepines are also used for reduced the muscle spasm diazepam reduced the anxiety of patient. Diazepam can be given intravenous 10-40 mg every 1-8 hours. Magnesium used in the combination with benzodiazepines for the management of tetanus complications (Ceneviva et al.

2003). It should be administered intravenously (IV) as a 5 g bolus, followed by a 2-3 g/hour continuous infusion until spasm control is attained (Thwaites et al. 2006). The management of tetanus is to be controlled the respiratory muscles, cardiovascular complications and other body order dysfunctions for the life care of patient. Patient need full tetanus toxoid immunization at recovery for the future immunity (Fletcher et al. 2019) (Duss, F. R., & Voide, C. 2018).

7. COMPLICATIONS

Complications of tetanus include respiratory muscle contractions and larynx is also involved in the infection of tetanus (Bunch et al.2002).

8. CONCLUSION

At least it has to be said tetanus infection may be spread in poor hygienic and low immunized people if the tetanus early diagnose it can be cured early diagnose maybe the high mortality rate in the patient. Now a days as advanced treatment can go on tetanus have no high mortality rate and the infection can be manage within 4 to 5 days patient have given high fibre diet for the proper management of infection.

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