

tetanus
[created
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general

- tetanus is caused by toxin from the bacterium Clostridium tetani & is characterised by muscle rigidity, spasms, & disturbance of the autonomic nervous system

diagnosis

- diagnosis is clinical based on history and examination
- strychnine is a glycine agonist that may give rise to a similar clinical picture but muscle tone is usually normal between spasms & urinary strychnine will exclude this as a cause
- other differentials include oropharyngeal infections causing trismus, dystonic reactions or psychogenic illness

pathophysiology

- tetanus is caused by a potent neurotoxin from the gram positive bacterium C. tetani which is a ubiquitous organism capable of surviving in the environment as highly resistant spores
- once in suitable anaerobic conditions these spores germinate, the bacteria multiply and toxin is released
- the most common sources of infection are minor lacerations or the umbilical stump in neonates
- toxin is preferentially taken up by motor nerves either locally or after circulation in the bloodstream and then transported retrogradely into the CNS
- tetanus toxin is a zinc dependent endopeptidase that cleaves vesicle associated membrane protein II (VAMP II) at a single bond. This molecule is essential for synaptic release of neurotransmitters and cleaves disrupts synaptic transmission
- the toxin preferentially affects the GABA inhibitory interneurons afferent to the motor nerves in the spinal cord and the brainstem
- by preventing inhibitory discharge, unrestricted motor nerve activity occurs, resulting in increased muscle tone and spasms characteristic of tetanus
- in severe forms of tetanus the autonomic nervous system is also affected, perhaps as a result of toxin action within the brainstem, giving rise to marked cardiovascular instability

management

general measures:
- tetanus patients should be nursed in a quiet environment & all stimuli should be minimised
- prevent further toxin release wounds should be cleaned & debrided & antibiotics should be given
airway management:
- airway management is a priority in tetanus
- generalised muscle spasm, laryngospasm, aspiration or large doses of sedatives may all impair respiration and airway compromise should be anticipated
- copious bronchial secretions are seen in tetanus and frequent suctioning is required
antibiotics:
- metronidazole is the antibiotic of choice although penicillin is used throughout much of the world
- penicillin may worsen spasms; however, probably is not associated with higher mortality
antitoxin & immunisation:
- should be administered to neutralise any unbound toxin (ideally 100-300IU/kg of human immunoglobulin should be administered IM in a single dose; equine antitoxin 500IU/kg can be administered as an alternative but is associated with a higher incidence of anaphylaxis
- tetanus infection does not result in immunity; therefore, all patients should be actively immunised with a full primary immunisation course

clinical features

- incubation is usually between 4 & 14 days with 90% of cases presenting within 15 days
- initial symptoms include muscle stiffness, with muscle groups with short neuronal pathways affected first; hence trismus and back pain are present in more than 90% of cases on admission
- involvement of the facial and pharyngeal muscles produce the characteristic risus sardonius and dysphagia
- increased tone in the muscles of the trunk results in opisthotonus
- muscle groups adjacent to the initial site of infection are often particularly severely affected, producing an asymmetrical picture
- the time from the first symptom to the 1st spasm is termed the period of onset. Both the period of onset & incubation period have prognostic significance with shorter times being associated with more severe disease (<48hrs for the period of onset and <7 days for the incubation period)
- spasms may be spontaneous or provoked by physical or emotional stimuli
- laryngospasm can occur early in the disease process resulting in acute upper airway obstruction
- respiration may also be affected by spasms involving the chest muscles
- muscle spasms are usually most severe during the 1st and 2nd weeks of illness but may persist for 3-4 weeks after which time rigidity may persist for many weeks
- in severe tetanus, autonomic disturbance usually appears during the 2nd week
- signs of sympathetic overactivity usually predominate with periods of tachycardia & hypertension
- acute renal failure is a recognised complication of tetanus with dehydration, rhabdomyolysis due to spasms and autonomic disturbance all contributing
- other complications include tendon avulsions, vertebral fractures secondary to muscle spasm, GI bleeding, venous thromboembolism

prognosis

- if the disease is not treated the mortality is >60% and higher in neonates
- mortality is 10-25% in units with good facilities
- adverse prognostic features include:
(i) incubation of <7 days
(ii) period of onset <48 hours
(iii) portal of entry from umbilicus, uterus, burns, open fractures or from IM injection
(iv) presence of spasms
(v) temperature >38.4
(vi) HR >120bpm in adults and >150bpm in neonates

further management:
- consists of supportive care until the effects of bound toxin wear off
- sedation with benzodiazepines is the standard therapy for tetanus because they inhibit endogenous antagonists of GABA_A receptors and may counteract the effects of tetanus toxin (large doses of 200mg per day or more are often required)
- non depolarising muscle relaxants may be required if spasms cannot be controlled with benzos & in this case cardiovascularly inert agents like vecuronium are preferred to pancuronium because of the sympathomimetic side effects of the latter agent
- magnesium may be useful in treatment of spasms and may limit autonomic instability. Doses are titrated to a magnesium of 2 to 4 mmol/L.
- autonomic instability is often difficult to treat and rapid fluctuations in blood pressure mean short acting agents are preferable
- patients with severe tetanus may require 2-3 weeks of IPPV until spasms subside and nosocomial pneumonia is an important complication that often arises in these patients