TETANUS

A REVIEW OF THREE CASES OF TETANUS IN STARSHIP CHILDREN'S HOSPITAL 2000-2010

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OVERVIEW

- 3 clinical cases in Starship between 2000-2010
- Worldwide & New Zealand Epidemiology
- Diagnosis & Management of Tetanus
- The preventable cost of tetanus

CLINICAL CASE: LB

- 4 yr old unimmunised Caucasian boy from Auckland
- Presented to ED with 1 day history of jaw stiffness
- History of trauma:
  - Stood on a plastic toy 3 wks ago with puncture wound to heel
  - Stood on a thorn 2 days prior with a small scratch
- Rapid progression to generalised body spasms
- Clinically noted to have generalised ↑tone with opisthotonic spasms occurring every 10 minutes with variable heart rate and reduced mouth opening
- In ED, he was given TIG & metronidazole
- Admitted to PICU for management of spasms & ventilatory support

CLINICAL CASE: LB

- In PICU:
  - Ventilated & sedated with midazolam infusion initially then required active cooling & paralysis for high temperatures
  - Autonomic instability including hypertension
  - Received nasogastric nutrition

- Treatments included:
  - Intragam P
  - 2 weeks treatment with Metronidazole
  - Orthopaedic debridement of foot wound
  - Extensive discussions regarding immunisation followed by his first immunisation with Infanrix-Hexa
  - Clonidine for hypertension
  - 15 days of Magnesium infusion
  - High dose oral vitamin C supplementation due to parental request

CLINICAL CASE: LB

- In PICU:
  - Complications:
    - Failed extubation after 2 weeks and required insertion of tracheostomy
    - Pneumonia requiring prolonged antibiotic treatment
    - PICC line wound infection with MRSA
    - Significant pain issues managed with methadone and diazepam
- Transferred to ward with tracheostomy after 3 weeks admission in PICU

CLINICAL CASE: LB

- On the ward:
  - SLT assessment – improvement in voice quality & gradual increase in oral intake with subsequent removal of NGT
  - Decannulation of tracheostomy just under 1 month from admission
  - 2nd immunisation of Infanrix-Hexa given
  - Ongoing PT and OT input with improvement in core strength & balance
- Discharged with physiotherapy plan

- Follow-up in Paed ID clinic 1 month from discharge:
  - Observed to run into clinic
  - Riding bicycle with trainer wheels removed
  - ?altered hearing – awaiting hearing assessment
  - Due for further DTaP, IPV, Hep B & MMR
  - Parental reports of uptake of ongoing immunisation including all older siblings

CLINICAL CASE: MP

- 16m old unimmunised Maori girl from Northland
- Presented to Whangarei Hospital with 4 day history of increasing respiratory effort (?infective exacerbation of asthma)
- Ongoing deterioration and subsequently intubated
- Transferred to Starship PICU 2 days following presentation
- In PICU:
  - Developed episodic breath holding attacks with associated stiffness and mouth clenching
  - Treated with IV Cefotaxime, Vancomycin and Acyclovir.
  - Normal CSF including viral PCR and cultures
  - Normal CT and MRI brain
  - Normal EEG

CLINICAL CASE: MP

- In PICU:
  - Given TIG in view of opisthotonic posturing to cover for potential tetanus and penicillin was commenced.
  - Extubated on day 3 and transferred to ward
  - Readmitted on day 9 due to increasing spasms and requirement for IV diazepam
  - Commenced on morphine infusion
  - Penicillin was changed to metronidazole on day 10
  - Re-examination found two skin cracks between her great & 2nd toe which was debrided
  - Transferred back to ward on day 15 with PICC line and NJT for feeding.

CLINICAL CASE: MP

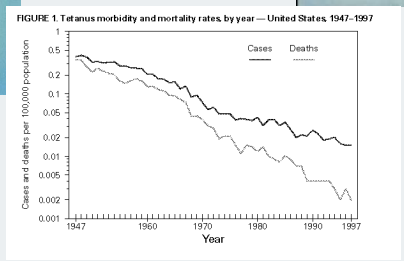
- On the ward:
  - Brief spasms treated with intermittent PR diazepam
  - Ongoing SLT, PT and OT input
  - Discharged home on day 23 following immunisations with DTPa, Hib/HepB and Polio.
  - Ongoing community paediatric and neurodevelopmental follow-up
- Her immunisations:
  - For catch up immunisations of HepB and DTPa with GP
  - MMR deferred for 6 months due to use of TIG
  - For booster tetanus 12 months later and again at 4 years of age

CLINICAL CASE: LA

- 9 yr old unimmunised Caucasian girl from Waikato
- Presented to GP with trismus and spasms following an infection of a leg wound
- Admitted to Waikato ICU with clinical tetanus & transferred to PICU Starship

- In PICU:
  - Ventilated & paralysed for an extensive period with requirement of a tracheostomy
  - TIG
  - IV metronidazole
  - Wound debridement with negative cultures
  - Magnesium sulphate infusions to control spasms
  - Clonidine for management of hypertension
  - Extensive discussion regarding catch up immunisation (MMR and Hep B only at discharge)
- Transferred back to Waikato hospital after 6 ½ wks in PICU for ongoing rehabilitation

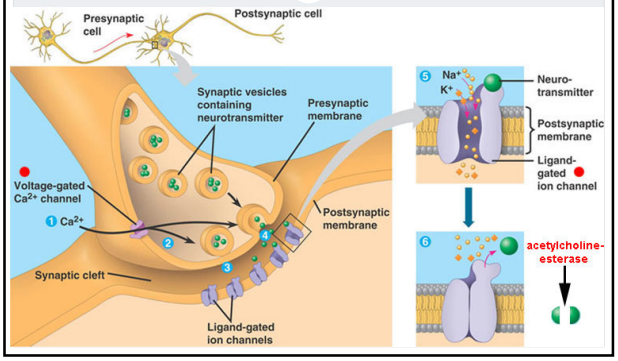
Tetanus



CLOSTRIDIUM TETANI

- Obligate anaerobic bacillus
- 2 toxins: tetanospasmin & tetanolysin
- Mature organisms lose their flagellae & develop a terminal spore
- Spores are extremely stable and retain ability to germinate therefore can cause disease indefinitely
- Spores are found worldwide as constituents of soil & in GI tracts of animals

PATHOPHYSIOLOGY

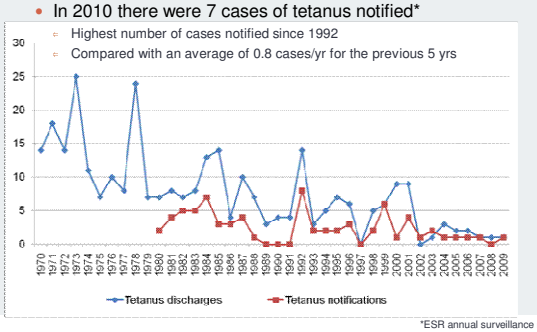


TETANUS: EPIDEMIOLOGY

- Tetanus is an important cause of hospital admission and death in parts of the world with limited vaccination programmes
- At least 1 million cases require hospital treatment worldwide every year
- ~400,000 deaths from tetanus each year
- Neonatal tetanus accounts for ~ half of the tetanus deaths in developing nations
- In developed countries, injuries account for ~70% of cases
  - Evenly divided between punctures and lacerations

TETANUS: NEW ZEALAND EPIDEMIOLOGY

- In 2010 there were 7 cases of tetanus notified*
  - Highest number of cases notified since 1992
  - Compared with an average of 0.8 cases/yr for the previous 5 yrs



*ESR annual surveillance report

TETANUS: NEW ZEALAND EPIDEMIOLOGY 2010

AGE GROUP (yrs)										
< 1	1-4	5-9	10-14	15-19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70	total
0	1	0	0	0	0	0	1	0	1	4	7

SEX		
Male	Female	Total
3	4	7

Tetanus Immunisation

- Universal childhood immunisation with tetanus toxoid containing vaccines in NZ since 1958
- Still elderly cohort in NZ never fully immunised
- Tetanus in NZ usually follows minor injury
- Vaccine is prepared from cell free toxin treated with formaldehyde to create toxoid
- Stimulates the production of antitoxin, providing immunity against the effects of the toxin. It does not prevent *C.tetani* from growing in a contaminated wound.

Tetanus Immunisation....cont.

- Highly immunogenic vaccine
  - 100% effective when given to pregnant women to prevent neonatal tetanus
  - Studies show 100% infants have protective levels after 3 doses at least 4 weeks apart
  - Antibody decay studies predict 5 year protection by 3 infant doses: booster at 5 years should give at least further 21 years protection
  - Convenience and administrative issues determine frequency of boosters (10 or 20 yearly?)
    - NZ: at 11, 45 and 65 years

TETANUS: CLINICAL MANIFESTATIONS

- Incubation period is usually 3-21 days (median 8 days)
- Generalised type is most common
  - Trismus, risus sardonicus

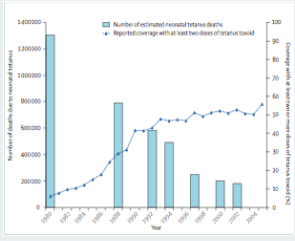
  - +/- abdominal rigidity
  - Opisthotonic posturing
  - upper airway obstruction & respiratory compromise
  - Autonomic dysfunction with severe sustained/labile BP & arrhythmias
  - progression for ~2wks, approx 10% mortality, or recovery is usually complete
  - Recurrent tetanus may occur if patient does not receive active immunisation

TETANUS: CLINICAL MANIFESTATIONS

- Localised tetanus
  - Involves rigidity of muscles at site of spore inoculation
  - May be mild & can resolve spontaneously
  - More commonly is a prodrome for generalised tetanus
- Cephalic tetanus
  - Special form of localised disease
  - Almost always follow an apparent head injury & causes a facial paresis

TETANUS: CLINICAL MANIFESATIONS

- Neonatal tetanus
  - Follows an infection of the umbilical stump when the mother is inadequately immunised
  - Newborns present with generalised weakness, feeding difficulties, rigidity & spasms
  - Mortality rate exceeds 90%
  - Apnoea is leading cause of death in 1st wk of life & sepsis in 2nd wk.



TETANUS: DIAGNOSIS

- Diagnosis is made strictly on clinical grounds
- Laboratory testing cannot confirm or exclude the diagnosis
  - C.*tetani* cultures from wound are not useful
  - Negligible serum tetanus antibody concentrations can support the diagnosis
- Strychnine poisoning is the only condition that truly mimics tetanus
- Other differential diagnosis include: dental infections, tonsillitis, parotitis, TMJ disease and dystonic reactions to medications

TETANUS: MANAGEMENT

- DIAGNOSIS & STABILISATION (first hr after presentation)
  - Assess airway & ventilation: consider ETT
  - Routine bloods including antitoxin level, strychnine, CK & urinary myoglobin
  - Determine portal of entry, incubation period, period of onset and immunisation history
  - Administer benztropine or diphenhydramine to rule out dystonic reaction
  - Administer benztropine or benzodiazepine to control spasm & decrease rigidity
  - Transfer to a dark quiet area with reduced stimulation

TETANUS: TREATMENT

- EARLY MANAGEMENT PHASE (first 24hrs)
  - Tetanus immunoglobulin IM or IVIG
  - Active immunisation
  - Metronidazole IV Q6H for 7-10 days
  - Consider tracheostomy
  - Wound debridement as indicated
  - Nutrition: NGT or TPN
  - Benzodiazepines to control spasms & provide sedation
  - Consider neuromuscular blockade if unable to achieve adequate spasm control

TETANUS: TREATMENT

- INTERMEDIATE MANAGEMENT PHASE (NEXT 2-3WKS)
  - Treat sympathetic hyperactivity with beta blockers or morphine
  - Sustained bradycardia usually requires a pacemaker
  - Prophylactic heparin
  - Pressure cares
  - Maintain benzodiazepines until neuromuscular blockade has been terminated & then taper over 2 to 3 weeks as spasms diminish
  - Rehabilitation planning
- CONVALESCENT PHASE (2-6 WKS)
  - Physiotherapy once spasms have completely resolved
  - Repeat dose of tetanus vaccine
  - Schedule for 3rd dose of toxoid to be given 4wks after the 2nd dose

TETANUS: Prevention Summary

- Tetanus is a vaccine preventable disease:
- passive immunisation and wound management is a poor second
- 3 injections at intervals of 4-8 weeks recommended
- Immunity is established with 2 doses and 3rd dose prolongs its duration
- Boosters are needed in adult life
- Full series of maternal immunisations would be ideal but even one dose confers substantial protection against neonatal tetanus
- Previous tetanus does not confer immunity
- No herd immunity possible

WHAT HAPPENED TO THESE CHILDREN?

MASTER LB

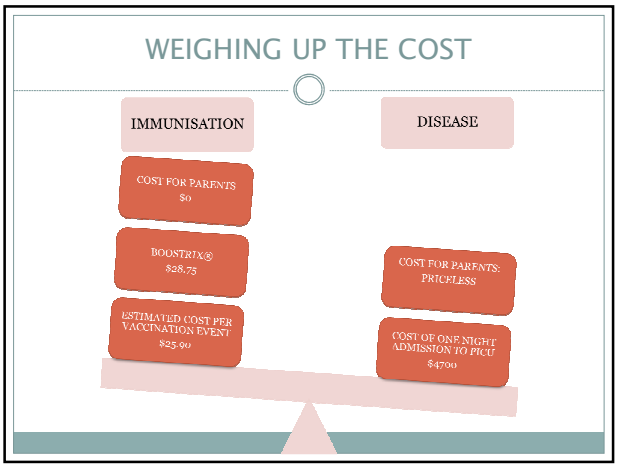
- Parental reports of compliance with ongoing immunisation in follow-up I.D. clinic
- No further immunisations given following hospital discharge
- Siblings only received 2 sets of immunisations during the period LB was admitted

MISS MP

- Lives with large extended whanau in a rural setting
- Limited access to primary healthcare
- No further immunisations given following hospital discharge according to NIR

MISS LA

- Family strongly against immunisation
- No tetanus immunisations given in hospital
- No further immunisations in the community following discharge home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