Fever in Infants Under 3 Mon.

Dr. Bob Wilson Golden BC

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- C. 25%
- D. 50%
- E. 100%

What is the most common congenital viral infection ?

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- C. Varicella
- D. Rabies
- E. CMV

A 3 week old infant presents with fever > 38 degrees C. You will -

- A. Give acetaminophen and reassure the parents
- B. Take a blood culture and commence IM ceftriaxone as OP
- C. LP, urine and blood culture, chest x-ray, initiate ampicillin and gentamycin IV as IP
- D. Ask Dr. Blondel-Hill

I have no financial interests or other relationship with any pharmaceutical company
I have no other conflict of interest to report

Unfortunately

Learning Objectives

- Infants < 3 mon represent a special group for assessing possible causes of fever due to their intrinsic susceptibility to serious bacterial infection and particular risks of exposure
- Infants < 1 mon are the high risk group within the high risk group

Definition

- Rectal temp > 38.0
- Tympanic, temporal, axillary may be inaccurate
- ? Excessively bundled – remeasure 20 min. after unbundling

Conditions Beyond Scope of My Talk

- Infection in VLBW infants
- Neonates in nursery


What me worry?

Why are Infants at Risk ?

- Hold over from neonatal period
- Infections acquired in nursery but expressed later
- Increased susceptibility (poor ability to localize infection)
- Congenital infections

How Concerned Should We Be

- Avner, Baker Emerg Med Clin NA 2002;20: 49-67
- infants < 2 mon with documented fever
- 10% serious bacterial infection
- 3% bacteremia or bacterial meningitis

Difficulty in “Reading” Infants

- Non specific physiologic responses
  - elevations in HR and RR dependant on fever
- History dependant on caregivers – some may not be present
- Localizing signs of inflammation may not be present (eg meningismus)

Fever in Infants < 3 months

- Infection
- Infection
- Infection
- Other:
  - Neurosurgical – CNS bleed, tumor
  - Abdominal – NEC, intussusception
  - Inflammatory – variants of Kawasaki's, lupus
  - Metabolic – hyperthyroidism, volume depletion, electrolyte etc
  - Drug related

Types of Infection to Consider

- Bacterial
- Viral
- Protozoan
- Fungal (mainly VLBW infants with central lines and/or TPN)

Congenital Infections
Storch

- Syphilis
- Toxoplasmosis
- “Others” (influenza, varicella, et cetella)
- Rubella
- Cytomegalovirus
- Herpes Simplex

Incidence in USA

Agent	Per 100,000 births	Annual
CMV	1000	40,000
Toxoplasmosis	100	4000
HSV	20	800
Syphilis	10	400
Rubella	<1	5

Number of Neonates With Symptoms At Birth Is Small

Agent	Total Cases	Symptomatic
CMV	40,000	4,000
Toxoplasmosis	4,000	1,000
HSV	800	800
Syphilis	400	130

Serious Bacterial Infections in Febrile Infants

- Bacteremia
- Meningitis
- Osteomyelitis/Suppurative Arthritis
- Skin/Soft Tissue Infection
- Urinary Tract Infection
- Gastroenteritis
- Pneumonia

Common Bacterial Pathogens in Febrile Infants

- Gp B streptococcus
- E. coli
- Salmonella sp.
- Streptococcus pneumoniae
- Staphlococcus sp – esp MRSA
- Hemophilus influenzae type b, non typeable
- Enterococcus
- Listeria monocytogenes
- Neisseria meningitidis

Less Common Pathogens

- TB
- Pertussis
- Chlamydia
- Syphilis
- Malaria

History

- Pregnancy, birth wt and maturity, neonatal illness or prolonged stay in nursery ? ICN
- Change in feeding, vomiting, diarrhea, blood in stools
- Respiratory Sx : rhinorrhea, cough, distress
- Measured temp?
- Parental intuition
- Intercurrent illness in family, sibs in daycare, immunization, family coccooned?

Physical Exam

- Rectal temp, vital signs, O2 sat
- Volume status
- CNS – interaction, fontanel, meningeal irritation
- Respiratory: URI?, flaring alae, retractions, work of breathing, lobar consolidation, wheeze, cyanosis
- Cardiac: peripheral circulation, pallor, hyperdynamic precordium

Exam cont’d

- Abdomen: distension, tenderness, organomegally, bowel sounds
- Skin and soft tissues: rash, petechae, purpura, jaundice, arthropathy
- Trial feed

Infants under 1 Month

- Sepsis workup – must include LP due to late onset gp B strep meningitis
  (CBC, urine R/M, culture blood, urine, other, chest x-ray, pos. stool WBC and culture)
- Consider herpes simplex esp. if seizure or lesions
- Consider Chlamydia if pneumonia
- Consider S. aureus if nursery stay, family member colonized

Infants 30-90 Days

- Ill appearing, signs of possible localizing infection or decompensation
  - sepsis workup including LP
  - anticipatory treatment
- Well appearing with possible benign explanation
  - limited workup
  - +/- anticipatory treatment
- Follow up

Group B Strep Sepsis

Year	Early Onset < 7 days	Late Onset 7-89 days
1992	1.7/1000 births	0.3/1000 births
1997	0.7	0.3
2009	0.26	0.3

Herpes Simplex

Dr. Sara Long's way

- Age < 21 d fever/hypothermia without focus or vesicles/oral lesions and CSF pleocytosis
- Virus culture conjunctiva, throat, rectum
- PCR CSF for herpes virus, antigen detection for bacterial pathogens (and gm stain)
- Bacterial culture CSF, blood, urine + other
- Acyclovir 60 mg/kg/d div Q8H x 21 d IV + antibiotics (amp and genta)

Treatment of Suspected Bacteremia or Meningitis

- Ampicillin 200-400 mg/kg/d IV div Q6H (max 12 gm/d) some adjustment for age and premis
- Gentamycin 2.5 mg/kg IV Q8H – alternate 6.5 mg/kg/d once daily (5 mg/kg 8-30 d) many adjustments for age and maturity adjust based on levels
- If staph or resistant S. pneumo suspected add vancomycin 15-20 mg/kg Q8H (age > 1 mon 10-15 mg/kg Q6-8 H) adjust in neonates
- Older than 2 mon may use ceftriaxone or cefotaxime +/- vanco (remember Ca with ceftriaxone restriction)

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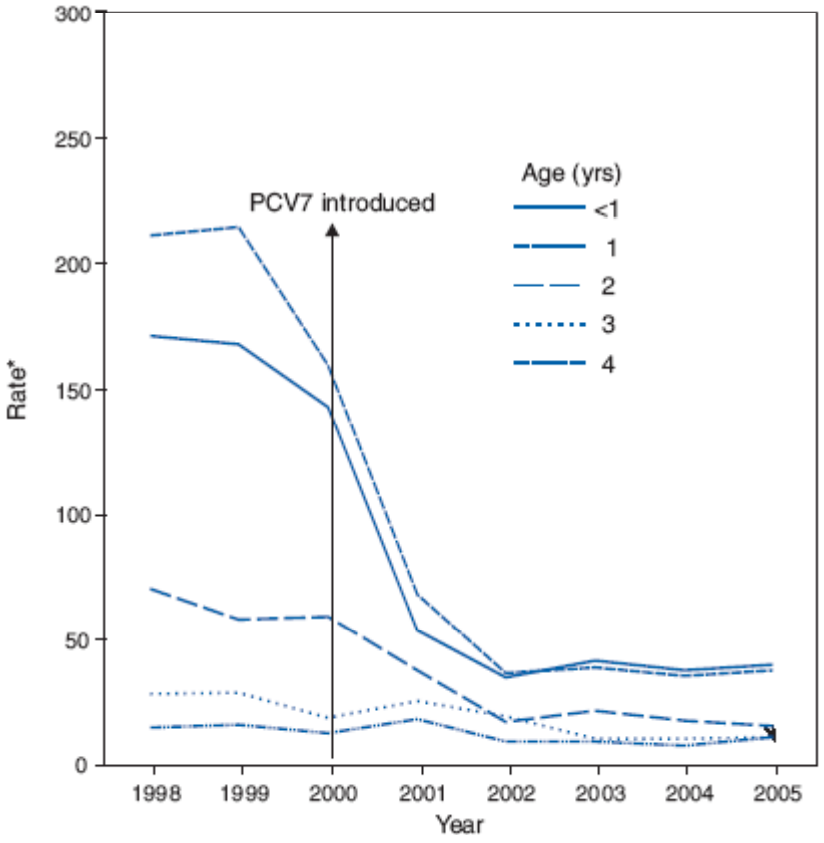
Incidence rate : cases per 100,000

Changes in Pneumococcal Disease

FIGURE 1. Changes in incidence rate* of invasive pneumococcal disease (IPD) among children aged <5 years before and after introduction of 7-valent pneumococcal conjugate vaccine (PCV7), by age and year — Active Bacterial Core surveillance, eight states,† 1998–2005



Etiology of Pneumonia in Neonates

- Gp B Strep
- Staph aureus
- Gm –ve enteric organisms
- Strep. pyogenes
- Listeria
- Chlamydia trachomatis
- CMV
- RSV

Etiology of Pneumonia in Infants

- RSV, parainfluenza, influenza, adenovirus
- Streptococcus pneumoniae
- Haemophilus influenza (non-typable)
- Mycoplasma pneumoniae
- Pertussis
- Chlamydia sp
- TB

Pneumonia Treatment

McIntosh, NEJM 2002;346:429-437, Pediatr Rev 2008;29:147

if staph aureus suspected add Clox or Vanco

Age	OP	IP – no lobar infiltrate or effusion	IP - severe
Birth – 20 d	Admit	Amp + Genta +/- Cefotaxime	Amp + Genta +/- Cefotaxime
3wk–3mon (afebrile)	Erythro or Azithro	Erythro or Azithro	N/A
3wk-3mon (febrile)	Admit	Cefotaxime	Cefotaxime or Amp (high dose)

Protecting Infants Against Pertussis

- Immunize
- Cocoon (immunize sibs and caregivers)
- Treatment is only effective for shortening symptoms when started in catarrhal phase
- Treatment does shorten period of infectivity

Patient 1

- 2 ½ month male infant with one day of fever to 38.0 (axilla), rhinorrhea, decreased breast feeding duration but increased frequency

Patient 1

- No problems in pregnancy, delivery or neonatal period
- Breast feeding has progressed normally
- Intercurrent respiratory illness in mom and one older sibling

Patient 1

- Appears well hydrated, interacts normally with parent and examiner, demonstrates ability to feed on breast
- No markers of CNS disease (not full fontanelle, meningeal irritation, lethargy or hyperirritability)
- Mild rhinorrhea and pharyngeal injection, otherwise NAD on examination

Patient 1

- Does this patient need more evaluation
- Can we just send them home?
- What other factors might we consider?

Rochester Criteria (variants Yale, Harvard)

- Ill or well appearing, previously healthy?
- Term (> 37 wk)
- WBC > 20 x 10^9/l , bands > 1.5
- Urine bag dip/ cath – positive leuk esterase, greater than 10 WBC/hpf spun urine
- If diarrhea, > 5 WBC/hpf
- Telephone, transportation, reliable, able to follow in 24 hr

Patient 2

- 4 week old infant female with two days of reduced feeding, now fever of 38 and has vomited last two feeds

Patient 2

- Babe is lethargic in mom's arms, fails to feed
- "looks ill"
- Normally hydrated
- Fontanelle fails to depress when held upright
- Babe emits high pitched cry with diaper change

Patient 2

- What further investigations does this babe need?
- What treatment would you initiate?
- Admit?
- Transfer?
- Escort?

Conclusions

- Fever in infants < 3 mon represents a higher than usual risk of serious infection
- Fever in infants < 1 mon is especially concerning and always warrants full work up, admission for close observation and anticipatory treatment
- The expression “a high index of suspicion” particularly applies to assessing sick infants

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