The Forensic Evaluation of Sexually Transmitted Diseases in Childhood

VFPMS seminar 2018
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STD’s are unique infections because they may imply…..

- Infidelity
- Immorality
- Serious criminal offending
Why should we worry?

• STI in a child – how was it transmitted? Does it indicate that sexual abuse has occurred?

• Incidence of many STD’s increasing - syphilis, chlamydia

• Forensic evaluation for CSA challenging – many uncertainties, variables

• Risk = difficult to determine
  • Increased when genital injury present
  • Increased with other genital lesions (other STD)

• Children different epidemiology from adults??
  • Seattle 1990 SA adults = 43% +ve STD <72 hours
  • Infrequent…rare… in pre-pubertal children
Case-based discussion on how we Ix and form an opinion relating to the presence of STI’s in children and adolescents who may have been sexually abused

- Gonorrhea
- Chlamydia,
- HSV
- HPV
- Hepatitis B
- Trichomonas/Mycoplasma Genitalium/BV
- Syphilis, HIV
As forensic practitioners we need to ask ourselves………

“Does the identification of a sexually transmitted organism in a child imply that this child has experienced sexual contact?”

STD

Vertically acquired;
- in utero
- at delivery
- breastfeeding

Sexually acquired; child sexual abuse/assault
- False diagnosis
- Age of “child”
- Age of consent
- Sexual exploitation – ‘consent’ given

Non-sexually acquired;
- Fomite transmission
- Hetero-inoculation
- Auto-inoculation
What we know

- STD’s in pre-pubertal children are RARE
- Children with STD’s - often other features of CSA
- Genital STDs in pre-pubertal children are usually SYMPTOMATIC (Dx, pain, abnormal exam)
- Extra-genital sites (oropharynx and rectum) are usually ASYMPTOMATIC
- Pre-pubertal children low risk of PID so no rush to treat – accurate and complete Ix crucial
- Presence of certain STDs (beyond the incubation period of congenital/perinatal transmission) = red flag, high alert for SA
What we still need to find out?

- Paucity of high-quality research – circular reasoning
- What is the role of bacterial vaginosis and mycobacteria genitalium as markers of sexual abuse in children?
- What is the significance of isolated ophthalmic infection outside the period of likely vertical transmission?
Case 1 – *Neisseria gonorrhoea*

- Child presents to ED with purulent vaginal Dx
- Swabs taken, 24-48 hours later swabs grew *neisseria gonorrhoea*
- What would you do now?
  - Is this CSA?
  - What is your level of concern?
  - What further tests do you need to do?
  - Would you report to CP/Police?
VFPMS assessment

- Vaginal swab and slide – PCR and culture +ve NG, *mycoplasma hominis* and *ureaplasma*, negative for *Chlamydia (CT)*
- Urine NAAT – NG detected, CT not detected
- Anal swab and slide – negative
- Throat swab not done
- Serology – Hep B non-immune, Hep C, HIV, syphilis negative
- Notified to public health

LEARNING POINT - When one STD is identified – a full screen should be done
Is this sexual abuse?

- Gonorrhoea in pre-pubertal children **almost always** sexually transmitted
- Vertical transmission excluded as cause
- Possibilities;
  - Mum infected by person A and then infected child by close contact (heteroinoculation) - **Innocent**
  - Mum infected by person A who also infected child by sexual contact – **Sexual Abuse**
  - Child infected by person A and child then infected Mum by close contact – **Sexual Abuse**
- Other STD’s increase chance of CSA as mode of transmission
Gonorrhoea in pre-pubertal children

- Gonorrhoea outside the neonatal period is strongly suggestive of CSA ("virtually" 100% CDC guidelines 2015)
- Period of latency of congenital eye infection..? Not really known....
- Isolated eye infection outside neonatal period may indicate CSA
- **Always** notify as suspected CSA
- Pharyngeal and rectal infections common and often asymptomatic so look for them
- Timing of infection - short incubation period – 2-3 days
Chlamydia

- Commonest reported STD in USA (> under 24yrs) - PID, ectopic pregnancy, infertility
- Chlamydia infection outside neonatal period strongly suggestive of CSA – 75-94% of under 12’s
- Perinatally acquired infection of nasopharynx, urogenital tract and rectum can persist for > 1 year (up to 2-3 years)
- Perinatally acquired decreasing in incidence because of prenatal screening of women
- Period of latency for congenital eye infection not known
- Eye infection does not exclude CSA – especially if > 3yrs of age
Trichomonas vaginalis, bacterial vaginosis and mycoplasma genitalium

- TV and MG – increasing evidence that they are sexually transmitted
- BV does not occur in virgins or if no Hx of coital or non-coital sex but significance in children unclear
- Trichomonas vaginalis may be confused with trichomonas hominis – correct diagnosis essential
- Urgent need to consider diagnostic criteria for BV in children
- Urgent need for research into the role of BV, MG and TV as markers of CSA
Diagnosis - Urine NAAT

• Not validated in children? PPV
• One study – only girls positive for STD’s, no validation in boys
• Currently CDC only recommends for genital testing in girls however no reason why shouldn’t be same as in adults
• Confirmatory testing using 2nd specimen or target sequence
• Increasing recognition of its use – AAP supportive for chlamydia, gonorrhoea & trichomonas
  • Culture low sensitivity but still recommended for extra-genital sites
  • ? Mycoplasma and BV
Diagnosis – how should CT, NG, MG, TV and BV we looked for?

- Accurate diagnosis essential – high sensitivity and specificity
- Urine NAAT (2 specimens/target sites) for genital infections to confirm/exclude false positive
- Culture for extra-genital sites – no reason why not a NAAT……?
- Gram stains alone not sufficient, need culture
- Screen all body sites
- Culture for extra-genital sites and boys (?)
- Culture and PCR from swabs equally sensitive
- Full screen if identified from one site
Case 3 – herpes infection
HSV in childhood

- Rare
- Up to 20% of genital HSV is type 1, therefore type non-discriminatory
- Diagnosis by PCR from lesion (not serology)
- Either type can cause either lesion
- Long latent periods, “dormancy” – can still transmit when aSx
- Should always raise the suspicion of CSA and prompt lx
### Modes of transmission of HSV

<table>
<thead>
<tr>
<th>Sexual transmission</th>
<th>Non-sexual transmission</th>
<th>Vertical transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genital-genital (usually 2 but can be 1)</td>
<td>Auto-inoculation (typically 1)</td>
<td>Sx develop within first 4 weeks of life</td>
</tr>
<tr>
<td>Genital–anal (usually 2 but can be 1)</td>
<td>Hetero-inoculation (innocent touch by caregiver with oral or hand lesions)</td>
<td>Mother with genital HSV</td>
</tr>
<tr>
<td>Oral-genital (usually 1 but can be 2)</td>
<td></td>
<td>Vaginal delivery</td>
</tr>
<tr>
<td>Oral-anal (usually 1 but can be 2)</td>
<td></td>
<td>LSCS following PROM &gt; 4-6 hrs</td>
</tr>
<tr>
<td>Digital-genital (rare)</td>
<td></td>
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</tbody>
</table>
Is this sexual abuse? How confident can we be?

- Child sexual abuse more likely when:
  - Older children (> 5 years)
  - + Genital lesions alone
  - + Type 2 HSV

- **Type 1** in genital or anal area raises *possible* concern for CSA (Adams 2001)
- **Type 2** in genital or anal area raises *probable* concern for CSA (Adams 2001)

- All should be reported unless clear Hx of
  - *Autoinnoculation*
  - *Vertical transmission*
  - *Caregiver with oral lesions*
Important points about HPV in children

• Over 100 types
  • Genital warts 6 and 11 (also conjunctival, oral, nasal, laryngeal warts)
  • Oncogenic 16, 18 and also 31, 33, 35
• ASx infection common, most of us infected at some point, self-limiting in most
• HPV DNA detected in up to 40% neonates of HPV +ve mothers (Virology 2012, PLOS 2013, syst review 2005, Obs Gyn 1998)
• Not all SVD’s (HPV detected in sperm, amniotic fluid, placenta, cord & maternal blood)
• HPV still detected in 15% at 2 years of age (most clear in infancy but may persist well beyond)
• Unclear how often infantile infection progresses to clinical disease – long incubation periods
• Makes interpretation difficult
Mode of transmission - warts

- Congenital/perinatal
  - Periconceptually
  - Transplacentally
  - Via amniotic fluid
  - Direct exposure via birth canal
  - Ascending infection PROM

- Postnatal
  - Heteroinoculation
  - Autoinoculation

- **Sexual abuse**

- Makes interpretation difficult – caution required
Unger 2011

- 576 children 1-13 years tested for genital HPV
- Definite, probable and possible abuse compared to no abuse
- 14% v 1.3% ($p<0.0001$)
- Prevalence of genital HPV increased with certainty of abuse ($p<0.0001$)
- HPV6 indicates auto or heteroinoculation of hand warts unlikely – role of typing?
- CSA cause of genital warts in 31-58% of under 14’s
How can we form an opinion on genital warts and SA?

- Hx maternal HPV important
- Age of child important but not only discriminator
  - AAP and Pediatrics 2005
    - older than 2-2 ½ more suggestive?,
    - role of reactivation latent infection in older children?
    - >4yrs 3x and >8yrs 12x more likely to be abused

- Increasing age, increasing likelihood of CSA, but VT with reactivation and still possible ? probable

- Pre-school with +ve maternal history, no disclosure/other signs/RFx reasonable to attribute to vertical transmission/heteroinoculation

- More recent shift to increased concern…..

- “Highly suspicious, consider report” CDC 2015
Case 4 – Hepatitis B and sexual assault
Hepatitis B - prevention

• Low transmission risk and assumed immunity = low attention to Hepatitis B care after SA

• What is the optimal management strategy considering the unique population seen after SA?
  • Nothing – assume above
  • Bloods for Hepatitis B Ab and recall if low (<10 sub-optimum level)?
  • Hepatitis B booster at assessment
  • HB immunoglobulin plus booster at assessment
420 subjects 13 to 17 years
Alleged penetrative sexual assault
Assessed by VFPMS

- 25% had immunity measured
- Just under half had levels <10 despite vaccination
- 4.5% of the 420 had any kind of prophylaxis administered at the time of assessment
- Over 1/3 failed to attend scheduled follow-up
- Missing a captive opportunity to maximise healthcare in a vulnerable patient group

Acknowledgment Dr Michael Jones
A sensible approach for penetrative SA…….

- Consider baseline serology BUT beware F/U rates
- If known not to be vaccinated and perpetrator Hep B +ve = VACCINE + Ig
- If known not to be vaccinated and perpetrator status unknown = VACCINE
- If fully vaccinated but no test result available = SINGLE BOOSTER DOSE
- If serology taken, can wait for result but need to ensure compliance
APPROACH TO STD TESTING/EVALUATION IN RELATION TO SEXUAL ABUSE AND SEXUAL ASSAULT

Adolescents and pre-pubertal children
The adolescent who presents after alleged sexual assault

- Urine NAAT for chlamydia, gonorrhoea, TV and mycoplasma genitalium – presence v infection
- Consider serology for Hepatitis B, Syphilis and HIV – previous exposure
- Strongly consider Hepatitis B vaccine at point of contact (+/- Ig if indicated)
- Consider HIV PEP – local guidelines, consult with ID
- Antimicrobial prophlaxis – azithromycin 1g
- Emergency contraception - postinor
- Give HPV vaccine for 9-26 year olds if not vaccinated
- Follow-up
  - Detect new infections ? Acquired during SA
  - Complete HBV and HPV vaccinations if needed
  - Complete Rx/ensure compliance
The pre-pubertal child who presents for assessment of possible SA

Which children need screening? (CDC guidelines 2014)

- Penetration or exam findings suggestive of recent/healed penetration injury to genitals, anus, oropharynx
- Abused by stranger
- Abused by perpetrator known to be infected or high risk (IV drugs, MSM, multiple sex partners)
- Sibling or household relative with STD
- High community rates of STD’s
- Signs or Sx of STD
- Already diagnosed with one STD
How should we screen?

• In conjunction with full forensic assessment
• Testing all sites for all organisms not recommended
• NG – culture from pharynx, anus, urethra (boys), urine
  NAAT can be used for vaginal infection in girls.
• CT – culture from anus (no pharyngeal specimens as
  yield low and perinatally acquired infection may persist,
  no urethral specimens as yield low) plus urine NAAT in
  girls
• TV – culture but NAAT now being used
• BV – wet mount of vaginal swab
• Hep B, syphilis, HIV - blood samples
• No presumptive treatment required
Take home messages 1

• High proportion of children with STI’s after neonatal period have been sexually abused
• Most identified following *symptomatic* presentation
• The absence of an identified source of infection does not exclude CSA
• The presence of an STD in pre-pubertal children outside the neonatal period should almost always prompt a CSA evaluation
Take home messages 2

Infections indicative of sexual abuse (strong/almost certain likelihood )

- Neisseria gonorrhea
- Syphilis
- Genital or rectal chlamydia
  - Esp if > 3 years
  - If < 3 years and not perinatally acquired
- Trichomonas vaginalis
- HIV if non-transfusion and non-perinatally acquired

Infections suspicious for sexual abuse

- Genital herpes
- T. Vaginalis
- Anogenital warts
<table>
<thead>
<tr>
<th>Infection type</th>
<th>Evidence for CSA</th>
<th>Suggested action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonorrhoea *</td>
<td>Diagnostic</td>
<td>Report</td>
</tr>
<tr>
<td>Syphilis *</td>
<td>Diagnostic</td>
<td>Report</td>
</tr>
<tr>
<td>HIV **</td>
<td>Diagnostic</td>
<td>Report</td>
</tr>
<tr>
<td>Chlamydia *</td>
<td>Diagnostic</td>
<td>Report</td>
</tr>
<tr>
<td>Trichomonas *</td>
<td>Highly suspicious</td>
<td>Report</td>
</tr>
<tr>
<td>Anogenital warts *</td>
<td>Suspicious</td>
<td>Consider report ^#</td>
</tr>
<tr>
<td>Genital HSV</td>
<td>Highly suspicious (type 2 especially)</td>
<td>Report ^</td>
</tr>
<tr>
<td>Bacterial vaginosis</td>
<td>Inconclusive</td>
<td>Medical follow-up</td>
</tr>
</tbody>
</table>

* if not likely prenatally acquired and RARE non-sexual vertical transmission excluded
**if not likely to be acquired perinatally or through transfusion
^ unless there is a clear Hx of auto-inoculation
^# report if there is additional evidence to suspect abuse including Hx, physical exam or other STI’s
References

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