The problem of child sexual abuse (CSA) has engendered lively interest among physicians and other health care providers for more than 20 years. The number of cases of sexual abuse known to child protection service agencies in the United States rose sharply from 1977 to 1988, then leveled off and declined between 1988 and 1996 (Fig 1).\(^1\) Since the mid-1970s, accumulating clinical experience and research have considerably expanded and refined our understanding of this common problem.

Several investigators have provided comprehensive reviews of CSA and of the role of the physician in diagnosis and management.\(^2\)-\(^4\) A partial list of epidemiologic, psychological, and legal topics in the area of CSA that have been investigated and reviewed during the past decade includes the effectiveness and accuracy of various techniques for obtaining histories of sexual abuse (repeated interviews, standardized questionnaires, drawings, anatomically correct dolls)\(^5\)-\(^7\); the sexual abuse of boys\(^8\),\(^9\); the impact of sexual abuse on children's subsequent psychosocial wellbeing\(^10\),\(^11\); the relationship of CSA to sexual aggression in children and appropriate treatment for offending children\(^12\),\(^13\); the criminal prosecution of CSA cases\(^14\); and the effectiveness of CSA prevention programs.\(^2\)

In this article, we will highlight research published during the past decade that deals particularly with topics in the medical evaluation of sexually abused children and that has advanced our understanding of those topics. We have divided our discussion into three sections: the conduct of the physical examination, the interpretation of physical examination findings, and selected sexually transmitted infections in children.

### CONDUCTING THE PHYSICAL EXAMINATION

#### Special Examination Techniques

The immediate goals of the medical assessment of the sexually abused child are to identify injuries that require treatment, to screen for or to diagnose sexually transmitted infections, to evaluate and if possible to reduce the risk of pregnancy, and to document findings of potential forensic value. We review three special forensic techniques that recently have been assessed or reassessed: colposcopy, the Foley catheter technique for hymenal examination, and Wood's lamp illumination for the detection of seminal fluid.

#### Colposcopy

Forensic examination using the colposcope was introduced by Teixeira\(^15\) in the 1980s. Since then, only two studies have compared colposcopy directly with inspection. Muram and Elias\(^16\) compared the rate of abnormal genital findings in 130 prepubertal girls identified as having been sexually abused when examined by inspection and by colposcopy. Forensically important findings were identified by colposcopy but not by inspection in 4 patients (3%). The investigators concluded that unaided examination is sufficient in most cases.

Adams and co-workers\(^17\) obtained clear, usable colposcopic photographs of the genitalia of only 88 (46%) of a series of 190 patients. The colposcopic photographs confirmed anogenital findings (same findings seen by both methods) in 54% of the 88 patients, clarified findings (additional findings noted on colposcopy when compared with unaided examination) in 12%, and failed to confirm findings seen during inspection in the remaining 34%. For identifying anal gaping, the authors considered direct inspection more accurate than colposcopy. For identifying anogenital scars, there were discrepancies between inspection and colposcopy, but the authors did not indicate which method they considered more accurate.

Although colposcopy can increase physicians' identification of genital and perineal abnormalities, Paradise and colleagues\(^18\) found in a recent survey that only 19.7% of physicians who do examine children's genitalia use colposcopy to examine children for possible sexual abuse. Colposcopy was used more frequently by physicians who rated themselves skilled in sexual abuse examinations than by physicians who rated themselves as having lower than average skill (35.9% vs 3.4%; \(P < .001\)).

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In some instances, colposcopy can increase the accuracy of examiners’ descriptions of girls’ external genitalia, and colposcopic photographs can facilitate consultation between examiners. On the other hand, data we review below (see “Interpretation of Physical Examination Findings”) indicate that few genital findings identifiable only by colposcopy have forensic importance and, conversely, that most forensically important examination findings are apparent using unaided inspection. Thus, although colposcopic examination can be a helpful adjunct, it need not be viewed as an obligatory procedure.

**Foley Catheter Technique**

In the past decade, Ferrell and Starling and Jenny have recommended using a Foley catheter to spread out the estrogenized hymenal tissue of postpubertal girls to facilitate complete examination of that structure. Persaud and co-workers reported success using this method in 17 patients. None of the patients refused the examination or complained of pain. This technique may facilitate the identification of forensically significant physical findings in sexually abused and assaulted adolescent girls.

**Wood’s Lamp Illumination**

Although Wood’s lamp illumination has been recommended traditionally for identifying seminal fluid on skin in cases of sexual assault and abuse, Gabby and colleagues have highlighted previously unrecognized and substantial shortcomings of this method. The patterns of Wood’s lamp fluorescence of semen and urine differ (semen fluoresces irregularly, urine homogeneously), but they fluoresce with the same color. Furthermore, urine fluoresces considerably longer than does seminal fluid, increasing the likelihood that urine might be incorrectly identified as seminal fluid. Santucci et al raised similar concerns about falsely positive Wood’s lamp fluorescence. Using a Wood’s lamp, none of 10 pediatric emergency physicians could correctly distinguish semen from 13 other products commonly found in the perineum of children undergoing examination (eg, Balmex, Desitin, Surgilube). Of various tests for the detection of seminal fluid, enzyme-linked immunosorbent assay for the prostate-specific protein p30 remains the most sensitive and specific. If it is used, Wood’s lamp illumination should be used only to identify suspicious areas or specimens for more definitive forensic testing.

**Reducing Children’s Distress During CSA Evaluation**

Many clinicians and researchers are concerned that CSA evaluations constitute an additional source of distress for some sexually abused children. However, there are some data to indicate that children and families consider the investigation process as beneficial or at least not harmful. Tedesco and Schnell highlighted a discrepancy between families’ and clinicians’ perceptions in that regard. Investigative interviewing and criminal
prosecution were rated as harmful to children by five (71%) of seven treatment workers, but were rated as helpful or neutral by 53% of 48 surveyed children and families. Lazebnik et al.25 found that of 99 3- to 17-year-old patients who had just received physical examinations and genital cultures for suspected sexual abuse, approximately one third reported experiencing no associated pain and/or fear, half reported some pain and/or fear, and 14% to 16% reported “a lot” of pain and/or fear. Twice as many children reported some fear of the sexual abuse examination compared with their expected fear of an ordinary doctor visit (50% vs 27%). Fear of the sexual abuse examination was significantly associated with self-reported fear of ordinary doctor visits (P < .05), but was not associated with pain during the sexual abuse examination, the doctor’s gender or perceived kindness, or the patient’s age. We have found no data about whether distress associated with genital examination is persistent or short-lived.

For procedures such as surgery, laceration repair, and dental treatment, techniques ranging from pre-procedure patient education to films that model coping skills26 and procedural sedation27–30 have been used to reduce children’s discomfort and anxiety. Similarly, these interventions may be preferred for anxious or uncooperative children who need genital examinations. In a controlled, single-blinded study, Lynch and Faust investigated the effect of a 10-minute teaching film on children’s self-reported fear and observed behaviors during genital examinations.31 The film taught children coping techniques-breathing, guided imagery, and positive self-statements. In comparison to children who saw a control film about animals, the 21 children who saw the study film were significantly less positive self-statements. In comparison to children who saw a control film about animals, the 21 children who saw the study film were significantly less distressed during the examination, the doctor’s gender or perceived kindness, or the patient’s age. We have found no data about whether distress associated with genital examination is persistent or short-lived.

For procedures such as surgery, laceration repair, and dental treatment, techniques ranging from pre-procedure patient education to films that model coping skills26 and procedural sedation27–30 have been used to reduce children’s discomfort and anxiety. Similarly, these interventions may be preferred for anxious or uncooperative children who need genital examinations. In a controlled, single-blinded study, Lynch and Faust investigated the effect of a 10-minute teaching film on children’s self-reported fear and observed behaviors during genital examinations.31 The film taught children coping techniques-breathing, guided imagery, and positive self-statements. In comparison to children who saw a control film about animals, the 21 children who saw the study film were significantly less fearful and showed significantly less distress during their examinations. Hogan32 found that 35 (10%) of 338 children warranted conscious sedation for genital examinations. Sedation with oral midazolam was described as completely successful in 28 cases (80%), although the treated children’s emotional responses were not described or compared with those of untreated children. Sedation was unsuccessful in 4 children (11%) and complicated by agitation or combative behavior in an additional 3 children (9%).

Summary

The studies just cited add importantly to our knowledge, but they have been small and have had some methodologic shortcomings. The effectiveness, ease of implementation, acceptability to patients and clinicians, risks, and costs of various interventions to reduce children’s and families’ distress and discomfort during CSA evaluation have yet to be elucidated fully. The recently developed Genital Examination Distress Scale (GEDS)33 may prove a useful tool for such research. The GEDS was adapted from a scale (Observation Scale of Behavioral Distress) measuring behavioral responses to painful procedures such as bone marrow aspiration. The GEDS incorporates categories such as nervous behavior, cry, restraint, muscular rigidity, verbal fear, verbal pain, and flail. Gully and colleagues33 have established the interrater reliability, internal consistency, and validity of this tool in an outpatient setting with experienced staff and scheduled appointments. This instrument has several potential uses such as measurement of the efficacy of stress reduction techniques during the examination, and evaluation of the examiner’s level of experience on the child’s distress.

INTERPRETATION OF PHYSICAL EXAMINATION FINDINGS

In published series in the late 1980s and early 1990s, a substantial proportion of sexually abused children, both boys and girls, were reported to have anatomic abnormalities of the external genitalia or perineum.3,4 Investigators suggested that findings such as hymenal clefts, bumps, attenuation, and synechiae constituted physical evidence of the sexual abuse the children had experienced. More recently, observations about the relative frequency of certain anatomic findings in children who have and have not been sexually abused have refined our understanding of the validity of physical examination findings as indicators of sexual abuse. Other observations have considerably increased our knowledge about the reliability of physical examination in the diagnosis of sexual abuse.

Validity: Physical Findings in Children Who Have and Have Not Been Abused

Taken together, data from McCann and colleagues,34 Berenson and associates,35 Soifer,36 and Gardner37 demonstrate conclusively that small variations in the size, contour, and appearance of the external genitalia in girls who have not been sexually abused occur relatively frequently (Tables 1 and 2). Although fewer data are available about boys, McCann and colleagues38 and Berenson and associates39 have shown that erythema, hyperpigmentation, wedge-shaped smooth areas in the midline, and other minor variations in appearance of the perianal area are common both in boys and in girls who have not been sexually abused. Accordingly, the presence of these anatomic variations should not be interpreted as evidence that sexually abusive physical contact has occurred.

Reports by Adams and co-workers,40 Muram,41 Defong and Rose,42 and Kerns and Ritter (abstract),43 albeit involving small numbers of cases with detailed data, indicate that the majority of children who have been legally proven, by confession, guilty plea, or criminal conviction, to have been sexually abused have no genital or perineal abnormality. Thus, it is not accurate to interpret a normal genital examination as evidence that sexually abusive physical contact did not occur. The most common reason for normal genital anatomy in sexually abused children is that the abusive physical contact produced no injury. Alternatively, and probably less commonly, abusive contact produced an injury that healed completely before physical examination was performed.
Reliability of Genital Examination in the Context of Sexual Abuse

Roberts and Moran recently reported that two child abuse teams, one in Australia and one in New Zealand, had good interobserver reliability (weighted \( \kappa \) statistic: 0.67–0.70) in rating genital findings with respect to sexual abuse using a three-point scale.\(^4^4\) In contrast, in a sample of seven experienced clinicians, Sinal et al found low interobserver reliability (overall \( \kappa \) statistic: 0.20) for ratings of genital findings on a five-point scale.\(^4^5\) In the largest study of this question to date, Paradise and colleagues compared an expert panel’s assessments of genital findings in seven simulated cases with assessments by 206 US physicians who rated themselves skilled in examining children for suspected sexual abuse.\(^1^8\) There was considerable interobserver variability. Across the seven cases, 14% to 79% of the physicians agreed with the expert panel’s descriptions of important genital findings and 42% to 96% of the physicians agreed with the expert panel’s interpretations of those findings.

Factors shown to affect interobserver reliability include examination method\(^4^6\) and clinician awareness of patients’ clinical histories.\(^4^5,4^7,4^8\) Ashworth and associates reported that histories incongruent with genital examination findings reduced interobserver agreement among 23 pediatric residents using a dichotomous rating system.\(^4^7\) Paradise and colleagues found that the extent to which a patient’s history suggested sexual abuse influenced 604 physicians’ interpretations of genital examination findings.\(^4^8\) Physicians more often interpreted genital examination findings as indicative of sexual abuse when the accompanying history suggested sexual abuse, and vice versa. Physicians with more experience evaluating cases of suspected abuse evinced less diagnostic suspicion bias than did physicians with less experience.

Problems in the Validity, Reliability, and Predictive Value of Physical Findings in the Diagnosis of Sexual Abuse

The term sexual abuse includes many different kinds of touching, each presumably with a different likelihood of producing a discernible alteration in a child’s physical status. Intrusion of an adult male’s penis into the vaginal vault of a prepubertal girl might produce a hymenal or vaginal laceration, but intrusion of the penis only between the girl’s labia majora (a circumstance that constitutes “penetration” in most states and is clearly a criminal offense) seems less likely to produce a genital injury. For example, in 19 cases of legally proven sexual abuse reported by Adams and co-workers,\(^4^9\) the children were reported to have stated, “He touched

### TABLE 1. Cross-sectional Prevalence of Selected Genital Findings in Premenarcheal Girls Who Have Not Been Sexually Abused

<table>
<thead>
<tr>
<th>Finding</th>
<th>% Prevalence With Supine Labial Traction*</th>
<th>% Prevalence With Knee-Chest Position†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thick hymenal edge</td>
<td>54–90</td>
<td>26</td>
</tr>
<tr>
<td>Hymenal notch‡</td>
<td>2–8</td>
<td>2</td>
</tr>
<tr>
<td>Longitudinal intravaginal ridge</td>
<td>25</td>
<td>No data</td>
</tr>
<tr>
<td>Hymenal tag</td>
<td>2–24</td>
<td>20</td>
</tr>
<tr>
<td>Hymenal bump</td>
<td>7–34</td>
<td>18</td>
</tr>
<tr>
<td>Increased hymenal vascularity</td>
<td>31–37</td>
<td>29</td>
</tr>
<tr>
<td>Increased PF§ vascularity</td>
<td>5–15</td>
<td>4</td>
</tr>
<tr>
<td>Linear, midline PF§ avascularity</td>
<td>16–23</td>
<td>26</td>
</tr>
<tr>
<td>Friable posterior fourchette</td>
<td>2–6</td>
<td>5</td>
</tr>
<tr>
<td>Labial adhesions</td>
<td>17–39</td>
<td>14</td>
</tr>
</tbody>
</table>

* References 34, 35, and 37.
† Reference 34.
‡ In reference 35, all notches were located between the 8 o’clock and 4 o’clock positions in supine patients. In references 34 and 37, locations of notches were not specified.
§ PF indicates posterior fourchette.

### TABLE 2. Hymenal Dimensions in Girls Who Have Not Been Sexually Abused, Examined in the Supine Position Using Labial Traction

| Age of Girl | Width of transverse hymenal orifice (mm) | Width of vertical hymenal orifice (mm) | Width of inferior hymenal rim (mm)§ |
|-------------|------------------------------------------|----------------------------------------|--------------------------------───|
|             | Mean                                     | Maximum                                | Mean                               |
| ≤12 Months* | 2.5                                      | 3.5                                    | 2.8                                |
| 13–24 Months*| 2.9                                      | 6.5                                    | 2.7                                |
| 25–48 Months*| 2.9                                      | 6.5                                    | 2.7                                |
| 4–7 Years†  | 3.6–5.6                                  | 9.0                                    | 2.7                                |
| 8–10 Years‡ | 6.9                                      | 10.5                                   | 10.0                               |

* Adapted from reference 35.
† Adapted from references 34 and 35.
‡ Adapted from reference 34.
§ The tissue between the hymen’s attachment to the introitus at the 6 o’clock position and its free edge, while the patient is supine.
my private with his private.” The nonspecific nature of statements like this illustrates the difficulty of defining physical contacts precisely in cases of CSA.

Relying on legal determinations of sexual abuse to measure the prevalence of physical abnormalities in sexually abused children constitutes a laudable and important effort to enhance validity, but presents a potential logical difficulty. In unreported proportions of cases selected in this manner,40,43 physical examination findings have contributed to the legal determination that sexual abuse occurred. To argue that those same physical abnormalities are valid indicators of sexual abuse because the abuse was legally proven is thus circular.

Gardner has raised the question of whether reports of “scars” of the posterior fourchette in sexually abused girls in fact represent midline areas of avascularity that have been observed in a substantial proportion of nonabused girls34,37 and that appear to be physiologic in nature. To distinguish conclusively between normal tissue and scar tissue, histologic examination of specimens would be needed, but the ethical and logistic barriers to such an investigation in humans seem substantial.

Fargason et al49 have noted that estimates taken from the peer-reviewed medical literature of the sensitivity of physical examination findings for the diagnosis of “penetration” are very inconsistent. These investigators concluded that current information does not permit the physical examination to generate a valid estimate of the likelihood that penetration has occurred in cases of suspected sexual abuse.

Summary

The past decade of research has clarified the questions that remain to be answered about the contribution of physical examination findings to the diagnosis of sexual abuse in children. To pass muster, new research aimed at describing the relationship of physical examination findings to sexual abuse should consider children who have experienced substantially different kinds of physical contact separately, specify what physical examination methods are used and use them consistently, carefully define physical examination findings, blind clinicians to keep physical examination findings independent from and unbiased by historical information, not base conclusions about whether sexual abuse has occurred on physical examination findings, and specify the basis on which diagnoses of sexual abuse are established. These criteria raise the bar for sexual abuse research to a level that is high and admittedly difficult to attain. Substantial funding and collaborative research efforts are likely to be helpful in such a challenging endeavor.

In the clinical arena, it remains true that only two conditions, both rare in sexually abused children, indisputably indicate sexual contact—pregnancy and the identification of sperm or seminal fluid. Two other conditions in children—fresh injuries of the genitalia as evidenced by clearly apparent bleeding, ecchymosis, or tissue destruction and sexually transmitted infections—require explanation urgently. Sexually abusive contact is the most likely explanation for either of these conditions if the affected child reports such a contact or if no alternative explanation is plausible. Physicians who are not only aware that genital and perineal anatomic variants are prevalent in nonabused children but also familiar with the range of genital diseases and conditions seen in prepubertal children are best prepared to make clinical judgments about the relationship of children’s physical examination findings to suspected sexual abuse.

SEXUALLY TRANSMITTED DISEASES (STDs) IN ABUSED CHILDREN

The prevalence of all STDs in sexually abused children ranges from 2% to 7% in girls and from 0% to 5% in boys.30 Generally paralleling their relative prevalence in adults, chlamydial infections, genital warts, and gonorrhea are the most prevalent clinically evident STDs in sexually abused children.31 Human immunodeficiency virus (HIV) infection and syphilis are rare. In the last decade, Sirotnak52 and Hammerschlag53 have reviewed the indications for testing sexually abused children for STDs. Here, we discuss three topics that have seen advances during the past decade: indications for STD screening, considerations relating to HIV infection, and the implications of human papillomavirus (HPV) infection with respect to CSA.

STD Screening

Recent research has focused on the efficiency of diagnostic testing for STDs in children, particularly since recommendations by the Centers for Disease Control and Prevention (CDC) have evolved from three-site STD screening of all abused children (1989) to screening only for sexually abused children with specific risk factors for acquiring STDs (1993).54 Siegel et al55 selected sexually abused children and adolescents to be tested for STDs, based on specific criteria adapted from the 1991 American Academy of Pediatrics guidelines.56 Thirty-seven percent of 855 patients did not meet the criteria for STD testing; 50% of those nevertheless received some diagnostic testing. At least some testing also was performed in 85% of the patients who did meet the criteria. An STD was identified in 5.7% of the children and adolescents who met the criteria (all of them female), and in none of the patients who did not meet them. Criteria for selecting sexually abused children and adolescents who should be tested for STDs, based on data from Siegel et al and Ingram et al55 and on the CDC’s 1998 Guidelines for Treatment of Sexually Transmitted Diseases,58 are presented in Table 3.

HIV Infection in Sexually Abused Children: Screening and Prophylaxis

Despite a few case reports in the 1980s suggesting that HIV could be transmitted via sexual abuse,59–61 HIV transmission to children through sexual abuse
was not studied in detail until the 1990s. No case of HIV transmission was identified either in 126 abused children tested by Yordan and Yordan\textsuperscript{31} or in 140 abused children tested by Siegel and colleagues.\textsuperscript{35} Gutman and associates identified sexual abuse as a certain or possible source of infection in 10 (10.4\%) of 96 HIV-infected, 2- to 15-year-old children.\textsuperscript{64} Gellert and colleagues found that 26 (0.3\%) had been sexually abused and that, of those, 14 (53.8\%) had no identified risk factor for HIV infection other than sexual victimization of a child by an adult male.\textsuperscript{64} Table 4 provides a summary of the children reported since 1990 to have acquired HIV infection through sexual abuse.

### Prophylaxis

At present, there are no data in children that can answer the question of whether sexually abused children potentially exposed to HIV should receive prophylactic treatment.\textsuperscript{65,66} The risk of transmission of HIV to a child during a single episode of sexual contact with an adult is unknown. In adult women, the risk of transmission from one episode of vaginal–penile contact is estimated to be between 0.1\% and 0.2\%.\textsuperscript{67} In adults, the risk from one episode of receptive penile–anal contact is estimated at 0.1\% to 3.0\%. The risk of oral–genital contact is unknown but, although presumably lower, is not zero. The increasing prevalence of HIV in the general population and striking recent improvements in the efficacy of therapeutic and prophylactic regimens for this infection have underscored the importance of identifying patients with HIV infection or exposure early.

The US Public Health Service recommends antiretroviral prophylaxis for occupational exposures to HIV, but notes that “no data exist regarding the efficacy of this therapy for persons with nonoccupational HIV exposure.”\textsuperscript{68} Some clinicians recommend prophylaxis after selected, high-risk episodes of sexual exposure to HIV.\textsuperscript{64} Factors that parents and clinicians should consider in deciding whether a sexually abused child or adolescent should receive antiretroviral prophylaxis include the likelihood that the perpetrator is HIV-positive; the estimated riskiness of the particular physical contact; the time elapsed since the first contact; whether the patient has other, ongoing risk factors for HIV infection such as unsafe voluntary sexual intercourse; the patient’s and family’s ability to adhere to the prophylactic regimen; and the regimen’s toxicity. The demonstrated effectiveness of postexposure prophylaxis for occupational HIV exposure suggests that, in certain high-risk instances, its benefits for sexually abused children and adolescents will outweigh its costs and risks.

### Screening

The considerations to be weighed in deciding whether to screen a sexually abused child or adolescent for HIV infection are essentially the same as those for the other sexually transmitted infections (Table 3), with one exception. If HIV infection is discovered in a young child, vertical transmission from the mother is an important possible explanation. This possibility and its implications for the mother (and her sexual partner) should be discussed with parents before their children are screened for HIV infection.

### Genital Warts, HPV Infection, and Sexual Abuse

The interrelationships among HPV infection, genital warts, and sexual abuse are complex. Not all patients with HPV infection develop clinically evident anogenital warts,\textsuperscript{53} and the time from infection to the appearance of visible lesions in those who do can be as long as 5 months, if not longer.\textsuperscript{69} Siegfried et al detected HPV DNA in only 2 (5\%) of

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**TABLE 3. Criteria for Testing Sexually Abused Children and Adolescents for Sexually Transmitted Diseases**

<table>
<thead>
<tr>
<th>Factor</th>
<th>History of abuse</th>
<th>Other history</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Multiple perpetrators</td>
<td>Perpetrator has an STD</td>
<td>Sexual maturity rating &gt;-III</td>
</tr>
<tr>
<td></td>
<td>Perpetrator has an STD</td>
<td>Patient has an STD</td>
<td>Genital discharge</td>
</tr>
<tr>
<td></td>
<td>Sibling of patient has an STD</td>
<td>Prior consensual sexual contact</td>
<td>Genital discharge present</td>
</tr>
<tr>
<td></td>
<td>Prior consensual sexual contact</td>
<td>Genital injury present</td>
<td>Genital discharge</td>
</tr>
</tbody>
</table>

Adapted from Siegel et al\textsuperscript{55} and Ingram et al.\textsuperscript{57}

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**TABLE 4. Child Sexual Abuse in HIV-positive Children**

<table>
<thead>
<tr>
<th>Investigator, Publication Year (Reference Number)</th>
<th>Number of HIV-Positive Children</th>
<th>n (%) With History of Sexual Abuse</th>
<th>n (%) With No Other HIV Risk Factor</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gellert 1990 (60)</td>
<td>2 of 1000 tested</td>
<td>2 (100)</td>
<td>Not reported</td>
<td>Number of children tested is approximate, determined retrospectively by telephone interviews.</td>
</tr>
<tr>
<td>Gellert 1993 (63)</td>
<td>41 of 5622 tested</td>
<td>41 (100)</td>
<td>28/41 (68)</td>
<td>Number of children tested is approximate, determined retrospectively.</td>
</tr>
<tr>
<td>Lindgren 1998 (64)</td>
<td>9136</td>
<td>26 (0.3)</td>
<td>23/26 (88.5)</td>
<td></td>
</tr>
</tbody>
</table>
40 sexually abused children, none of whom had genital warts.70 Thus, although HPV is surely necessary, its presence is not always sufficient to produce warts. The factors that determine whether and when a child with the virus will develop anogenital disease are unknown.

Do Warts Indicate Abuse?

Sexual contact is the most likely source of infection for anogenital warts that appear in children after the age of 2 or 3 years and an important potential source in younger children. Gutman et al detected genital HPV DNA in 5 of 15 sexually abused girls who had vaginal signs or symptoms, but in none of 17 nonabused controls (P < .02).

Vertical transmission of HPV to infants and toddlers is possible in theory. However, in the most comprehensive investigation to date of the possibility of vertical transmission, Watts et al found only unclassified HPV DNA (not typed as common genital types) in the anogenital areas of only 5% of 151 infants, each of whom had been evaluated prospectively on several occasions between birth and 36 months of age.72 Several observations in that study argue against vertical transmission: women with no specimen positive for HPV DNA were just as likely as women positive for HPV DNA to have infants with positive specimens; infants’ positive specimens occurred late rather than during the neonatal period; infants delivered by Cesarean section were just as likely as those delivered vaginally to have detectable HPV DNA; and the HPV DNA types in mother–infant pairs were not concordant. The maximum likelihood of perinatal transmission of HPV to infants’ anogenital areas was estimated at 2.8% (upper 95% CI).

In the absence of a history of sexual contact, the mode of HPV transmission in a child with genital warts may be impossible to determine. Child protective service agency investigations of children whose presenting problem is genital warts (or another STD) have frequently been unrevealing.73 Because HPV infection is not incontrovertible proof of sexual abuse and because HPV DNA without visible disease does not warrant any change in patient management, screening sexually abused children for HPV infection is not advisable. Physical examination to detect genital warts is sufficient. Children found to have genital warts should be screened for other STDs (see “STD Screening”). Interviews of children with genital warts in an effort to identify the source of infection should be developmentally appropriate for the children’s age and are best conducted by clinicians with skill and experience in this area.

HPV DNA Types and Sexual Abuse

Individual HPV DNA genotypes are associated closely with either skin or genital disease, but these associations do not help to identify sexually abused children.74 Because HPV infection in adults is widespread, and many adults with HPV DNA do not have clinical disease, the identification of HPV DNA in an adult is unlikely to shed any light on the source of genital type HPV DNA in a child with genital warts. Furthermore, three possible explanations exist for anogenital warts with skin-associated DNA types—autoinoculation from common skin warts and either abusive or nonabusive horizontal contact with a person who has common warts. Even autoinoculation through fomites has been postulated, although not demonstrated. Bergeron and colleagues detected HPV DNA in the underwearness of 17% of 74 adult patients, most of whom had vulvar condylomata.75

Summary

Research is needed to evaluate the positive and negative predictive values and cost-benefit ratios of various criteria for screening sexually abused children for each of the sexually transmitted diseases. Assessing the appropriateness of less invasive screening methods, such as urine ligase chain reaction testing for Neisseria gonorrhoeae and Chlamydia trachomatis,76 is another potentially fruitful area for research.

With respect to the two infections we have highlighted, issues that merit particular attention include estimates of the risk of HIV infection resulting from CSA and the efficacy and effectiveness of postexposure prophylaxis in the context of sexual abuse or assault. Because these questions will be difficult and expensive to answer in prospective studies, it will be important to consider inferences from animal research, surveillance data concerning occupational exposures, and case–control studies. Finally, Hammerschlag has underscored the importance and complexity of the challenge of elucidating the relationship of HPV infection to the development of clinically apparent anogenital disease in children.53

CONCLUSION

We have reviewed research published during the last decade that has advanced our understanding about sexually abused children in three important areas: methods for examining children’s external genitalia, the validity and reliability of interpretations of girls’ examination findings, and sexually transmitted infections. Potentially fruitful areas for subsequent research include the effectiveness, risks, and costs of interventions to reduce children’s distress during genital examination, Bayesian analyses of the contribution of physical examination findings to the diagnosis of sexual abuse, the benefits and costs of and indications for noninvasive STD screening in sexually abused children, and the effectiveness and costs of postexposure prophylaxis to prevent HIV infection in sexual assault and abuse victims.

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SUPPLEMENT


The Medical Evaluation of the Sexually Abused Child: Lessons From a Decade of Research
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