APPENDIX - A

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1. McCann, Reay, Siebert, Stephens, and Wirtz, *Postmortem Perianal Findings in Children*, 17 THE AMERICAN JOURNAL OF FORENSIC MEDICINE & PATHOLOGY 289-298 (1996)

2. Adams, Harper, Knudson, and Revilla, *Examination Findings in Legally Confirmed Child Sexual Abuse: It's Normal to Be Normal*, 94 PEDIATRICS 310, 311 (1994)

3. Hobbs and Wynne, *Sexual Abuse of English Boys and Girls: The Importance of Anal Examination*, 13 CHILD ABUSE & NEGLECT 195, 207 (1989)

4. Kirschner and Stein, *The Mistaken Diagnosis of Child Abuse: A Form of Medical Abuse?*, 139 AM. J. OF DISEASES OF CHILDREN 873, 873-74 (1985)

5. Bays and Jenny, *Genital and Anal Conditions Confused With Child Sexual Abuse Trauma*, 144 AM. J. OF DISEASES OF CHILDREN 1319, 1321 (1990)

6. Muram, *Anal and Perianal Abnormalities in Prepubertal Victims of Sexual Abuse*, 161 AM. J. OBSTETRICS & GYNECOLOGY 278, 280 (1989)

7. Bays and Chadwick, *Medical Diagnosis of the Sexually Abused Child*, 17 CHILD ABUSE & NEGLECT 91, 96, 106-07 (1993)

8. Krugman, *Editorial: The More We Learn, the Less We Know "With Reasonable Medical Certainty"?*, 13 CHILD ABUSE & NEGLECT 165 (1989)

9. Cmte. On Child Abuse and Neglect, *Guidelines for Evaluation of Sexual Abuse in Children: Subject Review*, 103 PEDIATRICS 186, 188 (1999)

10. McCann, Voris, Simon, and Wells, *Perianal Findings in Prepubertal Children Selected for Nonabuse: A Descriptive Study* 13 CHILD ABUSE & NEGLECT 179, 192 (1989)

11. Lamb, *The Investigation of Child Sexual Abuse: An Interdisciplinary Consensus Statement*, 18 CHILD ABUSE & NEGLECT 1021, 1027 (1994)

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Postmortem Perianal Findings in Children

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The postmortem finding of anal dilation or an exposed pectinate line in children who have died under suspicious circumstances continues to raise the concern of possible sexual abuse. The following multicenter, collaborative study was designed to help address that question. Sixty-five subjects, ranging in age from birth to 17 years, were autopsied at three different sites. A standard protocol along with 35-mm cameras were used to record the results. Thirty-eight (58%) subjects were boys, and 27 (42%) were girls. Forty-two (65%) were white, 10 (15%) African-American, five (8%) Asian, three (5%) white Hispanic, and five (8%) other. Fifty-seven (88%) were in Tanner stage I of secondary sexual development. Thirty-four (52%) died of natural causes, 26 (40%) from accidental injuries, three (5%) from other causes, and four (6%) as a result of a homicide. Forty-eight subjects (74%) had some dilation of the anal sphincters. In 21 children (32%), the entire anal canal, including the rectal ampulla, could be visualized. In another 21 (32%) subjects, the pectinate line was exposed. Only the outer portion of the anal canal opened in six children (10%), whereas 17 (26%) had no dilatation of the anus. Anal laxity led to flattened skin folds in 50 (77%), a shallow anal canal in 40 (62%), the exposure of both the pectinate line in 38 (59%), and the anal mucosa in 24 (37%). Venous congestion was present in 14 (22%), venous pooling in three (5%), erythema in six (9%), and increased pigmentation in eight (12%). Funneling was found in two (3%). Blood was present in three (5%), and an abrasion was discovered in one (2%). No fissures, lacerations, hemorrhoids, or scars were found in any of the children. Anal orifice size varied with the age of the child, the amount of traction applied to the buttocks, and a history of a CNS injury at the time of death. It is suggested, finally, that anal dilatation alone cannot be used as a marker for prior sexual abuse and that exposure of the pectinate line should not be confused with tears or fissures of the anal verge. Further studies of children known to have been sodomized prior to death are required.

Key Words: Sexual abuse—Child abuse—Anal dilation—Postmortem findings.

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On occasions, a postmortem perianal finding in a child will raise the issue of possible sexual abuse. Two of the more common reasons for this concern are a dilated anus and the exposure of the pectinate line. The latter finding can look like a series of deep clefts in the rim of the anus and may be confused with fissures. In an article dealing with sexual abuse of English boys and girls, Hobbs and Wynne (1) suggest that postmortem evidence of "gross anal dilatation" along with an "irregular anal margin, and smooth perianal skin" was evidence of sexual abuse. A contrary opinion is expressed in a recently published text on forensic pathology that states "a widely-open, patulous anus is often seen postmortem, due to flaccidity of the sphincter" (2). Unfortunately, in this latter publication, no references were cited. The only other reference found in the medical literature of postmortem anal dilatation is a report of one case in which the author attributed the finding to a "variation of normal" (3). Although these disparate opinions have provided a basis for argument, none have adequately answered the question about whether anal dilation or other physical findings discovered during an autopsy are signs of sexual abuse or variations of normal.

Until recently, the evaluation of the living child suspected of having been sexually abused was hampered by a lack of standards of normal. The studies that helped resolve this problem have shown that there is a wide variation in the ano-genital anatomy of children; caution must be exercised in interpreting the findings (4,5). This same situation appears to be operative for medical examiners who are being asked to explain unusual ano-genital findings in the dead child.

The following study is designed to help establish standards of normal for the perianal portion of a child's autopsy. Anal dilation and other soft tissue findings were recorded and analyzed to ascertain the frequency with which they were encountered during the postmortem examinations. This infor-

TABLE 1. *Cause of death by age*

Cause of death	0–2 y	2–4 y	5–9 y[a]	TSSDII	TOTAL
Natural					
SIDS	18	0	0	0	18 (28%)
Congenital anomaly	7	1	0	0	8 (12%)
Infectious	3	0	1	0	4 (6%)
Malignancy	1	1	0	0	2 (3%)
Accidental					
Drowning	1	6	2	1	10 (15%)
CHI/CNS	1	1	4	5	11 (17%)
Asphyxia	1	1	1	3	6 (9%)
Crushed	0	0	1	0	1 (2%)
Homicidal	3	1	0	0	4 (6%)
Total (%)	36 (55%)	11 (17%)	9 (14%)	9 (14%)	65 (100%)

[a]One child aged 9 still in Tanner Stage I.
TSSDII, Tanner stage of secondary sexual development of ≥ II; CHI/CNS, closed head injury/CNS injury.

mation is being presented to help the pathologist determine if a finding should be considered a normal variant or an indicator of sexual abuse.

METHODS

The cases for this Human Subjects Review Committee–approved research project were obtained from three sites over a period of 2 years. The postmortem examinations were performed by a pathologist at Children's Hospital and Medical Center of Seattle, Washington (J.S.), by the Medical Examiner of King County, Washington (D.R.), and by the Medical Examiner of San Francisco County, California (B.S.). The examinations for this convenience sample study were obtained sequentially by the participating pathologists when they were on duty.

A standardized questionnaire was used to record all available demographic, historical, and medical data. In cases in which the child was pronounced dead in the field, information regarding the circumstances of the death was obtained from police reports. When the child was declared dead in a hospital, the attending physician's discharge summary and other available reports were used to gather data. Reports of prior investigations of the family by the Children's Protective Services (CPS) or law enforcement agencies for possible child abuse or neglect were sought.

The historical information in the project's protocol included questions regarding the cause of death, the organ system(s) involved in the child's death, unusual circumstances surrounding the death, significant past medical history, family history, social history, resuscitation efforts, and all forms of anal penetration by medical personnel prior to death. A review of systems included questions about constipation, chronic diarrhea, rectal bleeding, encopresis, use of enemas, use of suppositories, and/or any preceding neurological disorders.

The medical examination portion of the questionnaire incorporated the time from death to refrigeration, the time from refrigeration to autopsy, the body temperature, the state of rigor mortis, the examination method, the outcome of the autopsy, and the results of any relevant studies such as cultures or toxicology screens.

Most of the infants were examined in a supine position, whereas the older subjects were studied in a prone position. The examiners agreed to use only enough traction to separate the gluteal fold to expose the anus and the surrounding tissues. The pathologist's interpretations of the physical findings were transcribed at the time of the autopsy, and 35-mm cameras with macrolenses were used to record the findings. All anal orifice and other soft tissue measurements were obtained from the photographs.

To ensure the accuracy of the assessment, a metric scale was included in all photographs as a guide for determining sizes. Midline measurements were used to record anterior-posterior (A-P) diameters. The "external" lateral anal orifice diameters were obtained by using a point on the anal verge that was on the same plane as that used to record the "external" A-P measurement. The distal portion of the "saw-toothed" pectinate line was employed as the point of reference for measuring the "internal" A-P and lateral anal orifice diameters. When "complete dilation" was present and the interior of the rectal ampulla was visible, the measurements were obtained from the inner walls of the anal canal/ampulla.

Because the muscle fibers of the external and internal anal sphincters are interdigitated at their junction, no attempt was made to define which sphincter, if either, was dilated. For purposes of consistency, "external" anal dilation was considered present when the edges of the anal verge were separated without the pectinate line being visible. "Internal" anal dilatation was defined as present when the edges of the anal verge were separated and the pectinate line was visible. "Complete" anal dilation was deemed to be present when the entire anal canal was dilated and the rectal ampulla was visible.

Most of the soft tissue findings were obvious in the photographs. However, if there was a difference in the interpretation of a finding between the examiner and the photograph, the examiner's conclu-

TABLE 2. *Postmortem perianal soft tissue findings*

Findings	Yes		No		UTD	
	n	Percentage	n	Percentage	n	Percentage
Blood present	3	5%	62	95%	—	—
Rigormortis	56	86%	8	12%	1	2%
Fecal soiling	26	40%	39	60%	—	—
Livormortis	45	70%	20	31%	—	—
Venous congestion	14	22%	47	72%	4	6%
Venous pooling	3	5%	58	89%	4	6%
Hemorrhoids	0	0%	61	94%	4	6%
Erythema	6	9%	55	85%	4	6%
Erythema, mild	5	83%	—	—	—	—
Erythema, moderate	1	17%	—	—	—	—
Increased pigmentation	8	12%	—	—	—	—
Rash	2	3%	59	91%	4	6%
Lichenification	0	0%	61	94%	4	6%
Diasatsis ani (smooth)	2	3%	58	89%	5	8%
Diastasis ani (dimple)	3	5%	57	88%	5	8%
Fissure	0	0%	60	92%	5	8%
Abrasions	1	2%	59	91%	5	8%
Lacerations	0	0%	60	92%	5	8%
Scars	0	0%	60	92%	5	8%
Tags, anterior	5	8%	55	85%	5	8%
Tags, posterior	1	2%	64	98%	—	—
Skin folds, well defined	14	22%	48	74%	3	5%
Skin folds, flattened	50	77%	12	19%	3	5%
Skin folds, thickened	7	11%	55	85%	3	5%
Skin folds, irregular	12	19%	50	77%	3	5%
Funnel shaped	2	3%	62	95%	1	2%
Shallow anal canal	40	62%	24	37%	1	2%
Exposed pectinate line	38	59%	24	37%	3	5%
Prominent anal mucosa	24	37%	40	62%	1	2%

sions were used. Venous congestion and engorgement were two such examples. The pathologist recorded venous congestion as present when there was a purplish discoloration but no distortion of the perianal tissues. Venous pooling (engorgement) was defined as a bulging of the tissues secondary to underlying venous distention. As with venous congestion, venous pooling created a deep purple hue appearance in the tissues.

When more than one photograph had been taken during an autopsy, the anal orifice measurements from each were compared to determine if there was a significant variation in size. The measurements from the largest and smallest orifices were then compared to determine if the examination technique had an effect upon the results. Only the photographs with the smaller diameter orifices were used to generate the data in this report.

The data were analyzed using the Center for Disease Control's EPI INFO computer data analysis package and the SPSS PC+ statistical package (6,7). Descriptive univariate statistics were generated for all variables. Cross tabulations, using the χ^2 method, were employed to explore the bivariate relationships between categorical variables. Both *t* tests and correlation statistics were used for continuous variables.

RESULTS

Demographic Data

Sixty-five subjects were included in this postmortem study conducted between April 1990 and July 1992. Thirty-one cases were obtained from the King County Medical Examiner's office, 25 cases from the Children's Hospital and Medical Center in Seattle, Washington, and nine cases from the Medical Examiner's office in San Francisco. Thirty-eight (59%) were boys, and 27 (41%) were girls. There were 42 (65%) whites, 10 (15%) African- Americans, five (8%) Asians, three (5%) white Hispanics, and five (8%) other races. The age of the subjects ranged from stillborn to 17½ years. Fifty-seven (88%) subjects were in Tanner stage I of secondary sexual development, one (1%) in Tanner stage II, two (3%) in Tanner stage III, three (5%) in Tanner stage IV, and two (3%) in Tanner stage V.

Cause and Location of Death

Thirty-three (51%) of the subjects died of natural causes, 28 (43%) because of accidental injuries, and four (6%) as a result of homicidal injuries (Table 1). One death, not considered homicidal, was investigated for possible neglect. There were no su-

TABLE 3. *Anal orifice size by age (mean diameter and range)*

Anal orifice	0–2 y	2–5 y	5–9 y	TSSD ≥ II
A-P diameter (A-P range)	9.4 mm (5–20 mm)	14.4 mm (7–20 mm)	16.7 mm (8–23 mm)	18.2 mm (9–23 mm)
AV diameter (AV range)	4.8 mm (2–12 mm)	8.0 mm (2–17 mm)	10.2 mm (6–18 mm)	11.3 mm (5–22 mm)
PL diameter (PL range)	2.2 mm (0–10 mm)	4.5 mm (0–15 mm)	5.8 mm (0–11 mm)	7.1 mm (0–15 mm)

A-P, anterior-posterior; AV, anal verge; PL, pectinate line; TSSD, Tanner stage of sexual development.

icide victims. Although the majority of the infants died of natural causes, most of the older children died because of accidental injuries.

Thirty children (46%) died in the hospital. Seventeen subjects (26%) were in the hospital for <24 h, four (6%) were hospitalized for 24–48 h, two (3%) for 48–168 h, and seven (11%) lived a week or longer.

Historical Information

Although complete historical data was not available for all subjects, the information collected was analyzed to determine if relationships existed that would explain a subject's physical finding. From the available information, the review of systems revealed that only two (4%) out of 45 children had a history of constipation, none had chronic diarrhea or encopresis and only one of the 50 (2%) had rectal bleeding. None of these subjects had a history of chronic use of suppositories or enemas.

Resuscitation was attempted in 47 (72%) of the children. Thirty-eight of the 47 children (80%) were intubated, 20 (43%) were given stimulants, eight (17%) were administered narcotics, seven (15%) were given anticonvulsants, six (13%) had muscle relaxants, and four (9%) were dispensed sedatives. Of the 47 children in whom resuscitation was attempted, 39 (83%) received intravenous fluids. No association was discovered between this information and the children's physical findings.

Anal penetration was documented in 27 (42%) of the subjects <24 h prior to death. This consisted of the use of rectal temperature thermometers in 15 (56%), digital examination in eight (30%), antemortem anal manipulation in three (11%), and the use of suppositories in two (7%). No association was discovered between this information and the children's physical findings.

Autopsy Findings

The majority of the 26 (40%) children who were 2 months of age or younger were examined in a supine position, whereas the older children were examined in a prone position. Traction, as determined from the photographs, was applied to the buttocks of 46 (71%) of the subjects, whereas 19 (29%) were examined by observation only. The soft tissue findings of the autopsies are recorded in Table 2.

The most common soft tissue findings were flattened skin folds (77%), a shallow anal canal (62%), and an exposed pectinate line (59%). Because mild perianal erythema (6%) was indistinguishable from livormortis (70%) on the photographs, the determination of this finding was left to the pathologist who performed the autopsy.

Upon review of the photographs, 77% (50) of the subjects had some anal dilation. The entire anal canal, including the rectal ampulla, was visible in 32% (21) of the children. In a similar number of subjects (21), the pectinate line was exposed but the anal canal remained closed. There was only "external" dilatation of the anal verge, without visualization of the pectinate line, in 10% (6) of the subjects. No anal dilation was noted in 23% (15) of the children.

With external anal dilation, the orifice was elliptical or oval in shape. Both round and oval anal orifice configurations were noted, with either internal or complete anal dilation. The nondilated anal orifice had a "slit-like" appearance.

Two or more photographs of the subject's perianal area were obtained during 38 (58%) of the 65 autopsies. When the anal orifice measurements from one photograph were compared to another from the same individual, a statistically significant difference between the orifice sizes was discovered. This was true for both the lateral verge and pectinate line measurements but not for the A-P dimension. With traction, the mean diameter for the lateral verge measurement varied from 8.6 to 11.1 mm ($p < 0.0001$), with the range of the discrepancy being 0–7 mm. The mean diameter for the lateral pectinate line measurement changed from 6.0 to 8.7 mm ($p < 0.0001$), with the range of differences being 0–7 mm. There was no significant change in the A-P diameters among the photographs.

TABLE 4. *Summary of postmortem anal findings*

No.	Age	DILAT	A-P	LAT (V/P)	Event/diagnosis	Anal findings/ comments
1	6 years	Internal	14 mm	10/6 mm	Drowned	Oval, mucosa
2	16 years	Internal	16 mm	11/8 mm	Drowned	Oval, mucosa
3	9 years	Internal	21 mm	10/7 mm	Auto accident	Oval, CHI
4	22 months	External	8 mm	6/2 mm	Abused	Slit, CHI
5	7 years	External	8 mm	7/0 mm	Auto/ped	Slit, CHI
6	5 years	External	19 mm	6/2 mm	Drowned	Slit
7	5 years	Internal	18 mm	10/7 mm	Kicked	Oval, CHI
8	10 years	Complete	20 mm	13/10 m	Auto accident	Oval, CHI
9	2 years	Internal	13 mm	5/3 mm	Drowned	Slit, mucosa
10	4 years	Internal	14 mm	7/5 mm	Auto accident	Slit, CHI
11	6 years	Complete	15 mm	8/5 mm	Auto accident	Irregular, CHI
12	12 months	Internal	17 mm	10/6 mm	Drowned	Oval, mucosa
13	2 months	Internal	10 mm	5/2 mm	SIDS	Slit, mucosa
14	2 months	None	9 mm	4/0 mm	SIDS	Slit
15	2 months	None	7 mm	3/0 mm	SIDS	Slit
16	3 years	Internal	18 mm	9/4 mm	SBS	Oval, CHI
17	3 years	Complete	20 mm	12/9 mm	Drowned	Oval, stool
18	2 months	External	7 mm	4/0 mm	SIDS	Slit
19	4 months	Complete	9 mm	9/8 mm	SIDS?	Oval, funnel
20	10 years	External	15 mm	5/0 mm	Auto accident	Slit, CHI
21	15 months	Internal	10 mm	5/2 mm	Oven door	Slit
22	22 months	Internal	20 mm	8/5 mm	Auto accident	Oval, mucosa
23	17 months	Internal	14 mm	8/2 mm	SBS	Oval
24	4 years	Internal	20 mm	8/3 mm	Drowned	Slit
25	4 years	Internal	20 mm	17/15 m	Smoke inhalation	Oval, smooth canal
26	7 years	Complete	23 mm	12/8 mm	Crushed	Oval, empty ampulla
27	11 years	Complete	21 mm	8/7 mm	CO	Oval, stool
28	14 years	Internal	9 mm	10/6 mm	Suffocation	Irregular
29	5 years	Complete	22 mm	18/11 m	CP/infection	Round, asphyxia
30	17 years	Internal	19 mm	15/7 mm	Auto accident	Oval, CHI
31	14 years	Complete	23 mm	22/15 m	Brk neck	Round, stool
32	2 years	None	10 mm	5/0 mm	Drowned	Slit
33	6 years	Complete	20 mm	13/8 mm	Suffocation	Round, retarded
34	9 years	Internal	20 mm	8/4 mm	Auto accident	Slit, CHI
35	2 years	Internal	8 mm	8/2 mm	Drowned	Elliptical
36	1 month	None	9 mm	4/0 mm	Burn	Slit, fissure
37	8 years	Complete	11 mm	8/5 mm	Crushed	Round, CHI
38	2 years	Complete	16 mm	12/6 mm	Drowned	Irregular
39	2 months	None	15 mm	4/0 mm	SIDS	Slit
40	21 months	Complete	9 mm	7/4 mm	Unknown	Oval, hyperthermia
41	4 months	Complete	10 mm	4/2 mm	SIDS	V-shaped
42	1 month	Complete	8 mm	5/5 mm	SIDS	Round
43	4 months	Complete	6 mm	3/2 mm	SIDS	Irregular
44	10 months	None	10 mm	2/0 mm	Cancer	Slit
45	4 years	Internal	7 mm	3/2 mm	CHD	Slit
46	20 months	Complete	10 mm	5/4 mm	CHD	Round
47	4 months	None	8 mm	3/0 mm	SIDS	Slit
48	2 months	Complete	5 mm	5/5 mm	SIDS	Round
49	1 month	None	7 mm	3/0 mm	SIDS	Slit
50	4 months	Complete	10 mm	4/2 mm	SIDS	Oval, emptamp
51	17 months	Complete	10 mm	5/3 mm	Cong mal	Oval, stool
52	1 month	Internal	8 mm	5/4 mm	Cong anl	Oval, mucosa
53	14 days	None	7 mm	2/0 mm	Cong anl	Slit
54	3 years	None	12 mm	2/0 mm	Brain tumor	Slit
55	3 months	None	5 mm	4/1 mm	SIDS	Slit
56	1 day	Internal	10 mm	4/2 mm	Cong mal	Oval, meconium
57	1 month	None	11 mm	5/0 mm	SIDS	Slit
58	12 days	None	5 mm	3/0 mm	Cong mal	Slit
59	Birth	Complete	10 mm	12/10 m	Cong mal	Round, meconium
60	19 months	None	10 mm	2/0 mm	Infection	Slit
61	8 months	None	11 mm	2/0 mm	Infection	Slit
62	1 month	None	8 mm	3/0 mm	SIDS	Slit
63	2 months	External	11 mm	6/2 mm	SIDS	Slit
64	Birth	None	7 mm	3/0 mm	Cong mal	Slit
65	2 months	Complete	8 mm	6/6 mm	SIDS	Irregular, funnel

DILAT, dilation of external and/or internal anal sphincter; A-P, anterior/posterior diameter; LAT V/P, lateral verge/pectinate line diameters; CHI, closed head injury; CHD, congenital heart disease; CP, cerebral palsy; Cong anl, congenital anomaly; Cong mal, congenital malformation.

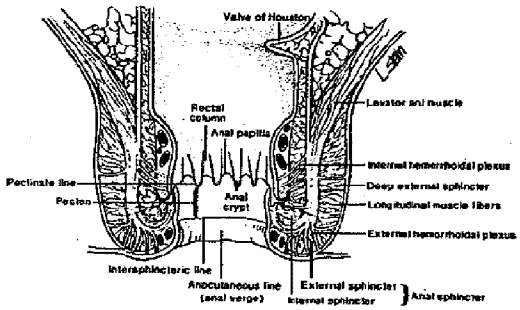

FIG. 1. Cross-section of rectosigmoid and anal structures. (From ref. 27, with permission.) All photographs (Figs. 1–9) were taken with the subject in a prone position; A-P diameters are listed first, followed by lateral anal orifice measurements, and magnification varies.

Of the 21 children with complete anal dilatation, the A-P diameter was 10–14 mm in 15 (71%), 15–19 mm in seven (33%), and ≥20 mm in six (29%). No stool was present in 11 (52%). The anal orifice size and range by age may be found in Table 3.

To determine if any associations could be detected between soft tissue findings and historical information, statistical bivariate analysis was performed. This analysis was limited to those variables in which there were sufficient numbers and variation in the findings. Significant relationships discovered included an increase in the diameters of the anal orifice with increasing age of the child ($p < 0.0001$), an increase in the lateral diameter of the anal orifice with traction ($p < 0.001$), and an increased likelihood of anal dilation with a CNS injury at the time of death ($p < 0.02$). A history of a neurologic disorder prior to death also appeared to increase the possibility that anal dilatation would be present at the time of the child's death. However, the number of subjects was too small to determine the statistical significance of this association. A summary of the postmortem anal findings may be found in Table 4.

DISCUSSION

As the medical community's awareness of childhood sexual abuse has grown, so has the concern over postmortem perianal findings discovered at autopsy (Fig. 1) (1–3). This has been particularly true when anal dilatation is encountered. Although a patulous anus has been documented immediately following a sexual assault, the question of whether or not anal dilatation is a marker for ongoing abuse has remained unanswered (8).

In the living child, a large number of perianal findings have been associated with ongoing sexual abuse. These include erythema, hyperpigmentation, dilated veins, localized venous pooling, loss of normal skin folds, thickening of the perianal tissues, shortened anal canal, funneling, swelling of perianal tissues, fissures, hematomas, skin tags, scars, and anal dilation (9–25). Although the significance of many of these findings is still being debated, the unanswered question is whether or not any of these same findings, when discovered during an autopsy, are indicative of sexual abuse.

This study was designed to explore the type and frequency of perianal findings that might be encountered by pathologists performing autopsies on children. Although it is necessary to view this as a preliminary study due to its methodological limitations, the intent of this report was to help establish a baseline of normal findings for the postmortem examination of a child.

Most of the children appeared to have died because of accidental injuries or other natural causes. Although four children died as a result of homicidal violence, a review of the available information identified only one subject for whom the possibility of sexual abuse arose. In that subject, it was the autopsy finding of a patulous anus that led to the suspicion of possible sexual abuse (Fig. 2). This

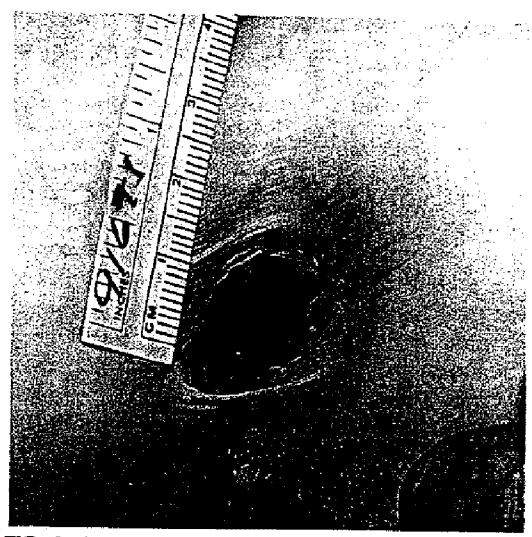

FIG. 2. A 5-year-old white girl kicked in the head by a horse. The possibility of sexual abuse was investigated due to patulous anus. No documentation of evidence was contained in the medical record. Note smooth perianal tissues with faint bluish discoloration (venous congestion). Shallow anal canal. Prominent pectinate line with anal canal columns visible. External anal verge diameter: 21 × 16 mm. Internal pectinate line diameter: 20 × 15 mm. Ampulla opening: 10 × 2 mm.

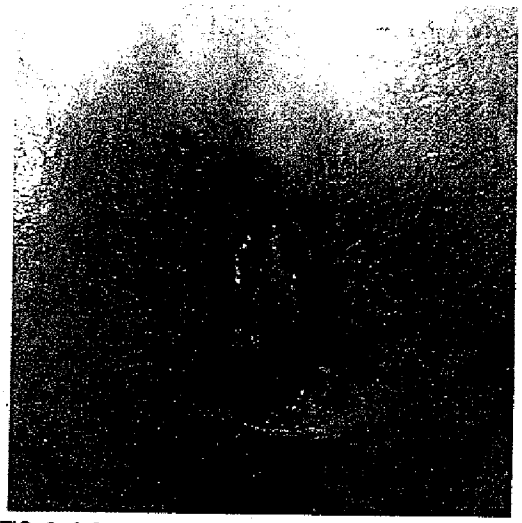

FIG. 3. A 9-year-old white girl died in an automobile accident. Massive closed head injury. Fractured skull, broken ribs, and multiple contusions. Note smooth perianal tissues, localized venous engorgement at 3 o'clock, and generalized venous congestion. Pectinate line and prominent anal mucosa visible. Had digital rectal examination just prior to death. External anal verge diameter: 20 × 8 mm. Internal pectinate line diameter: 18 × 4 mm.

FIG. 5. A 6-year-old girl with hypomelenosis of Ito died of suffocation. Found in her body cast wedged upside down between bed and wall. Child severely developmentally delayed. Note generalized perianal livermortis. Smooth perianal skin folds, shallow anal canal with pectinate line, and anal mucosa visible. External anal verge diameter: 24 × 15 mm. Internal pectinate line diameter: 20 × 13 mm. Ampulla opening: 15 × 8 mm.

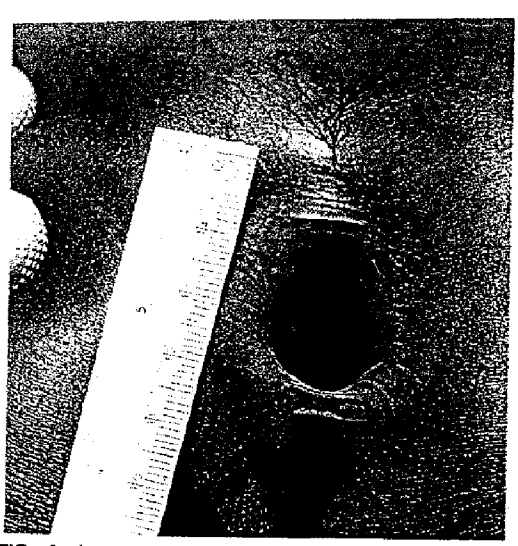

FIG. 4. A 5-year-old African-American girl died in her sleep. Severely developmentally delayed secondary to neonatal asphyxia. Smooth perianal tissues with venous congestion between 1 and 6 o'clock positions. Shallow anal canal with prominent pectinate line and anal canal. Rectal ampulla visible. External anal verge diameter: 24 × 20 mm. Internal pectinate line diameter: 20 × 18 mm. Ampulla opening: 16 × 10 mm.

FIG. 6. A 6-year-old white girl thrown from car and sustained fractures of skull, pelvis, and humerus. In intensive care unit 2 weeks prior to death. Perianal tissues wrinkled. Prominent folds of pectinate line give orifice an irregular appearance. External anal verge diameter: 15 × 8 mm. Internal pectinate line diameter: 13 × 7 mm. Ampulla opening: 10 × 5 mm.

FIG. 7. A 7-year-old Asian girl crushed by a pickup truck. Died of a closed head injury. Smooth perianal skin folds, shallow anal canal, pectinate line, anal canal, and empty rectal ampulla visible. External anal verge diameter: 23 × 15 mm. Internal pectinate line diameter: 20 × 12 mm. Ampulla opening: 14 × 7 mm.

child was a 5-year-old girl who was kicked in the head by a horse and died as the result of a severe head injury. Her medical records contained no evidence of sexual abuse and the anal dilation is consistent with her central nervous system injury.

Statistically, there is a possibility that one or more of the children in this study was sexually molested (26). Despite a dilated anus discovered in two of the four physically abused children, both of whom died of closed head injuries, there was no evidence of sexual abuse in any of the subjects.

As expected, the A-P dimension of the anal orifice did increase with the age of the child. This relationship existed even if there was anal dilatation (Figs. 3 and 4). The lateral anal orifice size varied within the same age group, primarily because of dilatation of the anus in some subjects (Table 4).

Lateral or horizontal anal orifice diameters proved difficult to record from the photographs. The identification of an anatomical plane that could be used to measure both the A-P and the lateral dimensions was tedious. Even when there was no true dilation of the anus, the lateral edges of the anal verge were slightly separated when the above plane was used to transcribe measurements.

The amount of traction applied to the buttocks and perianal tissues did influence the lateral dimensions of the anal orifice. Even without consciously attempting to open the anal canal, the examiners inadvertently applied varying amounts of traction, which caused a significant difference in the lateral diameters of the orifice. This was most evident in the older child, in whom it was necessary to spread the buttocks in order to visualize the anus.

Children who died of a CNS injury (Figs. 2, 4, 7, and 8) had an increased likelihood of having a dilated anus. The children who were severely brain damaged (Figs. 5 and 6) also were more likely to have a dilated anus at the time of their death. However, not all children who had sustained a CNS injury or who had a history of significant developmental delay had a dilated anal orifice. Similarly, there were subjects whose anus was dilated but had no history of a CNS injury (Figs. 3 and 9). Except for age, there were no other combinations of historical or physical findings that were of statistical significance when matched with the finding of anal dilation.

The findings in the 40 (62%) subjects with shallow anal canals and the 24 (37%) with exposure of the mucosa (Figs. 2 and 4), were consistent with the statement in Knight's textbook *Forensic Pathology*: "The inner mucosa is often visible . . . in the postmortem examination of the child" (1). The laxity of the sphincter muscles was also responsible for a smooth anal verge (77%) (Figs. 2–7) and the exposure of the pectinate line (59%) (Figs. 2–9).

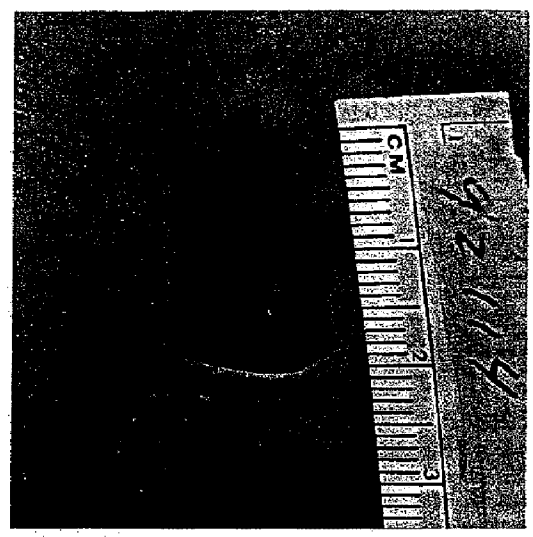

FIG. 8. A 4-year-old white girl died of smoke inhalation in a house fire. Perianal tissues smooth with anterior perianal skin tag at 6 o'clock position. Pectinate line and anal canal columns visible. External anal verge diameter: 20 × 15 mm. Internal pectinate line diameter: 18 × 8 mm. Ampulla closed.

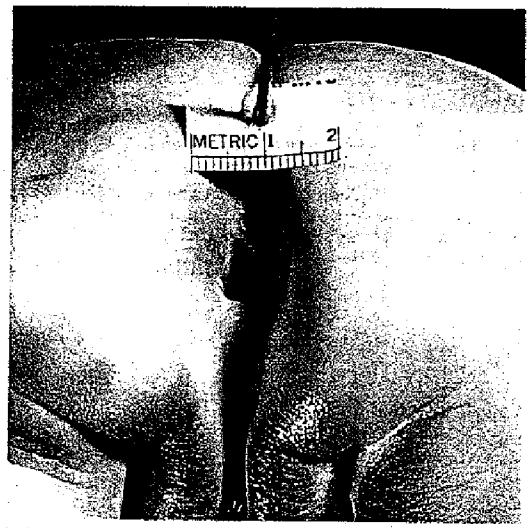

FIG. 9. A 2-month-old white girl died of sudden infant death syndrome (SIDS). Anal canal and rectal ampulla dilated. Smooth perianal area with funnel-like appearance. Shallow anal canal with pectinate (Z) line and anal canal mucosa visible. External anal verge diameter: 10 × 8 mm. Internal pectinate line diameter: 8 × 6 mm. Rectal ampulla opening: 8 × 6 mm.

Irregular (19%) and thickened (11%) folds were relatively uncommon (Fig. 7 and Table 2).

No true hemorrhoids, fissures, or scars were identified in any of the children. Two subjects had blood in their anal canals, and one had a perianal abrasion. All three were in accidents involving automobiles. Three other subjects had a peculiar V-shaped cleft in their anal verge at the 4 o'clock position. Despite this appearance in the photographs, the pathologists did not identify them as fissures. The only skin tags (9%) detected were in the midline (Fig. 9). A funnel-shaped appearance of the perianal tissues was discovered in one infant (Fig. 3) and in one older child. In neither case was there evidence of abuse.

CONCLUSION

Anal dilation was a common postmortem finding in these dead children. The anal sphincter muscle laxity, which produced the smooth perianal skin folds, was also responsible for a shallow anal canal. This led to the exposure of the pectinate line and the mucosa of the anal canal. At times, the irregularity of the pectinate line created an appearance similar to perianal fissures. Other common findings included fecal soiling, venous congestion, and increased pigmentation of the perianal tissues. In contrast, hemorrhoids, lacerations, fissures, and scars were not found in this population of subjects.

Although there are limitations of this study due to its methodology, it is suggested that anal dilatation alone cannot be used as a marker for prior sexual abuse. In addition, exposure of the pectinate line should not be confused with tears or fissures of the anal verge.

A study dealing specifically with the autopsy findings of children known to have been sodomized prior to death is needed to help identify the soft tissue changes that occur as a result of sexual abuse. However, based upon the results of this preliminary report, it is suggested that postmortem perianal findings must be interpreted with caution. Standards of normal are not yet firmly established.

REFERENCES

1. Hobbs CJ, Wynne JM. Sexual abuse of English boys and girls: the importance of anal examinations. *Child Abuse Negl* 1989;13:195–210.
2. Knight B. The autopsy: External examination. In: Knight B., ed. Forensic Pathology, 1st ed. New York: Oxford University Press, 1991.
3. Kirschner RH, Stein MD. The mistaken diagnosis of child abuse. *Am J Dis Child* 1985;139:873–867.
4. McCann J, Voris J, Simon M, Wells R. Perianal findings in prepubertal children selected for nonabuse: a descriptive study. *Child Abuse Negl* 1989;13:179–93.
5. Emans SJ, Woods ER, Flagg NT, Freeman AF. Genital findings in sexually abused, symptomatic and asymptomatic girls. *Pediatrics* 1987;79:778–85.
6. Dean AG, Dean JA, Burton AH, Dicker RC. *Epi info, version 5; A word processing, data base, and statistical program for epidemiology on microcomputers.* Stone Mountain, GA: USD, 1990.
7. *SPSS/PCT V4.0 (Statistical Package for the Social Sciences).* Chicago: SPSS, 1990.
8. McCann J, Voris. Perianal injuries resulting from sexual abuse: a longitudinal study. *Pediatrics* 1993;91:390–7.
9. Bamford F, Roberts R. Child sexual abuse II. *Br Med J* 1989;299:377–82.
10. Bays J, Chadwick D. Medical diagnosis of the sexually abused child. *Child Abuse Negl* 1993;17:91–110.
11. Canavan JW. Sexual child abuse. In: Ellerstein NS, ed. *Child abuse and neglect.* New York: Wiley, 1981:233–51.
12. Claytor RN, Barth KL, Shubin CI. Evaluating child sexual abuse: observations regarding ano-genital injury. *Clin Pediatr* 1989;28:419–22.
13. Finkel MA. Child sexual abuse: a physician's introduction to historical and medical validation. *JAOA* 1989;89:1143–9.
14. Herman-Giddens ME, Frothingham TC. Prepubertal female genitalia: examination for evidence of sexual abuse. *Pediatrics* 1987;80:203–8.
15. Hobbs CJ, Wynne JM. Buggery in childhood—a common syndrome of child abuse. *Lancet* 1986;2:792–6.
16. Hobbs CJ, Wynne JM. Child sexual abuse—an increasing rate of diagnosis. *Lancet* 1987;2:837–41.
17. Hobbs CJ, Wynne JM. Management of sexual abuse. *Arch Dis Child* 1987;62:1182–7.
18. Muram D. Rape, incest, trauma: the molested child. *Clin Obstet Gynecol* 1987;30:754–61.

19. Muram D. How you can detect and treat child sex abuse. *Contemp Obstet Gynecol* 1988;Feb:34–48.
20. Muram D. Anal and perianal abnormalities in prepubertal victims of sexual abuse. *Am J Obstet Gynecol* 1989;161: 278–81.
21. Paul DM. "What really did happen to Baby Jane?"—the medical aspects of the investigation of alleged sexual abuse of children. *Med Sci Law* 1986;26:85–102.
22. Paul DM. The pitfalls which may be encountered during an examination for signs of sexual abuse. *Med Sci Law* 1990;30:3–11.
23. Reinhart M. Sexually abused boys. *Child Abuse Negl* 1987;11:229–35.
24. San Filippo JS, Schikler KN. Identifying the sexually molested preadolescent girl. *Pediatr Ann* 1986;15:621–4.
25. Spencer M, Dunklee P. Sexual abuse of boys. *Pediatrics* 1986;78:133–8.
26. National Center on Child Abuse and Neglect. *Study findings—study of national incidence and prevalence of child abuse and neglect: 1988.* Washington, DC: U.S. Department of Health and Human Services, 1988.
27. Finkle MA, De Jong AR. Medical findings in child sexual abuse. In: Reece RM, ed. *Child abuse and neglect. Medical diagnosis and management. Vol 1.* Philadelphia: Lea & Febiger, 1994.

2.

ARTICLES continued

Examination Findings in Legally Confirmed Child Sexual Abuse: It's Normal to be Normal

Joyce A. Adams, MD; Katherine Harper, PA-C; Sandra Knudson, PNP; and Juliette Revilla, FNP

ABSTRACT. *Background.* Studies of alleged victims of child sexual abuse vary greatly in the reported frequency of physical findings based on differences in definition of abuse and of "findings." This study was designed to determine the frequency of abnormal findings in a population of children with legal confirmation of sexual abuse, using a standardized classification system for colposcopic photographic findings.

Methods. Case files and colposcopic photographs of 236 children with perpetrator conviction for sexual abuse, were reviewed. The photos were reviewed blindly by a team member other than the examiner, and specific anatomical findings were noted and classified as normal to abnormal on a scale of 1 to 5. Historical and behavioral information, as well as legal outcome was recorded, and all data entered into a dBase III program. Correlations were sought between abnormal findings and other variables.

Results. The mean age of the patients was 9.0 years (range 8 months to 17 years, 11 months), with 63% reporting penile-genital contact. Genital examination findings in girls were normal in 28%, nonspecific in 49%, suspicious in 9%, and abnormal in 14% of cases. Abnormal anal findings were found in only 1% of patients. Using discriminant analysis, the two factors which significantly correlated with the presence of abnormal genital findings in girls were the time since the last incident, and a history of blood being reported at the time of the molest.

Conclusions. Abnormal genital findings are not common in sexually abused girls, based on a standardized classification system. More emphasis should be placed on documenting the child's description of the molestation, and educating prosecutors that, for children alleging abuse: "It's normal to be normal." *Pediatrics* 1994;94: 310–317; *child sexual abuse, genital findings.*

ABBREVIATION. CSAEP, Child Sexual Abuse Evaluation Program.

Children who give a history of having been sexually molested, and children in whom abuse is suspected for other reasons, are increasingly referred for medical evaluation. Questions regarding the frequency of abnormal findings in sexually abused children have been difficult to answer with certainty for two reasons: changing definitions of what constitutes an "abnormality," and the lack of a true "gold standard" for proven abuse.

The publication of studies describing the appearance of the genitalia and peri-anal tissues in non-abused prepubertal children,[1-3] and of the hymen in newborns,[4] have helped examiners to understand which variations should be considered normal, or at least nonspecific for abuse. Likewise, there appears to be a growing consensus among researchers in the field of medical examination of sexually abused children as to which findings can be considered conclusive or specific for abuse.[5-7]

Two studies reviewing cases in which the alleged perpetrator was convicted of molesting the child reported a frequency of abnormal findings of 45%[8] and 23%[9] among the children examined. Again, the definition of genital abnormalities differed, as did the type of examination conducted.

This study was designed in order to determine the frequency of abnormalities among children in whose case the perpetrator was convicted of abusing the child, using a standardized classification system for blindly rating colposcopic photographs for the presence of findings suggestive or conclusive of abuse. The classification scale, which was previously described in detail,[10] was developed using published data on abused and nonabused children.

METHODS

At the Child Sexual Abuse Evaluation Program (CSAEP) at Valley Medical Center in Fresno, CA, notations have been made on cases in which the alleged perpetrator confessed, plead guilty or was found guilty in court of sexual abuse. Of the 2732 children evaluated by members of CSAEP between July 1, 1986 and July 1, 1993, there were 262 cases in which information was obtained confirming that the perpetrator had been convicted.

The case files of patients seen before July 1, 1991 were reviewed by one of the authors (who had not been the original examiner) and only those cases with good quality colposcopic photographs were selected for the study. There were 18 cases with no photographs and eight with nonmagnified Polaroid photographs. After excluding these cases, 141 cases (130 girls, 11 boys) of children examined before July 1, 1991 were carefully reviewed. These photographs were all taken using a Cryomedics MM4000 or MM6000 colposcope with a 35-mm Olympus camera attached. The photographs were reviewed without referring to the case history, and the findings were recorded and classified using our previously reported classification scale.[10] Measurements of the hymenal and anal orifice were taken from the photographs using a method described by McCann et al.[11] Anal and genital photographs were separately rated as being normal, nonspecific, suspicious, suggestive, or showing clear evidence of penetrating injury, as listed in

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Table 1. Normal findings are those which have been reported in nonabused children and newborns. Nonspecific findings may be due to abuse, especially if they are found shortly after an abusive episode, but may also have other causes. After the photographs were rated, the complete record was reviewed. An overall assessment of the likelihood of abuse was made, based on the quality and clarity of the child's statement, the reported emotional and behavioral changes in the child, and the presence of laboratory findings, if any. The overall scale is shown in Table 2. Specific details of the molestation were also recorded, if available.

TABLE 1. Proposed Classification of Anogenital Findings in Children*

- Normal (Class 1)
  - Periurethral bands
  - Intravaginal ridges or columns
  - Increased erythema in the sulcus
  - Hymenal tags, mounds, or bumps
  - Elongated hymenal orifice in an obese child
  - Ample posterior hymenal rim (1–2 mm wide)
  - Estrogen changes (thickened, redundant hymen)
  - Diastasis ani/smooth area at 6 or 12 o'clock in perianal area
  - Anal tag/thickened fold in midline
- Nonspecific findings (Class 2)‡
  - Erythema of vestibule or perianal tissues
  - Increased vascularity of vestibule or hymen
  - Labial adhesions
  - Rolled hymenal edges in the knee-chest position
  - Narrow hymenal rim, but at least 1 mm wide
  - Vaginal discharge
  - Anal fissures
  - Flattened anal folds
  - Thickened anal folds
  - Anal gaping with stool present
  - Venous congestion of perianal tissues, delayed in exam
  - Fecal soiling
- Suspicious for abuse (Class 3)§
  - Enlarged hymenal opening—greater than two SDs from nonabused study (McCann et al).[2]
  - Immediate anal dilitation of at least 15 mm with stool not visible or palpable in rectal vault.
  - Immediate, extensive venous congestion of perianal tissues
  - Distorted, irregular anal folds
  - Posterior hymenal rim less than 1 mm in all views
  - Condyloma acuminata in a child
  - Acute abrasions or lacerations in the vestibule or on the labia (not involving the hymen), or perianal lacerations
- Suggestive of Abuse/Penetration (Class 4)
  - Combination of two or more suspicious anal findings or two or more suspicious genital findings
  - Scar or fresh laceration of the posterior fourchette with sparing of the hymen
  - Scar in peri-anal area (must take history into consideration)
- Clear Evidence of Penetrating Injury (Class 5)
  - Areas with an absence of hymenal tissue, (below the 3 o'clock to 9 o'clock line with patient supine) which is confirmed in the knee-chest position
  - Hymenal transections or lacerations
  - Perianal laceration extending beyond (deep to) the external anal sphincter
  - Laceration of posterior fourchette, extending to involve hymen
  - Scar of posterior fourchette associated with a loss of hymenal tissue between 5 and 7 o'clock

* Table has been modified slightly from that which was published in *Adolesc Pediatr Gynecol* (1992;5:73–75).
‡ Findings that may be caused by sexual abuse, but may also be caused by other medical conditions. History is vital in determining significance.
§ Findings that should prompt the examiner to question the child carefully about possible abuse. May or may not require a report to Protective Services in the absence of a history.

TABLE 2. Overall Assessment of the Likelihood of Sexual Abuse*

- Class 1: No evidence of abuse
  - Normal exam, no history, no behavioral changes, no witnessed abuse
  - Nonspecific findings with another known etiology, and no history or behavioral changes
  - Child considered at risk for sexual abuse, but gives no history and has nonspecific behavior changes
- Class 2: Possible abuse
  - Class 1, 2, or 3 findings in combination with significant behavioral changes, especially sexualized behaviors, but child unable to give history of abuse
  - Presence of condyloma or herpes I (genital) in the absence of a history of abuse, and with otherwise normal exam
  - Child has made a statement, but not detailed or consistent
  - Class 3 findings with no disclosure of abuse
- Class 3: Probable abuse
  - Child gives a clear, consistent, detailed description of molestation, with or without other findings present
  - Class 4 or 5 findings in a child, with or without a history of abuse, in the absence of any convincing history of accidental penetrating injury
  - Culture-proven infection with *Chlamydia trachomatis* (child over 2 years of age) in a prepubertal child. Also culture proven herpes type 2 infection in a child, or documented Trichomonas infection
- Class 4: Definite evidence of abuse or sexual contact
  - Finding of sperm or seminal fluid in or on a child's body
  - Witnessed episode of sexual molestation. This also applies to cases where pornographic photographs or videotapes are acquired as evidence
  - Nonaccidental, blunt penetrating injury to the vaginal or anal orifice
  - Positive, confirmed cultures for Neisseria gonorrhoeae in a prepubertal child, or serologic confirmation of acquired syphilis

* Table reprinted with permission of Springer-Verlag, New York. Published in *Adolesc Pediatr Gynecol* (1992;5:73–75).

For children seen between July 1, 1991 and July 1, 1993 (n = 770), data cards were completed by the CSAEP examiner within 1 week of the examination. Colposcopic photographs, which were taken on all patients, were reviewed weekly, and a team member other than the examiner "read" the photographs and recorded and coded the findings, without being told the history on the child. The classification scale was then used to give a rating for genital findings and anal findings. The history and laboratory findings were then reviewed, a rating was given for the overall likelihood of sexual abuse, and this information was recorded. There were 95 cases (85 girls and 10 boys) reviewed in this manner in which we were able to determine that the legal outcome was a guilty plea, court conviction, or confession.

Information regarding legal outcome was provided by the law enforcement agency or District Attorney's office prior to or following the child's examination. Written requests for follow-up on legal outcome, and telephone calls to the District Attorney's office were also made by clerical staff, and by the research assistant. Information was sought concerning the type of criminal count, and whether the sentence included probation, house arrest, jail time, or fines. We were unable to obtain details on counts and sentencing on many cases, due to difficulty in tracking cases decided prior to 1991.

Data from all reviewed cases were entered into a dBase III program, and a BMDP statistical package was used to analyze the data. Discriminant analysis was used to identify variables which could predict the presence of abnormal (Class 4 or 5) genital findings on examination. Chi square analysis was used to compare the proportion of cases with abnormal findings between different groups, and paired *t* tests were used to compare data between groups with different legal outcomes.

RESULTS

In the final sample of 236 children, the mean age was 9.0 years, with a range of 8 months to 17 years 11

months. The majority of children (63%) were 8 years of age or older. There were 215 girls (91%) and 21 boys (9%). The distribution of racial background of the victims was 49% white, 42% Hispanic, 6% African-American, 1% Asian, and 2% mixed ethnicity. In 98% of cases, the suspected perpetrator was an adult male known to the child, and in 26% of cases was the father.

The type of molestation described by the child was fondling in 36%, oral-genital contact in 31%, digital-vaginal penetration in 44% of girls, and penile-vaginal contact in 63% of girls. Most children described more than one type of contact. Penile-anal contact/penetration was described by 28% of the children. The child reported experiencing pain in 45% of cases, and blood was found or reported at the time of the assault in 43 of 130 cases (34%) in which this information was available. The mean number of episodes of molestation, which were known in 63 cases, was 5.2. These numbers were estimates given by the children, and could not be verified.

The majority of suspected perpetrators (72%) plead guilty immediately prior to the trial or hearing. The court found 34 (14%) guilty following a jury trial, and 32 (14%) of the suspects confessed to varying degrees of sexual abuse. The type of criminal count was known in 172 cases. For the remaining 64 cases, the only information recorded on the chart by our office was that the perpetrator had pled guilty or confessed. We were unable to obtain further details on these cases because of different numbering systems at the police and the district attorney's office. The most common criminal counts were as follows: oral copulation (38%); "lewd and lascivious acts," which involve touching, but not necessarily penetration (15%); child molest, which includes exhibitionism and does not require that the child was touched (10%); other acts, including incest and sodomy (15%); digital penetration (8%); and rape (6%). The criminal counts often did not correlate with the specific acts alleged by the child. Sentencing included jail time in 90%, with a mean sentence of 7 years, as well as probation (30%), and other outcomes, especially fines (12%). Sentences often included probation or fines in addition to jail time.

Utilizing our classification system, we found the cases to break down as follows: 1) No evidence of abuse (4%); 2) Possible abuse (5%); 3) Probable abuse (81%); and 4) Definate evidence (10%). In the probable abuse category, 94% were based on a history of molest alone. Table 3 shows the frequency of normal and abnormal genital findings in girls, and of normal to abnormal anal findings in both girls and boys. None of the boys had abnormal genital findings.

Table 4 shows the frequency of the two or three most common specific findings in each class. Percentages were calculated using a total N = 213 for anal findings and N = 213 for genital findings in girls. There were 23 cases in which no anal photos were taken on girls, and two cases where the genital photographs did not show the hymenal rim clearly enough to make an assessment. These percentages do not necessarily correlate with the percentage of cases with overall genital or anal ratings in Table 3, because most patients had a combination of normal and nonspecific findings.

Figures 1 through 4 provide examples of genital findings using colposcopic photographs, with explanations of how each case was rated using the standard classification scale. For data analysis on genital findings in girls, the 213 cases with classifiable genital photos were studied.

In order to determine which variables predicted the presence of Class 4 or Class 5 (abnormal) genital findings in girls, discriminant analysis was performed using the following variables: age, child or caretaker's report of blood being observed with an episode of molest, time since last incident, description by the child of penile-genital contact or penetra-

TABLE 3. Frequency of Findings, by Type

Classification	Genital Findings in Girls (n = 213)*		Anal Findings in Boys and Girls (n = 213)‡	
	n	%	n	%
Normal	59	28%	67	31%
Nonspecific	104	49%	132	62%
Suspicious	20	9%	12	6%
Suggestive	10	5%	0	0%
Clear evidence	20	9%	2	1%

* Genital photos on girls were unable to be classified in two cases, due to inability to clearly visualize the entire hymenal rim.
‡ Anal photos were not taken on 23 girls.

TABLE 4. Frequency of Specific Findings

	n	% overall
A. Genital finding in girls (n = 213)		
Normal		
1. Normal appearance of hymen	107	50%
2. Ample posterior rim	104	48%
3. Estrogen changes	93	43%
Nonspecific		
1. Erythema	68	32%
2. Increased vascularity	53	25%
3. Labial adhesions	37	17%
Suspicious		
1. Narrowing of posterior hymenal rim to less than 1 mm (notch)	14	6%
2. Acute abrasions or lacerations in vestibule or labia (not involving hymen)	5	2%
Suggestive		
1. Combination of two or more suspicious genital findings	8	4%
Clear evidence		
1. Areas with an absence of hymenal tissue posteriorly, confirmed in knee-chest position	8	4%
2. Hymenal transection	11	5%
B. Anal finding in both (n = 213		
Normal		
1. Normal anal folds	119	56%
Nonspecific		
1. Fecal soiling	47	22%
2. Thickened anal folds	38	18%
3. Venous congestion	40	19%
Suspicious		
1. Anal dilatation of at least 15 mm, no stool	10	5%
Clear evidence		
1. Anal laceration	2	1%

Fig 1. Colposcopic photograph taken at 10 × magnification, patient supine, using labial traction. A 4-year-old girl with sexualized behaviors stated that her 14-year-old brother "hurt my vagina." Brother pled guilty to child molest. Photo shows normal annular hymen, no evidence of injury.

Fig 2. Colposcopic photograph taken at 10 × magnification, patient supine, using labial traction. A 9-year-old female stated that her 13-year-old cousin "poked his pee pee in my pee pee. It hurt a lot." Cousin pled guilty. Photo shows narrow rim of hymen posteriorly, which measured less than 1 mm at the 7 o'clock position. This was rated as a suspicious finding.

tion, and Tanner genital stage. Of the 213 cases, there were only 90 with complete data on all five variables. The F value to enter was 4.0, to give a statistical significance of $P < .05$.

The only variables which significantly discriminated between cases with and without abnormal genital findings in girls were the time since the last episode of molest and the reported presence of blood at the time of the molest. Chi square analysis showed a significantly higher incidence of abnormal genital findings in girls examined within 72 hours of the last episode of molest (8/19, 42%) compared to that seen in girls examined 1 month or more after the last episode (7/88, 8%; $P = .003$). Of 43 cases in which blood was reported in girls, the genital examination was abnormal in 20 (46%), compared to being abnormal in 7 of 87 (8%) cases where no blood was reported. Using chi square, this difference was also highly significant at $P = .000$. Of the 20 cases with a history of bleeding, 12 had acute trauma, with nine rated Class 5 and three rated Class 4 for genital findings. Eight girls had evidence of prior injury (nonacute), which was healed; five were Class 5 findings, and three were Class 4.

Table 5 shows the probability of finding Class 4 or 5 genital findings in girls, according to time since assault and history of bleeding. Using chi square analysis, the proportion of cases with abnormal genital findings in girls did not vary significantly according to age group, reports of pain, Tanner genital stage, or report of penile-vaginal contact/penetration.

The mean size of the horizontal diameter of the hymenal opening, using labial traction, was compared between 19 Tanner Stage I girls, age 8 years to 10 years, 11 months, who had described penile-vaginal contact/penetration (7.7 ± 2.6 mm), and published data on nonabused children of the same age (6.9 ± 2.2 mm²). There was no significant difference in these measurements. The girls alleging genital-genital contact had all stated: "He touched my private with his private," or some variation. Only one girl (see Fig 3) had an abnormal (suggestive) examination, with increased orifice size (11 mm) and hymenal narrowing to less than 1 mm.

Because the cases of 129 of the girls were reviewed retrospectively, based on photographs, and 84 were reviewed prospectively, the mean rating of genital findings in girls were compared between the "old" (N = 129) and "new" (N = 84) groups using a pooled t test. The P value was .81, which is not significant. Similarly, the cases (girls only) with a legal outcome of guilty plea (N = 151), confession (N = 29), and

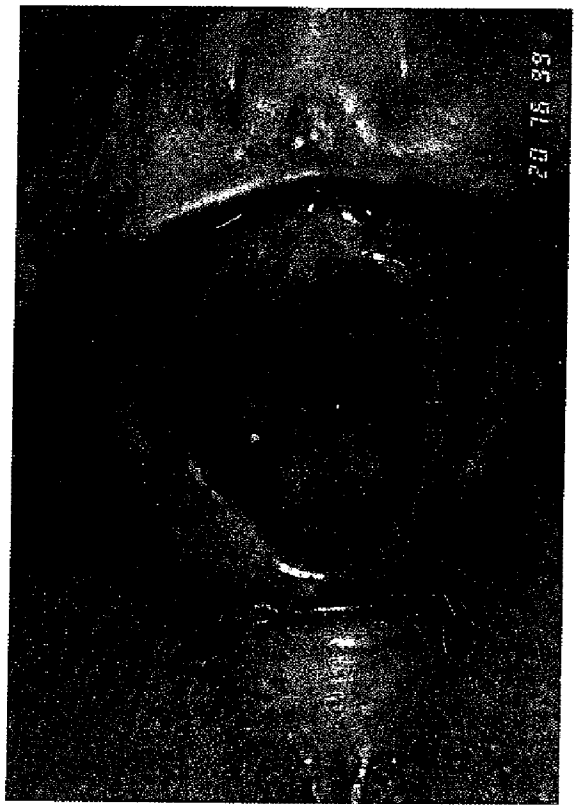

Fig 3. Colposcopic photograph taken at 10 × magnification, patient supine, using labial traction. A 10-year-old female gave a history that her grandfather "touched my front private with his private." She described pain, but no blood. The grandfather pled guilty to child molest. Photo shows enlarged orifice for age, with horizontal opening of 11 millimeters using traction, which is greater than two standard deviations above the mean for age and method. Also, hymen measured less than 1 mm in width between 5 and 7 o'clock. Combination of two or more suspicious genital findings makes this suggestive of abuse/penetration.

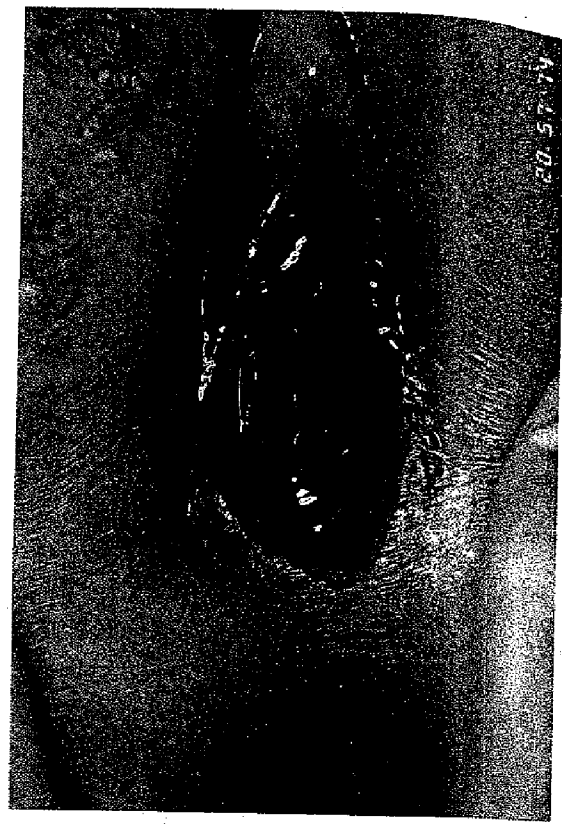

Fig 4. Colposcopic photograph taken at 16 × magnification, patient supine, using labial separation. This 8-month-old female infant was examined within 12 hours of being found with a large amount of blood in the diaper. The photo was taken approximately 36 hours after the injury. A 21-year-old male babysitter pled guilty to one count of digital penetration. This photo shows a healing laceration of the posterior fourchette which angles from 6 to 5 o'clock, a complete hymenal transection at 6 o'clock, and yellowish granulation tissue in the fossa, partially covering the hymenal transection. These findings are clear evidence of a penetrating injury, Class 5.

court conviction (N = 33) were compared on the following variables: age, history of penile penetration, report of blood, report of pain, time since last incident, and classification of genital findings. Analysis of variance revealed no significant differences between the groups on any of these variables. In a separate analysis of 29 confession cases in girls, details of specific acts confessed to were available in 11 cases. Of six cases in which the perpetrator confessed to digital-vaginal penetration, none had an abnormal examination, while abnormal (Class 4 or 5) findings were seen in four of five cases in which the perpetrator confessed to penile-vaginal penetration.

In order to determine whether cases with legal confirmation differed from cases without such confirmation, the 213 cases (girls) in this study were compared, using paired *t* tests or chi square analysis, with 157 cases of girls referred to our program in which it was confirmed that no criminal charges were filed. The mean age of the child in the legally confirmed cases was significantly higher than in the "no charges filed" (NCF) group (9.0 vs 7.3 years, $P = .000$). Descriptions of penile-vaginal contact and pain were more frequent; however, there was no significant difference in reports of bleeding. The mean rating of genital findings was significantly higher in the confirmed cases (2.2 vs 1.8, $P = .001$), using the paired *t* test. Using chi square analysis, the frequency of abnormal genital findings was significantly higher in the confirmed, compared to the NCF group (14% vs 2%, $P < .005$).

TABLE 5. Probability of Abnormal* Genital Findings in Girls

Time Since Incident‡	n	Blood Found or Reported§	
		Yes	No
Less than 72 hours	19	.90	.72
4 to 14 days	28	.79	.52
15 days to 5 months	59	.61	.32
More than 6 months	29	.40	.16

* Class 4 or 5 genital findings.
‡ Time known in 135 cases.
§ History available in 130 cases.

DISCUSSION

The patients in this study were chosen because the legal outcome in each case involved conviction of the alleged perpetrator. This selection method may have inadvertently included children who were not actually molested, therefore, the frequency of abnormal findings may be falsely low. Legal confirmation of sexual abuse was used as a selection criteria in order to obtain the largest undiluted population of referred children who were probably molested. The number of cases in which the perpetrator confessed to specific acts[11] was too small to conduct meaningful statistical analysis.

Since the charges in 170 of the 236 cases were the result of plea bargain agreements, there was no correlation between the acts described by the child (penile-vaginal penetration in 63%) and the specific counts to which the perpetrator plead guilty (rape in 6%). The perpetrator pled guilty to lesser charges, even though vaginal or anal penetration may have occurred. Also, since the examiner testified in court in 34 of the cases in which the perpetrator was convicted following a jury trial, it is possible that testimony concerning medical findings contributed to the conviction. However, the proportion of cases with abnormal genital findings did not differ between those involving confession, court conviction, and guilty pleas.

Child victims in the legally confirmed cases were significantly older, reported penetration and pain more frequently, and had more abnormal examination findings than children in those cases in which no charges were filed. These observations reflect the fact that in the six Central Valley counties that refer patients to our program, decisions whether to proceed with criminal charges are often based on either physical evidence, the child's ability to describe the abuse in detail, or a combination of both factors. In addition, age is very often a factor in whether or not a child is perceived to be a "good witness."

Kerns and Ritter[17] have reported that there was no difference in the likelihood of abnormal genital findings between a group of 83 girls in whose case the perpetrator confessed, and 563 girls with suspected abuse, but no confession. In their study, colposcopic photos were taken on all subjects, and reviewed in a standard manner. Their data also showed that 8 of 13 patients (61.5%) with perpetrator confessions of digital-vaginal penetration had normal examinations, compared to only 4 of 22 (18.2%) in which the perpetrator confessed to penile-vaginal penetration. In our study, the number of cases with specific details was small, however, a large percentage (4/5, 80%) of girls had abnormal findings when the perpetrator confessed to penile-vaginal penetration.

The classification of genital and anal findings using a standardized classification scale allowed for the independent review and rating of colposcopic photographs of each child, an objective process which has not been applied previously in this type of study. In Muram's study,[8] genital findings were classified using a four-point scale, however, colposcopic photographs were not used.

The frequency of normal or nonspecific genital findings in our study is the same as that reported by DeJong and Rose,[9] who reported that 77% of the 115 subjects whose charts they reviewed had no "physical evidence" of sexual abuse. In their study, colposcopic examinations were not performed, and photographs were not taken. Examinations took place at two or three different centers, and were conducted primarily by residents. The fact that we found the same proportion of normal cases using colposcopy and photographic review suggests that the detection of significant injuries may not necessarily require the use of the colposcope. We utilized measurements of the hymenal rim from the photographs to determine whether areas of apparent narrowing were less than 1 mm wide, and whether apparent enlarged hymenal openings were larger than two standard deviations beyond reported means for age and position. Using this method, many questionable abnormalities on examination were rated as nonspecific, rather than suggestive or clearly abnormal.

Our assessment of genital findings was based solely on review of the colposcopic photographs, and not on reports of what was noted by the examiner during the genital examination. This method may have led to an under-reporting of abnormalities, especially in pubertal females. Changes during a dynamic examination may not be reflected in static photographs. We used photographic findings in an attempt to use more objective criteria for reviewing the cases.

In rating the photographs without knowing the history, it might be possible to underestimate the significance of nonspecific findings such as erythema, superficial abrasions, and venous congestion found immediately after an episode of molest. An overall assessment is always given, however, and if the child's history is clear, the overall rating would still be "probable abuse." In the summary of the evaluation sent to the referring child protection agency, the examiner would comment that, for example: "The marked erythema of the vulva noted two hours after the alleged episode of molest is consistent with the child's history, and most likely reflects residual to such contact." Likewise, if a child describes only fondling and oral copulation, the examination would be expected to be normal, and that information is also given to the referring agency. Many kinds of touching leave no signs.

Muram[8] found a higher frequency of abnormal genital finding (45%) in the 31 cases he reviewed. In his study, the suspects confessed to sexually molesting the victims, and 18 of 31 cases, confessed to vaginal penetration. Information as to whether blood was reported, and the time since the last episode of abuse, was not provided in any of the three studies.

In our study, a history of penile-vaginal contact or penetration was not found to correlate with the presence of abnormal genital findings. This contrasts with the data presented by other authors[8,12] and even with data from an earlier study by one of us (J.A.A.).[13] One reason for this difference may be that we grouped together cases where the child described penile-genital contact and penile-vaginal penetra-

tion. Our rationale for this was that young children have no concept of what is meant by the term: "in the vagina." A statement such as "He put his thing in my private," may or may not mean that full penetration of the vagina occurred. Also, because estrogen changes in the hymen were seen in 42% of the girls in this study, the increased elasticity and distensibility of the hymen may have accounted for the lack of correlation between a history of penetration and the presence of abnormal findings.

The only two significant predictors of abnormal genital findings in this study were the time since the last episode and the history that blood was reported or observed at the time of the molest. This finding may have been influenced by the characteristics of the patients referred to our center. Only 10% of the patients in this study were examined within 3 days of the last episode of molest. It is known that acute injuries to the anogenital tissues heal rapidly, and may be difficult to detect after weeks or months.[18–20] The association of abnormal findings with a history of blood being reported or observed is not unexpected, even though it has not previously been reported.

The frequency of abnormal anal findings in our study was 1%. It is difficult to compare these results to other research, because the definition of abnormal findings differs from one study to another and has changed over time. Hobbs and Wynne[16] reported abnormal examination findings in 25% of girls and 83% of boys in their population of patients with suspected abuse, however, findings such as erythema, venous congestion, hyperpigmentation, and intermittant anal dilatation, which were considered abnormal, have subsequently been documented in nonabused children.[1] In addition, most studies do not list individual findings and their frequency, so that a comparison of the frequency of selected findings between studies is impossible.

One limitation of the current study is the lack of certainty regarding the exact type of abuse suffered by the child victims, since most charges were the result of plea bargain agreements. As in the entire area of child sexual abuse evaluation, we must rely upon the child's description of the molestation as the best method of characterizing the abuse.

In this study, 63% of the girls described penile-vaginal penetration as having occurred. There is no way to know whether the penetration was only through the labia, or partially into the vagina, without the events being videotaped or observed by a third party. Using the child's report alone, the only conclusion justified by this data is that the child's description of penetration was not significantly correlated with the presence of abnormal findings, in cases where the perpetrator was convicted. In most states, the legal definition of penetration is: "penetration of the female external genitalia or anus, however slight," so that it should not be necessary to prove that penetration beyond the hymen occurred before a child's description of the act is believed. In order to determine the frequency of abnormal genital findings in cases where there is some type of verification that full penile-vaginal penetration occurred, it will be necessary to review colposcopic photographs from cases where the perpetrator has confessed to penile-vaginal penetration. Because the number of cases is relatively small at each institution, a collaborative study is needed to collect sufficient data.

It could be argued that the review of the colposcopic photographs was not completely blinded, as it was known that all children photographed were referred for suspected abuse. However, at the time of the photo review, the findings were documented and classified using our scale before any historical information was reviewed. A truly blinded review would require that photographs of nonabused children as well as photos from legally confirmed cases of abuse be reviewed and rated by an outside consultant.

It should also be noted that the classification scale used in this study is currently undergoing revisions as more data are reported on nonabused children and known victims of penetrating genital injuries. This classification system was developed in order to maintain some internal consistency in the review process used at our center, and does not represent a consensus of medical experts regarding the classification of findings with respect to abuse. Although efforts are underway by committees of the American Professional Society on the Abuse of Children to reach a consensus on classification of findings, this will be a lengthy process.

CONCLUSIONS

This study provides additional data that the majority of children with legally confirmed sexual abuse will have normal or nonspecific genital findings. Abnormal anal findings are very rarely found. The best predictors of abnormal genital findings in female victims are the time since the assault and a history that blood was reported or observed at the time of the molest. A history of vaginal penetration given by the child did not significantly correlate with abnormal genital findings.

The use of a clearly defined method of classifying the significance of anal or genital findings, and determining the overall likelihood of abuse, allowed for the objective review of a large number of cases. It is hoped that this classification scale, or its revised version, may enable researchers and clinicians at other centers to collaborate effectively in future research endeavors.

This study also reaffirms that the history of the molest provided by the child is probably the most important evidence of sexual abuse. While widely accepted in the medical field, this fact is still not universally accepted in the legal arena. There are many reasons why a child's examination may be normal, as reviewed by Bays and Chadwick[6], and these reasons need to be reiterated to professionals involved in the assessment of children who have been molested, as well as those who are responsible for decisions regarding legal proceedings.

A comprehensive discussion of the importance of interviewing children in a sensitive manner, as well as a presentation of interviewing techniques, appears in a recent textbook on child abuse evaluation.[21] This

book is an excellent resource for all health professionals working with children who may have been abused. When the child makes a statement that is clear, consistent, and detailed, the physical examination should not be relied upon to provide the "proof" before proceeding with criminal charges. Health professionals who examine children must be as diligent in obtaining and recording the details of the child's statement as we are in recording the appearance of the hymen, and not be pressured to make a "diagnosis" of sexual abuse based on medical findings alone.

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REFERENCES

1. McCann J, Voris J, Simon M, Wells R. Perianal findings in prepubertal children selected for non-abuse: a descriptive study. *Child Abuse & Neglect*. 1989;13:179–193
2. McCann J, Wells R, Simon M, Voris J. Genital findings in prepubertal children selected for non-abuse: a descriptive study. *Pediatrics*. 1990;86: 428–439
3. Berenson AB, Heger AH, Hayes JM, Bailey RK, Emans SJ. Appearance of the hymen in prepubertal girls. *Pediatrics*. 1992;89:387–394
4. Berenson AB, Heger A, Andrews S. Appearance of the hymen in newborns. *Pediatrics*. 1991;87:458–465
5. DeJong, AR. Genital and anal trauma. In: Ludwig S, and Kornberg AE, ed. *Child Abuse, A Medical Reference*. 2nd ed. New York, Edinburgh, London, Melbourne, Tokyo: 1992; 18:245
6. Bays J, Chadwick D. Medical diagnosis of the sexually abused child. *Child Abuse & Neglect*. 1993;17:91–110
7. Adams J. Significance of medical findings in suspected sexual abuse: moving towards consensus. *J Child Sexual Abuse*. 1992;1:91–99
8. Muram D. Child sexual abuse: relationship between sexual acts and genital findings. *Child Abuse & Neglect*. 1989;13:211–216
9. DeJong AR, Rose M. Legal proof of child sexual abuse in the absence of physical evidence. *Pediatrics*. 1991;88:506–511
10. Adams, JA, Harper K, Knudson S. A proposed system for the classification of anogenital findings in children with suspected sexual abuse. *Adolesc Pediatr Gynecol*. 1992;5:73–75
11. McCann J, Voris J, Simon M, Wells R. Comparison of genital examination techniques in prepubertal girls. *Pediatrics*. 1990;85:182–187
12. Kerns DL, Ritter ML, Thomas RG. Concave hymenal variations in suspected child sexual abuse victims. *Pediatrics*. 1992;90:265–272
13. Adams, JA, Ahmad M, Phillips P. Anogenital findings and hymenal diameter in children referred for sexual abuse examination. *Adol Pediatr Gynecol*. 1988;1:123–127
14. Emans SJ, Woods ER, Flagg NT, Freeman A. Genital findings in sexually abused, symptomatic and asymptomatic, girls. *Pediatrics*, 1987;79: 778–785
15. White ST, Ingram DL, Lyna PR. Vaginal introital diameter in the evaluation of sexual abuse. *Child Abuse & Neglect*. 1989;13:217–224
16. Hobbs CJ, Wynne JM. Sexual abuse of English boys and girls: the importance of anal examination. *Child Abuse & Neglect*. 1989;13:195–210
17. Kerns DL, Ritter ML. Medical findings in child sexual abuse cases with perpetrator confessions. *Amer J Dis Child*. 1992;146:494
18. McCann J, Voris J, Simon M. Genital injuries resulting from sexual abuse: a longitudinal study. *Pediatrics*. 1992;89:307–318
19. Finkel MA. Anogenital trauma in sexually abused children. *Pediatrics*. 1989;84:317–322
20. McCann J, Voris J. Perianal injuries resulting from sexual abuse: a longitudinal study. *Pediatrics*. 1993;91:390–397
21. Finkel MA, DeJong A. Medical findings in child sexual abuse. In: Reece RM. *Child Abuse—Medical Diagnosis and Management*. Philadelphia, PA: Lea & Febinger; 1994:185–247

YOUR DOCTOR IS NOT IN, BY JANE M. ORIENT

Jane M. Orient. *Your Doctor Is Not In.* Crown: 288 pages, $23.

The government has signed a contract to pay $850,000 for development of "practice guidelines" and "protocols" to tell doctors how to treat an ear infection, a $20 problem. If the Clinton administration has its way, there will be protocols for the treatment of virtually every ailment. Yet there is no evidence that protocols save money or improve quality. Nurses, for instance, outperform protocols in deciding how to treat abdominal pain.

So why aren't doctors raising a cry of alarm? Many have been browbeaten into submission, or have discovered that it's easier to play the game than to buck the system. But also, a different type of person is entering medical practice these days. Although the evidence is largely anecdotal, Dr. Orient says that the best students are avoiding medical schools and the schools are lowering their standards. (In 1990, 16% of medical graduates flunked the national boards, compared with 9% in 1984.)

Goodman J. *New York Times*. June 10, 1994. Dr. Goodman is president of the National Center for Policy Analysis and co-author (with Gerald L. Musgrave) of "Patient Power" (Cato Institute, 1992).

Noted by J.F.L., MD

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SEXUAL ABUSE OF ENGLISH BOYS AND GIRLS: THE IMPORTANCE OF ANAL EXAMINATION

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Abstract—Child sexual abuse is attracting increasing attention in the United Kingdom. In Leeds this is reflected in the work of two pediatricians who receive multiagency, direct referrals for children of all ages. Over two years 1,368 referrals were received for all kinds of abuse and neglect, including 608 for suspected sexual abuse (Hobbs & Wynne, 1987a), of which 337 (243 girls, 94 boys) were confirmed or probable cases. The abuses included genital touching, masturbation, oral, vaginal and anal penetration. Of these abuses, 30% (which were frequently multiple) involved anal penetration by finger or penis; and 42% of 337 children exhibited one or more anal findings, rising to 60% of 115 children in the 0-5 years of age group. The diagnosis of abuse was made from results of multidisciplinary assessment including medical examination. Genital findings were present in 3% of boys and 50% of girls. Anal findings included erythema; swelling (tyre); laxity; shortening or eversion; reflex anal dilatation (dilatation); fissures; venous congestion; reversible and permanent skin changes; twitching; funnelling; hematoma and bruising; as well as signs of infection. The pattern of anal signs varied with the age of the child and chronicity of abuse, as judged from the history. Healing and resolution of anal physical findings on follow-up were observed from days to months after initial examination. The general absence of these findings in the group of children judged not to have been sexually abused supports a cause and effect hypothesis, but further research is required. Medical examination of every child where symptoms, signs, or situation raise the possibility of abuse or neglect must include anal inspection, but instrumental or digital examination is not recommended.

See Also Editorials, Commentaries, and pp. 179-193; 211-224.

INTRODUCTION

CHILD SEXUAL ABUSE in the United Kingdom is receiving increasing attention. Recently a major public inquiry (Butler-Sloss, 1987) reporting its findings stated that "we have learned during the Inquiry that sexual abuse occurs in children of all ages, including the very young, to boys as well as girls, in all classes of society and frequently within the privacy of the family." In the U.K. attempts to intervene are in their infancy, and this paper represents experience derived in this early phase of understanding and management of sexual abuse.

The spectrum of physical abuse has changed over the years since the first cases were reported in the 1960s, and to assume that the clinical spectrum presented in this paper is necessarily comparable to that which may be found in other countries is unwise, particularly in those countries with longer experience of working in the area of sexual abuse, such as is true in the U.S.A.

In 1986 we published findings relating to 30 children who were seen in an 8-month period in 1985 (Hobbs & Wynne, 1986). From the history, statements made by the child, admission of guilt by many of the abusers, and findings on physical examination, we concluded that anal abuse (buggery) had occurred to these children. As some of these children presented because physical and other abuses had been detected, we could only presume that prior to 1985 sexual

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Table 1. Gender Distribution by Year

	Boys	Girls	Mean Age
1985	21	79	8.8
1986	73	164	7.4
Total	94	243	

abuse had not been recognized among physically abused children, either because of failure to inquire of the children or routinely to examine their anuses.

The physical signs found in these children included signs previously described in the context of anal penetration (Gancz, 1962; Paul, 1986). While the communication did not primarily attempt to assess the selectivity or specificity of these physical findings for sexual abuse, we did indicate that in the nonabused children we had examined, certain of these findings had not been observed. In this paper we describe the anal findings in a larger group of 337 children (Hobbs & Wynne, 1987a), in whom a diagnosis of probable or confirmed sexual abuse was made, and we attempt to place anal abuse within the context of the overall clinical picture of child sexual abuse. Abnormal findings in anal abuse result from the process of traumatic penetration of the anus, although it is not possible from examination to state the exact nature of that penetration.

Experience of Child Sexual Abuse in Leeds

In 1982 a multidisciplinary group of interested child care professionals began to meet to explore the problems of child sexual abuse. Although a pediatric service for physically abused and neglected children had been available since the 1960s, we had diagnosed no cases of sexual abuse prior to 1980. In 1980, 3 were seen, and numbers rose slowly to 9 in 1983, followed by a steeper rise with 30 cases in 1984, 100 in 1985, and 237 in 1986.

METHOD

Subjects (Hobbs & Wynne, 1987a)

The information provided in this paper relates to experience in the two calendar years 1985 and 1986. Out of 1,368 children referred in these years from the two health districts of Leeds (total population 750,000) with suspected abuse or neglect, 608 were referred primarily because of concerns regarding sexual abuse. Of these, 100 in 1985 and 237 in 1986 (total 337 or 55% of referrals for suspected sexual abuse) were diagnosed as having been sexually abused.

As there are no absolute criteria for diagnosis of sexual abuse, the cases included a spectrum of certainty ranging from complete proof (statement by child, admission by abuser with corroborative physical and forensic evidence) to lesser degrees of certainty (e.g., genital wart infection) with evidence of disturbed family relationships or behavior disorders in child. We attached particular importance in diagnosis to a clear unprompted statement by a child, to the presence of sexually transmitted disease, and/or physical abnormalities of the genitalia and anus which had resulted from injury. Physical signs alone are rarely sufficient for diagnosis, but their association with sexually inappropriate behavior or with a number of symptoms or indications known to be associated with sexual abuse raises the probability. In preverbal children, diagnosis has to rest on evidence other than the statement of the child, and here physical signs of genital or anal damage was of paramount importance. We did not attempt to grade cases with a degree of certainty. However, in every case (33% of 337) in which protec-

Table 2. Gender Distribution by Age ($N = 337$)

	Boys	Girls	Total
0–5	30	85	115
5–10	34	80	114
10–15	23	67	90
15	7	11	18
Totals	94	243	337

tive orders in court were sought, a successful outcome was obtained. In relation to 25% of the children, successful prosecution of the abuser was achieved. Up to February 1987 a clear disclosure of abuse had been made by the child in 204 cases, but there were other children who through age, death, handicap, protection by disclosure of a sibling or accommodation had not disclosed where physical evidence strongly pointed to abuse.

There were 79 girls and 21 boys in 1985, and 164 girls and 73 boys in 1986 with a mean age of 8.8 years in 1985 and 7.4 years in 1986. Excluding 19 children over the age of 15 years, the percentage of children in the age groups for girls and boys respectively were 0–5 years old was 27% and 9%, 5–10 years old was 25% and 11%, 10-15 years old was 21% and 7% (Tables 1 and 2).

These children were referred by doctors, social workers, nurses, health visitors, day care and residential staff, school teachers, hospital staff including child psychiatrists and psychologists, pediatricians, accident and emergency specialists, police, and the general public. These agencies have open access direct referral to our service for the diagnosis of child abuse.

Assessment

The child was usually seen the same day by one of the study's pediatricians or less commonly by a senior training grade pediatrician under supervision. With selected cases of sexual abuse, a delay of a day or two was acceptable. Where acute symptoms had been observed, the child was seen quickly and often before other doctors had become involved. Pediatric assessment was viewed as an early part of the overall assessment of the possible victim of sexual abuse. Colleagues in child psychiatry receiving referrals for emotional and behavioral disturbance generally arranged pediatric assessment including examination as part of their initial evaluation where abuse was suspected, although this only accounted for 3% of referrals during the study period. Mode of presentation is shown in Table 3. Of the 2% detected during routine examination of children in special schools, some exhibited behavioral and learning difficulties which might have been related to the abuse. In this sample, around two-thirds of abusers were blood relatives or a stepparent of the child; and just under one-third, natural fathers. Further information is available elsewhere (Hobbs & Wynne, 1987a).

Table 3. Mode of Presentation (337 Children)

Disclosure by child	39
Alerting symptoms or indicators;	
behavioural	7
physical	15
Physical abuse	10
Sibling or child in contact	16
Allegation by third party	11
Routine	2

(figures as percentages)

Table 4. Types of Abuse (History and Examination)

	Anal		
	Boys (94)	Girls (243)	Vaginal
0–5	27	42	6
5–10	23	17	13
10–15	21	12	34
15	1	1	10
Totals	78	72	63

To assess the full scale of abuse which a child has suffered is difficult. Months or years later children continue to reveal more of what has happened. In the initial and subsequent assessments, we estimated that 30% of all the various abuses identified were anal (boys, 83%; girls, 29%). Many children suffered multiple abuses. Again further details are provided elsewhere (Hobbs & Wynne, 1987a) (Table 4).

Anal Examination

The anal examination is a small part of the overall pediatric assessment (Hobbs & Wynne. 1987b) of the child suspected of abuse. The examination includes history; assessment of child's health, growth and development; emotional and behavioral problems; and a full physical examination including genital and anal inspection.

The genitalia are examined with the child lying on his/her back. The anus is inspected with the child lying on the left side on a couch with hips and knees flexed, and with a pillow under the head; when the child is very young, on his mother's knee. The child must be relaxed in order to achieve a satisfactory examination. We have no experience of examining children in the knee chest position and do not know if findings are comparable. Some children find this position less dignified. In the left lateral position, the buttocks are gently separated with both hands; and without exerting traction on the anus, the examiner pauses for about 30 seconds to see whether the anus dilates. During this time the examiner may become aware in some children of external venous engorgement. Also localized gentle traction on the anus allows clear visualization for fissures and an assessment of the tone of the anus.

Some examiners, mainly police surgeons in the U.K. (Roberts, 1986), recommend digital rectal examination to assess the grip of the anal sphincter which is said to reduce following abusive penetration. Being dubious of the value of the extra information which the examination is said to offer while acknowledging that some doctors may find it useful, we have avoided this, not wishing to violate the child further.

Instrumental examination of the rectum may be of value if alternative or additional pathology is considered in the differential diagnosis where abnormality has been found. In one 4-year-old child with signs indicative of anal abuse, the presence of unusual recurrent bleeding was found to be due to a rectal polyp which was visualized and removed via a colonoscope. In two other anally abused children who showed evidence of prolapsed rectal mucosa, colonoscopy revealed mild changes of proctitis of the distal end of the rectum, but no other pathology was noted.

We would certainly not recommend routine instrumental examination. Appropriate forensic and bacteriological swabs should be taken. Adequate photographs can be obtained using a macro lens with focal length of around 100 mms which provides half life-size images on the film. As some of the physical signs are dynamic, photographs must also be interpreted alongside the examining doctor's written report.

Table 5. Distribution of Abnormal Findings in Sexually Abused Boys and Girls

Number with Anal Signs Present	All Ages (337)	0–5 (115)
Boys (N = 94)	78	27
Girls (N = 243)	65	42
Total	143	69

OBSERVATIONS

Physical Examination (Hobbs & Wynne, 1987b)

There is widespread agreement among physicians skilled in the examination of sexually abused children that many children have no physical abnormalities. The presence or absence of signs of injury, infection, or forensically valuable material (e.g., semen) depends on the nature of the sexual contact and the time interval between the last episode and examination. Physical findings in the study population included the following: Three boys had a genital injury—one, a bruised penis; and two, scrotal burns. Of the girls, 141 (58%) showed physical findings consistent with trauma or infection and therefore of relevance to the diagnosis of abuse (Hobbs & Wynne, 1987a). Eleven children had a sexually transmitted disease. Along with other authors (Emans, Wode, Flage, & Freeman, 1987), we have noted the difficulties of interpretation of genital physical findings in girls (Hobbs & Wynne, 1987a). In Leeds early physical examination has been adopted in the assessment of abuse and may be one of the reasons that signs of trauma were seen more frequently in this study as compared to others.

Physical Signs Associated with Anal Abuse

Various signs were observed in children, many of whom disclosed anal abuse. Tables 5 and 6 illustrate the percentage, distribution of abnormal findings and frequency of individual signs in sexually abused children with anal signs among children of all ages and those aged 0-5 years.

The signs are variable. It is reasonable to ask whether such factors as the use of lubricants, age of child, force used, chronicity and frequency of abuse, and position of child in relation to adult, influence the degree, site, and nature of any injury. Appearances and findings are greatly influenced by the time interval between the examination and last penetration of the child. The signs observed included the following:

1. Perianal erythema (reddening). This reddening may extend anteriorly to include the skin overlying the perineum as well as the inner aspects of the thighs and labia, where there has been intracrural intercourse (penis between legs and laid along the perineum). Ery-

Table 6. Percentage Frequency of Individual Signs in Children with Anal Signs

Physical Sign	All Ages (N = 143)	0–5 (N = 69)
Fissures or tears	53	59
Reflex anal dilitation	42	53
Reddening/skin changes	53	43
Laxity	38	37
Venous congestion	24	21
Tyre	8	19
Scars/Tags	8	3
Warts	4	6

Figure 1. (Plate 6). Two-year-old black girl with sudden onset of nightmares, wetting, and clinginess noted at home and in day nursery. Anus shows reflex dilatation, "tyre sign," and some perianal venous congestion. Signs had healed in one week. Child said, "Daddy's snake bited my bottom."

Figure 2. (Plate 3a). Gross anal abnormality found in 3-year-old girl who had been exhibiting aggressive biting of younger brother. Lax dilated anus with deep fissures, swollen rim, and venous (dark) congestion in a half-circle around the posterior anus. Prominent skin papillae are noted, suggested edema of the tissues. Two other children in family with similar findings discovered.

Figure 3. (Plate 2). Postmortem findings in a 14-month-old female child who allegedly drowned in the bath while in the care of stepfather. Gross anal dilatation present on first arrival in emergency room (shortly after death). Absent sphincter, irregular anal margin, and smooth perianal skin. Old fracture (healing) of femur, severe malnutrition, "grasp" bruises around both knees. Older brother (5 years) disclosed oral and anal abuse by stepfather.

Figure 4. (Plate 1). Wide reflex dilatation in 12-year-old girl who had a 6-year history of regular anal intercourse with father. Resolution of signs was gradual over about 12 months.

Figure 5. (Plate 8). Girl (3.5 years old) referred with possible cigarette burn on abdomen. Anus showed dilatation, reflex dilatation, multiple fissures (especially seen well laterally), thickened margin, and prominent skin papillae. There was an anterior vaginal wall tear. The child exhibited frozen watchfulness and developmental delay. Father admitted to penetration of child's anus.

Figure 6. (Plate 7). Eight-year-old girl presented in school with a love bite on her neck, allegedly caused by her brother, aged 12 years. Child was overfriendly and passive. Anus showed pale, wide, deep anterior tear with a swollen prominent fold adjacent to it. The anus is closed and the other folds are reasonably normal. There is a posterior band of dark venous distension, and the whole of the anus is darkened by venous discoloration. Vulva shows widely dilated, smooth, hymenal orifice, with rolled attenuated hymen. Child disclosed both anal and vaginal abuse, witnessed by child's mother.

Figure 7. (Plate 4). Twelve-year-old boy abused extrafamilially as a "rent boy." Anus deeply placed in a dished hollow suggests "funnelled" appearance. The fold pattern is irregular with swelling of upper folds. No dilatation, fissures, or distended veins present. Minimal appearances are commonly in recurrently abused older children and adolescents. Child disclosed that full penetration paid £5.00; half penetration £2.50.

Figure 8. (Plate 5). Four-year-old boy with perianal warts (stained with iodine at surgery for removal). Anal margin is swollen in "tyre" formation. Twin brother and father also had perineal warts. The usual mode of transmission is sexual.

Figure 9. (Plate 3b). Same child as Figure 2, healing three weeks after Figure 2. Anal folds reforming, anus closed, and areas of flat venous congestion still noticeable.

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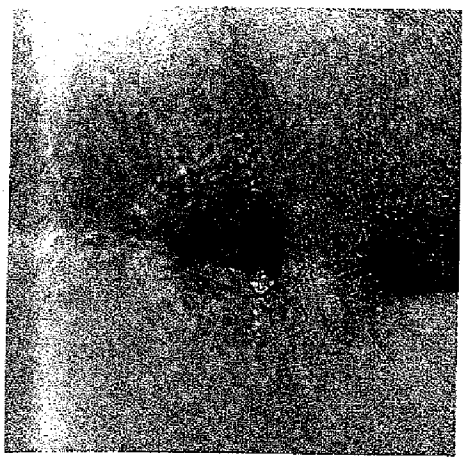

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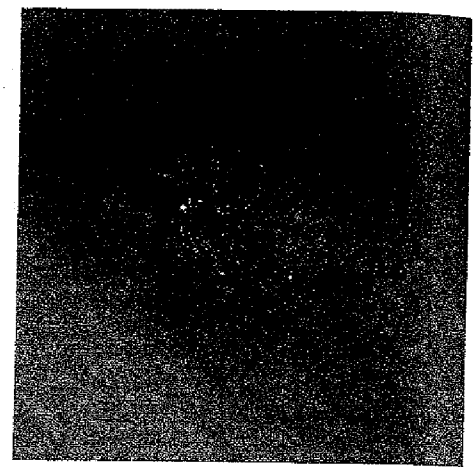

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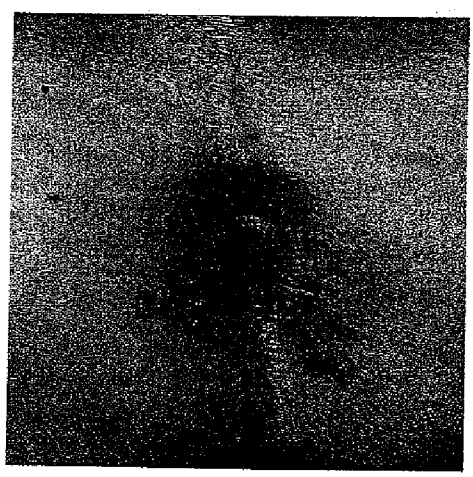

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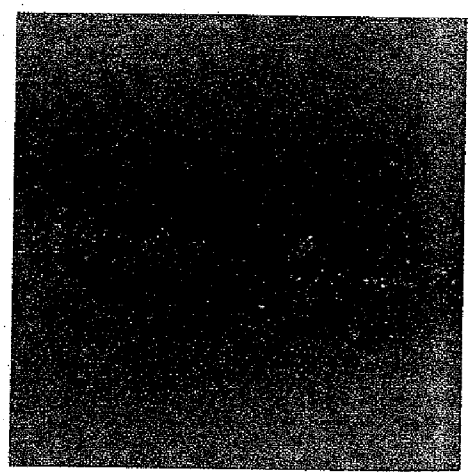

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thema can be found in children with diaper rash, poor hygiene, or after scratching and irritation which accompany threadworms (enterobiasis).

2. Swelling of the perianal tissues (Figure 1). This swelling is diagnosed in a ring, and we have called this the tyre sign. It is commonly seen as an acute sign and may reflect traumatic edema. It has been suggested that muscular hypertrophy of the external sphincter could produce a similar appearance (Bamford & Kiff, 1987).
3. Laxity and reduced tone of the anal sphincter (Figure 2). This is assessed by exerting gentle traction on the sphincter; other doctors have favored digital examination (Roberts, 1986).
4. Shortening or eversion of the anal canal (Figure 3) so that the anorectal junction with its characteristic star-shaped folds becomes approximated to the anal orifice. This is a finding limited to the first two or three years of life and is likely to reflect repeated anal intercourse. It is usually associated with laxity and reduced anal tone.
5. Anal dilation (Reflex Anal Dilatation, Figures 1, 2, 4, & 5). This is the most dramatic sign found in anally abused children. Different names have been used in the past for a sign which has been described over many years for forensic physicians (Gancz, 1962; Mant, 1960; Paul, 1986; Rentoul & Smith, 1973; Summers, 1969). Terms include reflex anal dilatation, reflex relaxation of the anus, the lateral buttock traction test, "O" sign (Goligher, 1984).

While it is true that in the left lateral position the buttocks of necessity are separated in order to view the anus, opening or dilatation of the anus is not always an immediate response to buttock separation; and therefore it is doubtful that this is a true reflex response to that stimulus. The dilatation has been observed in children where there is no "hands on" contact with the examiner. Dilatation frequently follows visualization by several seconds (up to 30 seconds or more in some cases), suggesting a mechanism other than reflex. What the observer sees is that the anus, which normally remains closed, opens into a circular tube down which the examiner is able to observe the lining of the anal canal and in many cases the rectum. The opening may close, only to reopen, sometimes repetitively. The opening is smooth, circular, and the degree of dilatation variable—at maximum up to about 2 cm and occasionally a little more.

To ask whether this dilatation occurs in normal nonabused children is reasonable. Minor dilatation (i.e., dilatation up to 0.5 cm diameter) occurs with the passage of wind, and it is wise not to examine the child just before or after defecation. However, dilatation over 0.5 cm without the passage of wind does not, in our experience, occur in normal children examined as described. The presence of stool visible in the rectum should not discount significance of the finding. It is safest to ask the child to pass the stool and reexamine. Anal dilatation has been described following manipulative surgery to the anus (for example, stretching of the anus undertaken in the treatment of constipation, soiling and fissures) (Paul, 1986). Care should be exercised in interpreting this sign if there has been repeated digital rectal examination, use of suppositories or enemas. However, there appear to be no data to support the hypothesis that this finding occurs in such diverse conditions as threadworms, Candidal infection or nonspecific inflammation of the perianal skin due to poor hygiene.

The sign was present in only 4% of our total referrals for possible abuse, 18% of sexually abused children, and 42% of sexually abused children with anal signs. The widespread attention afforded to this physical sign by the media in the U.K. is a reflection of the findings of the pediatricians in Cleveland (Donaldson, Higgs, & Wyatt, 1987).

In an analysis of 120 children (82 girls, 38 boys), all the boys and 49 of the girls had anal signs consistent with sexual abuse. Of the children with signs, 86% showed anal dilatation, 61% fissures, 25% venous congestion, 16% scarring, 16% funnelling, 7% laxity, and

32% other signs (reddening, edema, skin tags, and warts). Only two index case children (index refers to the child who presented as opposed to sibling) exhibited reflex anal dilatation alone in the absence of the mention of other anal or vaginal signs.

Finally, it has been suggested that massive retention of rectal feces in severe chronic constipation may lead to relaxation and distension of the internal anal sphincter and a tendency for the anus to dilate (Clayden, 1988). In these children the presence of a mass should be easily detected and confusion with abuse avoided. The visibly relaxed sphincter in these cases, many of whom had megarectum, is somewhat different to the findings in abused children of anal dilatation.

The mechanism of anal dilatation following penetrative anal abuse is not clear. At least one child has demonstrated voluntary control of this phenomenon. We suspect that the more relaxed and accommodating the child is to the examiner, the more likely this sign will be elicited. This would be consistent with the hypothesis that anal dilatation facilitates penetration and thereby protects the child from pain and discomfort. Another view is that stretching of the internal anal sphincter from mechanical trauma following buggery leaves the sphincter damaged and unable to remain closed (Bamford & Kiff, 1987). When the child is examined, relaxation of the external sphincter occurs as the child is able to maintain contraction for no more than a few seconds. With the buttocks separated, the natural tendency of the walls of the anal canal to remain closed is lost. The child attempts to keep the sphincter closed, but the external sphincter tires and the anus opens due to the relaxation of both sphincters.

6. Fissures (also known as tears) (Figures 2, 5, & 6). Breaks in the skin/mucosal covering of the rectum, anus, and anal skin occur as a result of overstretching and frictional force exerted on the tissues. This may follow the passage of a hard stool (over which the child has some control) or traumatic penetration of the anus in abuse.

   One or two fissures may result from either situation, whereas multiple (more than two) fissures have, in our experience, only followed abuse. Tiny superficial cracks in the anal verge or perianal skin occur following scratching with threadworms or with excoriation from acute diarrhea or diaper rash. Significant fissures extending into the anal canal, or across the perineum, should be painful, and elicit anal spasm. The combination of lack of spasm and the presence of a fissure should suggest abuse, although the reverse is not true. Why children with fissures do not apparently complain of pain may be related to a form of psychological anesthesia, and this should be noted.

   The fissures may occur anywhere around the 360° radius (0-12 o'clock) and directly posterior (6 o'clock). Sizeable fissures may heal with scarring and leave a skin tag as a marker of the site of earlier trauma. Sentinal veins may be found on either side of a fissure. Chronic fissures can appear as deep clefts distorting the anal shape. Chronicity suggests that the existing cause is continuing.

7. Venous congestion (Figures 1, 2, 6). In order to elicit this physical sign, it is necessary to wait for up to half a minute with the anus visualized. Purple, blue to black discoloration around the anal margin corresponds to areas of venous congestion. The patterns vary from bunches of grape-like clusters to flat areas of discoloration. The veins may extend as a ring around the whole 360° circle, or be limited to a segment, as for example in association with a fissure. Veins are not usually seen in the normal anus unless undue traction is exerted or observation for extended periods employed. The incidence of hemorrhoids in children, which could possibly cause confusion, is extremely low.

   Venous congestion is not specific for the injury from abuse, and it is likely that anything which interferes with the normal vascular drainage in the area can produce a similar picture. In one case a tumor in the lower rectum produced marked venous distension. Venous congestion may be one of the last findings to disappear with healing.

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Excessive traction and long periods of observation (over 30 seconds) may lead to venous congestion in normal children. Also we do not know the effects of differing examination positions on this sign. Until further research is available, we emphasize caution in the interpretation of this sign, especially if it is an isolated finding.

8. Skin changes (Figure 3). These are of two types: reversible and permanent. Reversible changes in the skin have been described by Paul (1986). He states that repeated acts of penetration will lead to reaction in the anal verge skin in response to repeated frictional stimulation. This results in thickening, and the normal anal skin folds will be smoothed away by the thickening and repeated stretching of the fibers of the corrugator cutis and muscle. The appearances are of smooth, often rather pink, shiny skin with loss of normal fold pattern. The presence of these skin changes suggests chronicity of abuse.

   Permanent skin changes in the form of scars provide long-term evidence of earlier trauma. Paul (1986) states that the skin edges are pulled apart once the anal verge skin has split, providing a triangular break in the continuity of the anal verge skin with the apex of the triangle directed into the anal orifice. Healing may be delayed by infection, passage of stools, or further abuse. The scar, therefore, is often fan-shaped, radiating from the anal orifice, and appears as a pale thickened area distorting the normal folds. A heaped up skin tag is also sometimes found, as well as linear scars. Scars are uncommon and found in under 10% of abnormal anuses in our series.
9. Twitchy anus. Visualization of the anus may allow the observer to witness alternate contraction and relaxation of the external sphincter without anal dilatation. In our experience this twitchiness is a significant sign, as many children with it have later disclosed of abuse or developed additional signs. Relaxation of the external sphincter may produce a dish-shaped anus similar to the appearance of funnelling.
10. Funnelling (Mant, 1960), (Figure 7). This is a traditional sign but its presence in children has been questioned (Paul, 1986). Certainly we also doubt whether it is seen in very young children, but have observed a deep-set, dished anal appearance in older children. When photographing the findings in such cases, the photographer is aware that there are difficulties in achieving focus because the anal folds do not lie in a single plane.
11. Hematoma, bruising. Most of the purple/blue discoloration seen around the anal margin in abused children is the result of changes in vascularity, and the changes with time confirm this. While bruising of the perianal skin is uncommon in our experience, hematomas at the anal margin are seen from time to time. These present as proud, discolored, localized swellings which distort the normal fold pattern. They are usually painful, and children with this finding may be anxious about examination.
12. Anal warts (Figure 8). These can occur as an isolated physical finding or with other signs consistent with abuse, either anal or genital. A clear relationship between anal warts and anal coitus has been demonstrated in adults (Oriel, 1971). In adults, ano-genital warts are most frequently associated with human papilloma virus types 6 and 11 and less commonly 16 and 18 (Fleming, Verning, & Evans, 1987). DNA HPV typing should assist assessment when the question of non-venereal transmission (e.g., from hand warts) is raised. At the present time, anal warts suggest the possibility of sexual abuse and invite careful assessment with this in mind.

DISCUSSION

Healing

Our practice of follow-up anal examination has led to the finding that virtually complete healing, even in very young children (1-2 years), is to be expected. This may take from weeks

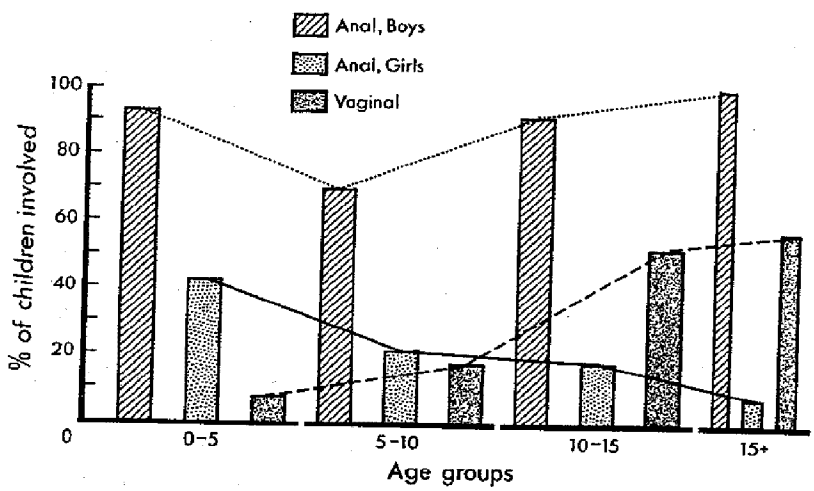

Figure 10. Penetrative sexual abuse.

to years, with some anal appearances remaining permanently abnormal with scarring. Acute, single acts may result in gaping, dilatation, and swelling of the anal margin which largely disappears within 7-10 days. Healing takes longer in chronic abuse. Deep fissures may take months to heal, and distended veins are frequently one of the last signs to disappear (Figure 9). Anal dilatation commonly disappears in 1-6 weeks, but for some children it has remained many months after abuse has ceased. As the signs disappear, lesser degrees of dilation are seen.

Follow-up examination is recommended to doctors who undertake this work to enhance their experience and assessment of chronicity and timing of abuse. This can be of importance medico-legally, but it is as well to emphasize the uncertainties and wide range of healing responses seen.

Kinds of Sexual Abuse

The experience described here differs from the widely held view that most sexual abuse involves fondling and inappropriate touching, leading over a long seduction period to intercourse in the preadolescent or adolescent period. In Figure 10 (based on this data) the frequency of vaginal and anal penetrative abuse (as estimated both from children's statements and physical findings) is high throughout all the age groups.

In our study, among boys of all ages, 83% had suffered anal abuse, while for girls of all ages the figure was 29%, rising to over 40% in the 0-5 age group. The reverse was true for vaginal penetration with only 7% of preschool children showing evidence to suggest that attempted or partial penetration (most commonly digital) had been attempted. In contrast, in the 10-15 year age group, 50% of girls had evidence consistent with vaginal penetration. In these older girls, anal penetration was still common. Our data supports the view of Summit (1985) who states:

> Since the girl is sexually underdeveloped and since the man generally tries to avoid physical injury to the child, vaginal intercourse is usually not the immediate goal. Manual, oral, and anal containment of the penis are the "normal" activities of incestuous intercourse, as they are also for the more typically out-of-family sexual assault of boys.

Anal Abuse

The reasons why anal abuse is common are not difficult to understand. The anus and rectum are distensible muscular organs which permit containment of the penis even in small children. One child, aged 6 weeks, with fecal peritonitis following penetration of her anus which led to rupture of the rectum, is the only child in our experience with serious injury. At all ages there is surprisingly little disturbance of function following anal abuse; constipation, diarrhea, or incontinence are unusual. However, physical injury resulting from anal penetration was commonly found in our series when routine examination of suspected abused children was undertaken. Interestingly, few anally abused children (or their parents) communicated anal complaints to the doctor even when there was obvious physical abnormality.

The physical signs described in these children were signs seen "in association" with sexual abuse and with a child's explicit history of anal penetration. In the two years of this study, it has become our practice, with children with suspected abuse of any type and neglect, to inspect the genitalia and anus. As the greater proportion of the 1,368 children seen had not been sexually abused (as judged from the multidisciplinary assessment including pediatric evaluation), there was a group of nonsexually abused children whose genital and anal findings provided us with experience of "normality." In this paper we have not presented the clinical findings in this group in detail, as they were essentially normal. However, occasionally anal physical findings were observed in this group, notably reddening, but we were usually able to recognize a cause for this. We did not see dilatation, fissures, funnelling, or the other signs which we have described in relation to the abused group. Even in children with constipation, single fissures are exceptional and scars rare. Further studies of anal findings in children with gastro-enterological complaints are required however, and already we note case reports of findings such as anal dilatation in association with uncommon and often unusual disease states (Vickers, Nokers, Morris, Coulthard, & Eastham, 1988).

Significance of Anal Findings in the Diagnosis of Abuse

Gross findings (for example, a combination of anal dilatation, multiple fissures, distended veins) may on their own provide sufficient evidence to strongly suspect sexual abuse, although in every case a multidisciplinary investigation and full assessment of child and family are essential to support the diagnosis of abuse. Lesser physical evidence (for example, single fissure, one or two dilated veins, and moderate laxity) can provide a starting point for further investigation including other possible medical causes.

The presence of emotional or behavioral problems in a child in association with lesser degrees of abnormality provides grounds for concern and the hypothesis that the two may be linked explored. Follow-up of anal abnormalities may help to separate the normal anatomical variations and minor disease from abuse, which is frequently repeated and chronic. Immediate talking to children where anal abnormality has been found commonly provides startling disclosures of abuse, but in other cases appropriate additional help and support is needed before children who have been abused can tell.

The differential diagnosis includes accidental injury (penetration extremely uncommon), laxity due to neurological disease (for example, spina bifida), rectal tumor, chronic severe constipation, postmortem anal dilatation (Kirschner & Stein, 1985); but other conditions, e.g., lichen sclerosus et atrophicus (Handfield-Jones, Hinde, & Kennedy, 1987), Crohn's disease (Hey, Buchan, Littlewood, & Hall, 1987), are so different in appearance as to be unlikely to cause confusion. Diagnosis should not be based on reddening or the presence of one or two fissures alone, but these findings may support a child's statement, or if there are other indicators, be the starting point for further investigation. Interpretation of physical findings must therefore always be made in the broad context of a history and full examination as well as the child's statements and the social and psychological assessment.

We would agree that there is no single physical sign that is in itself uniquely diagnostic of abuse and that "a fingerprint approach" is not helpful to diagnosis. However, the reverse view, which is to discount the importance of physical signs, is also not helpful.

It is of interest to compare these findings with those of others. In view of the greater awareness of so-called "homosexual abuse" of boys, the reports of anal findings relating to male children may be more reliable than with girls whose anuses in general have received less attention than their genitalia. Reinhardt (1987] found anal abnormalities in 54 (29%) of 189 boys evaluated for sexual abuse and an overall frequency of anal contact in 10%, and anal penetration in 40%—the most frequent form of abuse in boys. Many of his physical findings are similar to ours, although he does not mention dilatation or venous congestion. The lower frequency of physical findings may reflect the highly variable times after abusive events at which the children presented for medical evaluation to his center. This author also notes a higher frequency of ano-genital findings in younger children.

Spencer and Dunklee (1986) reviewed records of 140 boys evaluated for sexual abuse. Of these, 53% described penile anal penetration; 11%, digital anal penetration; 9%, attempted penile penetration; and 5%, penetration by foreign body. Of boys average age 7.2 years, 68% had physical findings, the vast majority of which were anal. The proportion of male to female children in their study was somewhat less than we have described (11% in 1983), but they observe an upward trend. From their results, it seems likely that at least some children seen were acute cases as evidence of ejaculation was found in 5% and erythema and abrasions in 27%.

Spencer and Dunklee (1986) do not mention anal dilatation, although they discuss the use of Paul's paper (1986) in correlating their physical findings with the history. The reasons for this are not clear, although it would be necessary again to know the time interval between concern being raised and medical examination.

In 1980 Ellerstein and Canavan reported physical findings in 50% of boys who had been sexually abused. The 16 boys reported constituted 11% of the sample, and their mean age was 9.7 years. They commented on the high frequency of anal injuries which included abrasions, hematoma, lacerations, and ecchymosis. All of these authors have linked the importance of anal abuse in relation to the sexual abuse of boys.

The Nature of Anal Intercourse

The terms buggery and sodomy are synonymous and refer to the act of anal intercourse. In the past this act has always been regarded as unnatural and a crime of considerable gravity. In England, however, in recognition of the existence and needs of homosexual people, the Sexual Offense Act of 1964 made the act lawful when it occurs between consenting men 21 years of age or over in private (Gee, 1984). Obviously it remains an offense for it to be performed on a person who cannot or does not give consent, and this includes children.

The frequency of anal intercourse in the heterosexual population is, along with sexual habits in general, little researched. However, one recent study (Daling et al., 1987) examining the relationship between sexual practices, sexually transmitted diseases, and the incidence of anal cancer, reported that 10.8% of women in a controlled group and 16.9% of women with anal cancer had experienced anal intercourse at some time. Some of the wives of men who have anally abused their children have told us of their dislike of the practice to which they too have been subjected. We have no information on any long-term physical effects of anal abuse. The possibility of anal transmission of HIV in children cannot be excluded.

From the work of Daling and colleagues (1987) with adults, an association of squamous cell anal cancer and a history of genital warts suggests that the papillomavirus infection is a cause of anal cancer. The possibility that this association exists in childhood infection has not

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been excluded. We suspect, however, that the major effects of this abuse will be psychological and emotional in nature.

From our follow-up work, it is possible to reassure in every case of anal abuse that the child's anus will return to normal and that there will be no permanent damage. The follow-up examination to check on healing is a further reassurance to the children.

In Leeds, the approach to sexual abuse evaluation and diagnosis has evolved from a system of managing cases of physical abuse. Physical examination, as part of an overall pediatric assessment undertaken early on after concerns have been raised, has yielded a significant number of children with physical signs consistent with genital and anal injury. A great proportion of the children have been in the 0-5 age group and have presented with acute problems. As many of these signs regress quickly, the open access and quick response service has facilitated detection of them. Early recognition of the abuse, leading to immediate protective action, has enabled many of the children subsequently in days or weeks that follow to tell of their abuse. When children are involved initially in interviews aimed at helping them disclose abuse, followed up later by physical examination, or where referral is delayed, then physical findings will be fewer.

Anal abuse of boys and girls of all ages, from babies to teenagers, is one part of the whole spectrum of sexually abusive behavior toward children. A greater awareness and willingness of doctors to examine and evaluate physical findings of anal examination would be a major step forward in the detection and prevention of this major form of child abuse.

Acknowledgement—We are grateful to the Department of Medical Illustration at St. James's (University) Hospital for Figure 10, and to Lynne Hawkins for her invaluable secretarial assistance.

REFERENCES

Bamford, F. N., & Kiff, E. S. (1987). Child sexual abuse (Letter). *Lancet*, **II**, 1396.
Butler-Sloss, E. (1987). *Report of the inquiry into child abuse in Cleveland*. London: Her Majesty's Stationery Office.
Clayden, G. S. (1988). Reflex anal dilatation associated with severe chronic constipation. *Archives of Disease in Children*, **63**, 832-836.
Daling, J. R., Weiss, N. S., Hislop, T. G., Maden, C., Coates, R. J., Sherman, K. J., Ashley, R. L., Beagrie, M., Ryan, J. A., & Coney, L. (1987). Sexual practices: Sexually transmitted diseases and the incidence of anal cancer. *New England Journal of Medicine*, **137**, 973-977.
Donaldson, L., Higgs, M., & Wyatt, G. (1987). *Epidemiological profile of the cases of suspected child sexual abuse diagnosed in Cleveland* (Statement to the Inquiry into Child Abuse in Cleveland 1987). Newcastle-Upon-Tyne, England: Northern Regional Health Authority.
Ellerstein, N. S., & Canavan, J. W. (1980). Sexual abuse of boys. *American Journal of Diseases of Children*, **134**, 255-257.
Emans, S. J., Woods, E. R., Flage, N. T., & Freeman, A. (1987). Genital findings in sexually abused symptomatic and asymptomatic girls. *Pediatrics*, **79**, 778-785.
Fleming, K. A., Verning, V., & Evans, M. (1987). *Lancet*, **II**, 454.
Gancz, E. (1962). Signs of sodomy. *British Medical Journal*, **1**, 263.
Gee, D. J. (1984). *Lecture notes on forensic medicine* (4th ed., pp. 82-83). Oxford: Blackwell Scientific Publications.
Goligher, J. C. (1984). *Surgery of the anus, rectum and colon* (5th ed.). London: Balliére Tindall.
Handfield-Jones, S. E., Hinde, F. R. J., & Kennedy, C. T. C. (1987). Lichen sclerosus et atrophicus in children misdiagnosed as sexual abuse. *British Medical Journal*, **294**, 1404-1405.
Hey, F., Buchan, P. C., Littlewood, J. M., & Hall, R. I. (1987). Differential diagnosis in child sexual abuse (Letter). *Lancet*, **I**, 283.
Hobbs, C. J., & Wynne, J. M. (1986). Buggery in childhood: A common syndrome of child abuse. *Lancet*, **II**, 792-796.
Hobbs, C. J., & Wynne, J. M. (1987a). Child sexual abuse: An increasing rate of diagnosis. Lancet, **II**, 837-842.
Hobbs, C. J., & Wynne, J. M. (1987b). Management of sexual abuse. *Archives of Diseases in Children*, **62**, 1182-1187.
Kirschner, R. H., & Stein, R. J. (1985). The mistaken diagnosis of child abuse. *American Journal of Diseases of Children*, **139**, 873-875.
Mant, A. K. (1960). *Forensic medicine*, p. 243. London: Lloyd.

Oriel, J. D. (1971). Anal warts and anal coitus. *British Journal of Venereal Disease*, **47**, 373-376.
Paul, D. M. (1986). What really did happen to Baby Jane? The medical aspects of the investigation of alleged sexual abuse of children. *Medicine, Science and Law*, **26**, 85-106.
Reinhart, M. A. (1987). Sexually abused boys. *Child Abuse & Neglect*, **11**, 229-235.
Rentoul, E., & Smith, H. (1973). Unnatural sexual crimes: Buggery. In *Glaister's medical jurisprudence and toxicology* (pp. 453-454). Edinburgh and London: Churchill Livingstone.
Report of the Standing Medical Advisory Committee, Department of Health and Social Security. *Diagnosis of child sexual abuse: Guidance for doctors*. London: Her Majesty's Stationery Office (available from PO Box 276, London SW8 5DT).
Roberts, R. E. I. (1986). Examination of the anus in suspected child sexual abuse (Letter). *Lancet*, **II**, 1100.
Spencer, M. J., & Dunklee, P. (1986). Sexual abuse of boys. *Pediatrics*, **78**, 113-138.
Summers, R. D. (1969). *The practical police surgeon: Association of police surgeons of Great Britain* (Chapter 17, p. 149). London: Sweet and Maxwell.
Summit, R. (1985). Causes, consequence, treatment, and prevention of sexual assault against children. In J. J. Meier (Ed.), *Assault against children*. London and Philadelphia: Taylor & Francis.
Vickers, D., Nacers, D., Morris, K., Coulthard, M. C., & Eastham, E. J. (1988). Anal signs in haemolytic uremic syndrome. *Lancet*, **I**, 998.

Résumé—En Grande-Bretagne, on prête une attention grandissante au problème des sévices sexuels à l'égard d'enfants. A Leeds, 2 pédiatres en particulier consacrent leur activité à des enfants de tout âge qui leur sont adressés directement par des entités administratives variées. Sur une période de 2 ans, ces pédiatres se sont vus référer 1,368 enfants pour toutes sortes de sévices et de négligence. Parmi eux, 608 cas avaient été soupçonnés de sévices sexuels dont 337 purent être classés comme confirmés ou comme probables (243 filles, 94 garçons). Ces sévices comprenaient des attouchements génitaux, de la masturbation et des exemples de pénétration orale, vaginale et anale. Le 30% de ces sévices (souvent répétés) comprenaient une pénétration anale par doigt ou pénis et 42% des 337 enfants présentaient physiquement des lésions anales. Ce chiffre s'élevait à 60% dans le groupe de 0 à 5 ans (115 enfants). On est arrivé au diagnostic de sévices à partir d'évaluations multidisciplinaires, y compris l'examen médical physique. Des constatations positives touchant la région génitale furent trouvées chez le 3% des garçons et le 58% des filles. Ces constatations, en ce qui concerne la région anale, comprenaient un érythème, une tuméfaction, un relâchement, un raccourcissement ou une éversion, une dilatation anale réflexe, des fissures, une congestion veineuse, des lésions cutanées, soit réversibles, soit permanentes, des spasmes, des déformations en entonnoir, des hématomes et ecchymoses, ainsi que des signes d'infection. La nature des signes constatés au niveau de l'anus variaient avec l'âge de l'enfant et le degré de chronicité des sévices, ceci en comparant les trouvailles avec l'anamnèse. La guérison et la disparition des signes physiques au niveau de l'anus furent observés lors du suivi de ces enfants, soit des jours, soit des mois après l'examen initial. Chez les enfants qui, a-t-on estimé, n'avaient pas été victimes de sévices sexuels, ces anomalies n'ont pas été observées. Ceci suggère effectivement qu'il y avait une relation de cause à effet chez les enfants victimes, mais on doit poursuivre les recherches pour affirmer cela définitivement. Lorsque l'on procède à l'examen physique d'un enfant, chez qui les symptômes, les signes ou les circonstances suggèrent la possibilité de sévices ou de négligence, on doit y inclure l'inspection anale, mais il n'est pas recommandé de pratiquer cet examen, soit avec le doigt, soit avec des instruments.

Resumen—El abuso sexual de menores esta atrayendo cada vez más atención en Inglaterra. En Leeds esto se refleja en el trabajo de dos pediatras que reciben pacientes directemente de múltiples agencias. En dos años se recibieron 1,368 pacientes sospechados de ser víctimas de todo tipo de abuso y negligencia, incluyendo 608 sospechados de ser víctimas del abuso sexual, de los cuales 337 (243 niñas, 94 niños) fueron considerados casos confirmados o probables. Los abusos incluyeron tocamiento de los genitales, masturbación, y la penetración oral, vaginal y anal. 30% de estos abusos (que fueron frecuentemente múltiples) concernieron la penetración anal con el dedo o el pene y 42% de los 337 niños exhibieron uno o más hallazgos anales, subiendo a 60% de los 115 niños en el grupo de 0-5 años de edad. La diagnosis de abuso fué hecha a basis de los resultados de una evaluación multi-disciplinaria incluyendo un examen médico. Hallazgos genitales fueron hechos en el caso de 3% de los niños y 58% de las niñas. Los hallazgos anales incluyeron ericema, inflamación (tyre), laxitud, acortamiento o el volverse de dentro afuera, dilatación anal refleja (dilatación), fisuras, congestión venosa, cambios de la piel reversibles y permanentes, contracciones, embudimiento, hematoma y magullaciones, así como síntomas de infección. La configuración de síntomas anales varió con la edad del niño y la cronicidad del abuso, juzgado a base de la historia. El sanamiento y la desaparición de los hallazgos anales que se observó durante el tratamiento complementario tuvieron lugar de días a meses después del examen físico inicial. La ausencia de estos hallazgos en el grupo de niños que no se consideraron sexualmente abusados respaidan una interpretación de causa y efecto, pero es necesario llevar a cabo mas investigaciones. El examen médico de cada niño cuando los síntomas o la situación plantean la posibilidad del abuso o la negligencia debe incluir una inspección anal, pero el examen digital o con instrumentos no es recomendado.

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The Mistaken Diagnosis of Child Abuse

A Form of Medical Abuse?

Robert H. Kirschner, MD, Robert J. Stein, MD

• The suspected diagnosis of child abuse may prove to be unfounded. Reports in the literature have focused on unusual diseases and folk medicine practices that may mimic abuse. We report ten cases where allegations of abuse were lodged against parents because the treating physicians in the emergency room mistook life-threatening illness or postmortem artifacts for inflicted injury. In all cases the families were from the inner city, and with two exceptions the involved institutions were small hospitals without pediatric personnel present in the emergency department. Although the histories related by the parents were in all cases truthful and consistent with the results of physical examinations of the child, the involved physicians failed to make a correct diagnosis. Not only a lack of experience with severe childhood illness and death but also an attitude of suspicion and/or hostility probably contributed to these misdiagnoses.

(*AJDC* 1985;139:873-875)

Cases of suspected child abuse are being reported with increasing frequency. Often the charges prove to be unsubstantiated and the parents or other caretakers are cleared of any wrongdoing. Even when handled appropriately, such accusations cause increased stress on the family. If the inquiry into the alleged injury has been conducted in an accusatory atmosphere, however, additional emotional stress is placed on parents already suffering from anxiety and possible guilt feelings.[1] In the extreme case, parental suicide may result.[2]

See also pp 867 and 876.

From the Institute of Forensic Medicine, Office of the Medical Examiner of Cook County, Chicago.

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Reprint requests to Office of the Medical Examiner, 2121 W Harrison St, Chicago, IL 60612 (Dr Kirschner).

The mistaken diagnosis of child abuse may involve children who have died suddenly without apparent explanation or whose illness or injuries have been misinterpreted as nonaccidental trauma inflicted as punishment. Reports in the literature have called attention to bone lesions of Menkes' (kinky-hair) syndrome[3] and congenital syphilis,[4,5] hemophilia,[6] hypersensitivity vasculitis,[7] mongolian spots,[8,9] practices of traditional forms of medicine,[10-15] and retinal hemorrhages associated with vigorous resuscitation,[16] all of which may mimic or be misinterpreted as child abuse. A folk remedy producing significant injury has been characterized as a variant of battered child syndrome.[17] These cases are summarized in Table 1.

PATIENT REPORTS

We report ten cases of mistaken clinical diagnosis of abuse in children without evidence of significant injury. These children had died suddenly and their deaths were reported to the Office of the Medical Examiner of Cook County (Illinois) in accordance with statutory requirements. The investigation included review of all medical records, police reports, and other pertinent information. The pathologist responsible for the autopsy spoke directly with the medical personnel and/or police officers involved in the death notification. A complete autopsy was performed in each case. These cases are summarized in Table 2.

PATIENTS 1 AND 2.—Both patients share the common feature of a fall associated with ataxia, causing trivial injuries that appeared somewhat more severe because of developing disseminated intravascular coagulation. The histories related by the parents were entirely consistent with the event. Both children were febrile. In each case progressive lethargy and coma were misinterpreted as secondary to head injury, and the correct diagnosis of meningitis was made too late to save the life of either child.

PATIENT 3.—The father reported the sudden development of "bruises" on the buttocks and legs of his son. The child was admitted to the hospital with fever and confluent purpura of the buttocks and legs, misinterpreted as bruising due to a severe beating and probable head injury. The father was taken into custody, and the moribund child was transferred to a large medical center where purpura fulminans was immediately diagnosed. Efforts to save the child's life were unsuccessful.

PATIENT 4.—Allegations of abuse were lodged against the parents of this child, a 1-year-old infant who was admitted to an emergency room in a comatose state with severe pneumonia and respiratory arrest. Atypical parietal suture lines seen on x-ray films were misinterpreted by a radiology resident as multiple skull fractures.

PATIENT 5.—Retinal hemorrhages discovered after failed resuscitation of a 3-month-old infant led to allegations of head trauma and child abuse. The circumstances of the child's death, the father's history of attempted vigorous resuscitation by chest compression, and the findings at autopsy confirmed the diagnosis of sudden infant death syndrome.

PATIENTS 6, 7, AND 8.—Allegations of child abuse in these patients arose from the misinterpretation of postmortem changes as indicative of injury. Gaping of the rectum and vagina thought to represent sexual abuse in patient 8 (Figure) was enhanced by a nurse in the hospital emergency room attempting to clean stool from the perineal region. In so doing, she spread the buttocks and the vaginal labia, which subsequently retained their enlarged appearance due to postmortem cooling of the body and congealing of subcutaneous fat.

PATIENT 9.—The mother presented to the emergency room with her 25-day-old child who had suddenly died in her arms. Examination of the child at a hospital

Table 1.—Lesions Simulating Child Abuse as Reported in the Literature

Source	Patient Sex/Race/Age	Original "Child-Abuse" Diagnosis	Correct Diagnosis
Adams et al[3]	M/W/10 wk	Fractures of femurs, humeri, tibiae, fibulae	Menkes' (kinky-hair) syndrome (sex-linked, recessive, copper deficiency)
Fisher et al[4]	F/B/5 wk	Tenderness of arms, metaphyseal fractures of humeri with periosteal reactions	Congenital syphilis with osteochondritis and periostitis
Horodniceanu et al[5]	M/W/6 wk		
Schiver et al[9]	M/W/10 mo	Numerous bruises, ecchymoses, and hematomas of body	Hemophilia A
Waskerwitz et al[7]	M/B/2½ yr	Unexplained swelling and bruising, physical evidence of previous injury	Hypersensitivity vasculitis
Wickes and Zaid[8]	*	Contusions of back and buttocks	Mongolian spot at base of spine
Anh,[2] Yeatman et al,[10] Primosch and Young,[11] Du[12]	†	Contusions and abrasions of back from beating	Cạo gió (Vietnamese traditional medicine)
Sandler and Haynes[13]	F/W/11 yr	Skin lesions leading to suspicion of abuse	Cupping lesions (Mexican-American and Russian-immigrant children)
Asnes and Wisotsky[14]	M/W/6 yr		
Feldman[15]	†	Cigarettelike burn scars of abdomen	Moxibustion (Chinese and southeast Asian traditional medicine)
Bacon et al[16]	M/W/2 mo	Suspicion of abuse, cyanosis, shock, and retinal hemorrhages	Near-miss sudden infant death syndrome; retinal hemorrhages due to thoracic compression associated with resuscitation
Guarnaschelli et al[17]	M/W/2 mo	Bilateral subdural hematoma	Subdural hematoma due to Mexican folk remedy for *caída de mollera* ("fallen fontanelle")

*Several infants reported, mostly black.
†Several children reported, mostly Oriental.

Table 2.—Mistaken Diagnosis of Child Abuse in Cook County, Illinois*

Patient No./Sex/ Race/Age	Presenting Complaint	Findings at Physical Examination	Original Diagnosis	Correct Diagnosis
1/M/B/4 yr	Fell off bike, hurt wrist and head	Lethargy, "multiple bruises," fever	Cerebral concussion, child abuse	Meningitis, DIC with WFS
2/F/W/2 yr	Fell down four steps	"Bruises on cheek and inner thigh," fever	Possible child abuse	Meningitis; DIC
3/M/B/2 yr	Sudden development of "bruises" on buttocks and legs	Semicomatose state, fever, confluent purpura of buttocks and legs	Severe beating	Purpura fulminans
4/F/W/1 yr	Respiratory arrest	Comatose state	Multiple skull fractures on x-ray films	Atypical parietal suture lines, pneumonia
5/M/B/3 mo	Respiratory arrest	Retinal hemorrhages, respiratory arrest	Child abuse, beating to head	SIDS, delayed fatal unsuccessful resuscitation (Purtscher's retinopathy)
6/F/B/3 mo	DOA	Laceration of ear, abrasions of chest and neck	Child abuse	SIDS, postmortem lividity and purging of fluid from nose and mouth
7/F/W/5 mo	DOA	Bruise under right eye, blood from nose, discoloration of back	Possible child abuse	SIDS, postmortem lividity, mongolian spot
8/F/W/15 mo	DOA	Gaping of vagina and rectum	Possible sexual abuse	SIDS, postmortem sphincter dilation and loss of elasticity of skin and subcutaneous tissue
9/F/B/5 mo	DOA	Normal	Possible child abuse, verbal threats to mother	Severe congenital heart disease (large ventricular septal defect)
10/F/B/5 mo	DOA	Blood coming from nose; bruises of both eyes, buttocks, back, and ankles; abrasion of eyelid	Suspected child abuse	SIDS, postmortem purging, extensive mongoloid pigmentation

*DIC indicates disseminated intravascular coagulation; WFS, Waterhouse-Friderichsen syndrome; SIDS, sudden infant death syndrome; and DOA, dead on arrival.

Patient 8. Postmortem gaping of labia majora and vaginal introitus mistaken for possible sexual abuse. There is no evidence of injury, and intact hymen is observed.

showed no abnormalities, but the physician claimed there was possible abuse and made verbal threats to the mother. At autopsy, a large ventricular septal defect was discovered.

PATIENT 10.—The infant had extensive mongoloid discoloration of the lower back, buttocks, and ankles. These areas were mistaken for bruises. No injuries were present about either eye, although bruises and an abrasion were recorded as present. The autopsy diagnosis was sudden infant death syndrome.

COMMENT

Most physicians are unfamiliar with death outside the hospital, particularly in children. As a result, the usual postmortem changes that develop progressively in the hours after death may be misinterpreted as evidence of injury. Frequently, acute pulmonary edema causes exudation of frothy fluid from the nares and/or mouth (postmortem purging), and this fluid is often blood-tinged or frankly bloody due to rupture of nasal capillaries. The inexperienced physician may mistake this as evidence of antemortem bleeding due to facial trauma. Postmortem lividity results from the settling of blood in dependent portions of the body, which was misinterpreted as bruising in three of the patients. This process of gravitational engorgement of superficial blood vessels produces an appearance of erythema that can be blanched by direct pressure in the early hours after death. Distortion of normal anatomic features due to congealing of subcutaneous fat as body temperature falls may lead to further misinterpretation, as occurred in patient 9.

Previous reports in the literature have focused on unusual diseases or lesions that may mimic child abuse. In our experience, unfortunately, it was the "usual" that was misinterpreted, and our cases shared several common features. The families were inner-city residents who brought their children to hospitals with less than optimal emergency room staffing. In only two hospitals was a pediatric resident in attendance. In no instance was a staff pediatrician available to see the child at time of admission. There was a uniform failure of the hospital staff either to elicit a careful history from the parents or to believe the parents' story. In those children who were critically ill (patients 1, 2, and 3), there was a significant delay ranging from one to eight hours in making the correct diagnosis. In two of these cases, the diagnosis was established when nursing personnel noticed the onset of "new bruises" in the hospital. Two children were transferred in a moribund state to major medical centers, where they died within an hour of admission.

Our experience in these cases, and in others, suggests that in this type of stressful situation physicians may lose their sense of professional objectivity at a time when it is most needed. This appears to be particularly true when physicians poorly trained in pediatrics are required to distinguish common but serious medical illness from abuse. The emergency room records we reviewed indicated a significant failure to properly consider nontraumatic etiologies. Furthermore, in our personal conversations with the involved physicians, and from the medical records, we frequently detected an attitude of suspicion and/or hostility toward the parents of these children. The serious illness or death of a child is a traumatic event. Interrogation of parents or other caretakers must take place in a calm, organized, and nonjudgmental manner. When the stress of losing a child is compounded by false accusations of child abuse, verbal threats, or police detention, this becomes a form of medical abuse. The availability of expert pediatric consultation in all emergency rooms would greatly reduce the probability of such consequences.

References

1. English JM, Sutlieff PA: Accidental injury in children and interrogation of families. *Br Med J* 1979;2:1003.
2. Anh NT: 'Pseudobattered child' syndrome. *JAMA* 1976;236:2288.
3. Adams PC, Strand RD, Bresnan MJ, et al: Kinky hair syndrome: Serial study of radiological findings with emphasis on the similarity to the battered child syndrome. *Radiology* 1974;112:401-407.
4. Fisher RH, Kaplan J, Holder JC: Congenital syphilis mimicking battered child syndrome. *Clin Pediatr* 1972;11:305-307.
5. Horodniceanu C, Grnebaum M, Volovitz B, et al: Unusual bone involvement in congenital syphilis mimicking the battered child syndrome. *Pediatr Radiol* 1978;7:232-234.
6. Schiver W, Brueschke EE, Dent T: Family practice grand rounds: Hemophilia. *J Fam Pract* 1982;14:661-674.
7. Waskerwitz S, Christoffel KK, Hauger S: Hypersensitivity vasculitis presenting as suspected child abuse: Case report and literature review. *Pediatrics* 1981;61:283-284.
8. Wickes IG, Zaid ZH: Battered or pigmented? *Br Med J* 1972;2:404.
9. Smialek JE: Significance of mongolian spots. *J Pediatr* 1980;97:504.
10. Yeatman GW, Shaw C, Barlow MJ, et al: Pseudobattering in Vietnamese children. *Pediatrics* 1976;58:616-618.
11. Primosch RE, Young SE: Pseudobattering of Vietnamese children (cao gio). *J Am Dent Assoc* 1980;101:47-48.
12. Du JNH: Pseudobattered child syndrome in Vietnamese immigrant children. *Can Med Assoc J* 1980;122:394-395.
13. Sandler AP, Haynes V: Nonaccidental trauma and medical folk belief: A case of cupping. *Pediatrics* 1978;61:921-922.
14. Asnes RS, Wisotsky DH: Cupping lesions simulating child abuse. *J Pediatr* 1981;99:267-268.
15. Feldman KW: Pseudoabusive burns in Asian refugees. *AJDC* 1984;138:768-769.
16. Bacon DJ, Sayer GC, Howe JW: Extensive retinal haemorrhages in infancy: An innocent cause. *Br Med J* 1978;1:281.
17. Guarnaschelli J, Lee J, Pitts FW: 'Fallen fontanelle' (caida de mollera): A variant of the battered child syndrome. *JAMA* 1972;222:1545-1546.

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berg MB. *Dr. Spock's Baby*
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one VJ, Christophersen ER.
nt of thumb sucking. *Pedi*

owitz JM. An effective and
ternative for chronic thumb
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ort Press; 1987.
ner Child's Health. New
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Genital and Anal Conditions Confused With Child Sexual Abuse Trauma

n Bays, MD, Carole Jenny, MD

• Examination of a child with genital or al disease may give rise to suspicion of xual abuse. Dermatologic, traumatic, fectious, and congenital disorders may confused with sexual abuse. Seven ildren referred to us are representative such confusion.

(*AJDC*. 1990;144:1319-1322)

When genital or anal disease occurs, the health care provider must perform a careful examination and consider diagnoses other than sexual abuse, especially when the child volunteers no history of abuse. Ten percent to 25% of children are sexually abused before age 18 years.[1] With increasing awareness of this problem, physicians are being called on more frequently to examine children for signs of possible abuse. A diagnosis of sexual abuse may have serious consequences for the child, family, and suspected offender. We will review the existing literature on conditions mistaken for injuries due to child sexual abuse and present cases of seven children referred to us.

PATIENT REPORTS

PATIENT 1.—A 6-year-old girl was referred for a sexual abuse examination after her pediatrician noted fresh vaginal bleeding and genital bruising and made a report of suspected abuse. On the day of the examination, the child had returned to her divorced mother after a visit with her father. She had subepidermal bleeding over the left side of the clitoris, the left labium minus, and the left wall of the introitus. There was a 1-cm ruptured bulla in the posterior fourchette to the right of the midline. The hymen was normal. There was a slight decrease in the pigmentation of the skin surrounding the genitalia. There were two superficial fissures of the anal verge. The child was questioned in private and denied sexual abuse. She was referred to a dermatologist, who diagnosed lichen sclerosus confirmed by biopsy (Fig 1). Treatment with topical corticosteroid decreased the friability of the skin around the vagina and anus.

PATIENT 2.—A 5-year-old girl was referred by her private pediatrician with a complaint of intermittent vaginal bleeding. Over a 15-month period, the child had had 11 episodes of small amounts of red or brown blood on her underwear or on toilet paper. She had occasional episodes of dysuria. A vaginal culture was positive for *Streptococcus pyogenes* on one occasion, but treatment with antibiotics did not stop the vaginal bleeding. Serum follicle-stimulating hormone, luteinizing hormone, and estradiol levels were normal on two occasions.

Genital examination revealed Tanner 1 female genitalia with a large, dilated, tortuous vein running from the top of the clitoris down through the right labium majus. The vaginal opening was completely hidden in hymen tissue, which was swollen and dark beefy red. There were a number of bright red, dilated blood vessels in the posterior fossa. The child was interviewed alone and denied sexual abuse. A magnetic resonance imaging scan of the pelvis was normal. Examination under anesthesia revealed a hemangioma of the entire vagina. There was no evidence of sarcoma botryoides or foreign body. No treatment will be undertaken unless significant bleeding occurs.

PATIENT 3.—A 7-month-old female infant was seen in an emergency department for high fever. The examining pediatrician found an area in the perineum that he thought might be due to an injury from sexual abuse. The child and her 2-year-old sister were placed into protective custody by the police. Three days later, the child was brought in for examination at a sexual abuse evaluation center. Genital examination revealed a vaginal opening hidden in light pink, redundant hymen tissue, which showed no evidence of trauma. Just below the rim of the posterior fourchette in the midline there was a deep red depression measuring 2 mm long and 1 mm deep. Under the colposcope, this depression appeared to be a congenital pit (Fig 2), which could be manipulated and stretched so that the increased vascularity in its depth blanched. The infant's sister had a normal genital examination, and both girls were returned to the custody of their parents.

PATIENT 4.—A 5-year-old girl was brought to the outpatient clinic for a genital injury. The child stated that she had been climbing on a stool at her grandmother's house and had fallen. A wooden leg of the stool had struck and injured her genitalia. She had experienced two episodes of dysuria and hematuria in the 4 hours since the injury occurred. Several clinic personnel expressed concern that the child might have been sexually abused.

Genital examination revealed a 2-cm laceration in the crease lateral to the right labium minus, with adjacent bruising (Fig 3). The hymen was normal. The child denied sexual abuse. No report of suspected abuse was made.

PATIENT 5.—A 2½-year-old boy told his mother that his "bottom hurt" on returning from day care. His physician diagnosed anal trauma, and a day-care worker was interviewed by the police after the child said, "Mark hurt me." After the child was examined at a child abuse center, the diagnosis of perianal streptococcal cellulitis was made (Fig 4). On further questioning, the child said the day-care worker had hurt him when he was wiped after toileting. The pain apparently occurred because of preexisting anal irritation from the infection.

PATIENT 6.—A 5-year-old girl was referred to a sexual abuse evaluation program because her pediatrician had noted that her clitoris was split. Examination revealed a complete cleft of the upper genital structures, including the clitoris, labia minora, and anterior urethral wall. The child denied trauma or sexual abuse. Normal uterus, ovaries, and kidneys were visualized on ultrasound examination. Voiding cystourethrogram was normal except for a 1.7-cm split in the pubic symphysis. The child was referred to a pediatric urologist with a diagnosis of

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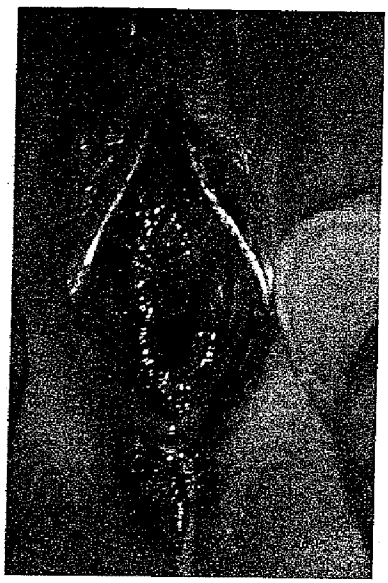


Fig 1.—Patient 1. Lichen sclerosus.

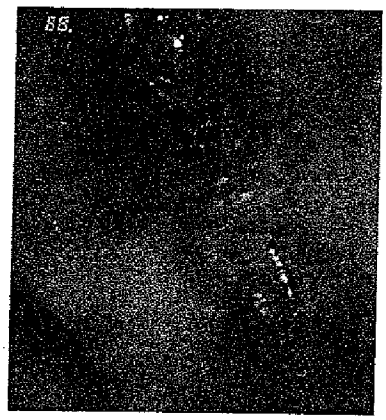


Fig 2.—Patient 3. Congenital pit of the perineal body.

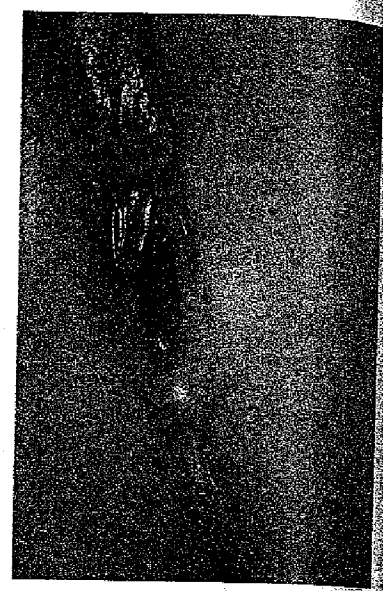


Fig 3.—Patient 4. Straddle injury adjacent to the right labium.

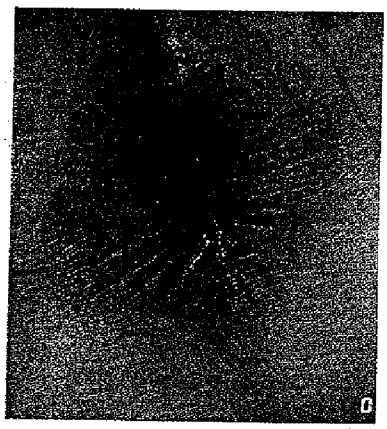


Fig 4.—Patient 5. Perianal streptococcal cellulitis.

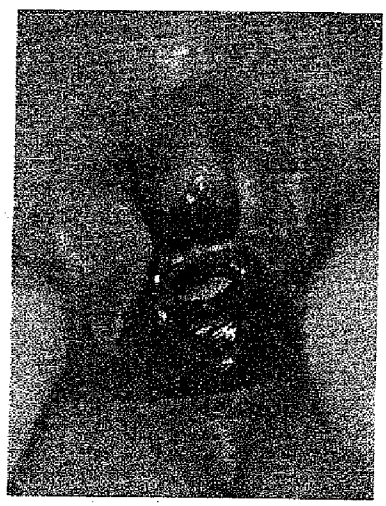


Fig 5.—Patient 6. Epispadius (incidental foreign body).

Fig 6.—Patient 7. Periurethral caruncle.

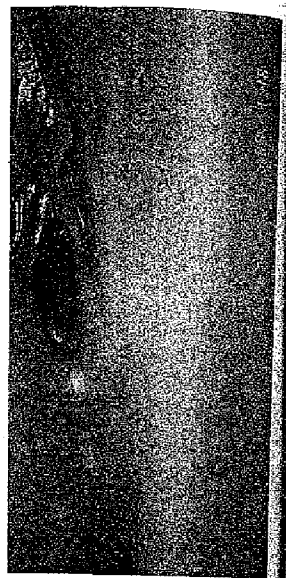
congenital epispadius (Fig 5).

PATIENT 7.—A 4-year-old girl was referred for possible sexual abuse when she complained of dysuria and had several episodes of hematuria after playing with older neighborhood children. The child and her playmates convincingly denied sexual abuse or sexual play when questioned by the patient's concerned mother and pediatrician. Genital examination revealed a hemorrhagic urethral caruncle (Fig 6). The child's symptoms resolved over 3 weeks with warm sitz baths and topical estrogen cream. A report of suspected abuse was not made.

COMMENT

Dermatologic Disorders

Erythema and excoriations of the genitalia are not signs specific to sexual abuse, as they may have many other common causes, including diaper dermatitis, poor hygiene, *Candida*, pinworms, and irritants such as bubble bath.[2,3] Increased pigmentation around the anus, although reported after chronic sexual abuse, is a common finding in nonabused children.[2] Bruises in the genital or anal area can raise suspicion of possible sexual abuse. Bruising confused with child abuse has been re-



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ses, including diaper der- hygiene, *Candida*, pin- irritants such as bubble ased pigmentation around although reported after d abuse, is a common find- ased children.[7] Bruises in anal area can raise suspi- le sexual abuse. Bruising child abuse has been re-

Sexual Abuse—Bays & Jenny

ed in the Ehlers-Danlos syndrome,[4] atologic disorders, hypersensitivi- sculitis, purpura fulminans, men- is with disseminated intravascular ulation, mongolian spots, and cases ining or other folk medicine prac- .[6] Phytodermatitis also has been aken for bruising or burns due to abuse. This disorder occurs when psoralens, notably the juice of fig, lemon, parsnip, or celery, contact kin before sun exposure.[6,7]

her dermatologic conditions that ause pain, bleeding, fissures, and changes in the genital or anal re- s that must be differentiated from s of sexual abuse include lichen rosus, lichen planus, seborrheic der- itis, atopic dermatitis, contact der- itis, lichen simplex chronicus, and asis.[8]

ichen sclerosus manifests as alarm- ubepidermal hemorrhages and bul- and vesicular lesions that can occur minor trauma such as wiping with t tissue, as occurred with patient 1. clinician should be familiar with the phic skin and hourglass-shaped of decreased pigmentation around genitalia and/or anus that character- his disease. A biopsy may be done to firm the diagnosis.[9,10]

abial fusion is a common condition in who are still in diapers. In older it may be more likely related to al abuse but is not diagnostic.[11,12]

Congenital Conditions

ongenital abnormalities of the geni- a can cause concern about possible ual abuse. Patient 2 had a hemangio- of the hymen and vaginal wall that duced hypervascularity and swell- of the hymen tissues with intermit- bleeding. A vulvar hemangioma ulcerative changes has been diag- ed and investigated as a perineal secondary to child abuse.[13] Anoth- hild was referred to protective ser- s after she presented with a midline defect, thought to be a traumatic extending from the fossa navicu- into the anus. Colposcopic exami- on at a child abuse center revealed vidence of scarring. A diagnosis was le of congenital failure of midline fu- across the posterior fourchette.[14] A mon congenital anomaly of the ex- al anal sphincter may cause smooth, fan-shaped areas in the midline at the anal verge, which may be mistaken for anal scars. Although anal skin tags have been observed after trauma from anal sodomy,[8] a prominent medial raphe and anterior midline anal skin tags are also common in nonabused children.[2] Patient 3 had a congenital midline pit of the perineal body, which was confused with an injury due to abuse. Patient 6 had midline congenital cleft of the genital structures above the urethra, an anomaly that was undetected for 5 years despite regular pediatric care. Caution is advised in diagnosing midline lesions of the genitalia or anus.[2,12]

Injuries

Accidental injury to the genitalia may also be mistaken for sexual abuse.[15] Straddle injuries usually cause crushing of soft tissue over a solid structure such as the pubic symphysis, ischiopubic ramus, and adductor longus tendon. Compared with injuries due to sexual abuse, straddle injuries are more often anterior and unilateral, cause damage to the external rather than internal genital structures, and are associated with an acute and dramatic history. Patient 4 had characteristic historical and physical findings of a straddle injury. Severe genital injuries, including vaginal lacerations and rectovaginal fistula, have been described in girls falling astride sharp objects.[16]

Sudden, accidental violent abduction of the legs may cause splitting injuries of the midline genital structures.[8,17] However, in the only patient report of this type of injury, the cause was forced abduction of the thighs during sexual abuse.[18]

Motor vehicle accidents can cause injury to the genitalia.[15,19] A seat-belt injury causing referral for possible sexual abuse has been described. The injuries included abrasions to the labia, hematoma of the mons, and a perineal tear. The hymen was undamaged.[20] In patients of African or Middle Eastern origin, female circumcision in infancy or childhood can result in hemorrhage and unusual genital adhesions and scars.[16]

Genital strangulation by hairs or other objects can occur accidentally, as a result of sexual abuse, or as punishment for toilet accidents.[21] Masturbation is not reported to cause genital injuries except in severely developmentally layed children or those who self-mu late due to genetic diseases.[15,17,22] A view of 11 clinical and behavic syndromes that can result in self-infli ed injury in children and adolesce includes one child with recurrent her turia apparently caused by the child serting a quartz crystal into his ureth As the authors caution, however, s destructive behavior is more commor abused and neglected children.[23] Ta pon use is reported to cause slig stretching of the hymenal opening l not actual injuries to the hymen.[22,24,25]

Other Anal Conditions

Diseases that produce anal chang that might raise questions of abuse clude Crohn's disease,[26] hemolytic u mic syndrome,[27] lichen sclerosus postmortem anal dilation,[6] rectal mor, neurogenic patulous anus, and vere or chronic constipation and meg colon.[28,29] Eversion of the anal canal h been described as a result of sexu abuse.[23] However, Zempsky and Rose stein[30] have listed 11 other medical co ditions causing rectal prolapse in ch dren. A causal relationship with a abuse has not been established defi tively.

Infections

Infections of the genitalia may lead concerns about sexual abuse. Perian streptococcal cellulitis, as in patient can present as an erythematous p ianal rash, painful defecation, anal f sures, and bleeding.[31] This case is example of the importance of obtaini a careful history to distinguish innoc actions from sexual abuse. Vaginal va cella has been confused with genital h pes.[32] Genital warts in adults are cons ered sexually transmitted. In childr other possible routes include in ut transmission, inoculation during del ery, and autoinoculation.[33]

Urethral Conditions

In patient 7, bleeding from a u thral caruncle led to concerns about s ual abuse. Other urethral conditi causing bleeding or alarming chan in anatomy include urethral hem gioma,[34] urethral prolapse, ureth polyps, papilloma, urethral carun sarcoma botryoides, and prolapsed u

rocele. Urethral prolapse occurs most mmonly in prepubescent black girls. one series, 67% (8/12) of girls with ethral prolapse had antecedent epides of increased intra-abdominal essure, which may have contributed the condition. Sexual abuse was the use of prolapse in one patient. Other uses were infection, seizures, respirary and urinary tract infections, burns, raddle injury, and strangury.[35]

SUMMARY

Sexual abuse is included in the differential diagnosis of a variety of abnormal physical findings in the genital and anal area. It is prudent for clinicians who discover these abnormalities to be aware of other potential diagnoses, to take a complete medical history, and to become comfortable with questioning children and their parents about possible abuse. Parents can be told that sexual abuse is one of several possible explanations for their child's findings, and they can be asked if they have had any concerns about abuse. If appropriate, the clinician can interview the child alone and ask if anyone has touched or hurt them in their "private parts." If abuse is suspected, it may be necessary to refer the child for a second examination and an in-depth interview.[36]

References

1. Haugaard JJ, Reppucci ND. *The Sexual use of Children*. San Francisco, Calif: Jossey-ss Inc Publishers; 1988:40-47.
2. McCann J, Voris J, Simon M, Wells R. Perial findings in prepubertal children selected for n-abuse: a descriptive study. *Child Abuse Negl.* 89;13:179-193.
3. Paul DM. The medical examination in sexual lences against children. *Med Sci Law.* 1977; 251-258.
4. McNamara JJ, Baier R, Lynch E. Ehlers-anlos syndrome reported as child abuse. *Clin Pe-atr.* 1985;24:317.
5. Kirschner RH, Stein RJ. The mistaken diag-sis of child abuse: a form of medical abuse? *JDC.* 1985;139:873-875.
6. Coffman K, Boyce WT, Hansen RC. Phyto-rmatitis simulating child abuse. *AJDC.* 1985; 9:239-240.
7. Dammaker CJ, Glover RA, Goltz RW. Phyto-rmatitis: a mystery case report. *Clin Pediatr.* 88;27:289-290.
8. Williams TS, Callen JP, Owen LG. Vulvar sorders in the prepubertal female. *Pediatr Ann.* 86;15:588-605.
9. Handfield-Jones SE, Hinde FRJ, Kennedy TC. Lichen sclerosus et atrophicus in children isdiagnosed as sexual abuse. *BMJ.* 1987; 4:1404-1405.
10. Jenny C, Kirby P, Fuquay D. Genital lichen clerosus mistaken for child sexual abuse. *Pediat-ics.* 1989;83:597-599.
11. Berkowitz CD, Elvik SL, Logan MK. Labial sion in prepubescent girls: a marker for sexual buse? *Am J Obstet Gynecol.* 1987;156:16-20.
12. McCann J, Voris J, Simon M. Labial adhesions and posterior fourchette injuries in childhood sexual abuse. *AJDC.* 1988;142:659-663.
13. Levin AV, Selbst SM. Vulvar hemangioma simulating child abuse. *Clin Pediatr.* 1988;27:213-215.
14. Adams JA, Horton M. Is it sexual abuse? *Clin Pediatr.* 1989;28:146-148.
15. Muram D. Genital tract injuries in the prepubertal child. *Pediatr Ann.* 1986;15:616-620.
16. Unuigbe JA, Giwa-Osagie AW. Pediatric and adolescent gynecological disorders in Benin City, Nigeria. *Adolesc Pediatr Gynecol.* 1988;1:257-261.
17. Hobbs CJ, Wynne JM. Child sexual abuse: an increasing rate of diagnosis. *Lancet.* 1987;2:837-841.
18. Finkel MA. Anogenital trauma in sexually abused children. *Pediatrics.* 1989;84:317-322.
19. Wynne JM. Injuries to the genitalia in female children. *S Afr Med J.* 1980;57:47-50.
20. Baker R. Seat belt injury masquerading as sexual abuse. *Pediatrics.* 1986;77:435.
21. Barton DJ, Sloan GM, Nichter LS, Reinisch JF. Hair-thread tourniquet syndrome. *Pediatrics.* 1988;82:925-928.
22. Woodling BA, Kossoris PD. Sexual misuse: rape, molestation and incest. *Pediatr Clin North Am.* 1981;28:481-499.
23. Putnam N, Stein M. Self-inflicted injuries in childhood: a review and diagnostic approach. *Clin Pediatr.* 1985;24:514-518.
24. Cowell CA. The gynecologic examination of infants, children and young adolescents. *Pediatr Clin North Am.* 1981;28:247-266.
25. Paul DM. 'What really did happen to baby Jane?' the medical aspects of the investigation of alleged sexual abuse of children. *Med Sci Law.* 1986;26:85-102.
26. Hey F, Buchan PC, Littlewood JM, Hall RF. Differential diagnosis in child sexual abuse. *Lancet.* 1987;1:283.
27. Vickers D, Morris K, Coulthard M, Eastham EJ. Anal signs in haemolytic uraemic syndrome. *Lancet.* 1988;1:998.
28. Hobbs CJ, Wynne JM. Sexual abuse of English boys and girls: the importance of the anal examination. *Child Abuse Negl.* 1989;13:195-210.
29. Clayden GS. Reflex anal dilation associated with severe chronic constipation in children. *Arch Dis Child.* 1988;63:832-836.
30. Zempsky WT, Rosenstein BJ. The cause of rectal prolapse in children. *AJDC.* 1988;142:338-339.
31. Spear RM, Rothbaum RJ, Keating JP, Blanfuss MC, Rosenblum JL. Perianal streptococcal cellulitis. *J Pediatr.* 1985;107:557-559.
32. Boyd M, Jordan SW. Unusual presentation of varicella suggestive of sexual abuse. *AJDC.* 1987;141:940.
33. Fleming KA, Venning V, Evans M. DNA typing of genital warts and diagnosis of sexual abuse in children. *Lancet.* 1987;2:454.
34. Roberts JW, Devine CJ. Urethral hemangioma: treatment by total excision and grafting. *J Urol.* 1983;129:1053-1054.
35. Lowe FC, Hill GS, Jeffs RD, Brendler CB. Urethral prolapse in children: insights into etiology and management. *J Urol.* 1986;135:100-103.
36. Krugman RD. Recognition of sexual abuse in children. *Pediatr Rev.* 1986;8:25-30.

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