

Acquired Syphilis by Nonsexual Contact in Childhood

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Background: Children may acquire syphilis by nonsexual contact as a consequence of close and repetitive contact with mucosal or skin lesions of people with active syphilis.

Methods: Prospective cohort study of pediatric patients with acquired syphilis by nonsexual contact. Demographics, clinical findings, posttreatment serology development and general laboratory data were collected. Sexual transmission was ruled out after a careful medical and psychosocial evaluation of the patient and his/her family.

Results: Twenty-four patients were included in the study. Mean age at diagnosis was 4.2 years old. All of them came from overcrowded households with poor hygiene conditions. The most frequent reason for consultations was secondary syphilis skin lesions (79.2%). The psychosocial evaluation of children and their families did not reveal signs of sexual abuse in any of the cases. Seventy-eight families and their cohabitants were evaluated, 23 (29.5%) resulted positive for rapid plasma reagin and treponemal test of hemagglutination; 60.9% of the cases were asymptomatic. The symptomatic relatives showed lesions of secondary syphilis. A sustained fall on nontreponemal antibodies titer (rapid plasma reagin) was observed after treatment, becoming negative in 6/24 (25%) cases within 12 months post-treatment.

Discussion: Following evaluation, it was considered that sexual abuse was unlikely. However, if examination and psychosocial evaluation do not support it, other ways of transmission must be considered. Overcrowded and poor household conditions boost the risks for nonsexual treponema transmission. An infected member of the family or a caretaker are a particular risk to an infant due to common practices such as using saliva to moisten the rubber nipples of the milk bottles or trying the food temperature using the lips before feeding the infants.

Key Words: nonsexual, syphilis, acquired syphilis, childhood

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Syphilis is not only a problem for worldwide public health still today, but syphilis cases have continued to grow recently including in children. Syphilis is mostly transmitted by sexual contact or congenitally, but nonsexual transmission is possible, particularly in children, through close contact with members of the family or caretakers with active secondary syphilis with skin or mucosal lesions, especially in communities that live with unhygienic conditions or crowded living conditions.^{1–4} The worldwide burden of syphi-

lis infection is high, with approximately 10.6 million cases annually.⁵ The name *Treponema* comes from the Greek “screw thread or corkscrew,” based on its shape and torsion movement, which allows it to penetrate intact mucosa membrane, as well as the worn skin areas through intracellular junctions.⁶ This process requires moist conditions and close contact. In dry conditions, *Treponema pallidum* can only survive for 24 hours,^{1,7} once it penetrates the skin, it goes deeper until it finds moist areas and low oxygen content. They probably spread themselves by fission and once they go through the epithelium, spirochete locally multiply eroding the superficial layer of the skin producing the primary lesion of syphilis called inoculation chancre.^{1,8}

These lesions can heal themselves spontaneously going through a secondary period characterized by high spirochetemia and localization of *T. pallidum* in different organs (bone, kidney, liver, eyes), including the skin and mucosa. Once this stage is over, a third stage begins, after a latency period, with the presence of syphilitic gumma, periostitis, cardiovascular and central nervous system variations.⁹

Mucocutaneous lesions in the secondary stage of syphilis manifest themselves between 4 and 10 weeks after the primary lesion.¹⁰ One of the main characteristics is they have a high quantity of *T. pallidum* in blood and tissues and with high serologic titers. One of the typical secondary skin lesions is Condyloma lata, which is generated by maceration and erosion of syphilitic papule. These are generally located in moist areas with high friction, such as the perianal area. These lesions contain a high number of treponemas, which are highly contagious by contact.¹¹ Because the mucous lesions are highly contagious, close and repetitive contact has been described as a common source of infection.^{12–15} Many cases of infection in health care and laboratory personnel were described after being in contact with patients with skin lesions^{3,16,17} and not wearing gloves as security measures.

Due to child protection issues, the evaluation of a child with a diagnosis of syphilis is commonly focused in the first focus on ruling out sexual abuse, regardless of the clinical. Therefore, sexual transmission should not be taken into consideration after having ruled it out.^{14,18–20} Although there are multiple cases in the pre penicillin era, there are a few recent reports of transmission cases through nonsexual close contact. The evaluation of pediatric syphilis cases for which there are no signs of sexual abuse must be conducted carefully to avoid unnecessary hospitalizations and legal proceedings and stigmatizing one or many members of the family.

The objective of this study is to describe a series of pediatric acquired syphilis cases due to nonsexual transmission by close contact with members of the family or caretakers.

PATIENTS AND METHODS

A prospective cohort study of pediatric patients with acquired syphilis, assisted at Parasitology, Buenos Aires Children's Hospital “Dr. Ricardo Gutierrez,” Argentina from October 2004 to April 2019.

Diagnostic criteria for pediatric acquired syphilis diagnosis were as follows: children under 18 with nontreponemal tests and

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positive treponemal; mother with negative syphilis serology during the last trimester of pregnancy and 48 hours postpartum.

Nonsexual close contact transmission was diagnosed when close contact with an infected person, absence of primary syphilis lesions (chancres) and absence of sociopsychologic indicators on the patient and his/her family that would suggest sexual abuse according to current guides,²¹ had not received a blood transfusion and nonsexually active adolescents.

The following data were collected: clinical tests, fundoscopic examination, hemogram, hepatogram, urinary sediment, specific serology to *T. pallidum*, human immunodeficiency virus (HIV), treatment, clinical and serologic evolution. In all the cases, a family serologic test was conducted to search for other cases of syphilis.

In-depth anamnesis on the patients and their families was conducted as well as a physical examination, including searching for clinical manifestations compatible with primary or secondary syphilis and information about the possibility of sexual abuse. A psychosocial report on the patient, on the maternal family and paternal family, was also carried out to rule out sexual transmission. A psychologic evaluation was conducted for children through games, in company with other children, alone, with their mothers, as well as in the wards, relying on the observation of the psychopathology service staff. Personal interviews with parents and their close relatives were also carried out. A poor household with unsatisfied basic needs was defined as a household that had at least one of the following needs or absences: unsuitable housing (tenement house, precarious or others), dwellings without bathrooms, critical household crowding (more than 3 people sleeping in a room), the presence of uneducated children, 4 or more people per salaried worker, and places in which the head of household has a low degree of education (2 years or less in primary school).²²

All this information was gathered by a multidisciplinary team made up of pediatricians, psychologists, psychiatrists and social workers from our institution.

Serologic Tests

Rapid plasma reagin (RPR) was used as a nontreponemal test (RPR reditest, BLOKIT S.A., Barcelona, Spain). Titers were shown in a semiquantitative way, considering as reactive equal or greater values as 1 dilution. Reactive results were confirmed with the treponemal test of hemagglutination (TPHA, BioSystems S.A., Barcelona, Spain). Titers were shown in a semiquantitative way, considering as reactive higher or equal numbers to 1/80. A specific HIV serology was conducted by ELISA.

Supplementary tests are as follows: hemogram, hepatogram, kidney functioning, fundoscopic examination, long bones radiographs.

In summary, the study algorithm used was including physical examination, laboratory studies of the index case and its family group, psychosocial evaluation of the patient and family.

Data were extracted from clinical charts and anonymized by issuing a random-number identifier to each individual patient. The master list linking patients identifying information (ie, name, date of birth and chart number) to the study identifier was kept in a secure location to which only the senior and principal investigators had access.

Descriptive statistics were used for the variables of interest. Continuous variables are presented as means with 95% CI or medians and interquartile range. Categorical variables are represented in percentages. The disappearance kinetics of serum antibodies were analyzed using survival analysis (Kaplan-Meier). Analyses were performed with R software v3.0 (R Core Team 2018; R Foundation for Statistical Computing, Vienna, Austria; <https://www.R-project.org/>).

RESULTS

Of the 97 patients with syphilis followed by our service, we determined 59 patients were congenital and 38 acquired; a total of 24 (63.1%) of the cases were by nonsexual close contact, 7 (18.4%) were diagnosed as sexually transmitted without evidence of abuse and 4 (15.5%) a result of sexual abuse. In these 4 patients, the multidisciplinary study allowed the family members to report intra-family sexual abuse. These cases were reported to the competent authorities for judicial resolution. All of them received treatment with penicillin with good response to it. We were unable to determine the mode of transmission in 3 patients. The median age at diagnosis of the nonsexually infected patients was 4.2 years old (age range 1–17 years old). Female 62.5% and male 37.5%. All of the patients lived in Buenos Aires city (Argentina) and greater Buenos Aires area.

All the patients came from poor households with unsatisfied basic needs, especially from overcrowded households with poor hygiene conditions. Most of the patients (20/24; 83.3%) were hospitalized to carry out the psychosocial evaluation to rule out the possibility of sexual abuse. Only 4 patients were evaluated as outpatients with a strict follow up from professionals from our Service and Social workers.

The most frequent reason for consultation was the presence of skin lesions of secondary syphilis in 19/24 (79.2%) patients (Fig. 1). Extending the evaluation to the whole family of the patients provided the opportunity to diagnose 3 asymptomatic children with syphilis, who lived together in the same families. Clinical findings are described in Table 1.

Supplementary laboratory tests showed a case with a variation in urinary sediment compatible with nephritic syndrome, and a kidney biopsy was performed that was diagnostic for membranous glomerulonephritis. In spite of appropriate syphilis treatment with penicillin and follow up by pediatric nephrology, the patient presented with proteinuria for 6 years, healing afterward without identifiable sequelae. Fundoscopic examination and long bones radiograph for this patient were normal.

In the physical/genital examination, none of the patients showed compatible lesions with primary syphilis (inoculation chancre) or traumatic genital/anal lesions suggesting sexual abuse. HIV infection was ruled out in all the cases.

Children's behavior was evaluated during playtime; they did not show signs of anxiety or fear in any of the cases, which may suggest possible sexual abuse behavior. These evaluations were repeated several times during the patients' hospitalization obtaining the same results.

Serology

All the patients presented positive RPR and TPHA at diagnosis. RPR titer had a median of 64 dils (range 4–256 dils), and treponemal tests showed a median of 2560 dils (range 80–20,480).

Relatives and cohabitants of the 24 patients were examined (Table 2). Seventy-eight relatives and cohabitants were evaluated, resulting in 23 (29.5%) positive and 55 (70.5%) negative syphilis diagnosis. At the moment of evaluation of the infected contacts, 14/23 (60.9%) were asymptomatic and 9 had secondary syphilis symptoms (all symptomatic patients were women); 8 of the cases had erosive lesions in the oral mucosa and tongue (Fig. 2), and 1 case presented papular genital lesions of secondary syphilis. Neither inoculation chancre lesions (primary syphilis) nor vaginal discharge was observed during gynecologic and clinical examinations.

All the relatives were very cooperative, showing concern and empathy for the infected child, which allowed us to evaluate the family more easily, studying beyond the close family and opening the examination to those people who frequently had contact with



FIGURE 1. Lesions on a 2-year-old patient. A: Condyloma lata in perianal region; B: rash on the palms.

TABLE 1. Clinical Findings in 24 Patients With Syphilis by Nonsexual Contact*

	n	%
Perianal Condyloma lata (Fig. 2)	17	70.8
Palms and soles' desquamation (Fig. 2)	8	33.3
Oral mucosal plaques	6	25
Rash	2	8.4
Glomerulonephritis membranous	1	4.2
Asymptomatic	3	12.5

*Some patients presented more than 1 symptom.

the studied case. Every adult in the family attended the consultation for a serologic test in a fast way and adopting a good attitude. We did not find any evidence on specific behavior that suggested sexual abuse.

Treatment

All of the patients received penicillin, 19/24 (79.2%) received a single dose of intramuscular Benzathine Penicillin G 50,000 U/Kg, and 5 patients received intravenous Crystalline Penicillin G 200,000 U/Kg for 10 days as treatment for suspected congenital syphilis. Jarisch-Herxheimer reaction, mainly fever, was observed in 2/24 (8.3%) patients.

Clinic and Serologic Follow Up

Symptomatic patients showed resolution of their skin lesions within 7 days of penicillin treatment in 20/21 (92.5%) patients. Hemogram and hepatogram did not present changes during treatment and follow up in any of the cases. Serologic follow up had a median of 6.8 months (IQ 25–75, 0.7–18.2 months). A sustained decrease, at least a 4-time titers, was observed in the nontreponemal antibody titers (RPR), cases becoming negative in 6/24 (25%) within 12 months posttreatment. The median negativization time was 35.5 months (IC 95, 32.2–infinity). Treponemal antibodies measured by TPHA did not become negative, but a sustained decrease was observed during follow up (see Figure, Supplemental Digital Content 1, <http://links.lww.com/INF/E417>). This is to be expected considering in many cases, even with appropriate treatment, negativization is not observed. No patients were lost to follow up.

DISCUSSION

Treponema pallidum presents the ability to penetrate the skin and mucosa in proper humid and temperature conditions. In vitro models of infection with *T. pallidum* and nonpathogenic treponemas showed their ability to invade endothelial cells through intracellular bridges without altering tight junctions. This mechanism would be responsible for the natural infection of tissues in acquired syphilis.^{21,23,24,25,26} Moreover, findings regarding the studies on few *T. pallidum* in the intracellular space of endothelial cells suggest that even if the cells are capable of ingesting the bacteria. The spirochete shape and the high mobility of the treponema could facilitate invasion through intracellular bridges.²³

When facing a child with syphilis in his/her early childhood, it is always necessary to rule out sexual abuse. If there is no evidence of such behavior, other ways of transmission must be taken into consideration. In the prepenicillin era, it was thought that nonsexual transmission in young children was something relatively common. Some research suggests a rate of about 23% of the transmission by nonsexual close contact in children.¹⁴

In our series, of 38 acquired syphilis cases, 63.1% were determined as nonsexually transmitted. The decisions that allowed us to see sexual transmission improbable were made after a multidisciplinary evaluation that included a regular and strict follow up.

Murrell et al (1947) reported 6 cases of children with secondary syphilis lesions, acquired through close contact with an actively infectious person, in all the cases, lesions were secondary (rash, adenitis, condyloma lata).²⁷

Certain contributing behavior must be present so that close contact transmission occurs, as well as the common use of contaminated fomites. Overcrowded households, sleeping in the same bed, sharing bed sheets, towels, cutlery, cups, toothbrushes, and other elements boost treponema transmission when some member of the family presents skin lesions of secondary syphilis. All our patients' families presented unmet basic needs and lived in overcrowded houses and poor hygiene conditions.

A possible weakness of the study is based on the problematic social situation of patients with this infection, being of poor settings, where the psychosocial evaluation becomes difficult.

A physical examination on its own does not confirm nor rule out sexual abuse,^{28,29} but the appearance of primary lesions (inoculation chancre) confirms direct inoculation. Therefore, it is of vital importance to complete physical exams with a multidisciplinary

TABLE 2. Clinical and Serologic Study of the Coinhabitants

Family Group	Family Group Index Case	Age (years)	Sex	Clinical Examination Lesion Found in the Index Case	Study of the Family Group (years)	RPR/TPHA	Clinical Examination of the Infected Family Member	Route of Infection of the Members of the Family Group
A	1	4	M	Perianal condylooma lata	Mother (24)	Pos	Asymptomatic	Sexual
	2	2	F	Palms and soles' desquamation	Father (26)	Neg		
	3	3	F	Perianal condylooma lata				
B					Mother (37)	Pos	Asymptomatic	Sexual
					Father (40)	Pos	Asymptomatic	Sexual
					Brother (20)	Neg		
C	4	6	F	Asymptomatic (†)	Brother (21)	Neg		
	5	10	F	Asymptomatic (†)	Brother (ND)	Neg		
					Sister (ND)	Neg		
					Sister (ND)	Neg		
					Mother (40)	Pos	Maculopapular rash	Sexual
					Father (44)	(*)	Asymptomatic	Congenital
					Brother (2)	Pos		
D	6	2	M	Perianal condylooma lata	Mother (34)	Neg	Oral mucosal plaques	Sexual
				Oral mucosal plaques	Father (26)	Neg		
				Asymptomatic (‡)	Babysitter (18)	Pos		
	7	3	M	Asymptomatic (‡)	Grandfather (60)	Neg		
E					Grandmother (57)	Neg		
					Aunt (34)	Neg		
					Uncle (42)	Neg		
					Cousin (5)	Neg		
					Mother (20)	Pos	Asymptomatic	Sexual
					Father (21)	Pos	Asymptomatic	Sexual
					Mother (30)	Pos	Asymptomatic	Sexual
F	9	4	F	Perianal condylooma lata	Father (34)	(*)		
	10	7	F	Perianal condylooma lata	Sister (6)	Neg		
					Sister (2)	Neg		
G	11	5	M	Perianal condylooma lata	Mother (22)	Pos	Asymptomatic	Sexual
H					Father (ND)	Neg	Asymptomatic	Congenital
					Brother (2)	Pos		
					Mother (21)	Pos	Oral mucosal plaques	Sexual
I	12	2	M	Perianal condylooma lata	Father (25)	Neg		
				Oral mucosal plaques	Aunt (26)	Neg		
					Aunt (14)	Neg		
					Uncle (19)	Neg		
					Uncle (15)	Neg		
					Uncle (8)	Neg		
					Uncle (10)	Neg		
					Cousin (1)	Neg		
					Grandfather (43)	Neg		
					Grandmother (43)	Neg		
					Mother (24)	Pos	Tongue plaques	Sexual
					Father (22)	(*)		
					Brother (8)	Neg		
J					Sister (2)	Neg		
					Uncle (12)	Neg		
					Mother (20)	Pos	Oral mucosal plaques	Sexual
K	14	2	M	Perianal condylooma lata	Father (20)	(*)	Oral mucosal plaques	Sexual
				Perianal condylooma lata	Mother (23)	Pos	Oral mucosal plaques	Sexual
				Oral mucosal plaques	Father (26)	Neg	Vulvar mucosal plaques	Sexual
					Sister (4)	Neg		
				Grandmother (39)	Neg			
				Aunt (18)	Neg			
				Uncle (14)	Neg			

(Continued)

TABLE 2. (Continued.)

Family Group	Family Group Index Case	Age (years)	Sex	Clinical Examination Lesion Found in the Index Case	Study of the Family Group (years)	RPR/TPHA	Clinical Examination of the Infected Family Member	Route of Infection of the Members of the Family Group
L	16	5	F	Perianal condyloma lata Palms and soles' desquamation mucosal plaques	Mother (28)	Pos	Oral mucosal plaques	Sexual
					Father (ND)	(*)	Asymptomatic	Sexual
					Brother (10)	Neg	Asymptomatic	Sexual
					Brother (11)	Neg	Asymptomatic	Nonsexual
					Uncle (35)	Pos	Asymptomatic	Nonsexual
					Aunt (24)	Pos		
					Cousin (1)	Pos		
					Cousin (5)	Pos		
					Mother (40)	Pos	Oral mucosal plaques	Sexual
					Father (ND)	(*)		
M	18	17	M	Maculopapular rash	Aunt (ND)	Neg		
					Grandmother (64)	Neg		
					Mother (19)	Pos	Oral mucosal plaques	Sexual
					Father (23)	Neg	Palm rash	Nonsexual
					Brother (4)	Pos	Asymptomatic	Nonsexual
					Aunt (6)	Pos		
					Grandmother (47)	Neg		
					Grandfather (48)	Neg		
					Grandmother (53)	Neg		
					Aunt (25)	Neg		
N	19	2	M	Perianal condyloma lata	Aunt (24)	Neg		
					Aunt (23)	Neg		
					Aunt (14)	Neg		
					Uncle (19)	Neg		
					Cousin (1)	Neg		
					Cousin (2)	Neg		
					Cousin (3)	Neg		
					Cousin (4)	Neg		
					Mother (24)	Pos	Asymptomatic	Sexual
					Father (21)	Pos	Asymptomatic	Sexual
O	20	3	F	Perianal condyloma lata	Father's couple (31)	Pos	Asymptomatic	Sexual
					Grandmother (46)	Neg	Asymptomatic	Sexual
					Aunt (12)	Neg		
					Step-sister (15)	Neg		
					Step-brother (8)	Neg		

*Single-parent family. No paternal data.

†Diagnosis made on the basis of his younger brother 2 years of age diagnosed with congenital syphilis.

‡Diagnosis made on the basis of the study for having a symptomatic 2-year-old sibling.

Abbreviations: ND, no data; Neg, negative; Pos, positive; RPR, rapid plasma regain; TPHA, treponemal test of hemagglutination.



FIGURE 2. Lesion on the base of the tongue corresponding to secondary syphilis.

evaluation.^{13,30} In our series, we did not observe sexual abuse traumatic genital lesions nor syphilis primary lesions (chancere).

Condyloma lata is produced from syphilitic papule, as they are localized in a moist area and with constant friction, like the perianal area, they macerate, erode and hypertrophy leading to the formation of condyloma lata. This type of lesion appears in a late secondary stage, no matter what the transmission route,¹¹ mistakenly considering it, in many cases the result of sexual contact since it appeared in the perianal area. Within our patients, condyloma lata was the most frequent skin lesion being an expression of secondary stage syphilis and not a primary syphilis lesion that can be associated with sexual abuse directly. These lesions contain a high number of highly contagious treponemas to the touch. It is also very frequent to observe these lesions in congenital syphilis cases,³¹ but in our series, this means of transmission was ruled out as all our patients' mothers presented negative serology to syphilis during pregnancy. The majority of the lesions that infected mothers presented were in the oral mucosa, tongue and hands. These lesions boosted transmission by close contact through kisses, breastfeeding, sharing utensils infected with treponema used to feed the children.^{18,27,32} An infected mother, father or caretaker is a particular risk to an infant due to common practices such as: using saliva to moisten the nipples of baby bottles, trying food temperature with the lips before feeding the children. In addition, kisses are very frequent as well as being in contact with parents' saliva.

Cases of transmission through pre-mastication food have been reported, in which due to cultural reasons, parents previously chew the food that later their babies ate.^{4,12,19} Caretakers must receive education on this unhealthy practice. Many cases of infection in health care and laboratory personnel were described as they did not wear gloves as security measures.¹⁷ Epstein, in 1952, reports 51 extragenital lesions (fingers, nose, eyelids, arm) in doctors and medical students due to the contact with lesions on patients with syphilis, being in their majority ear, nose and throat specialists.³³

Sexual abuse by women occurs in approximately the minority (5%–20%) of reported cases; most cases of child abuse and pedophilia are perpetrated primarily by men.^{34,35} In only 3 cases, the patient's father tested positive for syphilis. The remaining were negative. This makes the sexual route of infection less probable.

The response to treatment is shown through negativization or titer fall on the nontreponemal tests.³⁶ The titer fall after treatment is variable, and it depends on several factors such as illness stage, duration, starting titer, but in general, it is considered that in treated syphilis, the titer should decrease 4 times after 6 months.³⁷

Our results show a fall in nontreponemal antibody titers as an indicator of therapeutic response. The low number of patients who became RPR negative is due to the fact that not many patients have reached the necessary follow up to achieve such an event because there has not been sufficient time after treatment for a titer drop.

CONCLUSION

Defining the route of infection when we talk about syphilis is complex. In our hospital, all the acquired syphilis cases are hospitalized and evaluated by a multidisciplinary team to rule out the presence of sexual abuse. These evaluations must be carefully conducted to avoid stigmatizing the family adults as abusers. In our cohort, after the corresponding evaluations, repetitive contact with skin and mucosa lesions would seem the most probable route of transmission, due to socioenvironmental conditions and overcrowded households as well as poor hygiene conditions. We conducted a long-term follow up with periodic evaluations in search of evidence of sexual abuse; however, we have not observed any evidence on it.

Our main objective is to reinforce the existence of nonsexual transmission, especially in poor families who do not meet basic needs. We also consider it mandatory that every pediatric patient with syphilis must be evaluated by a multidisciplinary team to rule out sexual abuse. We suggest testing all the cohabitants, so treatment can be prescribed to avoid future complications and new cases of infection in the family.

We should not consider a perianal lesion (secondary syphilis) an absolute indicator of sexual abuse, and after performing all the corresponding evaluations, a different way of transmission should be considered, like the ones presented in this study.

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