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THRUSH NAPKIN RASHES

BY

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The purpose of this paper is to show that thrush infection of the napkin area is a common condition in babies under 6 months of age in London to-day, and to describe its features and associations. Skin thrush in infancy has been said to be rare (Wright, 1954), but Holzel (1953) thought that it probably occurred more often than was recognized, and reported 11 cases.

Present Investigation

In April, 1954, a severe napkin rash, with the appearance described as typical of thrush, was seen in a week-old baby, and the skin swab showed the presence of *Candida albicans*. Two more examples were seen shortly afterwards, and it was decided to keep a close watch for further cases. During the next year most napkin rashes in babies in the obstetric hospital and attending the infant welfare department were seen by me. When a clinical diagnosis of thrush infection was made, a swab was taken from the rash and cultured for candida. As a control, swabs were also taken from examples of other types of napkin rash, from the perianal area of babies with oral thrush but no lesions in the napkin area, and finally from the buttocks of healthy infants. This last group was composed mostly of babies in the obstetric hospital, and included two who were immediate neighbours in both the nursery and the lying-in ward of a baby with oral thrush.

Swabs were cultured on blood-agar and Sabouraud's medium. Any yeasts isolated were identified by sugar reactions and ability to form chlamydospores. The results are shown in Table I.

Of 47 cases diagnosed as thrush napkin rash, yeasts were isolated from 42. In 39 of these they proved to be *C. albicans*, in two identification was doubtful, and in the remaining case another yeast was found. The presence of candida did not appear to be a chance finding unrelated to the cause of the rash, because no yeasts were grown from 28 infants with other types of napkin rash or from 15 healthy babies. In approximately one-half of infants with

TABLE I.—Results of Cultures for Yeasts from Swabs of Skin of Napkin Area in 102 Babies

Clinical Diagnosis	No. of Cases	No. from which Yeasts were Cultured	No. with <i>C. albicans</i>
Thrush napkin rash ..	47	42	39
Excoriated buttocks ..	20	0	
Ammonia dermatitis ..	8	0	
Oral thrush but no napkin rash	12	5	5
Healthy babies	15	0	

oral thrush candida could be grown from the perianal skin, although no lesions were visible. However, this does not invalidate the bacteriological findings in most of the 42 cases of thrush napkin rash from which candida was isolated, since only 12 had oral thrush at the time.

Thus 42 examples of thrush napkin rash were found in one year. Of 1,300 babies born in the obstetric hospital in that period, 37 were known to have been affected in the first six months of life—an incidence of nearly 3%. This suggests that the condition is common enough to be considered in the differential diagnosis whenever a napkin rash is seen.

Clinical Features

The common sites affected were the buttocks and inner thighs; most cases had lesions in both areas. The rash usually appeared on the prominences of the buttocks, and less frequently the perianal region was involved. In about a quarter of the cases the genitalia were affected and in a few the lower abdomen showed lesions. It is important to realize that thrush infection of the thighs, genitalia, or lower abdomen may occur without involvement of the buttocks.

The early lesions consisted of small dull-red areas, which subsequently coalesced in many instances. Sometimes a large dry red area with circumscribed lesions at the periphery was already present when the case was first seen. On the thighs and abdomen the lesions tended to remain circumscribed. Desquamation of the affected areas occurred, often after the formation of small flat superficial vesicles (Fig. 1). As desquamation proceeded, the peripheral part of the thin white epithelium covering a vesicle frequently remained behind. Small isolated lesions thus denuded of superficial epithelium and surrounded by a white collar are characteristic of thrush infection (Fig. 2).

FIG. 1.—Early thrush napkin rash showing flat superficial vesicles.

FIG. 2.—Thrush napkin rash showing characteristic lesions on inner thighs.

When healing occurred, the red colour of the skin slowly faded and desquamation gradually ceased. Without specific treatment a few mild rashes heal within one week, but severe examples persist for many weeks. It is in these cases that the rash may be attributed to soap residues in the napkins, the true nature of the eruption being unrecognized.

From this description it will be seen that a clinical diagnosis of thrush napkin rash can be made with considerable accuracy. As previously mentioned, yeasts were isolated from 42 of 47 cases so diagnosed.

Differential Diagnosis

Thrush infections have to be distinguished from other types of napkin rash, chiefly perianal soreness with excoriated buttocks, ammonia dermatitis, intertrigo, and seborrhoeic dermatitis. From the foregoing description of thrush rashes it will be realized that confusion with the first three should not occur, but seborrhoeic dermatitis may cause difficulty in diagnosis.

Excoriated buttocks—produced, for example, by loose stools or prolonged contact with soiled napkins—show raw red areas spreading from the perianal region, and the inner thighs are not involved.

Ammonia dermatitis involves the whole napkin area, but the flexures are largely spared. It occurs in three main forms: firstly, a vivid erythema; secondly, a brownish-red thickened skin with shiny superficial epithelium tending to desquamate; and, thirdly, isolated papulo-vesicular lesions which are often ulcerated (Jacquet's erythema).

Intertrigo consists of erythema of the skin creases, with exudation in severe cases. Candida infection may begin with intertriginous lesions, but the presence of white macerated epithelium indicates the correct diagnosis.

Seborrhoeic dermatitis in the napkin area may resemble thrush infection. There is usually an extensive dull red area with small isolated lesions at the periphery, but no desquamating white epithelium. It is often associated with seborrhoeic lesions on the scalp and elsewhere which reveal the primary condition. However, *C. albicans* was cultured from swabs of the perianal skin of two babies with seborrhoeic dermatitis involving the napkin area. The rash on the buttocks did not heal until specific treatment for thrush was given. It is therefore advisable to look for candida infection of all napkin rashes apparently due to seborrhoeic dermatitis.

Treatment

The first three infants in this series were treated by painting the buttocks with 1% aqueous solution of gentian violet. The results were satisfactory, but, in view of the staining of the babies' napkins and clothes, it was felt that mothers would not carry out this treatment adequately at home. In subsequent cases, therefore, a different method was adopted. Each time the napkin was changed 0.1% aqueous solution of merthiolate was dabbed over the rash and followed by an application of titanium dioxide paste. This paste has no special advantage in thrush infections, but gives an excellent protective covering for all types of napkin rash. With this treatment most thrush infections cleared up in one to six weeks, the average time being about two weeks.

Recurrences were seen in seven babies between two and ten weeks after the first rash had cleared. They quickly responded to further treatment. One infant had two further recurrences before he was a year old.

Aetiology

Some factors that might play a part in the aetiology of thrush napkin rashes were investigated.

Relation to Oral Thrush.—It is often stated that candida infections of the napkin area are usually accompanied by buccal lesions (Brain, 1953; Vulliamy and Mac Keith, 1954). In the present series less than one-third of the babies (12 out of 42) showed oral lesions. This experience

is similar to that of Holzel (1953), who found that 9 of his 11 cases had no thrush in the mouth and no monilia in the faeces. For these and other reasons, Holzel concluded there was a strong possibility that the skin, at least in some cases, was infected by the hands of a nurse or the mother. The present findings are in accord with this view, and the incidence of thrush vaginitis in the babies' mothers was investigated.

Relation to Maternal Thrush Vaginitis.—The incidence of thrush vaginitis in the mothers of 37 babies born in the obstetric hospital and who subsequently developed a thrush napkin rash has been compared with that in a sample of the 1,300 mothers delivered in the same year (Table II). Under the heading "maternal thrush vaginitis"

TABLE II.—*Comparison of Incidence of Thrush Vaginitis in Mothers of Babies with Thrush Napkin Rashes and of Healthy Babies*

	No. of Cases	Maternal Thrush Vaginitis
Thrush napkin rash ..	37	10 (27%)
Healthy babies ..	120	7 (6%)

$$\chi^2 = 11.1. \quad P < 0.001.$$

were included confirmed cases and those treated by the obstetrician as thrush without proof of the presence of candida. This is regarded as justified in that diagnoses of thrush infections on clinical grounds are usually correct (Dawkins *et al.*, 1953); errors tend to occur in the direction of missing candida infections when the clinical picture is atypical. In mothers of the group with thrush napkin rash, 5 of the 10 cases were proved, and in the controls 4 out of the 7. There was a significantly increased incidence of thrush vaginitis in the mothers of babies who developed a thrush napkin rash. It seems that the hands of mothers with vaginal thrush may become contaminated with candida, which are transferred to the infant's skin when the napkin is changed. Thrush rashes are produced chiefly in the first few weeks of life, when the skin is sensitive and very liable to irritation, and therefore likely to present conditions which permit the organism to thrive.

Relation to Previous Antibiotic Therapy.—The incidence of previous antibiotic therapy in the same two groups of babies considered in the last section was compared (Table III). The difference between the group with thrush napkin

TABLE III.—*Incidence of Previous Antibiotic Therapy in Healthy Babies and Those with Thrush Napkin Rash*

	Premature and Full-time Babies		Full-time Babies	
	No. of Cases	Previous Antibiotic Therapy	No. of Cases	Previous Antibiotic Therapy
Thrush napkin rash	37	12 (32%)	28	6 (21%)
Healthy babies ..	120	24 (20%)	116	22 (19%)

$$\chi^2 = 1.8. \quad P > 0.10.$$

rash and the controls is not significant. Further, there were more premature babies, who are more frequently given antibiotics, in the thrush group. If full-time babies only are considered, the difference between the two groups largely disappears. It is noteworthy that only three infants who developed a thrush napkin rash received antibiotics in the preceding week, although in one of these both buccal thrush and a napkin rash followed immediately after a course of treatment with chlortetracycline. It appears in general from this series that antibiotic therapy plays little part in the aetiology, although it may be a precipitating factor in occasional cases.

Relation to Seborrhoeic Dermatitis.—In addition to two babies already mentioned in whom thrush infection complicated a seborrhoeic dermatitis, three other infants developed that type of dermatitis one to two months after the napkin rash had healed. Thus 5 of the series of 37 babies showed seborrhoeic dermatitis at some time. It is therefore possible that the seborrhoeic skin is susceptible to infection with candida.

Summary

The clinical features of thrush napkin rashes are described; yeasts were isolated from 42 out of 47 cases so diagnosed in one year.

The condition is common. Of the babies born in an obstetric hospital, 3% were known to have been affected by the age of 6 months. Thrush infection should always be considered in the differential diagnosis of napkin rashes.

Treatment is described and some aetiological factors are considered.

It is emphasized that oral thrush was present in less than one-third of the cases.

There was a significantly increased incidence of vaginal thrush in the mothers of babies with thrush napkin rashes.

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SICKLING AND MALARIA IN THE GOLD COAST*

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In 1946 Beet suggested that the sickle-cell trait might protect the bearer from the effects of malaria in hyperendemic malarial areas, thus accounting for the high incidence of the trait in certain parts of Africa. Allison (1954) and Raper (1955), in East Africa, reported statistically significant differences in the incidence of malarial parasites in sicklers and non-sicklers. Moore *et al.* (1954), in East Africa, and Archibald and Bruce-Chwatt (1955), in Nigeria, could not confirm this difference.

The present paper records the results of sickling tests carried out during routine malaria surveys in the Gold Coast during 1954-5, and is a continuation of investigations already reported which suggested that sickling protected the bearer from malarial infestation (Edington, 1954; Colbourne and Edington, 1954b) but in which, owing probably to the small number of individuals examined, the accepted level of statistical significance was not reached. Two groups have been studied—Frafra in the Northern Territories of the Gold Coast, and inhabitants of Accra (mainly Ga) situated in the extreme south. The results have been conflicting and may explain the lack of uniformity noted by the authors quoted above.

The present investigation leaves a number of questions unanswered, but it is felt that the findings should be published, as they raise a number of interesting points.

*A portion of this paper was read at the fifth International Congress of Haematology and Blood Transfusion, Paris, 1954.

Method of Investigation.—We investigated 680 Frafra inhabiting the small village of Yorugu, in the Northern Territories of the Gold Coast, and 1,015 inhabitants of Accra, a large town situated in the extreme south of the country. In Accra the examinations were carried out in homes, schools, day-nurseries, workshops, and infant welfare clinics attended by healthy children. No hospital patients were examined. In addition, 52 infants from the suburbs of Accra were observed from birth to the age of 6 months and the effect of malarial suppression on 68 schoolchildren was assessed.

Technical Procedures

The rapid metabisulphite method was used to detect the presence of the sickle-cell trait. Malarial parasites were detected by staining thick blood films with Giemsa stain diluted to 4% in water buffered to pH 7.2. When necessary, species determination was confirmed by examination of a thin blood film. Parasite densities were calculated in thick films, assuming the leucocyte count to be 8,000 per c.mm., a figure probably within the normal limits in the Southern Gold Coast (Colbourne *et al.*, 1950). 400 white cells were counted and the number of parasites seen in these fields was noted. The groups into which the densities were classified (see Table II) are very broad, and it would require more than 100% error in the parasite count for the density to be wrong by more than one group. The sickling tests were performed and the parasite rates and densities estimated by independent observers.

An interesting point arose in the examination of the thick films. A number had a dense blue background in which could be seen the ghosts of many red cells, some containing a reticulin network. When the corresponding thin films were examined numerous target cells, poikilocytes, and polychromatic cells were seen. In the investigation in Accra four such films were seen and examination of the children revealed that they were suffering from sickle-cell anaemia. Two mechanisms were probably involved in the abnormal appearance of the thick films: the increase in target cells, which are more resistant to hypotonic solutions, and an increased number of reticulocytes. It is therefore possible by the examination of thick films in a malaria survey to detect likely cases of sickle-cell anaemia. This appearance in the thick film is not diagnostic, as it has also been noted in children recovering from an acute attack of malaria when a reticulocyte crisis occurs.

Malaria and Sickling in the Newborn

The blood of 52 babies, of whom 13 were found to have the sickle-cell trait, was examined weekly up to the age of 6 months. During the course of the investigation only 40 attended regularly, but 46 were examined at the end of six months. The results of the investigation are shown in Table I.

From this table it will be seen that at the end of six months 6 of the 11 sickling and 22 of the 35 non-sickling infants had suffered from malaria. All infections were by *P. falciparum*, apart from one mixed infection with *P. malariae* and *P. falciparum* in a non-sickler. The parasite densities were greater in the non-sicklers, the average

TABLE I.—Malaria and Sickling in Infants in Accra

Age	Sickling Under Observation		Non-sickling Under Observation	
	No. Under Observation	"Positive"	No. Under Observation	"Positive"
0-1 month	12	—	36	—
2 months	12	1	34	3
3 "	11	1	34	4
4 "	9	2	34	13
5 "	9	5	31	18
-6 months*	11	6 (54%)	35	22 (63%)

*"Positive" means that the infant had a positive blood film at some time during the period under observation.

*Including 6 defaulters traced between fifth and sixth months.