

TINEA CAPITIS

AN EPIDEMIOLOGIC, THERAPEUTIC AND LABORATORY INVESTIGATION OF 6,390 CASES*

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In 1919 a large proportion of all school children in Jerusalem was found to be afflicted with tinea capitis. During the subsequent years an intensive campaign led to the almost complete elimination of this endemic (2a). Thereafter, tinea capitis among the settled population, presented only a minor dermatologic problem. However, every immigration wave, especially from the neighboring countries, brought large numbers of cases of tinea capitis. In 1926 a systematic program of investigation and treatment based on the experience gained during the preceding years was adopted.

In the following report the results of this fight against tinea capitis, and the methods used to control its spread are described.¹

ANALYSIS OF SERIES

During the years 1926 to 1953 a total of 6,390 cases of tinea capitis were seen and treated in this department. The main groups of patients consisted of children referred by school physicians and the infected contacts found in the families of these children, recent immigrants routinely examined on arrival in this country or shortly after, and children brought by parents who had discovered scalp lesions.

In every case, the clinical diagnosis of tinea capitis was confirmed by microscopic examination of hairs and scales in KOH preparations. Since 1939, routine fungus cultures have also been made (10).

Among 6,208 cases in which the sex of the patients and the type of infecting organisms were known, there were 5,364 cases of tinea trichophytica and 844 cases of tinea favosa infection. Of those infected with tinea trichophytica, the percentage of males was 52.6 and of those infected with tinea favosa, 61.9.

The highest incidence of both types of infection occurred in children between the ages of 5 and 11 (Table 1). There were comparatively few cases below the age of 2 or over the age of 16. However, 4.2 per cent (218 cases) of those infected with tinea trichophytica and 10.4 per cent (84 cases) of those with tinea favosa were over the age of 16.

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Received for publication January 6, 1955.

¹ Statistics were compiled on a 50 per cent random sample obtained by withdrawal of every second case record card from a file arranged by year and in alphabetical order of family name.

This work was aided by a grant from the Ford Foundation.

TABLE 1
Age distribution of cases of tinea capitis*

Age	Tinea Trichophytica		Tinea Favosa	
	No. of cases	Per cent	No. of cases	Per cent
Up to 1 year.....	32	0.6	6	0.7
1-2 years.....	194	3.8	40	5.0
3-5 years.....	1,294	25.5	174	21.6
6-11 years.....	2,908	57.5	400	49.6
12-15 years.....	428	8.4	102	12.7
16 and over.....	218	4.2	84	10.4
Total.....	5,074	100.0	806	100.0

* Only cases in which the exact age is known are included.

About half of the patients were immigrants who had been in the country less than a year before the disease was diagnosed, and the great majority less than two years. Most of the patients were immigrants from the Near and Middle East and from North Africa. Infections with tinea favosa were most common in immigrants from Persia, while tinea trichophytica infections were found mostly in those from Yemen, Iraq and Morocco.

Complications occurred in 9 per cent of the cases. These consisted chiefly of pyoderma, manifested by pustule formation, or by the presence of flat crusted impetiginous lesions often accompanied by marked regional lymphadenopathy. In 1 per cent of the cases Kerion Celsi was found (4) and in less than 1 per cent of the cases tinea circinata was diagnosed. An "id" reaction (3) was seen in only 0.2 per cent of the cases, mostly following X-ray treatment. Rarely did more than one complication occur in a single patient.

TREATMENT

The main therapeutic method used was epilation followed by painting with iodine. After cutting of the hair, epilation was induced by X-radiation (5,904 cases). The five point method was routinely used by the X-Ray Department (Dr. A. Druckman, Director). In 194 cases epilation was achieved by ingestion of thallium acetate, 8 mg./Kg of body weight. After either treatment, the head was covered every two or three days with vaseline gauze until the hairs had become loose. Usually two to three weeks after X-radiation, a collophonium-bees' wax cap was used to complete the removal of normal and lanugo hair. Adhesive tape was sometimes used instead, but the results were not as satisfactory. The broken hairs (black dots) still remaining after removal of the cap were extracted with epilation forceps. This tedious system of therapy was adopted to insure completeness of epilation in mass treatment campaigns.

The scalp was then covered for one day with Lassar's paste and thereafter washed with soap and water. This was followed by a course of daily application of a 10 per cent alcoholic solution of iodine for six days, and then by one application of zinc paste. This course of treatments with iodine and zinc paste was given

three times for tinea trichophytica, and four times for tinea favosa infections, and the patients observed for another three months.

A second and very rarely a third series of X-ray treatments was applied in recurrent or newly reinfected cases only after a lapse of at least one year provided no damage due to irradiation was observed.

In 132 cases, instead of epilation, daily applications of ointments containing either beta-naphthol, resorcinol, chrysarobin, asterol hydrochloride (11) or podophyllin (8) were applied. This treatment was used for children below the age of two or three years and for those who showed signs of X-ray damage following irradiation. These drugs usually had to be applied for periods in excess of a year and gave inconstant results.

Epilation with thallium was abandoned because of the high rate of recurrences, 47.6 per cent, and also because of its tendency to produce toxic manifestations (2b, c). With X-ray epilation the recurrence rate was only 2.5 per cent. When the daily applications of X-rays over a five day period or the daily paintings with iodine over a six day period were interrupted and not given at daily intervals, the incidence of recurrences doubled or tripled. In every case of recurrence, the organisms recovered was the same as that found before the start of treatment.

CULTURES AND TESTS

Of 1,358 cultures, 23.6 per cent were negative. Of the positive cultures, 92 per cent consisted of *T. violaceum* and *T. schoenleini* (Tables 2 and 3). In three cases

TABLE 2
Distribution of organism grown from hairs of cases of tinea capitis

Organism	Without Complications (1,038 Cases)	With Complications (78 Cases)
<i>T. mentagrophytes</i>	4.8	20.5
<i>T. tonsurans</i>	1.7	10.2
<i>T. violaceum</i>	80.0	59.0
<i>T. schoenleini</i>	11.9	7.7
<i>T. unidentified</i>	1.6	2.6
Total	100.0	100.0

TABLE 3
Causative organisms in 116 cases of tinea capitis with complications

Organism	Pyoderma	Kerion Celsi	Tinea Circinata	"Id" Reaction
<i>T. mentagrophytes</i>	4	6	6	—
<i>T. tonsurans</i>	4	—	4	—
<i>T. violaceum</i>	34	2	8	2
<i>T. schoenleini</i>	4	2	—	—
<i>T. unidentified</i>	2	—	—	—
No growth	22	12	2	2
Total	70	22	20	4

TABLE 4

Results of trichophytin tests (304) in tinea capitis in relation to the causative organism

Organism	Trichophytin Test	
	Positive	Negative
<i>T. mentagrophytes</i>	10	4
<i>T. tonsurans</i>	4	—
<i>T. violaceum</i>	84	52
<i>T. schoenleini</i>	16	12
<i>T. unidentified</i>	4	6
No growth	18	24
Not cultured	36	34
Total	172	132

two organisms were recovered from the same case. Both *T. schoenleini* and *T. violaceum* were recovered from two patients (13) and both *T. violaceum* and *T. tonsurans* from another patient.

Intradermal injections of trichophytin prepared from freshly isolated organisms were performed in 304 cases (Table 4). The response after 48 hours was positive in 172 cases. This high incidence of skin allergy in patients suffering from a disease caused mainly by organisms of low sensitizing power is unusual (1, 12). There was no correlation between reaction to the skin test and the results of treatment.

DISCUSSION

During the early stage of the fight against tinea capitis, the following organizational steps were instituted by the Hygiene Departments of the National Council and Hadassah Medical Organization and later by the Ministry of Health in order to stop the spread of this disease.

A staff of school physicians and nurses was trained to examine every child before entering the kindergarten or school. Examinations were repeated at regular intervals during the school year. Children suspected of having tinea capitis were brought to this department for clinical and microscopic examination, and attendance at school was stopped if the diagnosis was confirmed. Return to school was allowed only after completion of the treatment schedule. Therapy was started only after the whole family and other contacts were investigated.

New immigrants were examined either immediately upon disembarking or upon arrival at transition camps during the period of mass immigration that followed the establishment of the State of Israel in 1948. At these centers children were accommodated until treatment was completed. By adherence to these methods carried out cooperatively by these various teams, the spreading and development of an epidemic of tinea capitis was prevented.

No significant differences in the sex incidence of tinea trichophytica were found. In tinea favosa, however, there was a preponderance of the male sex. No

explanation for this fact is apparent. Children in the first year of life are rarely affected (Table 1). Tinea capitis trichophytica and favosa seem to have a high tendency to spontaneous cure after puberty. However, a relatively large number of cases (302) was detected among adults whose infection had continued after puberty. This differs from the behavior of tinea microsporica which has been demonstrated to be a self-limited disease of relatively short duration (5a, b, c, 6, 7).

The clinical appearance of tinea trichophytica was that of the black dot type with usually a low degree of inflammatory reaction. In a number of cases only a few scattered broken hairs were present. This clinical picture is consistent with that of the endothrix type caused by *T. violaceum* found in most of our cases (9). No fluorescence was present in the cases examined under Wood's light. It is surprising that tinea microsporica was not detected among immigrants during the period of this study. Cases of tinea microsporica had been diagnosed clinically among immigrants from European countries before this period.

Any interruption in the schedule of the therapeutic procedure tended to decrease the rate of cure. The full treatment used in most of these cases required about 6 weeks and a relatively high rate of cure was observed during a 3 month follow-up period. The increase in the rate of recurrences following minor irregularities in the routine of treatment was striking. The difference between excellent and poor results depended to a very large extent on rigid adherence by the patient to the schedule of treatment.

SUMMARY

A total of 6,390 patients with tinea capitis were treated during the years 1926 to 1953.

More than 93 per cent of these cases occurred in immigrants who had been in Israel less than 5 years. Most of them came from the Near and Middle East and North Africa.

Of 1,038 positive cultures, *T. violaceum* was found in 80 per cent and *T. schoenleini* in 11.9 per cent.

The intradermal trichophytin test was positive in 172 out of 304 cases, indicating that *T. violaceum* and *T. schoenleini* possess a relatively high sensitizing power.

Treatment consisting of X-ray epilation followed by repeated painting with iodine gave a recurrence rate of 2.5 per cent. Thallium epilation was abandoned because of the high incidence of recurrences.

Thanks are due to Dr. A. Druckman, Dr. J. Taustein and Dr. M. Brachialu for their co-operation.

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