IMPETIGO CONTAGIOSA, ITS EPIDEMIOLOGY AND CONTROL

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(With 1 Chart and 1 Map)

CONTENTS

Introduction

The infectious fevers have, during the last fifty years, been the subject of much epidemiological research, and have thus been made to yield up secrets which have materially affected the whole outlook of preventive medicine. But there yet remains for exploration a vast adjacent territory, that of minor coccal infections of the skin. However, whereas the former, being clearly defined clinically and in many cases subject to compulsory notification, lend themselves well to investigations of this sort, Impetigo[1], as a type of minor coccal dermatitis, surrounds itself with difficulties. For not only does it vary very much in its appearances by the time it is first seen but it is often of so little severity that it does not come under the observation of a physician at all, so that the influence of missed cases, always an important factor to be reckoned with in the study of epidemics, may assume such proportions as to give quite an erroneous impression of the total incidence of the disease. Consequently the epidemic aspects of impetigo have as yet received very little attention.

But before actually approaching a field investigation of this sort it is necessary first to study the history of the disease in order to define clearly the subject under investigation, and to ascertain what changes, if any, have appeared in the course of time. The following work accordingly divides itself into three main sections. First, the clinical features and history of impetigo. Second, its incidence over a period of time in a particular district, together with certain features that may have influenced it. And thirdly, a reconsideration in the light of what has been ascertained of established doctrines concerning the methods of preventing it.

[1] Unless otherwise stated the term Impetigo in this paper refers to the variety Impetigo Contagiosa.

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HISTORICAL

Until the middle of the last century no distinction was made between those skin diseases which we now know to be of allergic origin and those which are pyogenic. Watson (1848), for instance, though he gives an accurate clinical description of the individual lesions of impetigo uses the terms "Impetigo eczematodes" and "Eczema impetiginodes" synonymously and asserts that "Impetigo is a non-contagious disorder. Sometimes this complaint occurs in an acute form and is attended with fever."

The first description of impetigo as a separate clinical entity was that of Tilbury Fox (1864). In the third edition of his text-book (1873), having described the characters and development of the individual lesions, he writes that the disease "is ushered in by smart, generally by slight, fever; or the child looks ill, pale, languid, or is said to have been 'in a burning heat' or to have had 'cold chills.' There is clearly an infection of the system at large before there is any eruption. In the summer of 1870 I had a large number of cases under my care at the hospital, and in many cases there was a smart pyrexia accompanying the onset of the disease." This disease was a malady of childhood, was seldom associated with pediculi, and was highly contagious, often appearing in epidemic form. And he distinguished it, as he had done in his original description, from "Impetigo Simplex," a primarily pustular disease, which was not confined to the young, often followed or accompanied eczema, and was not contagious or inoculable.

Duhring (1898) followed Fox in his description of different varieties of impetigo, but adds "the relation of this variety of Impetigo Simplex to Impetigo Contagiosa is probably close. They may prove on further examination to be identical in nature.... All varieties and forms of Impetigo are contagious: some are readily communicable by direct contagion, others only feebly so or under peculiar conditions."

Sabouraud (1900, p. 64) assiduously maintained the unity of the phlyctenular impetigos and distinguished them clinically as well as bacteriologically from the follicular impetigo of Bockhardt. "After Tilbury Fox a number of English, German, and American authors...repeated his description, *but they carefully distinguished Impetigo Contagiosa from Impetigo Vulgaris*. And that is how the old confusion has been maintained."

Since Sabouraud's description there seems to have been no attempt to keep alive the distinction between impetigo simplex and impetigo contagiosa: and modern authorities (Sequeira, 1927; McLeod, 1933) now describe the phlyctenular impetigos as one disease, impetigo contagiosa, but lay no stress on the evidences of constitutional disturbance accompanying its onset.

A study of the history of impetigo suggests that, since the time of its description by Tilbury Fox, the disease has diminished in its severity. The extent of the constitutional disturbance that used to go with it is unknown since the objective evidence of it is lacking; for Tilbury Fox does not give

any indication that he actually used a thermometer. On the other hand the "burning heat" and "cold chills" mentioned by the parents in 1864 have found their counterpart in but one case in the evidence offered by the parents in the series to be described later.

It may be presumed, therefore, that the severity of the disease has undergone a diminution in the last seventy years. To what is this diminution due? Dr Arthur Whitfield (1934, personal communication) has suggested that the impetigo contagiosa of Tilbury Fox was "a severe type of generalised impetigo probably associated with the much dirtier conditions of that age and the ignorance of its contagious properties." But perhaps another factor is involved. Impetigo is a streptococcal disease (Sabouraud, 1900; Percival, 1929) and there is abundant evidence that during a similar period there has been a considerable decrease in the mortality ascribed to other diseases of streptococcal origin such as scarlatina (Atwater, 1927), erysipelas (Atwater, 1927; Russell, 1933) and acute rheumatism (Atwater, 1927; Glover, 1930; Rolleston, 1933).

Nature and scope of the investigation

The town of Southampton is divided into two parts, of which the smaller lies to the west and is effectively cut off by the River Itchen so as practically to constitute a separate town. The southern section of this part of the town has a school population of some 5500 and is served by a school treatment centre from which the following observations were made. The northern section being at some distance recorded comparatively few visits to the centre and so was excluded from the scope of the investigation.

The great majority of all the cases of impetigo investigated were of children who actually attended the centre. With each fresh case an attempt was made to ascertain the date of onset of the infection, and, if possible, its source. Information about those children who were treated privately was obtained from a variety of sources, chiefly from the school attendance officers who were interviewed weekly: and as a check on their information evidence was supplied by the head teachers, at first from the attendance registers, and latterly from a weekly list of children suffering from infectious diseases which was sent to the central health department. The number of children treated privately was small in relation to the total; and the fact that the information received from these extraneous sources was complementary rather than supplementary suggests that the whole conspectus is as complete as it could be short of compulsory notification.

On this information a weekly incidence chart was built up, and from this the smoothed chart (see p. 154) was constructed in which the curves join up the week averages for ten weekly periods, each being referred to the mid-point.

But before considering this chart it must be noted that there exists one possible source of error which may colour the whole of an investigation such

as this, the error of diagnostic interpretation: for though the typical case is easy enough of recognition difficulties creep in where the patient is seen for the first time days or even weeks after the onset of the attack. Confusion is most to be feared between the lesion of impetigo that has been subjected to long-continued irritation from the patient's fingers, and a simple graze of the skin surface reopened by repeated injury. Reliance in such cases had to be placed on the following considerations. First, that "the primitive lesion of impetigo is never single" (Sabouraud, 1900, p. 322). Second, that the purely traumatic lesions are not to be found in hollows or, as a rule, on the less exposed situations. And thirdly, there is usually a definite history of injury to be obtained in appropriate cases, as opposed to the others where the spots are often said to have "come up on their own." Impetigo is by no means necessarily the same thing as "septic sores."

General epidemic features

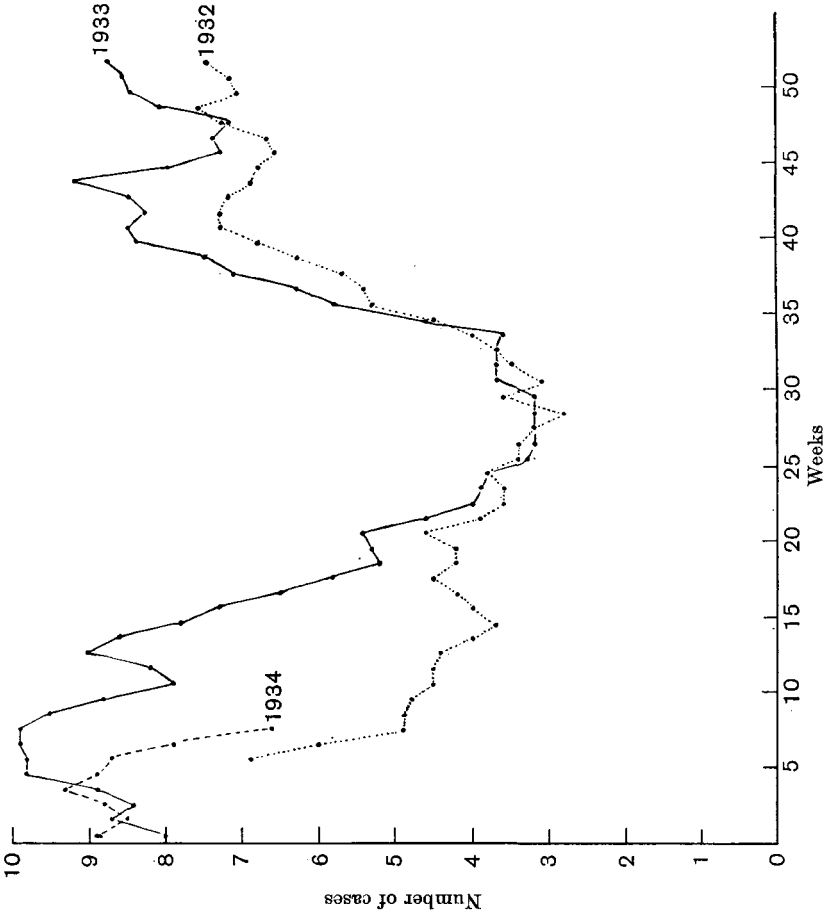
Tomkinson (1932) in Glasgow found no seasonal liability to impetigo over a period of three years. Smith and Burky (1924) in Baltimore found a maximum in the summer which they attributed to the fact that then the children were mixing more than in the winter when they stayed at home. But these workers based their conclusions on the figures for hospital attendances which do not necessarily reflect the actual total incidence.

In the present investigation (see Chart) the curve shows a definite seasonal variation repeated in the two years. The lowest point is found in the middle of the year from week 25 to about week 31. In weeks 32–42 there is a rapid rise to a high level, gradually reaching a maximum at the beginning of the new year and followed by a gradual decline to the minimum.

Two features are apparent from a study of this chart. First, its general resemblance to similarly constructed curves for diseases of streptococcal origin, of which perhaps scarlatina is the most familiar type. Secondly, the curve seems to be a seasonal one, uninfluenced by the beginnings and ends of the school terms. The rapid autumnal rise, for instance, is already well established by the time the schools reassembled in week 35; and the general decline in the spring shows no change which could be attributed to a fortnight's Easter holiday in the weeks 12 and 13 of 1932 and weeks 15 and 16 of 1933.

Source of the infection

It is probably safe to assume that the streptococcus is incapable of penetrating the healthy skin, and that in impetigo, as in erysipelas, there has to be made some breach, whether gross or microscopical, in the surface to provide the starting-point of the infection. The streptococcus is not an uncommon commensal, being found on 7·5 per cent. of skins (Haxthausen, quoted by Percival, 1929) and 5–30 per cent. of gums, throats, or noses (Colebrook, 1933). What could be more natural then than for the great majority of the cases of



	1932	1933	1934
1	—	10	8
2	10	11	14
3	11	9	15
4	9	11	9
5	4	8	9
6	7	10	9
7	8	10	8
8	8	4	6
9	7	11	10
10	4	14	5
11	1	10	6
12	1	12	5
13	0	9	3
14	1	7	
15	3	1	
16	4	1	
17	3	7	
18	1	13	
19	3	12	
20	4	5	
21	3	6	
22	3	1	
23	6	2	
24	1	2	
25	5	2	
26	4	3	
27	6	3	
28	3	5	
29	0	3	
30	3	2	
31	2	1	
32	1	2	
33	9	7	
34	5	5	
35	7	5	
36	6	6	
37	9	5	
38	8	15	
39	8	12	
40	4	8	
41	4	10	
42	8	5	
43	14	11	
44	10	8	
45	5	3	
46	5	8	
47	3	12	
48	7	3	
49	6	5	
50	9	3	

Chart. Smoothed curve, built up of 10-week averages, to show local incidence of impetigo from January 1932 to April 1934.

Table showing weekly incidence figures of impetigo from which accompanying chart is built up.

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impetigo to be spontaneous, arising in any one of the great number of skin injuries to which the average child is constantly subjected? In a great number of these cases the determining injury could easily be traced, and it seemed to be a very common event for the child to fall down and graze his knee, and then to subject the wound to repeatedly renewed injury till finally, whether by the implantation of a pathogenic strain of streptococci or perhaps as a result of damage to the local tissue resistance, an attack of impetigo would be precipitated and a number of the pustules typical of the disease would make their appearance around the old injury or elsewhere. Consequently—and especially in an investigation such as this where much of the evidence has to come from the statements of children—any attempt to trace positively the source of every infection is likely to prove erroneous. But certain facts may be mentioned which throw some light on this aspect of the disease.

Of all the possible sources of infection another member of the family is the easiest and most definite to trace. It is also in theory, and probably in fact, the most important, since nowhere else is contact so intimate whether in play, in ordinary life, or even in sleep. In this series the source of the infection, when attributed to the family, was usually already attending the treatment centre: in a few cases it could be traced to a child attending the welfare centre or the clinic for pre-school children. In all, 104 cases or 14·1 per cent. were traced to infection in the home, 31 in 1932 and 73 subsequently. These latter cases represent 52 families, and in the same period 381 other cases were recorded in 267 families: so that the disease spread in only one in every six of the 319 families. Of course whenever a parent was present the infectious nature of the disease was pointed out and the usual measures to prevent contagion were suggested. But it is to be doubted whether, under the conditions that obtain in most artisan homes, such steps could often be really effective. At any rate, of fifty patients, asked for particulars of their sleeping accommodation, forty-two were sleeping with one or more of their brothers or sisters, of whom only six became infected, while of the eight who slept alone two had infected other members of the family.

Around the home. An attempt was made by the construction of spot maps to see if there was any tendency for the disease to spread in particular localities. For this purpose the whole district naturally falls into five different areas, the divisions between them being formed by a railway cutting, main roads, or commons which children would be unlikely to cross in the course of play; and a spot map was made of each area term by term. Unfortunately the impossibility of definitely attributing infection in any particular case to a local source makes this part of the investigation unsuitable for statistical analysis: but the map of one of the areas for the winter of 1933 as reproduced shows the sort of result obtained.

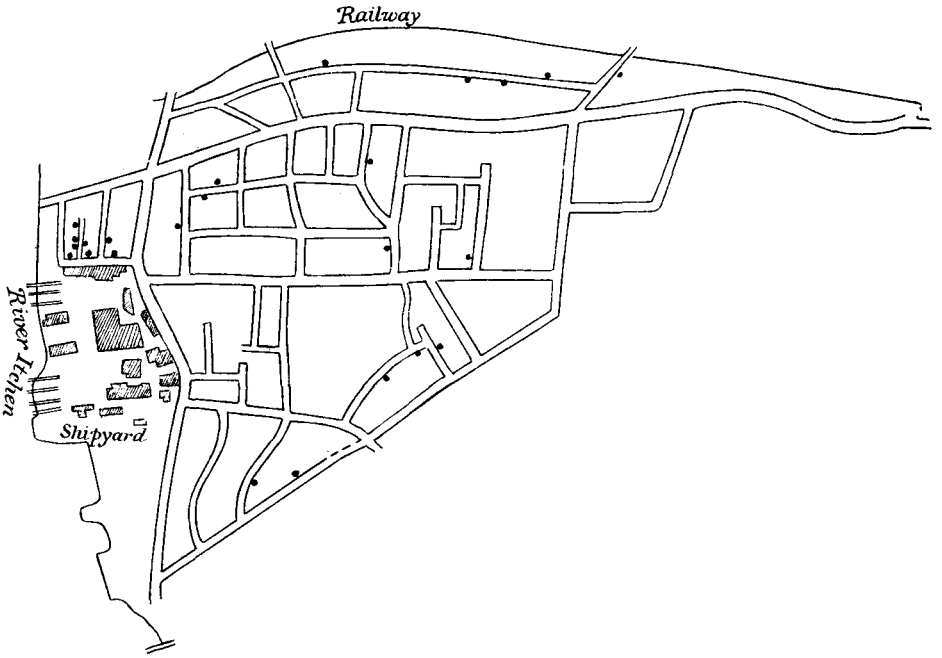
Of the twenty-four cases in the whole area eight patients lived in a small section cut off from the rest by two main roads and a shipyard. And that this is not due to pure chance is suggested by the following facts:

(1) Similar congregations of cases were found in other areas at other times: and in this particular area these four streets of rather poor houses showed a higher incidence than elsewhere on other occasions.

(2) The cases were spread over only eight of the seventeen weeks in the term.

(3) All three departments of the local school are represented, and in any one of the departments there was no evidence of a particular classroom being involved.

The school. The question of the influence of the school on the spread of impetigo is one of particular importance and particular difficulty. The common practice of excluding the infected from school depends on the tacit assumption



Map of the Woolston district of Southampton to show situation of houses affected by impetigo in September–December, 1933.

that the disease spreads readily in it. Yet if the risks of infection in the close contact provided by sleeping with a sufferer are as slight as they appear to be, how much less, indeed how insignificant, must be the risks of contracting it in school.

A weekly incidence chart was kept for each school department and information was obtained from the head teachers to show the classroom occupied by each patient. On only two occasions was one classroom found to be involved in a series of cases (three in one instance and four in another), and there was a complete absence of anything like an epidemic outbreak in any particular

school, although it was often known that individual children had been attending school for days, or maybe weeks, with the disease on them.

CONTROL OF IMPETIGO

The most important single factor for the elimination of the disease is, as is generally agreed, continued progress towards the ideals of personal cleanliness. Meanwhile the chief measure for its control is the exclusion of the infected from school, and it is as a cause of loss of school attendance that impetigo plays a very important part. In Southampton in 1933 532 sufferers from the disease lost no less than 11,060 days of school attendance and "it would not be an exaggeration to suggest that the 1029 cases coming to our notice were responsible for the loss of 17,000 school days" (Williams, 1933). And when it is borne in mind that the same child may fall a victim to the disease not once but many times, its importance in the sphere of education can be readily appreciated. Besides this, too, there must be added the cost of treating it at minor ailment centres, no inconsiderable item when considered for the country as a whole.

But it is my belief that exclusion of the infected from school is of little practical value. In the first place as the smoothed curve shows, the incidence of the disease is seasonal and shows no fluctuations attributable to school epidemics. The virulence of impetigo is no longer what it was, and the proximity of one child to another in the classroom does not now provide close enough contact to facilitate its spread. Moreover the home and its surroundings play a larger part in promoting contact than does the school, and a policy of merely returning a child to the very conditions where spread is most likely to occur is not likely to lessen the incidence of the disease. "Once a given infective disease has assumed endemic-epidemic prevalence within a herd, we should expect no appreciable result from the isolation hospital, so far as a reduction in morbidity is concerned" (Topley and Wilson, 1930). If this is true of isolation in hospital how little effect is "isolation" at home likely to have.

In the second place isolation from school is seldom practised with logical thoroughness. Time after time patients appeared at the centre who had had the disease for weeks while attending school.

A third piece of evidence against the efficacy of excluding the infected from school is provided by a study of the effect of allowing them to return. In one school which is not included in the survey for this reason, although it drew some of its population from part of the district, it was the practice of the head teacher not to insist on exclusion but to dispense simple remedies in the school. Only those children whose parents so wished it or in whom the illness developed more seriously fell into other hands for treatment. Yet out of 635 children only 26 such cases were traced for the whole period, and cases of impetigo encountered in the course of routine medical inspection seemed to be no more common in this school than in any other.

With a view to putting this question of exclusion to a more accurate test the infected children attending one group of schools were allowed to continue school attendance at the beginning of 1934. Unfortunately the results of this experiment cannot be regarded as conclusive, since it had to be brought to an end after only seventeen weeks' trial, and it might therefore be held that the absence of any increase in the attack rate was simply due to the fact that in any case the incidence might have been low. Suffice it merely to record the fact that the incidence for corresponding periods of the three years 1932–4 in the schools of this district was 23, 43 and 32 cases (school population in 1933—1355), or 1·69, 3·17 and 2·36 per cent., while in an adjacent district where exclusion was practiced the incidence for the same periods was 41, 74 and 45 (school population in 1933—1451) or 2·82, 5·10 and 3·10 per cent.

Control of impetigo is, therefore, not to be looked for in a policy of exclusion of the affected from school. There are, however, two methods by which the school authorities might effect a diminution in the disease. One is by the elimination of such obvious vehicles of contagion as the communal lavatory towel and drinking cup. The other depends on the suggestion already made that a very large number of cases are spontaneous, having their origin not so much in infection from another individual as in recurring injuries to the skin surface. If this is so the effective first-aid treatment of all such injuries might produce considerable benefit. There are two essentials for such treatment:

(1) Any cleansing of the wound must be relatively painless. Small children are not likely to volunteer for the application of iodine, and if they try to conceal their injuries this method of eliminating subsequent infection is likely to fail.

(2) Any dressing applied must be simple and unlikely to be dislodged.

The first of these provisos might be attained simply by the use of soap and water, or, perhaps better, by gently wiping the wound with a swab dipped in petrol, a method highly spoken of (personal communication) by J. M. Morris who has used it extensively in his practice as Medical Officer of Health for Neath. The second is easily met by the application of an elastic adhesive plaster such as "Elastoplast."

Conclusions

Impetigo is a disease which has decreased in virulence since it was first described seventy years ago.

It is subject to seasonal variations which show a minimum incidence in the summer, a rapid rise in the early autumn, a maximum at the beginning of the new year, and then a steady decline.

Contagion is not a conspicuous feature of the disease: even in the close contact of the home it does not spread as readily as tradition would lead one to suppose.

The smoothed seasonal curve shows no influence of the school on the

genesis of epidemics. Exclusion of the infected from school is of very doubtful value in stemming the tide of the disease.

Control is rather to be looked for in improvement in personal cleanliness, the elimination of common utensils in the school, and the effective first-aid treatment of minor wounds.

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