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Small Pox - A Clinical Study

The following notes are based upon a series of 215 cases of Small Pox occurring in the City of Nottingham during an epidemic which began in November 1903, and which is still going on. A hard and fast classification of the disease or definition of it is impossible owing to the protean variations through which it passes.

The latest epidemics of Small Pox show that the disease is materially changing its character, becoming less virulent in its type and leaving behind fewer evidences of its existence in the individual. This is probably due to the immunity rendered by the process of vaccination and to the increased resistance conferred by the operation, especially when repeated and possibly also when transferred from one generation to another.

This is the chief factor in the difficulty which has arisen in allaying the march and spread of the present epidemic in Nottingham, the attenuated and aborting cases presenting peculiar difficulties of diagnosis.

The symptoms of onset have presented a marked uniformity in mild and severe cases alike, consisting of the usual back pain, headache, bilious vomiting and sweating. The back pain has

mostly been situated in the lumbar and sacral regions though in a few cases it has been a gnawing pain in the neck and upper parts of the trapezius, and in one case the occurrence of pain in this latter region accompanied by a bilious attack has led to the isolation of an attendant upon the disease who subsequently developed a typical Small Pox Rash. Many of the cases which do not go on to pustulation, i. e. which abort in the papular or early vesicular stage have had no onset symptoms, or at least symptoms which have not attracted special attention, such as transient lumbago or headache. Sweating has been noted in about one third of the cases so that it is included as one of the characteristic initial symptoms. In "contacts" who were isolated in hospital and who subsequently developed Small Pox it was not associated with a high temperature or a fall of temperature, and bore no relation to the severity of the subsequent attack. The vomiting is of a peculiar character in that the quantity of "bile" ejected by the stomach is very great and is of an unassociated character not seen in ordinary bilious attacks - in these cases it being rejected by the bowel. The total quantity

ejected by the stomach is often stated by the patients to be "Quarts". The vomiting has in most cases the character of the gushing involuntary form of an acute intestinal obstruction, not the painful retching form of Renal colic.

While in the vast majority of cases the initial symptoms mentioned, with furred tongue, rise of temperature &c abate with the appearance of the smallpox rash occasional and very exceptional cases have been met with where one or more of the symptoms have persisted well on into the pustular stage. This has, in the two cases noted in the series consisted of occipital headache and lumbar pain and has in both cases been associated with a severe form of the disease with a confluent pustular rash, neither of them aborting or showing any attenuation.

Prodromal Rashes have occurred only in the milder cases or in the severer cases which have aborted, and in patients who have been well vaccinated in infancy. All of the severe confluent vesicular and confluent pustular cases have had no prodromal rash nor have any unvaccinated patients, even when in these latter the type of the disease has been very mild. These prodromal rashes have been

of a measly or urticarial appearance, most marked on the flexor surface of the forearms and on the inner surfaces of the thighs. The skin has a velvety feel and does not itch. There are raised blotches of congested skin, showing between them areas of normal healthy skin. The incidence of the prodromal rash does not modify the severity of the initial symptoms as does the incidence of the true varicellous rash. The transition stage between the prodromal and true rashes is somewhat gradual, and even when the measly prodromal is well marked, in many cases by the use of a hand magnifying lens, the minute papules not as yet in themselves characteristic, can be seen protruding through the patch of urticaria. This can be done by pressing and squeezing out the measly rash with the finger or thumb. Also about the flexor and ulnar surfaces of the wrists an occasional papule may be seen apart from but co-existent with a measly prodromal. This lasts for two or three days, but with the subsidence of the prodromal rash it takes on specific appearances, which at once clinch the diagnosis of the case.

Haemorrhagic prodromals have been absent

through, though in a previous epidemic in the city of Nottingham a case is reported of large petechial patches about six inches diameter on the fronts of the shoulders, epigastrium, groins & inner surfaces of the knees, this preceding a fatal case of Small Pox

As stated, the prodromal rashes have all been of a mealy or urticarial character on the flexor surfaces of the forearms, and on the inner surfaces of the thighs, and in the popliteal spaces. Transient erythema, scarlatinal rashes with erection of hair follicles, and petechial prodromals have not been noted.

Having regard to the uniformity of the initial symptoms, it is advisable, in coping with Small Pox from a public health point of view to isolate all contacts either in their own homes or in special provision made for them in hospital. This precaution has aided considerably in dealing with cases which would otherwise have been loose among healthy individuals while in an infectious stage, i.e. as soon as the rash has appeared. In this connection it is satisfactory to note that the Local Government Board has recognised and sanctioned the isolation of contacts in hospital at the public expense.

The incubation period has with marked consistency been under fourteen days, and it has been considered quite safe to discharge contacts at the end of a fortnight if they have no symptoms.

Fifteen cases have occurred in which the actual time of infection has been known, i. e. where there has been only one isolated opportunity of contracting the disease, and of these cases twelve developed sickness and back pain in twelve days.

The question arises "Is Small Pox Infectious in the pre-eruptive stage?". It is, for in a specific case to be presently quoted, the vount has carried infection, but no instances have occurred in which mere contact with the skin in the pre-eruptive stage has induced the disease, nor even has the pre-variolaous urticaria or prodromal rash been noticed to carry infection, in spite of the fact that several of these cases have been in close contact with susceptible individuals, i. e. adults who have been vaccinated only in infancy.

The following case illustrates the carriage of infection by the vount. A man living in a part of the city which was quite free from any cases of small Pox called to see a friend who lived in an infected area and found him suffering from

initial symptoms of Small Pox - severe prostration, vomiting, and back pain. He then called upon the medical officer of Health of the city to report his suspicions and at the interview with the M.O.H he made the remark "He nearly spoilt my trousers by vomiting over them". This was the only occasion on which he called at his friends house, and as far as could be ascertained, the only case of Small Pox with which he had come into contact, but in twelve days from this date he complained of headache and sweating, and in another three days developed a typical Small Pox Rash. The infecting case was visited when first reported, and he was found very ill with typical Small Pox onset symptoms, & he was isolated, and on the following day Small Pox papules first appeared.

The true Small Pox rash comes out first on the forearms, wrists, and face, and in those cases where the prodromal rash does not persist it is characteristic from the first. Here it is important to impress the fact that the naked eye alone cannot be depended upon to detect the characteristic appearances and it has been our constant habit to carry a hand magnifying lens with a focal distance of about one inch. The typical marks are seen on the flexor surfaces

of the wrists, between the fingers and on the forehead. The papule is hard, with the characteristic stolliness, & is deeply imbedded in the skin. The stolliness is appreciated best not by placing the hand or fingers flat upon the surface, but by pinching up between the finger and thumb a piece of skin containing papules and rolling it. On the summit of the papule is noticed a cerulean bluish colour, almost pearly, and the papule is not of a uniform red colour as in ordinary acne. Surrounding this bluish summit is a zone of acute hyperaemia, very red, but ending abruptly about the base of the papule and not extending ^{far} into the surrounding healthy skin. It is this peculiar colouration of the papule which is of extreme diagnostic importance for if it is found on the wrists, fingers, or face & especially if following any of the classical onset symptoms then the disease may with certainty at the earliest stage of the first or second day be diagnosed as Small Pox, as it does not occur in any of the other exanthemata.

The rash comes out rapidly and almost completely in the first twenty four hours, and while appearing first in the above mentioned positions, viz. the wrists and face, rapidly

spreads on to all parts of the body, up the arms, on the legs, palms, soles, the hairy scalp, mouth and throat. These papules may be sparse in amount and stand up sharply from a surrounding skin which is healthy in appearance, or they may be small and numerous, careful inspection being necessary to notice the characters of each individual one. In these cases also other papules may be felt, as it were, under the skin, & this is especially seen on the cheeks, the skin having a decided uneven surface, but without the spots of active hyperemia.

If the rash aborts at this stage it leaves behind it characteristic scars. These are small elevated truncated nodules with a circular top of minute circumference, requiring careful search. They are mostly of a dark brownish colour, or resembling treacle, their summit being about the size of a small pin's head, and quite circular. They have been likened to a snail's foot and termed the "operculum". Generally they are very sparse in quantity, perhaps only three or four, or even one, on the hand or forearm. It is useful to hunt well for these in the other inmates of a house where a Small Pox case occurs, and

where contact with a pre-existing case or source of infection cannot be found. They occur in persons comparatively recently vaccinated or even when vaccination is performed soon after exposure to infection, and they are of particular help when tracing a series of continuous cases. When the operculum or attempt at a scab is removed, as may be done by scratching with the finger nail a small red cicatrix is left which is in no way characteristic.

When the rash, instead of aborting passes on to further development the area of intense congestion and inflammation subsides to some extent, though not entirely, and the diagnostic pearly blue colour of the summit disappears. The typical umbilication takes place in many of the vesicles which are formed, but by no means in all. This formation is looked for first, and is considered more characteristic when it occurs in those situations where the rash first appeared, i.e. at the junctions of the arms and hands, and on the forehead. The vesicles are of varying size. They may be small, giving the skin a rough mottled appearance. This occurs mostly in the severe and confluent cases, and causes much discomfort to the patient, their tenseness

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and hardness being marked. The small vesicles portend a severe attack and are attended with much oedema and swelling. They are more apparant when they occur on the cheeks and forehead. Another variety of vesicles are the large globose ones, only slightly umbilicated and mostly with a flat top. Their occurrence does not influence the prognosis of the case. They are seen very typically on the extensor surfaces of the forearms and legs and soon pass into the stage of pustulation, leaving behind large pus infected ecthymatous sores which take a long time to heal. Umbilication is not to be looked for in all vesicles, and, in fact, the umbilicated ones which are considered typical may exist only in very small numbers in the midst of papules and vesicles, which except for their presence in their midst would not of themselves be characteristic or pathognomonic.

The multilocular character of the vesicles can be demonstrated by pricking them with a pin or needle on one side, when they do not collapse as do the varicella vesicles, but retain to some extent their tensesness to the touch.

The next stage of development of the Small Pox Rash is that of pustulation. The tenaculum which passes from the middle of the base of the vesicle to its summit and produces the umbilication gives way, the vesicle becomes globular and increases in size as the external wall becomes thinner, and it is at this stage that the degree of infectivity of the case is at its height, i. e. late vesiculation and early pustulation, and special care has to be exercised to ensure thorough cleansing of the hands and prevention of the carriage of any of the rash contents on the clothing. In the true variola which is unmodified the pustule contents are of a pale yellow colour, almost pearly grey, not so thick or so yellow as the contents of a pustule produced by the staphylococcus or streptococcus but more of a milky character.

Proceeding in its development the rash passes into the scabbing stage. The pustules burst and the contents are partly discharged and partly dry on the surface, leaving a crust which adheres. This stage of scab formation is the most variable of all as regards time, some cases at once discharging the contents of the pustule and leaving a fairly clean granulating base

which soon cicatrises, while the scab formation in others is extreme and of long duration.

In either case the resulting scar of a small Pox Rash which has passed on to full development is, if examined with the aid of a hand magnifying lens, in many cases very characteristic and pathognomonic. In the centre of the scar is seen a minute nodule



This corresponds to the insertion of the tenaculum which passed from the base of the vesicle to its summit. Then radiating out from this are small

streaky elevations in the scar which correspond to the divisions of the vesicle which divided it up into its separate locules. The scar also is circular, and may be resembled to a button on a leather chair. This condition is present with marked regularity, but the naked eye alone is often unable to detect the minuter features. While the scar of each individual pustule is circular, in a corymbose patch where several pustules have run together the scar of the aggregate is irregular in margin, yet the circularity of each individual element is preserved.

If the rash suppurates, that is, if to the specific organisms of Small Pox are added such pyogenic organisms as the staphylococci or streptococci a chronic scabbing takes place, a condition of Ecthyma being produced. This is very tedious in its course, often taking weeks to clear. It is most common on the forehead and this condition is much aggravated by the exposure of the patient to direct sunlight. The incidence of this pus infection tends to obliterate to some extent the characteristic star shaped cicatrices described. The scars left after the Ecthyma has healed and also after the cicatrice has lost its characteristic marking are of a peculiar pigmented colour, the pigmentation existing mainly in the base of the scar, somewhat resembling in colour the pigmentation of a syphilitic scar, but having more of a brickred colour, not much brown.

The scars left after small Pox may be classified under three headings (a) The elevated keloidal patches seen typically on the face and associated with exudation of serumenous matter from the skin of the face - not a true scab, i. e. not formed by the drying of pus. These keloidal scars are very chronic in their course, taking

a long time to be absorbed and for the surface of the skin to become smooth, but there is not much pigmentation about them. (b) The small shallow scars with the typical margin already described. These occur in the milder forms of Small Pox attenuated by vaccination. They are pigmented and very apparent, especially when they follow confluent cases, but the pigmentation is gradually absorbed and the scars fill up so that in a matter of a few months the disfigurement is not very noticeable. (c) The old "pitting", consisting of deep scars extending into the true skin, and of large circumference. These occur only in a small proportion of the later epidemics but followed the old un-attenuated cases of earlier epidemics. The scars are pigmented and marked in the usual manner at first, but these conditions wear off, and the patient is left with a smooth punched out white cicatrix, which is permanent. Two cases of Haemorrhagic Small Pox have occurred during the epidemic.

The first case was that of an unvaccinated female of $3\frac{1}{2}$ years of age. She had received her infection from her father who had a semi-confluent attack of the disease, but unattended

with any haemorrhage. The case was one which came under the classification of "Variola Haemorrhagica Papulosa". The haemorrhage took the form of vibices and ecchymoses about the face and chest, on the buccal and palatal mucous membrane, and under the conjunctivae. The patient's disease was diagnosed and she was admitted to hospital on the second day of rash. She was in an extremely low state with weak and flagging pulse and semicomatose. Her prodromal symptoms had been of the stereotyped character but not very severe, the vomiting having been the most distressing symptom. Nourishment was only given with great difficulty. On admission to Hospital her rash was in the following stage:—

There were beginning vesicles on the flexor and extensor surfaces of the forearms, about 30 to 40 on each arm with a few also on each palm. Many of these were umbilicated in the characteristic manner. There were also papules, very sparse in number scattered over the chest and lower limbs. There were patches of ecchymoses about the forehead, resembling much the effect of bruising, and not raised. There were also haemorrhages into the conjunctivae, much worse

extensive on one side than on the other, obtruding
 from view the whole sclera. The Buccal mucous
 membrane and soft palate were the seat of
 minute extravasations of blood, not more than
 a quarter of an inch in diameter, and slightly
 raised. Also on the sides of the chest were
 five patches of irregular shaped flat petechiae.
 There was no epistaxis, haematemesis, haemoptysis
 or melena. The typical Small Pox rash
 on the face was in the stage of papulation,
 scattered about the forehead, sparse in number,
 and apparently existing quite independently
 of the ecchymoses. They were not diagnostic
 except for the co-existence of umbilicated
 vesicles on the forearms and appeared to
 be in an earlier stage of development
 than the rash on the arms. The
 haemorrhagic rash appears to have been noticed
 by the patient's mother and medical man
 about the same time as the papules on the
 forearm, those on the face developing at
 a later stage. The haemorrhages did not
 increase in extent after admission nor
 did the papules and vesicles develop into
 the further stages. She did not regain
 consciousness after admission, the pulse
 getting weaker and irregular, the conjunctivae

insensitive. There was gentle perspiration about the body associated with a subnormal temperature, and the patient died on the second day of residence in hospital apparently from toxæmia.

The second case was that of an unvaccinated male of thirty five years of age. This history of his case previous to admission to hospital was not obtainable, but when first observed he had a confluent attack of small Pox in the vesicular stage of about the fourth or fifth day. The rash existed in profusion on the arms, legs, back, face & scalp, the vesicles being minute in size associated with œdema of the face and arms. There were two large patches of recent hæmorrhage under the skin on either thigh, extensive subconjunctival hæmorrhage with small patches of earlier ecchymoses on the forehead and right cheek. The remainder of the body was clear of hæmorrhage. The temperature on admission was $100.3^{\circ} F$ with a pulse rate of 108 per minute, weak but regular. The patient was delirious from the first and very troublesome, and had to be kept in bed by mechanical restraint, the delirium changing frequently from a violent to a low muttering type. He passed urine & feces in bed, but

could be brought to answer questions by persistent repetition of them. He took nourishment fairly well, consisting of milk, beef tea, and Valentines meat Juice but alcoholic stimulants were withheld as he was treated in the open air. The haematemesis persisted for two days after admission, was scanty in amount and attended with much pain and retching, but seemed to be independent of the introduction of any food into the stomach. Consciousness was not thoroughly regained, the pulse gradually slowed to 40 per minute the temperature got subnormal and the patient died on the morning of the third day of residence in hospital apparently from Toxaemia and Syncope. This is the form called "Variola Haemorrhagica Vesiculosa". Collier in his text book on "Fever" says that the characteristic of this form is that it does not proceed to pustulation, but many of the vesicles in the case described passed on to a further stage, especially on the forearms. Unfortunately we were unable to obtain any data as to the time or stage of the disease at which the haemorrhage made its appearance. The two cases compare thus:- both unvaccinated & both died. In the female child the haemorrhage

made its appearance at an early stage, while in the adult male ~~the~~ haemorrhage was present in the vesicular & early pustular stages and was associated with a foul smelling haematemesis. Osler states that the respirations are hurried out of all proportion to the fever (page 63 in his text book) but in neither of our two cases was this a noticeable feature, the rate bearing a constant relation to the frequency of the pulse, varying from 22 to 13, and getting slower & shallower as ~~the~~ death approached, and the pulse slowed, and asthma deepened.

Haemorrhage into the vesicles or pustules is not considered of much moment and does not influence the prognosis of the case if it is unassociated with haemorrhage into the healthy skin or mucous membranes. It bears no relation to the severity of the attack or the recency of the vaccination, and has in some cases been associated with an early abortion of the disease.

Four pregnant women are included in the list of cases attacked with smallpox. One was 32 years of age, six months advanced in her third pregnancy. She had been vaccinated as a child but not revaccinated. Her attack was of a semiconfluent character on the face, arms & legs

but sparse on the trunk. It ran through all the stages of papule, vesicle, pustule, and scab formation, and was ^{ca} preceded by very marked prostrating initial symptoms. The course of her pregnancy was however uninfluenced. She was discharged after a residence of twenty seven days in hospital and eventually gave birth to a healthy male child which was however in no way marked by its mothers illness. This child has been twice vaccinated when it was at the ages of eleven and fourteen weeks, once with Local Gov. Bowed Lymph and once with Jenner Institute lymph but in neither case was the operation successful.

The second case was that of a female of forty one years of age, five months pregnant and with a confluent attack of small Pox. She had a miscarriage while her rash was in the transition stage between papule and vesicle. She was placed in an open bell tent for open air treatment and she made an excellent recovery both from her small Pox and from her miscarriage though there was much offensive uterine and vaginal discharge. The foetus did not appear to show any traces of the mothers illness.

The third case was a female of twenty nine years

eight months advanced in her second pregnancy. when she developed her Small Pox Rash. She was admitted to hospital on about the second day of Rash, when it was noted to be in an early papular form, semiconfluent on the face, discreet on the arms and very sparse on the remainder of the body. She had a premature labour on the second day of her residence, most of her papules having developed into vesicles. She recovered from her labour excellently, but the child was emaciated and poorly nourished, bearing no traces, however, of the disease from which the mother was suffering. It was thoroughly washed in a weak solution of Igal immediately after birth, and after a delay of about six hours in obtaining lymph was vaccinated on the arm in four places. Each of the vaccinations "took" well, but on the thirteenth day of the child's life she developed a typical Small Pox Rash, semiconfluent in character, and died on the eighteenth day of life, apparently from toxæmia and malnutrition.

The fourth case in most respects resembles the third. The patient was a female of thirty three years of age eight months advanced in her second pregnancy. when she developed her Small Pox. She gave birth to a healthy

male child on the first day of her onset symptoms, the labour appearing to be induced by the vomiting, which was very distressing and painful. On the third day of the child's life the mother developed a Small Pox rash which was not diagnosed until the fourth day, at which time the baby was removed and isolated and the mother taken to the Small Pox Hospital. The baby was vaccinated in four places, two of which "took", running an ordinary course. On the seventeenth day of its life however it developed a confluent Small Pox of a severe character, causing its death on the twenty second day of its life, apparently from toxæmia, when the pustular condition of its rash was beginning to be well marked. Counting back two days for onset and twelve for incubation period, the date of infection thus corresponds with the appearance of the rash in the mother, i.e., three days after birth, and not as in the preceding case with the time of birth.

From these four cases it would seem that pregnant females do not, while suffering from Small Pox ~~to~~, at any stage of the disease convey ~~the~~ it to the child, though immunity, as indicated by refusal

to vaccinate would seem to be conferred in one instance. In the second case the child was immediately washed and removed from contact with its mother, but yet it developed Small Pox, and counting back thirteen days, gives the day of birth as the date of infection. The only explanation of this is that the child received the disease ~~through~~ in its passage through the vagina, as it would appear from the first case of the series ~~with~~ & other reported cases that infection in utero does not take place. It is not noted whether there were any pustules in the vaginal mucous membrane. It is also noteworthy that in the third and fourth cases the performance of the operation of vaccination at such an early stage after exposure did not, as would have been expected prevent or abort the disease, in fact the vesicles were large and resembled those of an unvaccinated case.

Three cases of Inoculated Small Pox have occurred during the epidemic. The patients were two female nurses in the Small Pox hospital, and the male ambulance driver, and in each case the infected sore was on the hand.

The first case was a female of the age of twenty four years who was vaccinated in infancy, and successfully re-vaccinated two

years ago. She had an abrasion on the back of her left hand and while attending to a patient in the ward got it infected with the contents of a Small Pox Pustule. Almost from the first the sore was tender and inflamed, this condition getting worse and attended with much pain and swelling. By the sixth day it had developed into a multilocular vesicle, about the size of a three penny piece, much resembling a vaccine vesicle, but more globose, and having around it an area of intense inflammation, and dotted around it were numerous minute nondescript papules. For the first six days the symptoms were entirely local - confined to the sore but at the end of that time a severe prostrating back ache was complained of, with headache and slight vomiting, and with a sense of impending death. This condition persisted with very little abatement for five days, the infected sore being intensely inflamed and painful, and passing on to pustular formation and scabbing. At the end of five days however of initial symptoms, that is, eleven days after primary infection a papular eruption appeared on the face and forearms. It was very sparse in amount, there being about seven elements on the face, about a dozen on each forearm

with six or seven scattered over the chest and hips. With the appearance of this rash the onset symptoms abated, the transformation in the patient being almost dramatic, while formerly she was in an acutely distressed condition she now became bright and cheerful. The rash aborted at an early stage, not going on to full vesiculation, but drying up and resembling the "Horn Pox" of the older text books, and essentially leaving behind hardly any traces of its existence. The primary sore, however, remains as an irregular shaped white cicatrix with ragged edges.

The second case in all details resembles the first. The patient was a female nurse of thirty two years of age stated to be revaccinated five years ago, but definite vaccination scars were not visible. The primary sore was on the middle finger of her right hand, but did not take on any active form until two days after the supposed time of infection. The incubation period, dating from the supposed infection was seven days, with five days of acute onset symptoms, which abated with the appearance of a very discreet papular rash which went on to the stage of pustulation. The primary sore took on the form of a globose multilocular vesicle, very congested & painful

and associated with axillary adenitis. The subsequent vesicles on the forearms were multilocated in a characteristic manner, and the scars which remained were mainly of a typical star-shaped form.

The third case was the ambulance driver, who was vaccinated in infancy, and successfully re-vaccinated three years ago in four places. His infected sore was on the palm of his left hand, but he could give no idea as to the time of infection as he was constantly handling the Small Pox cases. The primary sore was of an extremely severe character leading to extensive superficial sloughing, but the initial symptoms were not very marked, a general malaise and nausea being complained of, with a temperature of 102 to $103^{\circ} F$, and diarrhoea. After four days of these symptoms a semiconfluent papular Small Pox rash appeared on the flexor and extensor surfaces of the forearms, with much oedema of the infected arm and axillary adenitis. There was a sparse rash on the face, consisting of about eight papules, but the remainder of the body was clear. The rash aborted in the early vesicular stage, slight haemorrhage taking place into three of the vesicles on the forehead; but eventually the rash

cleared up, leaving behind no very evident traces of its existence. The primary sore was intensely painful, and did not present a very typical appearance. There was some clear watery discharge from it at first, this becoming purulent, and an ugly unhealthy looking granulation was left, which took about three weeks to heal. There were also during the incubation period fine nondescript papules on the wrist of the infected arm, but these did not develop any characteristic appearance.

These cases bear out Dr. Cory's evidence before the Royal Commission on Vaccination, where he states that natural and inoculated Small Pox are two separate diseases, and that neither natural Small Pox nor vaccination confer any immunity against inoculated Small Pox.

The incubation period appears to be shorter and the pre-eruptive stage longer than in normal Small Pox, the days six and five contrasting with twelve and three, but the initial symptoms have much the same characters in either case and both subside on the appearance of the Small Pox Rash.

The papules and vesicles formed are also of a typical macroscopic character and leave behind similar temporary scars to those of

natural Small Pox. The inoculated primary sores bear some resemblance to primary vaccination marks in that they develop an acute Inflammatory condition from the first, and pass through the vesicular stage in about six or seven days and then form a scab and leave a deep cicatrix. It is thus seen that in spite of recent revaccination the first and third cases developed the inoculated Small Pox, but while the vaccination was unable to inhibit the introduction of the disease, it in some measure tended to abort it. The history of re-vaccination of the second case is doubtful and the rash went on to full development leaving scars on the upper arms just above the elbows, and on the hips. In all three cases however the attacks were mild.

The belief in the possibility of the occurrence of "Variola sine Eruptione" is strengthened by the two following cases which occurred in the present and a previous epidemic. The first case is that of a woman of forty years of age, vaccinated in infancy with two marks. Her husband, an unvaccinated man of forty six years developed a severe attack of confluent Small Pox, not detected

until the rash was well out in the late vesicular and early pustular stage, and the patient delirious and wandering about the street in his shirt. He was removed to hospital, and his wife and two children removed at the same time to Quarantine, Isolated as contacts, and vaccinated. The two childrens vaccinations were successful but they both subsequently developed a Small Pox Rash, not however of a very severe character. The mothers vaccination, performed first with Local Gov. Board Lymph was unsuccessful and the operation was repeated in five days with Jenner Institute Lymph with the same result. She did not complain of any symptoms except a transitory headache which was not considered of much moment. It may be stated that at the same time as her vaccinations were performed other isolated contacts were vaccinated with the same strain of lymph, and in the second case from the same tube, the operations in these cases being attended with successful results. The question arises - "What was the reason of the refusal to answer to the test?" Is there an immunity rendered by contact with a case of variola without the actual incidence of the disease, or did the

patient herself suffer from an aborting Small Pox, unassociated with marked onset symptoms and being cut short in the pre eruptive stage?

The other case was one which occurred in a previous epidemic and reported by Dr Booblyer. The M. O. H. It was in a female of about 25 years of age who had been in contact with a sister a few years younger with a confluent attack of Small Pox in an early papular stage. She was isolated in Hospital and vaccinated successfully, the vesicles developing at the end of a week. For the seventh and eighth days of her residence she suffered from acute symptoms resembling those which usher in an attack of Small Pox. She had prostrating back pain and headache, with vomiting and a sharp pyrexia of 103 to 104° F. but had no sweating. These symptoms gradually subsided but were not followed by any rash or further evidence of Small Pox. The inflammation and induration surrounding the vaccination marks was very moderate, and apparently not sufficient to produce the constitutional symptoms. There was axillary adenitis. This case is taken to be a true one of "Variola sine Eruptioe" and as an attack of Small Pox may abort at any stage, this one

aborted in the transition stage between onset symptoms and eruption - a condition brought about probably by the vaccination after exposure to infection. The case contrasts with the previous one already mentioned in the fact that in one the success of the vaccination may be sufficient to account for the abortion at the early stage while in the other the failure of the operation can be explained only on the hypothesis that the patient had already received a mild attack of the disease which did not go on to rash production.

The complications of the cases of Small Pox which have come under our notice have consisted of glandular inflammation, laryngitis, corneal ulcers, suppurating Bursitis Patellae, and Pyogenic infection of the pustules. The Glandular inflammation has been situated in the cervical and inguinal region going on to suppuration and abscess formation. It presented no special characteristics, free incision and packing proving quite efficacious in the treatment. Laryngitis and Pharyngitis have been very common caused only by the existence of the rash in these situations. No special symptoms were caused other than aphonia and dysphagia, gargles of acid

Chlorine lotion and Boric lotion allaying them sufficiently. Corneal ulcers have arisen in two cases following the existence of a pustule on the conjunctiva. They have been of great chronicity accompanied by severe pain and congestion of the orbital and palpebral conjunctiva and a slight increase of intra ocular tension. The ulcers were of small area but deep. The pupils were kept dilated with atropine and a solution of Dionine was found most efficacious in relieving the pain beginning with a 2 1/2 % solution and gradually strengthening it up to 7 1/2 %

a suppurating patellar bursa which occurred in a woman of forty proved very tedious in healing and the patient was kept in Hospital for 120 days for it. Counter openings with drainage and a back splint were tried but did not seem to answer the purpose, and eventually the cavity had to be opened up by a large transverse incision across the front of the knee, scraped, and packed

The infection of the pustules is a very common condition, taking place mostly on the nose, forehead and hands. A condition of Ecthyma is produced with scab formation and secretion of pus formed by the staphylo-

cocci and streptococci which gain entrance. This condition is much aggravated by the exposure of the patient to sunlight, and often persists long after the remainder of the Small Pox marks on the body have healed and the patient is ready for discharge.

The effect of light on the degree and depth of the rash has been made a special point of observation and it has been found that it has no effect whatever on the true Small Pox Rash. This has been as abundant on the legs which have been kept absolutely in the dark under the bedclothes as on the face and hands. In four cases of varying severities one leg has been bandaged up and kept so from the first for the sake of comparison with the other leg, but in no instance has any difference been noticed. In fact some of the largest and ugliest patches in conyubore cases have been noted on the inner thighs and skins. This is in direct antagonism to the teaching of Finlen, who in an article in the British Medical Journal of June 6. 1903 is very strong on the evil effects of exposure to light. He states that "the disease is one for which the Public Health authorities oblige the patient to go into a

particular hospital and he has a right to ask that he shall not there be unnecessarily ~~be~~ exposed to dangers that may be fatal, or at least liable to disfigure him for life." He also states that during the late London epidemic one half of the deaths - which amounted to 16% of the cases - would have been avoided if red light had been resorted to in the treatment. The only effect that direct sunlight has had in our cases is possibly a retarding influence on the resolution of the rash. But the exclusion of white light from the skin affected with Rash does not appear to be attended by the beneficial results which have been alleged, and the degree of permanent injury which is ultimately left is indistinguishable on the various parts of the body whether exposed to light or not.

The harm of the exposure to light has with us occurred at a late stage of the rash, when the pustules burst. On the trunk in most cases when the large pustules burst they discharge their contents and leave behind an unhealthy granular base, which however soon cicatrises. But in patients who are allowed to expose themselves to the air the rash on the face takes on a chronic eczematous condition

with the formation of pus under a scale - the so-called Ecthyma. This is probably not due to the light but to the aerial infection of the granulations with superadded pyogenic organisms.

With regard to the effect of vaccination on a person already exposed to the infection of small Pox it may be stated generally that in no case is there any certainty that immunity is obtained, or abortion brought about, no matter how soon after exposure the vaccination is performed. This is seen in the case of the infant mentioned on page 22, who was vaccinated within six hours of birth, but who contracted the disease and died of it. As a rule vaccination during the first three days after infection will probably tend to abort or attenuate the disease. From the third to the sixth day the vaccination will be successful but will have little or no influence on the course of the disease. After the sixth day the vaccination will probably not take. In many cases where exposed patients are vaccinated several nondescript papules are seen surrounding the vaccination marks & imbedded in the inflamed and indurated area. These are generally looked upon as indicators that the vaccination is variolated, and a

True Small Pox Rash is looked for. The vaccination marks also in these cases take on peculiar markings. They are fuller, more elevated often with well marked indentations on the surface and perhaps a depression in the centre giving the vesicle an umbilicated appearance. It is probable that these are variolous, their contents infectious, and capable of conveying true Small Pox, and it has been our custom to keep the cases in isolation until the vaccination marks have healed, a process which may take longer than the healing of the true Small Pox which accompanies it.

Much confusion has arisen in the diagnosis of Chicken Pox from Small Pox. In cases of mild Chicken Pox the diagnosis is quite easy and it is only necessary to mention the multilocular character of the vesicles and their usual appearance on the trunk. From cases of severe Chicken Pox which pass on to pustulation the diagnosis may be considered under the following heads

- (a) Prodromal Symptoms. In the vast majority of cases of Chicken Pox there are no initial symptoms, but this is not always the case, for instances have occurred under observation of Chicken Pox in

adults being preceded by marked malaise, headache and mild pyrexia. This however was of short duration - only a few hours, but severe while it lasted. There was no back pain or vomiting. All the other cases of Varicella have been unattended with it, and the first indication of illness is the appearance of the rash.

(b) Date of appearance of the rash. In those cases of Chicken Pox where there are any initial symptoms to guide, the rash has appeared on the first day of complaint, while in Small Pox the onset symptoms last in an acute manner for two or three days.

(c) Situation of the Rash:- Small Pox Rash is looked for first at the junctions of the arms and hands, on the forehead, or on the hips with comparative mildness on the trunk. The rash of Chicken Pox is more variable, generally appearing first on the sides & front of the chest. It may however extend to all other parts of the body, or show itself first there, as on the face, palms, soles, mouth and scalp. As a general rule the rash of Chicken Pox is very light on the arms, slightly more marked on the face, and severest on the trunk.

(d) Appearance of Rash:- The Small Pox rash comes out quickly and almost entirely in the first twenty-four hours; and while the transformation of

The rash from papule to vesicle and then to
 pustule is slow the appearance is more or less
 uniform, i.e. all the individual elements of
 the rash are in nearly the same stage of
 development. In chicken Pox however the
 Rash comes out in "successive crops", and
 each crop passes rapidly through its stages
 of papule, vesicle, pustule, and scar. Thus
 the general appearance of the rash is a
 mixed one, and often in the midst of a
 patch of pustules or scars on the chest
 fresh papules are seen arising, this
 condition being in marked contrast to
 Small Pox. The vesicles of chicken Pox are
 in the main round globose, non umbilicated
 and unilocular. There are however many
 exceptions to this and by careful search
 umbilication may be detected in many of them.
 The umbilication however is not true, that is,
 it is not caused by a tenaculum passing from
 the base to the summit of the vesicle, but by
 a lower tension of it and a partial collapse.
 If the vesicles are punctured and evacuated
 they are found to be superficial and do not
 extend as deeply as do the variolous vesicles.
 The large corymbose patches of vesicles along
 the sides of the ribs are typical of chicken Pox.

The resulting scabs of the two diseases also differ considerably. In Small Pox the scabs of each individual pock are circular and of even edges, though in the aggregate, i.e. when numbers of pustules have run together the resulting scab is of uneven composite appearance. In chicken Pox, ^{the scabs} have not the even marking. They are irregular in shape and of a ragged margin, and their bases are bloody. This form of scab is seen typically on the chest and abdomen, though frequently also on the face & forearms. The existence of the rash on the palms, soles, scalp, palate & fauces is not characteristic of Small Pox, for many cases of undoubted chicken Pox have occurred in which it was present in these situations.

The ultimate scars of chicken Pox do not present the radiating elevations of Small Pox but are of more or less even bases, ovoid shape, and non-pigmented.

(c) Vaccination. It is said that the question of vaccination should only be considered when all other arguments have been exhausted.

As a general ~~rule~~ rule, persons who have been vaccinated within the past ten years are immune to small Pox. There is however an extreme variability in the personal factor,

in the number and extent of the vaccination scars, and in the quality of the strain of lymph used.

The open air treatment of Small Pox has proved a marked success, and cases which we have considered almost hopeless, such as pregnant women, and aged men, have made excellent recoveries under it. Septic complications have been reduced to a minimum, and there is also a marked advantage to other patients in hospital, in that they are out of reach of the poisonous emanations from the bodies of the severe cases during the ~~acute~~ acute stages of the disease. The means adopted have been those of ordinary army tents, with wooden flooring, and the three following cases will serve to indicate the benefit accrued.

The first case is one referred to on page 21. It was that of a female of forty one years of age, having a miscarriage in the fifth month of her pregnancy while suffering from a confluent attack of Small Pox in the papulo-vesicular stage. The face was entirely enveloped in the subsequent scabbing process, the same condition being present, but in a very much milder form on the hands, arms & legs. There was a mild wandering delirium, but

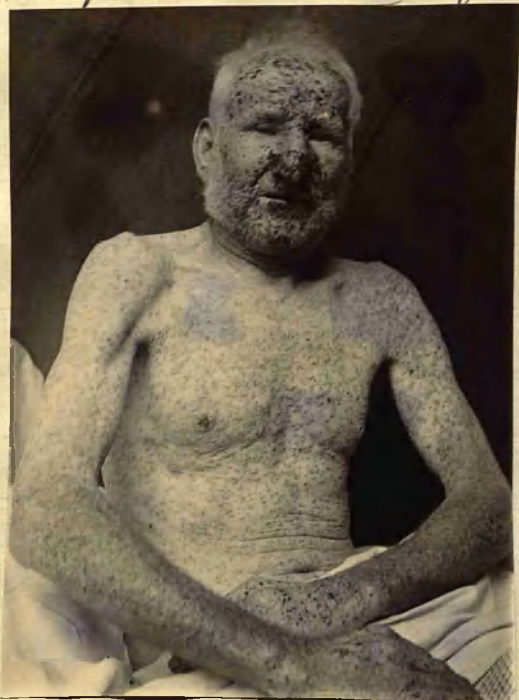
nourishment was taken well. The patient was placed in an open tent, and made an uninterrupted recovery, the delirium subsiding, pulse improving though the extreme severity of the case had led us to look upon it at first as almost hopeless. There was much foul smelling vaginal discharge, which soon dried up. Strength was rapidly regained, but the stay in hospital was protracted, owing to the profuse scabbing.

The second case was that of a male of 46 years of age, unvaccinated, and husband of the woman referred to on page 29. under "Variola sine Eruptione". He was first known to have small Pox by being found wandering about the street delirious in the middle of the night. On admission to Hospital he was found to have a severe attack of confluent small Pox in the late vesicular stage. He was put into an open tent for treatment and for the first two days was delirious, requiring mechanical restraint to keep him in bed. This however, passed off and the patient began taking a sufficient supply of nourishment, the pulse slowed from 120 per minute down to normal, and he made a rapid recovery, the scabbing process quickly coming on, but the skin soon became smooth



and clear though the pitting was well marked

The third case worthy of mention is one which is at present under treatment. He is a man of 68 years of age with confluent Small Pox. He was a very healthy, tough old man, having led a temperate life, and was by occupation a Gardener. He was got into Hospital on the first day of his rash,



which was of a very profuse character (see accompanying Photograph). For the third or fourth days he was slightly delirious, but after this his rash abated.

Hæmorrhage took place into the vesicles on the forehead, and the rash did not proceed to pustulation. The individual

elements of the rash are all minute - a condition which is otherwise considered as presaging a severe attack of the disease. His mind is now quite cleared up, his pulse is good and strong, temperature normal, taking nourishment well and showing every prospect of making a good recovery. He states he was vaccinated many years ago but no vaccination scars can be found

This is a form of case which would in the first case be looked upon as almost certainly fatal, and the gravest prognosis was given to the friend, and it is only the open air treatment which can account for the wonderful recovery he is making.
