

305

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The Antiseptic

A Monthly Medical Journal

Edited by

Dr. U. Rama Rau, M.L.C. & U. Krishna Rau, M.B., B.S.

24 APR 1941

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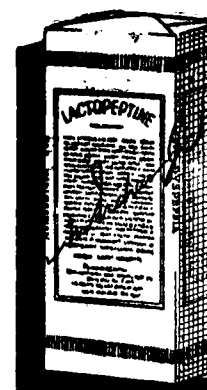


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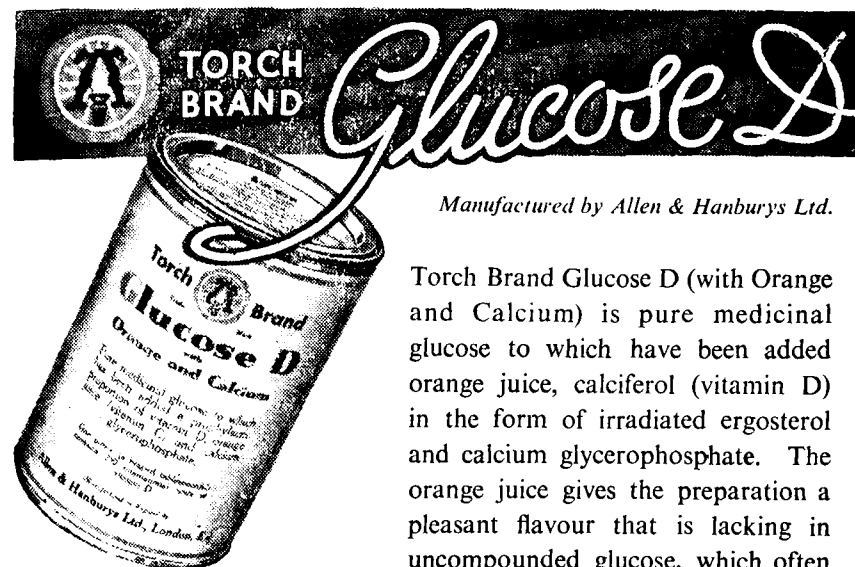
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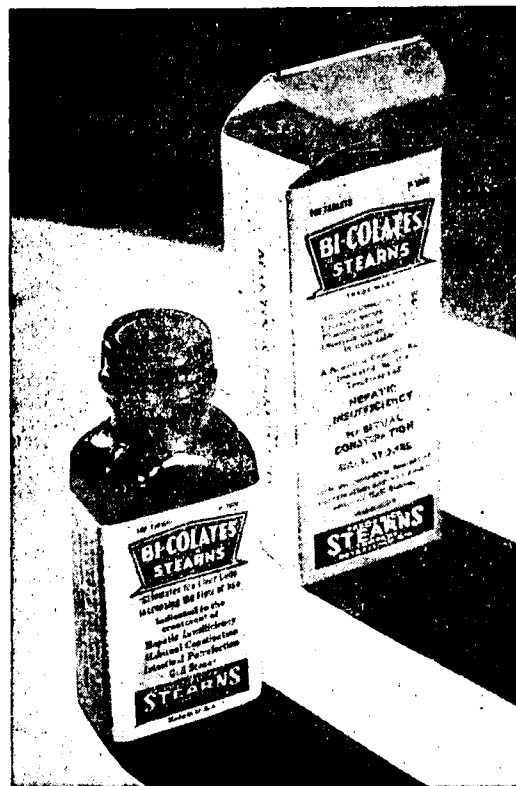
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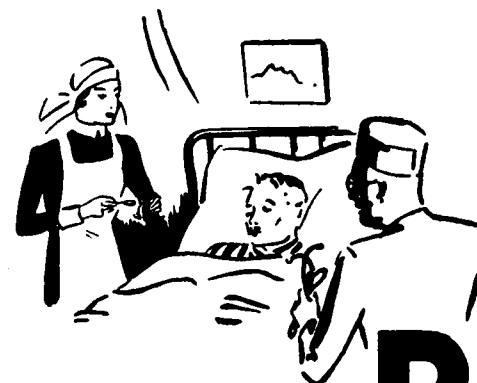
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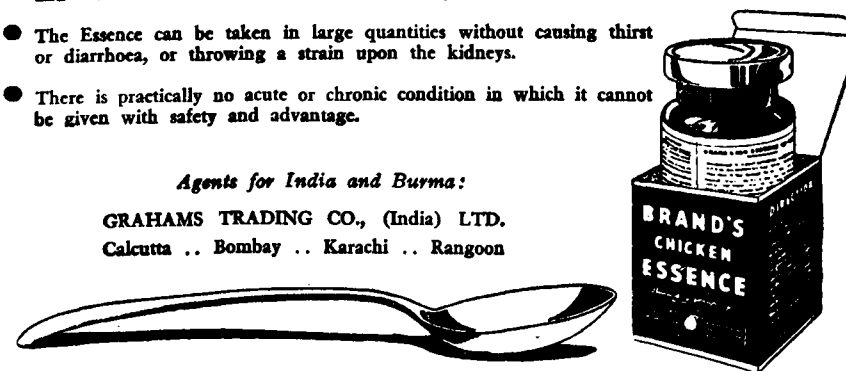
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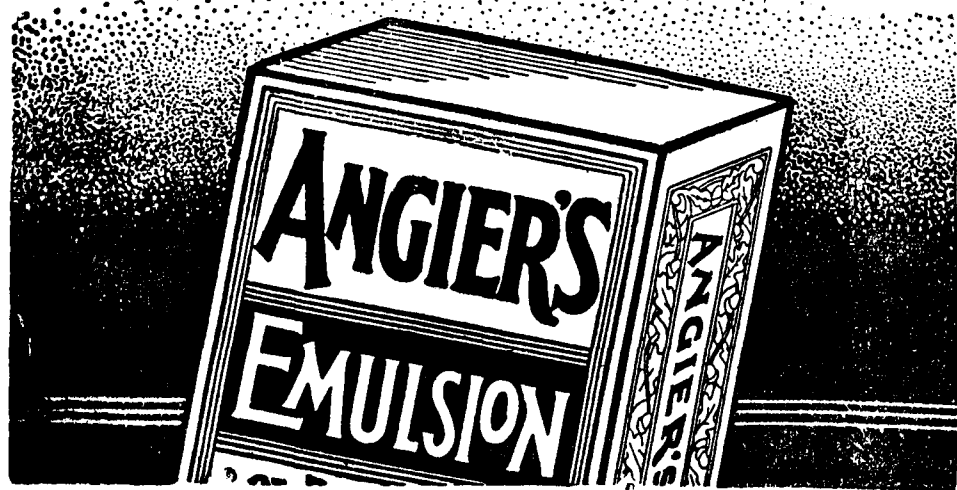
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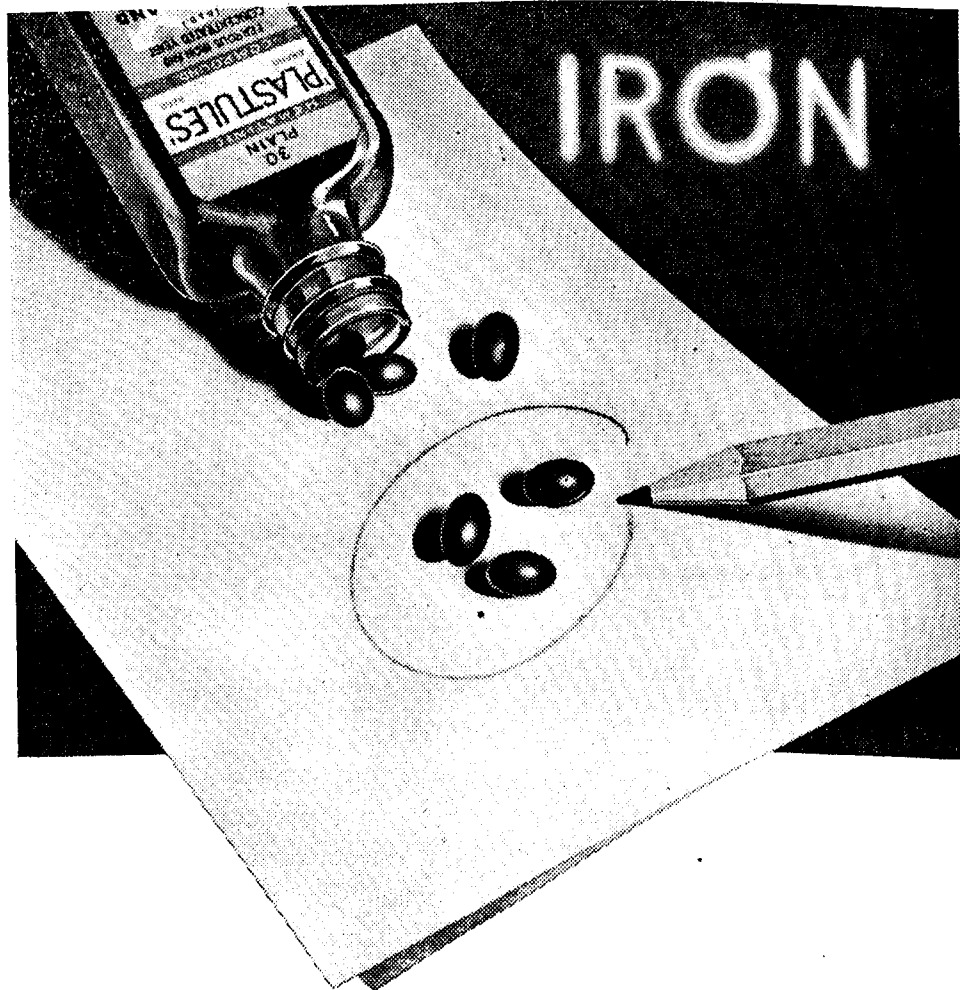
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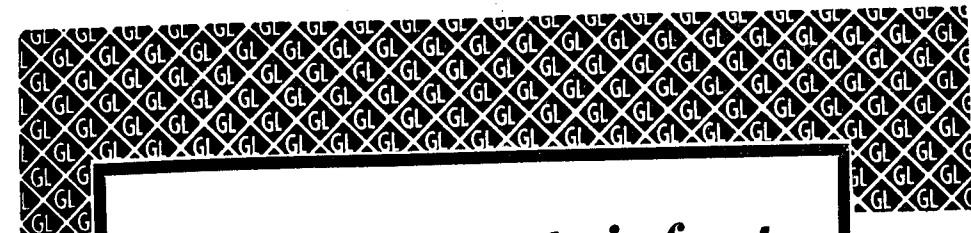
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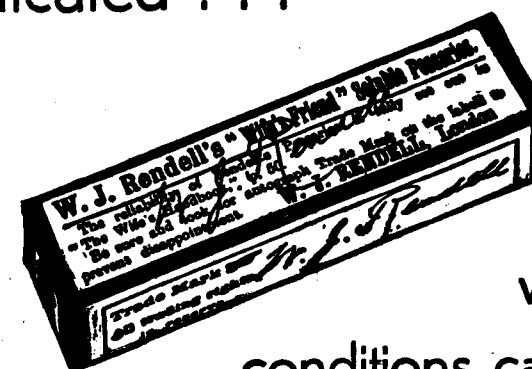
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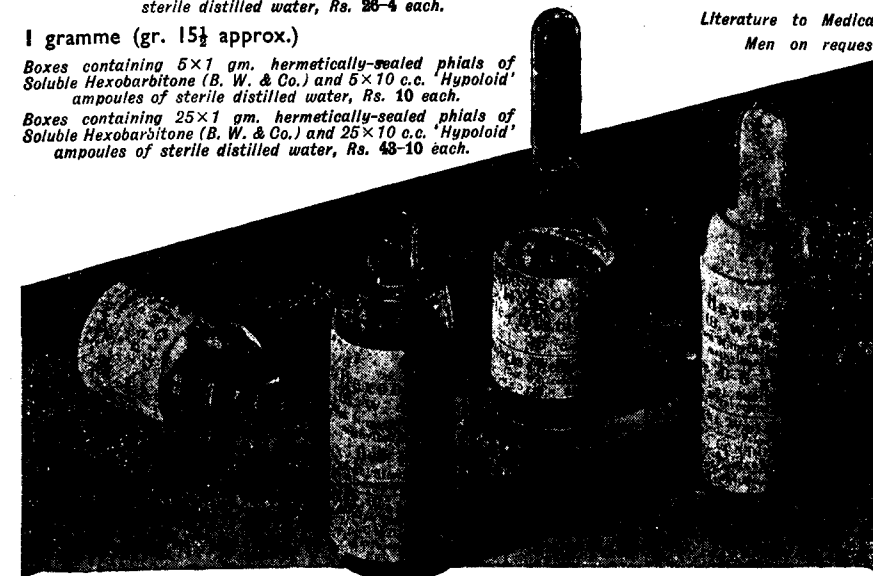
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Small-pox

BY

V. R. SHRIKHANDE, L.C.P.S.,

Medical Officer, I/c., Dispensary and Infectious Diseases Hospital, Pandharpur.

Synonym.—Variola.

Definition.—An acute, specific, highly infectious disease, characterised by definite incubation period and a distinctively distributed, deep-seated eruption, which passes through the stages of macule, papule, vesicle, pustule and crust. The fever in this disease shows two phases—remission, being followed by reaccession on the onset of the pustular stage.

The disease is of great antiquity and of wide-spread distribution and occurs both endemically and epidemically.

Ætiology.—All races, both sexes, and persons of every age are susceptible if unprotected by efficient vaccination. Formerly, small-pox was a children's disease but since vaccination has protected the child, it has become somewhat more prevalent amongst adults who have not been vaccinated at all or who have received but one vaccination. None is naturally immune, one attack ordinarily protects another but not necessarily. Second or even third attacks are known. Small-pox for the second time was seen in one case, in the I.D. Hospital, Pandharpur, during the last epidemic.

Periodicity and Virulence.—Epidemics tend to happen every sixth year and the mortality is highest during the peak of the epidemic. It is more severe in hot climates. In England and temperate climates, most outbreaks occur during the winter and spring and tend to die out with the commencement of summer. ROGERS claims that the prevalence of smallpox in India depends upon humidity with high temperature, i.e., the combination of high humidity with high temperature is inimical to its growth. It is believed that every tenth death was due to small-pox. More than five lakhs of people are known to have died every year. In recent years, the mortality rate has considerably decreased, owing to efficient prophylactic vaccination, which has modified the disease.

Mode of Infection.—Infection of small-pox is almost through the respiratory tract and may be direct or indirect i.e. by contact, which need

not be very close, with a patient suffering from the disease or through the medium of objects infected by the sick person. Usual sequence of events is that the virus is coughed out in droplets which contaminate the air and thus infect the mucosa of the upper respiratory tract of the susceptible individual; from here, it is distributed throughout the body. Another means of contamination of the air is by transudation of the virus through the skin—the organisms reaching the surface by way of sweat glands or hair follicles; this theory, however, lacks experimental proof. The greater incidence in the neighbourhood of smallpox hospitals suggests the possibility of aerial convection of the virus for considerable distances, perhaps exceeding a mile; but the influence of human carriers in these cases is hard to eliminate. Bedding, clothing and rags may retain their infectivity for considerable periods of time, especially when stored. Transmission by flies and domestic animals is regarded as a possibility. The infectivity of small-pox is slight at the time of the onset of symptoms, and is much greater when the eruption appears. It continues when all the scabs have separated. The virus is very resistant and long persists in the dry scales and crusts shed from the body. Corpses of those recently dead from smallpox can transmit the disease.

There have been many attempts to demonstrate a specific organism in smallpox lesions by ordinary bacteriological methods, and many bacteria have, from time to time, been isolated; but their exact ætiological role has not been established. The fact that the contents of smallpox vesicle, though capable of conveying the disease, do not yield any visible micro-organism, is against a bacterial hypothesis. GRUNHAGEN first described amœboid bodies in the vaccine lymph and in the contents of the smallpox pustules. GUARNIERI (1892) observed intracellular bodies in the lesions of the variola. These bodies have been called *Cytoryctes Vaccinæ* or *Cytoryctes variolæ*. GUARNIERI's views have, however, met with many dissentients. It has been argued that they are the products of nuclei of the epithelial cells and leucocytes due to the action of the virus. PUSCHEN drew attention to very numerous granules in variolous lymph and varicella, and these granules were considered to be specific, owing to the constancy of their presence and their absence elsewhere. These granules are infective and cultivable in tissue cultures, but it seems probable that they represent only a certain phase in the development of the virus. It is not generally agreed that the specific cause of variola and vaccinia is ultra-microscopic and filtrable. The viruses of vaccinia and variola are essentially the same—vaccinia having developed pathogenicity for bovines while variola is pathogenic to man. Attempts to prove the filtrability of smallpox virus have not been uniformly successful, although active filtrates have been obtained by some workers. LEVADITY and NICOLAU (1923) succeeded in transmitting vaccinia virus through a Collodion filter which is permeable to peptones and bacteriophage. The virus is widely distributed throughout the body when the infection occurs. Its persistence varies with the form of disease. In vaccinia, the scabs are virus-free in 14 to 15 days; but in smallpox, the virus persists for two months. Cultivation of the virus *in vitro* has failed, but tissue culture has been successful.

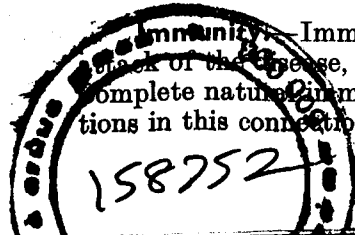
Immunity. Immunity to smallpox may be acquired by a previous attack of the disease, by variolation or by vaccination and revaccination. Complete natural immunity is very rare, but is reported. Many investigations in this connection have been carried out and the results indicate that

the material from the eruption of a smallpox case produces in calves a disease identical with cow-pox (*vaccinia*). If the virus is passed through the host of certain species, the activity of vaccinia virus is better maintained. After inoculation with vaccinia virus, a lasting immunity develops. The virus is rapidly taken up by the leucocytes and remains in circulation for at least eight days. Highest immunity is obtained if a living virus is used. Heat destroys the antigenic property of the virus very considerably, and it has been found that the lymph heated to 100°C. has no immunising effect at all. With raw lymph, immunity develops from the fourth day and becomes maximum about the tenth day.

Seat and Nature of Immunity.—It is important in clinical work to form an estimate of the amount of immunity present in men after vaccination and revaccination. A practical method depends on the observation of immediate reaction produced; the earlier and less the reaction, the greater is the immunity. The seat of immunity conferred by vaccination was at one time supposed to be confined to the ectodermal epithelial cells. The modern tendency is to regard immunity as general and humoral rather than local and cellular. It has been shown that the variolo-vaccine virus rapidly passes into the blood stream and can be found there within a few hours of the inoculation. From the blood stream, it passes into the reticulo-endothelial system and becomes generalised throughout the body. Though immunity has been shown to result from the use of killed virus, on the whole there remains considerable doubt whether immunity of any practical value can be produced by the use of killed or attenuated virus.

Recently, much work has been done on the nature of specific antibodies produced by vaccination. Specific variolical antibody was first discovered by STERNBERG in 1896. This anti-body has been shown to be closely related to the production of immunity. After an attack of the disease, these antibodies may persist for years, and are said to be enhanced after revaccination.

Pathology.—The virus of small-pox evidently elaborates a toxin, which gives rise to the severe constitutional symptoms and fever, especially of the invasive stage; this toxin also has a vasomotor and angiolytic effect as evidenced by the initial petechial rashes and by the hæmorrhagic forms of the disease. The regular and rapid development of local lesions in smallpox suggests that multiplication of the virus occurs at those sites; a toxin is at the same time secreted, which inhibits the activity of the phagocytes and facilitates the growth of pyogenic organisms. The entry of the virus into the blood stream must follow closely on the toxic invasion. The smallpox virus and its toxin act on the prickle cells of the corium. The cutaneous lesion of small-pox lies in the deeper layers of the epidermis. Vesiculation is due to serous exudation between the cells. Loculation is caused by vertical strands of degenerated epithelial cells which radiate from the base of the pock. The tenseness of the vesicle and tethering of the covering by this reticulum cause the pock to be umbilicated. In malignant attacks, where the pocks are flaccid, and in the old and debilitated, where a similar condition may obtain, umbilication is often absent. With pustulation the fibres of the reticulum are ruptured and the pock becomes dome-shaped. The suppuration is attributed to secondary infection with extraneous organisms, particularly *Streptococci*. Subsequently, the pock ruptures with the production of a very copious and foul discharge; the deeper layers of



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the corium ulcerate, but they undergo gradual healing with the formation of a permanent pitted scar. In milder cases, the contents of the pock become absorbed and are replaced by a granular amorphous material which hardens into a brownish firm scab. This is ultimately cast off and if the lower layers of the epithelium have not been involved, complete healing occurs without scar formation. Lesions of the mucous membranes are somewhat proportional to the extent and severity of those of the skin, and analogous in structure and those mucous membranes to which air has free access are specially affected, particularly the mouth and pharynx. The chief change in the blood is an increase in the mononuclear elements, which is coupled with great activity of the lymphocyte-producing tissues throughout the body. There is a great paucity of polynuclear cells. The post-mortem appearances are those usually found in acute infective processes. The rash persists, the liver is often much enlarged, and the spleen swollen. Particular attention has been drawn to the presence of local necroses in the liver, testicles and bone marrow. These are often infiltrated with mononuclear basophile cells. In hæmorrhagic small-pox, petechial and purpuric hæmorrhages are found in the skin, mucous membranes, lungs and other viscera, sometimes also in the retro-peritoneal tissues and the roots of the mesenteries.

There is an increase of the poly and mononuclear cells and, to a lesser extent, of eosinophiles. A marked secondary anæmia develops rapidly in many cases during the progress of the disease. Any sort of secondary complication may develop, leading to marked leucocytosis. Persistent high leucocytosis is always of bad prognostic significance and should arouse the suspicion of some intercurrent secondary infection. In very severe cases, myelocytes and normoblasts have been found, and if found in large numbers, it is a very unfavourable sign.

Symptoms.—UNMODIFIED SMALL-POX (VARIOLA MAJOR)—INCUBATION PERIOD:—Average period is 12 days. Generally, it is 10 to 14 days. Small-pox resulting from cutaneous inoculation develops in 6 to 8 days, because of the different portals of entry.

PERIOD OF INVASION OR INITIAL STAGE OF TOXÆMIA—Onset is sudden in the majority of cases, with rigor, vomiting and convulsions in children. The most prominent symptoms are high fever, severe frontal headache and intense pain across the loins. The pain in the loins is always present and is excruciating and very severe. This backache is a constant and diagnostic symptom in the pre-eruptive stage in small-pox. It is strictly localised in the lumbar region. The fever quickly reaches a maximum of 103° or 104° F. and is accompanied by severe prostration. Giddiness and nausea are present and vomiting may occur, particularly in children. Delirium and mental symptoms and even suicidal tendencies may accompany the invasive stage. With these severe symptoms, are coupled more ordinary febrile manifestations such as anorexia, thirst, coated tongue and disturbed sleep. The breath is offensive. The bowels are constipated. The skin is usually hot and dry, but sometimes perspiring. Pulse and respiratory rates are increased in proportion to the rise of temperature. Mild invasive symptoms usually presage a mild eruption; with a severe invasive, the attack is generally grave. After three or four days, eruptions are noticed on the forehead and the back of the wrists; with the appearance of the rash, the initial constitutional symptoms such as prostration, malaise, and pains diminish and the high temperature almost drops to normal, and the

patient feels very much better; thus he enjoys a temporary respite from the distress and prostration of the disease.

PRODROMAL RASHES:—These may precede proper eruption by one or two days; they are not always present. The prodromal rashes may be morbilliform erythematous or petechial in character and usually disappear after 24 hours. There are two types, one purely erythematous, the other petechial or hæmorrhagic with or without accompanying erythema. The hæmorrhagic or petechial rash, which often has at first a dusky erythematous background, is more characteristic. It appears in the flexures of the groins, which are stippled with small petechiæ. The petechial rashes are persistent and indicate a severe attack.

PERIOD OF ERUPTION:—On the third day, the symptoms of invasion are at their maximum and the eruption appears, showing first on the forehead and temples and around the wrists. It rapidly spreads to the rest of the body but always affects most the parts usually uncovered and those most exposed to pressure, friction or other irritation. It is least profuse on the abdomen and in the groin, somewhat more marked on the chest, still more marked on the back, especially across the shoulders, thicker still on the arms, choosing their distal portions, and most profuse of all on the face, especially its upper part. No matter how modified and spare the rashes, they never miss the face. It reaches the lower extremities within 24 hours of its first appearance. By the third day, it will have attained its full density, but the earlier lesions will be in a slightly more advanced stage of development than those which appear later.

In a characteristic way, the rash of small-pox avoids depressions, flexures and protected flexor surfaces such as the arm-pits, flanks, groins, orbital hollows and supra-clavicular fossæ. The pocks are aggregated over prominent bones and outstanding tendons, but the clavicles and the malleoli are exceptions to this rule. The rash is more or less symmetrical; one arm will not escape when the other is involved.

The evolution of the typical eruptions of small-pox is unique, its peculiar interest resting on the regularity with which it passes from one stage to another at certain definite intervals, such as is never seen in any other acute exanthematous disease. The rashes are centrifugal in distribution, because they are most marked on the head and beyond the elbows and knees.

In the female, menstrual-like bleeding begins at once in many of the patients and although this phenomenon is often associated with other febrile conditions, it is particularly characteristic of variola.

The eruption appears about the third day of the disease (i.e. on the first day of its appearance) as small, dull-red macules. Within 24 hours, they develop into papules, about the size of a small pea, hard and shotty to the feel; when the skin over the rashes is palpated, it gives a peculiar sensation as if there are so many pearls embedded under the skin. On the third day of eruption, the papules develop into conical points, which is the beginning of vesiculation. During the next three days, the vesicles gradually fill, increase in size, until they become circular, tense and umbilicated, owing to the development of a central depression. They reach maturity on the eighth day i.e., they gradually become purulent and develop into pustules, the umbilication disappears and they become rounded or dome-shaped. The inside of the pustule is multilocular because, on pricking by a sterile

needle and pressing it, it does not collapse completely as is the case with the rash of chicken-pox. On the eighth or ninth day, the typical variola pustule is seen. With pustulation, the pocks soften, become flat-topped and lose their areolæ. When the eruption is profuse and thickly distributed, it leads to a typical œdema of the face, especially around the eye-lids, nostrils and the mouth. They also impede the movements of hands and fingers. It is at this stage that the characteristic secondary rise of temperature sets in with constitutional symptoms and often delirium and, at this stage, the suffering of the patient is most intense. In uncomplicated cases, this fever only lasts for a day or two, and on the ninth or tenth day of the eruption, the pustules begin to dry up and scab-formation begins. The temperature falls, reaching to normal at the end of the second or the beginning of the third week. The drying up or desiccation process begins on the face and proceeds in the same order in which the eruption appeared. Brown or black crusts result which separate by the end of the thirteenth or the fourteenth day, but where the skin is very thick as on the palms and soles, the dried up unruptured pustules may form deep-seated "seeds", which may take weeks to make their way to the surface. During desiccating stage, the skin around lesions, especially on the limbs, may become inflamed and large, flat pemphigus-like bullæ develop. These are filled with a thin yellowish fluid and as they rupture, they leave an ulcerous surface in which crusts form. They cause to the patient intense discomfort and irritation and the temperature is again raised due to septic absorption from the septic contents of the bullæ.

To summarise, the rash is papular on the first to the third day; vesicular from the third to the fifth; pustular from the fifth to the ninth, and desiccating from the ninth to the seventeenth.

Histologically, there is at first, serous exudation in the cellular spaces deep in the epidermis. The cells degenerate, but some vertical strands still remain, and so, when fluid collects and distends the area, the vesicle that is formed is loculated and depressed in the centre. But, when suppuration takes place, the loculi are destroyed, umbilication disappears and the top becomes rounded. The healing is associated with some permanent fibrosis, which causes pitting, most marked on the face.

The cutaneous eruption is accompanied by an outcrop on the mucous membranes of the mouth, nose and pharynx. In severe cases, the larynx, bronchi, gullet and even the stomach may also be affected. On the mucous membranes, the vesicles are soon transformed into shallow gray ulcers. Vesiculation may be observed on the palate, while the lesions are still intermediate on the skin. In consequence of the eruption, the fauces and the tongue become sore, the nose is obstructed and deglutition is painful. The implication of the larynx will cause hoarseness or aphonia and even dangerous œdema. The mucous membranes of the vulva, vagina and rectum may also be involved.

CRUSTING STAGE:—During the crusting stage, the most annoying symptom is manifested by intense itching of the skin and often, unless prevented, the patient will scratch so forcibly as to induce secondary infection. Whether or not the skin-scars remain after desquamation is completed, depends upon the character of the suppurative process. If the suppurative process is superficial, the pustules dry without leaving a mark, but if the papillary layer has been included in the suppurative process, a scar will

surely remain at its site, due to the replacement of the epithelium by vascular granulation tissue which is transformed into connective scar tissue, leaving the typical "foveated" pock mark which will persist throughout life. In some patients, the hair falls out during the crusting stage and even later, but generally it grows again except, of course, where the hair-follicles have been destroyed by the suppurative process. In uncomplicated cases of variola, complete recovery takes place in three to six weeks. In the complicated cases, of course, the time limit is indefinite. Discrete lesions develop brownish scabs, granular in structure, which become dry and eventually are cast off, leaving pitted marks particularly in the face.

The fever of invasion reaches its acme with the appearance of the rash then it falls, but not immediately. It is generally normal by the fifth day of the eruption, often before this. It is at this stage, in milder attacks with scanty rash, that the patient may attempt to resume his ordinary occupation, and in modified cases, very little further disturbance may issue. Ordinarily, however, the secondary suppurative fever now sets in and reaches its acme about the ninth or the tenth day of the eruption. Its duration in the more severe cases is from ten days to a fortnight. In severe and confluent cases, the remission of temperature in the vesicular stage may be ill-marked or absent. The pulse and respiration are quickened proportionally to the degree of fever present. In an unfavourable case, toxæmia increases including cardiac, respiratory and nervous disturbances and the fatal end comes on the tenth to the twelfth day.

The blood shows leucopenia in the first five days, leucocytosis afterwards with an increase of lymphocytes. Urine shows temporary albuminuria and sometimes positive diazo reaction. The liver and spleen are moderately enlarged. A foul odour may emanate from the skin in suppurative confluent cases.

Types of Small-pox.—1. *Confluent type*:—Very severe, invariably terminating in fatality. Critical period is between the tenth to fifteenth day. The manifestations of the disease from the very start are severe, the eruption is rapid in development and it is so extensive and so numerous that the whole skin surface looks as if it is one continuous sheet of pus. The eruptions coalesce with one another, and no healthy patch of skin is visible between the rashes. Swelling of the underlying tissue is enormous and the hands, feet and head may be mis-shapen, and the features may become quite unrecognisable. Delirium is common and secondary fever high. Severe conjunctivitis, salivation, cough, aphonia and diarrhoea are common. Some patients pass into typhoid condition, and offensive odour emanates from the skin. Circulatory failure is progressive and death may occur towards the second week. The mortality is very high. When recovery occurs, it is only after a long and desperate struggle.

2. *Semi-confluent type*:—There is healthy skin visible between the individual rashes. The mortality of this type is not so high, and the constitutional symptoms are not so severe.

3. *Discrete type*:—The eruptions are numerous, but they have not got the least tendency to coalesce with one another. Swelling of the skin is not at all marked except at the sides of the lesions. The mortality is not high. Though the initial constitutional symptoms might be very

severe, yet subsequent course of the disease takes a mild turn and convalescence sets in quickly.

4. *Haemorrhagic type*:—This type is the deadliest form of small-pox. Mortality is usually cent per cent. The highest mortality could be attributed to the fact that due to the massive hæmolytic effect in the general circulation, the hydrogen ion concentration of the blood is greatly disturbed, life becomes incompatible and, therefore, death is inevitable. The initial constitutional symptoms are invariably very severe, but the temperature does not run so high as in the confluent cases. The suffering of the patient is so very intense and torturing that it is beyond description. The temperature rarely goes above 102°F. The whole body becomes crimson red or shows localised subcutaneous hæmorrhages in patches. There is intense burning sensation all over the body, a sense of bursting in the præcordial region, and the patient generally expires within 48 hours. Consciousness is retained till the last. Toxæmia is profound. Respiration is hurried, dysphagia is extreme; dull, aching headache is distressing and the unfortunate patient is always found to be groaning with deep boring pain which is so torturing, but strictly localised to the lumbar region. The patient describes this pain as if his back is being hammered constantly by somebody. This severe backache is the most prominent and constant symptom along with headache, vomiting, extreme restlessness, profound toxæmia and signs of collapse. Presence of subconjunctival hæmorrhages hæmatemesis, hæmoptysis, melæna, menorrhagia, patches of subcutaneous hæmorrhages, especially in the regions of the groins, axillæ, upper part of the inner sides of thighs, blotchy eruptions distributed in the face, hands, legs and back, which give a general feeling of shotting on palpation and which produce a peculiarly characteristic oedematous condition of the skin with blackish discoloration, are diagnostic. Hæmorrhagic small-pox may be divided into two types according to whether the hæmorrhagic manifestation appears in the invasive period or comes on during the eruptive stage. It is not known why one case develops hæmorrhagic form and the other does not. It might probably be due to variations in individual make up, but an unusually toxic strain of the virus may also be responsible; because in some epidemics, a higher percentage of hæmorrhagic cases is found than in other epidemics.

(a) *Purpuric small-pox, black small-pox or variola purpurica*:—Most malignant form of the disease. The incubation period is usually shortened to 7 or 8 days. The onset is sudden and violent. The initial constitutional symptoms are very severe and prostration and collapse are profound from the start. By the second day, petechiæ and purpura appear followed by hæmorrhages from the mucous surfaces. Death is inevitable before the sixth day, but may occur within 48 to 72 hours from the onset of the disease, even before the earliest manifestations of the usual eruption.

(b) *Variola hæmorrhagica pustulosa*.—More common and frequent type of hæmorrhagic small-pox. It is characterised by hæmorrhages into the pocks in the papular, vesicular, or postular stage of development. This form is only slightly less malignant and less fatal than purpuric; but is sometimes more prolonged—death usually occurring towards the end of second week. Profuse hæmorrhages from the mucous membranes are usually present. This type of the disease is apparently more apt to affect those who are debilitated by previous illness, old age or chronic alcoholism.

Small-pox—By V. R. Shrikhande.



A Typical Case of Small-Pox.

5. *Abortive type*:—The disease is ushered in by the usual constitutional symptoms and the appearance of the rash, but the case takes a surprisingly better turn within 24 hours. The rashes abort, vesicles begin to dry up before they develop into pustules, and the patient recovers within 2 or 3 weeks. Cases of this type are very curious from a clinical point of view and it is certainly very difficult to say further why the disease aborts in people who were highly susceptible before. A fair number of this type were seen in the Campbell Hospital, Calcutta, during the epidemic of 1935.

6. *Fætal Small-pox*:—Eruptions may develop before or after birth. Cases of small-pox in the new-born are seen. In every instance, the infection was traced to have originated from the mother. Almost all cases are fatal with a few exceptions.

7. *Modified type*:—(Varioloid)—The course of the disease and the subsequent development are always modified in all possible ways by partial presence of previous immunity due to vaccination and revaccination. In such cases, initial symptoms may be slight and the eruption, although typical, is scanty. Sometimes, it altogether fails to appear. More commonly, the initial symptoms are more severe and the rash appears early, but it is generally sparse and discrete, tends to evolve quickly, and many of its elements fail to progress beyond the papular or the vesicular stage—the suppurative fever being slight or absent. The lesions which are often small are superficial and may be unilocular. The modification is most evident on the face. In such cases, the arrest of development, leading to the juxtaposition of papules, vesicles and small pustules, may cause a resemblance to chicken-pox, but the distribution remains characteristic.

• **Variola Minor**.—(SYNONYMS—ALASTRIM, AMAAS, VARIOLOID, VARI-CELLA and PARAVARIOLA.)—It differs from ordinary small-pox in its mild course, low mortality, lesser infectivity, absence of secondary fever and incidence on adults rather than on children. It occurs in unvaccinated people.

The incubation period is ten to fifteen days. Invasion is abrupt and may be accompanied by muscular pain, backache or vomiting. The rash never appears before the third day, more commonly on the fourth or the fifth. The rash is comparatively sparse and mild, and the lesions do not ordinarily go on to the pustular stage. Maturation is more rapid than in variola major. There is no secondary fever. This form of small-pox is due to a mild strain of virus, which breeds true and apparently never reverts to old virulent strain of small-pox. Immunologically, the alastrim virus is indistinguishable from the virus of small-pox. The lesions are more superficial than in variola major, but not so superficial as the blebs of chicken-pox. They are always spherical and are often unilocular and not umbilicated. The mature have an opalescent appearance and the crusts are of deep amber colour. It is easy to understand why the disease is so often mistaken for chicken-pox. The alastrim is small-pox without the greater part of its toxicity and usually without streptococcus complications.

Complications of Small-pox.—1. *Secondary infections of the skin*:—

(a) *Impetigo*:—It is frequently present and may be considered as one of the symptoms of the disease. (b) *Boils or furunculosis*:—They are very common and most dangerous. They are noticed in about 40% of cases, mostly in the confluent type, particularly in the stage when the crusts are

being shed *i.e.*, in the fourth week of the disease. Pyæmic abscesses are also commonly met with and many deaths have occurred due to this trouble. (c) Subcutaneous abscesses are frequently met with. (d) Bed-sores:—Localised areas of gangrene and cellulitis. (e) Erysipelas:—Erysipelas, especially of the face, though very uncommon, may develop during the second or third week. (f) The cervical and axillary glands may become enlarged or even suppurated. (g) Keloid condition.

2. *Ear complications*:—(a) The pocks may appear in the ear canal and may produce distressing inflammation with even temporary loss of hearing through obstruction of the canal. (b) During the suppurative stage of the disease, otitis media is sometimes noticed, especially in children.

3. *Eye complications*:—(a) Diffuse conjunctivitis with œdema. The conjunctiva of the eye-lids is the favourite site of the pocks. (b) Corneal ulcers with slough. (c) Exposure keratitis with sloughing. (d) Prolapse of the iris. Iritis is rare. (e) Retinal hæmorrhages sometimes cause blindness. (f) Panophthalmitis.

4. *Mucous membrane complications*:—(a) The pocks may occur in the larynx, which might lead to œdema of the glottis, with even dangerous obstruction to breathing. (b) Ulceration of the larynx. (c) Extensive ulcerations of the fauces, throat and soft palate. (d) Oedema and ulceration of the tongue. (e) Nasal obstruction. (f) Gangrene of the vulva is rare.

5. *Lung complications*:—(a) Bronchitis and broncho-pneumonia are commonly met with and may lead to death. Pneumonia and purulent pleurisy are rare.

6. *Heart complications*:—(a) Pericarditis. (b) Myocarditis (c) Endocarditis.

7. *Septicaemia* due to secondary invasion of the blood stream by pathogenic Streptococci always ends in fatality. In a very few cases, Streptococcus hæmolyticus has been isolated by blood cultures.

8. *Albuminuria* is present in almost all cases during the first week or ten days of the disease.

9. *Complications due to involvement of central nervous system*:—(a) Hemiplegia, paraplegia, monoplegia, disseminated sclerosis and peripheral neuritis. (b) Temporary loss of power of speech and hearing. (c) Mental derangements and loss of memory.

10. *Other complications*:—(a) Tetanus is believed to be a common complication, but has never been noticed. (b) Parotitis. (c) Orchitis. (d) Alopecia. (e) Infection of the wounds by maggots is a very dangerous secondary complication. (f) Abortions, miscarriages, premature and normal deliveries and still-births. (g) Arthritis, synovitis and osteomyelitis. (h) Progressive wasting, profound asthenia. (i) Intercurrent complications such as hyperpyrexia, hypostatic pneumonia and terminal diarrhoea.

Diagnosis.—The initial fever may itself lead to difficulty in diagnosis. The symptoms of onset are somewhat similar to those met with in other diseases, particularly influenza, pneumonia and cerebro-spinal fever.

Influenza:—During the first two days, diagnosis might be difficult. The temperature in influenza is not so high as in small-pox. The backache in influenza is felt along the whole spine, unlike that in small-pox, which

is excruciatingly painful but strictly limited to the lumbar region only. If, on the fourth day, no rashes are seen to appear, the disease is certainly not small-pox.

Pneumonia:—In pneumonia, sooner or later, lung signs appear, which is not the case in small-pox.

Cerebro-spinal fever:—The initial fever in this disease is not very high, the patient complains of bursting headache, which goes on increasing day by day, and backache is conspicuously absent. The patient is very restless and boisterous and shouting and trying to get out of bed. The general condition of the patient is very low. Profound toxæmia with loss of consciousness is present in the majority of cases. Prodromal rashes are not at all seen. Stiffness of the neck with positive Kernig's and Brudzinski's signs, very high leucocytosis of the polymorpho-neuclear variety are diagnostic of C. S. fever. Exploratory lumbar puncture will surely decide the diagnosis, the C. S. fluid will be turbid, coming out under great tension in the majority of cases.

Measles:—The prodromal eruptions, sometimes seen in small-pox, may quite resemble the prodromal eruptions of measles. Severe types of measles with hæmorrhagic eruptions and marked constitutional symptoms may simulate the hæmorrhagic type of small-pox. External bleeding in the form of melæna, menorrhagia, hæmatemesis, hæmoptysis with œdematous and discoloured skin, associated with shotty feeling, presence of excruciating pain in the lumbar region, presence of sub-conjunctival hæmorrhages and marked prostration are all in favour of hæmorrhagic small-pox. Presence of Koplik's spots and associated bronchial troubles are in great favour of measles.

The true eruptions of small-pox may be confused with those of measles, chickenpox, perhaps typhoid or typhus, and also with various forms of papular erythema urticaria, acne, papular and pustular syphilides and glanders. Sometimes drug rashes, particularly those due to Iodides and Bromides, lead to mistakes.

The differentiation of some forms of chicken-pox is a great source of difficulty. The points of difference in small-pox and chicken-pox are as follows:

Small-pox:—(1) Each lesion develops from the onset of symptoms to the vesicular stage in about 6 days and from the onset to the scab stage in 10 to 12 days, except in modified cases, where it may be shortened to perhaps 6 days. (2) In the majority of cases, the lesions are similar in size, shape and development, but lesions found on the extremities may slightly be younger than those found on the face. (3) The lesions are multilocular. They are tense and fairly circular in outline, flat and dimpled at the top. *i.e.*, they are umbilicated. They are hard and shotty in feeling. (4) The eruptions are plenty on the face and distal parts of the extremity, and more on the extensor, surface or, in other words, they are located centrifugally. (5) The lesions are set deep in the skin and cause pitting afterwards. (6) In the majority of cases, the rashes become confluent. (7) Usually, high continuous fever for three days, then goes off for a few days after the rash is out and fever of suppuration. (8) The stages of eruptions are macular, papular, vesicular, pustular and crusting. (9) Severe complications and sequelæ are common.

Chicken-pox :—(1) Each lesion develops from the onset to the vesicular stage in only a few hours, and to the scab stage from 1 to 4 days. (2) The lesions vary in size, and as they appear in successive crops, they are seen simultaneously in the different stages of development. (3) The lesions are unilocular *i.e.* on puncture and pressure, they will collapse completely. They are irregular in outline, and are not usually umbilicated. They are soft and velvety on palpation. (4) The eruptions are centripetal, affecting the upper parts of the arms and legs more than the distal parts, and the body more than the extremities. (5) The lesions are superficial and shallow and do not cause pitting. (6) The rashes never become confluent. (7) The fever is usually intermittent. (8) The eruptions are vesicular from the beginning. (9) Sequelæ are very rare.

Precipitate certification of a supposed case of small-pox even in a contact is unwise. It is better to await the appearance of the rash.

Confusion with typhoid and typhus is uncommon and should be eliminated by taking into consideration the distribution of the rash and character of the other symptoms.

Acne affects the face, shoulders, back and chest. It is chronic afebrile and often associated with comedones and scars.

The syphilitic rash :—The pustular lesions occasionally seen in syphilis sometimes cause confusion with the pocks of mild small-pox. Systemic manifestations of syphilis are much more indefinite in onset, and the rashes appear more gradually. The pustular syphilide rarely involves the palms and soles. The rashes are chronic in course and more coppery in colour. Wassermann and Kahn tests will be positive in syphilis and sometimes, spirochaetae can be detected from the lesions.

Glanders is rare, but when the nodules on the face suppurate and are accompanied by fever, small-pox may be suggested. There is usually nasal discharge and a history of association with horses. Bacteriological examination will show the *Bacillus mallei*.

LABORATORY DIAGNOSIS :—1. *Paul's test* :—A rabbit's eyes are cocaineised. A needle dipped in a pustule or vesicle is used for scarifying the cornea of the rabbit. If the material from the vesicle or pustule was small-pox lesion, in 36 to 48 hours, tiny vesicles appear on the cornea and develop into epithelial necrosis and ulceration. A subsequent histological examination of the lesion will reveal GUARNIERI'S bodies.

2. *Compliment fixation test of Parker and Muckenfuss* :—By means of this reaction and the use of specific immune serum obtained from inoculated laboratory animals, pock-fluids from lesions of vaccinia and of small-pox, when collected from the thirteenth day of the eruption, have given uniformly positive results. This test may prove, if it can be done at all, of immense help in the diagnosis of early stages of small-pox. Under optimum conditions, a report can be obtained in a few hours.

3. *Flocculation test* :—Recently, a serological method of diagnosis has been developed. A suspension of ground up variolous material is mixed with an anti-vaccinial rabbit serum and incubated at 37°C. A positive reaction is marked by the reaction of a finely floccular precipitate.

4. *Vaccination test* :—Vaccination, if done after the onset of an

eruption in an unvaccinated person, will fail to react, if that eruption is part of small-pox.

Prognosis :—Natural small-pox has a mortality, which varies from 25 to 40%. Prognosis in severe confluent cases is always bad. Hæmorrhagic (purpuric) cases are all fatal. In discrete cases, the prognosis is good, if not associated with any serious complications. In modified cases, the prognosis is always good and all the cases generally recover uneventfully.

The severity of the disease and with it the prognosis depend on a number of factors :—

(1) The presence and age of vaccination and revaccination :—The mortality from small-pox in vaccinated people is 15.5% and that in non-vaccinated is 78.4%.

(2) The nature of the epidemic :—The mortality is usually high at the start of the epidemic.

(3) The nature of the stage of the invasion :—A mild onset is always followed by a mild course.

(4) The nature of the eruption :—Confluent eruptions are much more serious than the discrete.

(5) The presence of hæmorrhagic manifestations :—hæmorrhages of any type—whether into the skin, into the pocks or from the mucous membranes—all indicate almost certain death.

(6) The presence of such complications as general sepsis, pneumonia, erysipelas, pregnancy or abortion and alcoholism greatly affect the outlook.

(7) The age of the patient :—Infancy and old age add materially to the gravity of the prognosis. The death rate in the first five years of life is very high and may exceed 40%. After that, there is a fall—at first gradual, then considerable—up to the age of 15 or 20, which is the most favourable period. Subsequently, the mortality rises steadily and may even exceed the figures given for the first quinquennium. In the vaccinated, however, the younger the patient, the more certain is the recovery. If revaccination has not been performed, as age increases, the mortality may also increase, and may reach 15% in persons over 30 years of age.

Approximate incidence of different clinical types of small-pox, as per classification noted in the small-pox ward of Campbell Hospital, Calcutta, is as follows :—

TYPE.	P. C.	MORTALITY.
Confluent	58.9	59.04%
Semi-confluent	17.9	16.10%
Discrete	3.4	6.70%
Modified	13.5	0.00%
Purpuric hæmorrhagica	6.4	100.00%

Treatment.—*Prophylactic* :—Efficient vaccination and re-vaccination are the powerful safeguards. The chief measures to be taken, when the disease is recognised, are as follows :—(1) Prompt removal of the patient to an isolation hospital, (2) Thorough disinfection of infected rooms and clothing, (3) Immediate vaccination or re-vaccination of all the other members of the household and of contacts, (4) Quarantining of contacts for 16 days or daily inspection of them (5) Notification of schools or institutions attended by inmates of the same house.

Vaccination.—In 1798, DR. EDWARD JENNER found that cowpox or vaccinia infection gave immunity to small-pox. He is the pioneer of introducing the practice of vaccination as a measure against small-pox.

In 1902, COPEMAN showed that the two diseases were allied, for when the virus of small-pox was given to a monkey and a calf was vaccinated from the monkey, cow-pox developed in the calf. The diseases of small-pox, cow-pox, horse-pox, sheep-pox, if not identical, are closely allied.

Small-pox is a preventable disease. It is well known that the incidence of small-pox is entirely amongst the unvaccinated.

Unless an epidemic of small-pox is prevalent, when the operation should be performed as soon as possible, vaccination should not be carried out until the infant is three or four months old. Vaccination is generally performed between the fourth and sixth months of age of the infant. The reasons for this delay are:—(1) that during the first ten days of life, hæmorrhagic disease of the new-born may be caused by the procedure; (2) that the proportion of failures is likely to be higher in the first two months than when vaccination is performed later. Apart from congenital debility, the only contra-indication to vaccination is an extensive skin eruption, in which there is danger of generalized vaccinia developing through auto-inoculation. The dates recommended by the Rolleston Committee for revaccination are between five and seven years of age and again between fourteen and sixteen.

The details of the technique of vaccination have lately been modified by the occurrence of certain nervous sequelæ, particularly encephalitis, especially in England and Holland, and to a less extent in Germany and France, while comparatively few have been recorded elsewhere. With a view of reducing the trauma to a minimum, which may possibly be responsible for the sequelæ, the Rolleston Committee appointed by the Minister of Health in conjunction with the Medical Research Council, have recommended that the officially advocated four insertions for vaccination and re-vaccination should be superceded by single insertion and that multiple scarification and cross-hatching should be avoided.

The site usually chosen for vaccination is the outer surface of the left arm just below the insertion of the deltoid. GOLDBERGER's method of vaccinating on the inner and back side is generally adopted, as the chances of trauma and infection are minimised and the scar is rendered much less conspicuous. The arm should be washed with soap and water and then alcohol and dried before applying the lymph. Antiseptic should be avoided, as they are liable to interfere with the action of the vaccine.

The pustules of vaccinia, emulsified in glycerolated saline, constitute vaccine lymph and it is largely used for vaccination. For human vaccination, though, calf lymph is generally employed, it has been shown that lymph taken from vaccinal lesions in other animals give satisfactory results. The usual procedure of vaccination is to vaccinate in a single linear incision or scratch, not more than $\frac{1}{4}$ inch long through epidermis. In India, the outer side of the upper arm is generally selected for vaccination. The procedure is that a drop of the lymph is put in two places, about an inch apart, and through it some scratches are made with the lancet to cause red marks without drawing blood. The vaccinated surface should be protected from dirt and injury.

Intracutaneous and subcutaneous vaccination, which have been recommended by some authorities, are inadvisable because both the methods take a longer time to perform and require more assistance than the ordinary procedure, as well as being more painful, while the absence of scar, for which they have been recommended, prevents an estimate being formed of the individual state of protection against small-pox.

After vaccination, there is an incubation period lasting about three days, during which little change occurs at the site of the vaccination. A localised papule develops on the third or the fourth day, which becomes vascular on the seventh or the eighth day and pustular on the tenth or the eleventh day. This subsequently dries up forming a scab, which in course of time falls off, forming a scar and pitting, popularly known as foveation. This process requires about three weeks from the date of vaccination. Slight febrile disturbance may be noticed as vesiculation proceeds with headache, malaise, enlargement of the axillary glands and, in some instance, of the spleen. In re-vaccination, the degree of reaction depends on the amount of immunity remaining after the primary vaccination.

Vaccination performed immediately prior to exposure to small-pox affords almost absolute protection against the disease; if done during the incubation period, it either prevents the development of small-pox or renders the subsequent attack mild. Similarly, recent successful re-vaccination is said to afford an almost complete protection. The immunity in primary vaccination lasts for ten to fifteen years. As the effect of vaccination appears to wear off with increasing age, it is advisable to perform re-vaccination at about ten years and again at the age of twenty.

Complications of vaccination.—Of the common complications of vaccination, suppuration and tetanus may be mentioned. Generalised vaccinia and urticarial rashes may develop. The introduction of putrefactive organisms to the inoculated sites occurs either through incomplete sterilization of calf lymph or uncleanness on the part of the vaccinator, or during after treatment. Tetanus is a rare complication. A more serious complication is post-vaccinal encephalitis, after an incubation period of ten to fourteen days it ushers in with acute symptoms, mainly pointing to the affection of the cerebrum. The cause of encephalitis is unknown; it has been suggested that the disease is similar to that seen in encephalomyelitis, following measles and in disseminated sclerosis, being caused by some neurotropic virus which is stimulated into activity either by vaccination or by some exanthematous infection. McINTOSH (1928) believes encephalitis to be due to vaccinia virus itself.

Treatment for post-vaccinal encephalitis consists in subcutaneous, intramuscular or intravenous injection, in doses of 10 c.c. of the serum of another person, preferably another member of the same family, who has been vaccinated with the same strain of lymph without any untoward result.

Besides compulsory vaccination in endemic and epidemic areas, other methods should be adopted so as to prevent dissemination of the infected material from the sick person to those around him. It should be realised that infected material exists in the eruption and may be carried through the air, and persons coming in contact with the patients may themselves be infected or carry and retain dangerous material. The first step towards prophylaxis, when a case occurs, is to isolate the infected person and treat him in a hospital, specially meant for the purpose. The infected

premises and the infected clothing should be thoroughly disinfected. A small-pox patient should not be discharged from the hospital until all infected scabs are fallen.

Compulsory vaccination in Germany has helped in banishing this disease from that country. The rooms infected by a small-pox patient should be white-washed after scrubbing the walls and disinfected by Phenyle 1:120 and Pesterine. The infected clothes should be put in H.P. Lotion 1:1000 for half an hour and then boiled in Phenyle and washed with water and dried.

The scabs from pocks should be collected in Carbolic lotion 1:40 and be destroyed by burning.

Curative.—*Hospitalisation is better* :—Owing to the difficulty in obtaining proper isolation and nursing facilities in an average private house, it becomes incumbent to remove the patient to a special hospital which should better be situated at the outskirts of the city or away from human habitation.

Selection of the room etc. :—In cases, where the patient cannot be removed from home, a large airy room, preferably at the top floor, isolated where possible, stripped of all hangings and furniture, should be chosen. The patient should have as much of fresh air as possible, and should rest in bed all the while, till the crusts have fallen away.

No specific cure for small-pox has yet been discovered, and the treatment must therefore be entirely symptomatic. The headache of the stage of invasion may be relieved by cold compresses or ice-cap or drugs such as Aspirin, Phenacetin, Pyramidon or Veramon which may also be employed for the backache, which is so characteristic a symptom of the onset. Often, however, this pain may be so agonising that it will not yield to any drug but Morphia, which may be given in $\frac{1}{4}$ to $\frac{1}{2}$ gr. doses.

In the initial stage, the patient often complains of headache and pain all over the body. The nervous symptoms of the onset such as headache, restlessness, insomnia or delirium, and in the case of children, are best treated by hydrotherapy in the form of sponging with tepid or cold water or it may be necessary to give sedatives such as Potassium Bromide, Chloral, Aspirin or Pyramidon. In severe attacks, in which the lesions are apt to invade the mucous membranes of the mouth, tongue, palate and fauces, and cause considerable difficulty in swallowing, some relief may be obtained by giving the patient ice to suck. Antiseptic gargles and demulcent drinks are to be frequently given. When there is difficulty of swallowing, it is helpful to spray the throat with 1% solution of Cocaine or Orthoform. In severe attacks and in debilitated persons, in whom bedsores are liable to develop, precautions should be taken by having a water-bed and frequently changing the patient's position, also paying careful attention to the lesions which should be kept as clean as possible.

In the eruptive stage, the patient should be sponged with hot water, which generally helps in developing the rashes early. Potassium Permanganate solution 5 to 10% is generally used which allays itching and causes disinfection of the skin. At times, saturated watery solution of Permanganate may be used all over the skin. It is daily used for three or four times a day, for the first two days and subsequently once daily. Tincture of Iodine is also recommended for application. If the eruption is profuse upon the face, it is usual to apply a lint mask saturated in a lotion such as 2% Carbolic acid solution, Glycerine and water (1 dram to the

ounce) or simply ice-cold water or smeared with an ointment such as Ichthyol 5 to 10%. The lesions may also be treated by dusting them with a powder composed of Zinc Oxide, Starch and Idoform. It is important that the patient should be prevented from scratching the pocks and thereby causing secondary infection. The nails therefore should always be kept short and clean and in the case of children, the hands should be put in small cloth bags and tied.

The violent delirium which is likely to occur in the stage of suppuration should be treated by injection of Morphia or Hyoscine and the patient should be restrained by applying a sheet loosely over the front of the trunk and attaching it firmly to the sides of the bed.

Itching of the skin :—Alkaline warm bath or touching the parts with 1 in 50 Carbolic-in-oil may be soothing. During the later stage of the disease, there is a foul odour from the skin, for this and also to prevent itching and other troubles, an oil of the following composition, applied liberally all over the skin, may be of considerable relief :—Menthol, Thymol, Acid Boric, Acid Salicylic, Oil Eucalyptus, Liquor Calcis, 1 dram of each to be added to 16 ounces of Olive Oil. This oil may be used with advantage from the stage of suppuration and subsequently. It not only prevents subsequent scars and pits but also relieves itching and reduces the stink. The crusts, when kept soaked with oil, cannot fly about and be sources of danger to others.

When the pocks have reached the pustular stage, they may be snipped off with a pair of curved scissors with due antiseptic precautions, followed by warm Boric or saturated Magnesium Sulphate compress with gratifying results. This is only possible for private cases.

The care of the eyes :—The eyes should be looked after with considerable care from the beginning, as only one eruption or even careless handling without any eruption, may prove damaging. They should be washed with warm Boric lotion or some such weak antiseptic, several times a day and Gutta Argryol 8 to 10% should be put into the eyes. The lids should be prevented from sticking together by anointing their edges with Vaseline or a drop of Liquid Paraffin should be put into the eyes. If there is discharge from the eyes, application of Silver Nitrate solution 1 to 2% to the conjunctiva should be used. When corneal ulcer has developed, an ointment like the following might be used with advantage :—Unguentum Hydrargyri Oxid. Flavi—gr. 4; Atropine Sulp.—gr. 2; Vaseline ad. $\frac{1}{2}$ oz. Many cases of sloughing out of the cornea take place with total blindness from intense systemic toxæmia. In these eyes, $\frac{1}{2}$ to 1% solution of Methylene Blue, locally applied, may be of some use.

Cutaneous abscesses, which are liable to develop in convalescence, should at once be opened and drained.

The red light treatment of small-pox introduced by JOHN of Gaddesden in the 14th century, and revived by FINSSEN about 40 years ago, has not fulfilled the extravagant claims made on its behalf.

No infallible method has yet been discovered to prevent scarring. TEISSIER, however, speaks highly of Xylol in doses of 1 to 2 drams in 24 hours, claiming that it arrests suppuration, prevents scarring and acts as a deodorant. The same writer also advocates the use of convalescent serum in doses of 25 to 30 c.c., but his observations lack confirmation. The subcutaneous injection of the serum of vaccinated heifers has proved ineffective.

Drugs:—An ordinary alkaline mixture with 10 to 20 grs. of Bromide may be given. Injections of liver extract intramuscularly, in 5 c.c. for 4 to 5 days, followed by 2 c.c. daily for another 2 or 3 days, often modify the disease. If given sufficiently early, it is advocated that they shorten its duration, abort the eruption and prevent subsequent hideous scars and pits. Some workers used Electrargol injections with success. At the stage of suppuration, Sulphanilamide may be used with advantage. Glucose, orally or intravenously, should be given with advantage. It alleviates the vomiting accompanying small-pox and prevents dehydration. It is administered in 20 to 25% solution intravenously, or 6% Dextrose solution rectally. The more severe cases usually manifest the symptoms of starvation and dehydration to a certain extent and are therefore given a 5 to 10% Dextrose-saline solution intravenously as recommended by HENDON in the treatment of sepsis. The chemotherapy may be combined with Dextrose therapy in the treatment of small-pox. A 1% Mercurochrome solution is frequently added to the Dextrose infusion mixture. The Mercurochrome solution used is 0.23 c.c. per pound of body weight. Starch poultices and alkaline washes are used for the removal of crusts. Heart failure is combated by Strychnine, Digitalis, etc. Complications should be treated on the usual lines. Abscesses of the skin are probably the most important complications.

Hæmorrhagic and purpuric cases are almost invariably fatal in even a few hours to a few days. Some advocate intravenous use of Iodine solution, but its efficacy is really doubtful. Laryngitis calls for a steam tent and inhalations of Benzoine or Lysol.

The patient should not be regarded as free from infection until all his scabs have fallen. When the scabs are deeply embedded in the thick skin of the palms and soles, they have to be dug out by the help of scissors.

Diet and nourishment:—Liquids, as advocated in the treatment of other acute febrile diseases, such as barley water, green cocoanut water, fruit-juice, glucose solution with lemon juice, butter milk, whey, lemonade and milk, milk and soda, and coffee are suitable. In bad, semi-conscious, comatose patients, besides the above, rum or any other suitable form of Alcohol in 2 to 4 drams, every four hourly, may be of help. Later in the disease, as the appetite returns, one may give soft boiled rice with butter and salt or with butter milk, smashed potatoes, bread and milk, pudding, etc. A normal diet is resumed gradually and cautiously. During the whole course of the illness, adequacy of all vitamins should be kept up in diet or through vitamin concentrates.

References :

1. Chopra, R. N., Col., I.M.S.—A Handbook of Tropical Therapeutics, 1936.
2. Price, M. D.,—A Textbook of the Practice of Medicine, 1933.
3. Dr. Chatterjee,—Articles on 'Small-Pox' in the issues of "The Antiseptic" Sep. 1937, Dec. 1937 and May 1938.
4. Dhar, D. R., M.B., D.T.M., M.B.C.S.,—Medical Treatment in General Practice with Recent Advances, 1939.
5. Majumdar, M. B.,—Bedside Medicine, 1934.
6. Majumdar, M. B.,—Modern Pharmacology and Therapeutic Guide, 1934.
7. Sir Robert Hutchison,—An Index of Treatment, 1940.
8. Corn Products & Co.,—Dextrose Therapy.

Role of Small-Pox in the Production of Deformities By Causing Infection of Bones and Joints

BY

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INFECTION of small-pox is still a problem in India, in spite of the great strides that have been made by vaccination in the prevention of this disease. In spite of an organised campaign against this disease, lots of cases of small-pox do occur among the new-born and in the older people who have not had revaccination. It is well known that small-pox is a virus disease and in the pustular stage of the infection, there is a super-added secondary infection due to organisms like the Staphylococcus and Streptococcus. It sometimes happens that, in the course of the small-pox infection, bones and joints also get infected. It is not known what percentage of those that are infected with small-pox suffer from these complications of bone and joint infection. A good number of deformities due to infection of bones and joints have been seen from the year 1930 to-date, but the following list shows the type of lesions that were produced by small-pox:—

Osteomyelitis.

Humerus	...	1.
Tibia	...	1.
Ulna	...	1.

Arthritis of joints.

Elbow, single	...	1. (Simple synovitis)
Elbow, double	...	4.
Elbow with bony ankylosis	...	4. (Single 3, double 1)
Hip, single	...	1.
Hip and ankle	...	1.
Knee with osteomyelitis of tibia	...	1.
Multiple joints with osteomyelitis	...	2.
Multiple joints without osteomyelitis	...	3.
Multiple joints with osteomyelitis and ulceration resulting in elephantoid condition of leg	...	1.

Vaccination osteomyelitis.

Humerus	...	2.
Multiple bones with pyæmia	...	2.

Total ... 25

It is difficult to assess from the history of the cases the time at which the bones and joints get infected. It is a great handicap, while elucidating the history of diseases in South India, to find that the patients are unable to

remember events which happened at a past period. In some cases, however, patients who suffered from infection later in life, were able to give correct information with regard to the incidence of this infection. To understand correct pathology, it is necessary to have either an operated specimen or postmortem specimen of a case that has died of the disease. On account of the peculiar belief that is commonly prevalent that small-pox is due to an evil influence, it is difficult to obtain a postmortem in a case that died of small-pox and so it is regrettable to note that first-hand information regarding pathological aspects of this disease in our country is lacking.

Pathology of bone and joint infection.—EIKENBARY, C. F. and LECOCQ, J. F.,⁶ have reviewed the opinions of CHIARI⁴ 1893, MALLORY^{1,3} 1894, DEBEYRE⁵ 1903, MUSGRAVE and SISON^{1,4} 1910 and 1913, CANGE³ 1912, SHELDON^{1,5} 1922, W. L. and C. P. BROWN² 1923, HUENECKENS and RIDLER⁸ 1926, LOMBARD^{1,2} 1929, on the various pathological aspects of the bone and joint changes seen post-mortem and in the living. From a clinical study of the cases, it becomes clear that there are two kinds of infections in the bone and joint. One is the suppurative variety and resembles the ordinary suppuration which occurs in the bones and joints (See pictures D.E.F.G.H.I and V) and the other is the non-suppurative variety which Browns² called 'osteomyelitis variolosa', in which there is an aseptic necrosis of bone with resorption and development of deformities. In the cases recorded, the epiphysis is more involved than the metaphysis and in some cases, where bony nucleus of the epiphysis appears at different periods of life as at the lower end of the humerus, it happens that a part of the epiphysis, which undergoes aseptic necrosis, causes changes in the joint architecture with unbalanced growth of other parts of epiphysis and metaphysis (See pictures O.P.Q.F.G.H. and I). The pathological aspects of osteomyelitis are the same as in the case of ordinary osteomyelitis of bone, and do not require any further description. It generally attacks the metaphysial ends of the bones as in the case of ordinary osteomyelitis with the same result, forming abscesses, sinuses and causing death of bone with new bone formation and in the cases that are living, the infection was not found to be of a very serious type. It is found that the degree of infection of small-pox has no bearing on the infection of bones and joints. It is not known whether there have been serious bone and joint infections amongst those cases that have died from small-pox. In the case of joints, the infection may be of various types. It may be purely serous, causing synovitis (See picture A), ultimately ending in complete resolution, causing no changes in the joint architecture, or may become frankly suppurative, requiring opening, or it may spontaneously burst, forming sinuses and later ending in ankylosis of a fibrous or bony variety. Bony ankylosis has been the rule in the cases recorded, and it is due to the destruction of the articular cartilage, which occurs as a result of suppurative changes in the joint (See picture C). In some cases, the epiphysiolysis due to aseptic necrosis occurs, resulting in resorption of bone with arrested growth due to changes both in the epiphysis and the metaphysis. The growth may be unbalanced with resulting deformities and in the cases of elbow joint, where function has been fairly useful, it has been found that there was a pathological dislocation with resorption of trochlear surface and adaptive elongation of the olecranon, forming a shallow concave surface. (See pictures O.P.Q. and U.). In the case of the joints, where the metaphysis is intra-capsular, as in the case of the hip joint and the shoulder joint, infection of joint may

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Picture A.—is a clinical photograph illustrating synovitis of the elbow, seen two and half months after small-pox.

„ B.—Is clinical photograph showing the result of operative treatment of a case of infective osteomyelitis of upper end of tibia and arthritis of knee. It occurred in the 3rd week of heavy infection of small-pox. She came with a flexion deformity of the knee and with spread of inflammation to the knee joint.



Picture B.1.—is a radiogram taken one year after treatment for osteomyelitis and arthritis of knee.

„ B.2.—is a lateral view of the same.

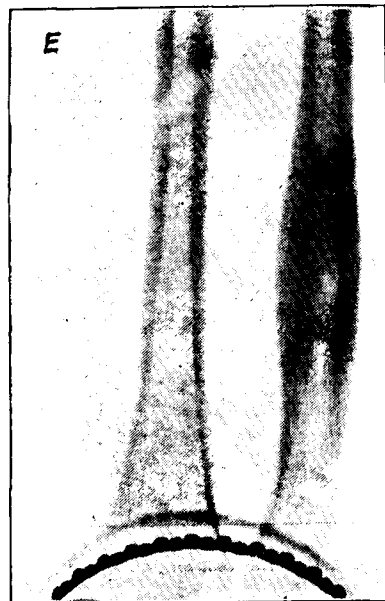
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Picture C.
Is a radiogram showing bony ankylosis of the elbow, result of small-pox in a boy aged 18 years. It occurred after small-pox when he was a child and he stated that the elbow swelled up, ultimately ended in a discharging sinus, later resulted in a fixed elbow. Note the radio-humeral joint is free. The other pictures are radiograms showing the result of excision of elbow.



Picture D.
Is a radiogram showing osteomyelitis of the humerus—result of small-pox infection. Note the small sequestra formation and the involucrum.



Picture E.
Is a radiogram showing thickening of the bone with a small cavity in the centre. This occurred in a girl 4 weeks after small-pox infection. She noticed first pain, and later, a swelling in the lower end of the ulna.

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Picture F.—Is a clinical photograph illustrating the deformity of the elbow and the wrist, result of small-pox infection when he was a child. Note the arrest in the growth of the arm and forearm.



G.—Is a clinical photograph of the same, showing the sinus in the upper end of the tibia and a puckered scar above the knee on the right side, result of small-pox infection when he was a child.



Picture H.—Is a radiogram showing the condition of elbow and both bones. Note the sequestrum just above the lower end of the radius.



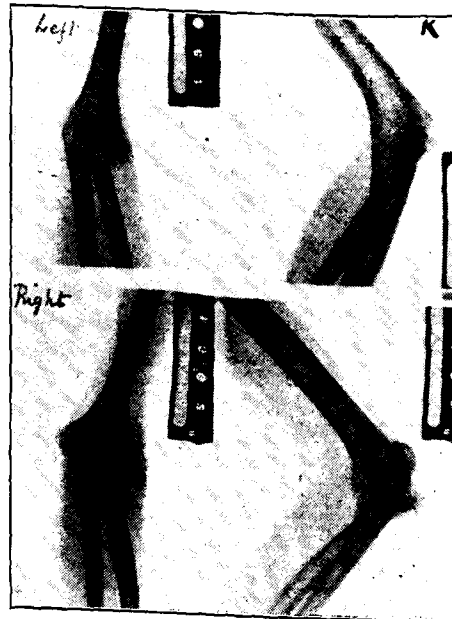
I.—Is a radiogram of the upper end of the tibia, showing a laminated sequestrum and a cavity, result of small-pox infection when he was a child.

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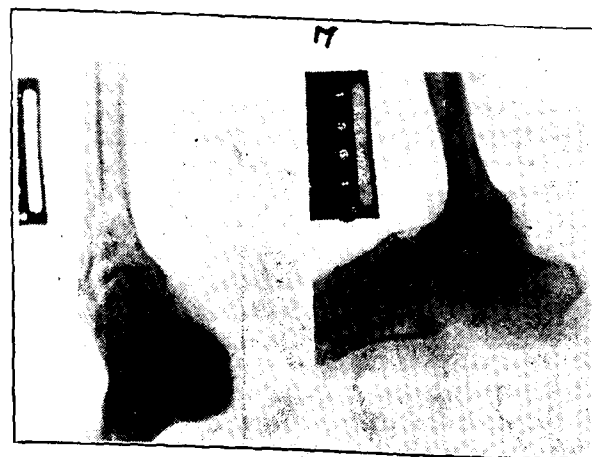
Picture J.—is a clinical photograph showing the deformity at the elbows, right hip, knees and the right ankle, result of small-pox infection when he was a child. He sought admission to the hospital for a duodenal ulcer. Note the atrophy of the left elbow which was fixed due to bony ankylosis. He stated that he got pain in both the elbows which gradually stiffened and on the right side retaining some movement at elbow but on the left femur with ankylosis of the hip.

K.—are radiograms showing the bony ankylosis of the left elbow and the condition of the right elbow showing the changes.



Picture L.—is a radiogram which shows the condition of the hip joint.

" M.—shows the condition of the right ankle. Note the fibula is longer and bent towards the middle. There is an arrest in the growth of the tibia.



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Picture N.

Is a clinical photograph of a boy who sought admission for acute duodenal ulcer. He stated that his upper limbs were deformed as a result of small-pox when he was a child. He stated that his elbows gradually stiffened and deformed. Note the right forearm is shorter than the left. There was some range of movement at both elbows.

Picture O.

Is a radiogram of the left elbow. Note the arrest in the growth of the trochlear surface of the lower end of the humerus and the altered structural change of the upper end of the olecranon and the head of the radius.

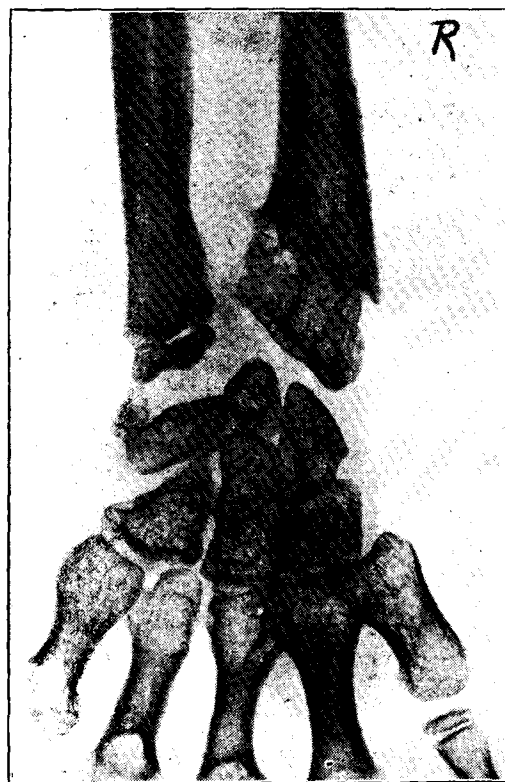


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Picture P.—Is a radiogram of the right elbow, showing the same condition as the left elbow.

Q.—Is an antero-posterior view of P. Note the deformity in the upper end of the radius and the olecranon and the lower end of the humerus.



Picture R.

Shows the changes at the metaphyseal end of the lower end of the radius. Note the arrest in development.

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Picture S.

Is a radiogram showing a pathological dislocation. Note the condition of the head and neck of the femur. This occurred when he was a child, after small-pox infection.



Picture T.

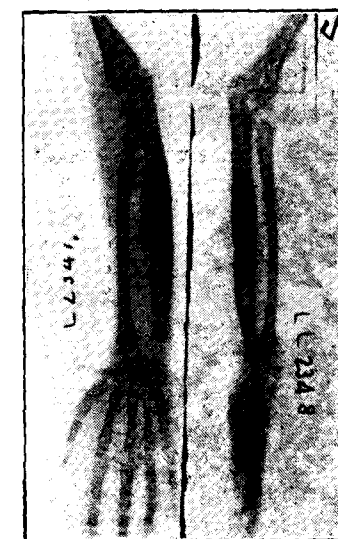
Is a radiogram showing a pathological dislocation of upper end of femur with absorption of head and neck as a result of small-pox infection when he was a child.

Picture U

Is a radiogram showing the changes in elbow as a result of small-pox infection.

Picture V.

Is a radiogram showing result of osteomyelitis due to small-pox infection.



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Picture W.—is a clinical photograph of a case, who suffered from small-pox when he was a child. Note the deformity in the right elbow and at the right wrist. The right elbow is fixed. He came for elephantoid condition of the leg which he stated resulted after small-pox infection with sinuses at the lower end of the leg, which ultimately formed an ulcer resulting in elephantoid condition. He wanted the limb to be amputated and it was done.

result from a metaphysial infection of the bone. In some cases, joints may get infected by the blood stream, causing infective arthritis. In the case of the hip joint, the pathological dislocation is a common occurrence and it is not peculiar to small-pox infection. It has been noted in all types of hip joint infection in children in South India, and in those cases of dislocation due to small-pox infection, the following ultimate results have been noted :—

- (1) The head and neck of the femur were found absorbed just as in the case of SMITH's arthritis of infants (*See picture T.*).
- (2) The head and neck have undergone a change in shape and size with a persistent dislocation. (*See picture S.*).
- (3) The head and neck have become shortened and ankylosed in the dislocated position. (*See picture L.*).

It has been found that cases of multiple arthritis do occur without any suppurative changes, with aseptic necrosis of bone with ultimate, fairly useful function in some joints, and frank bony ankylosis in others (*See pictures J. to R.*) and in some cases, arthritis is associated with osteomyelitis of bones. (*See pictures F. to I.*). It is interesting to observe that in those cases, where the patients could reasonably state the history of the case, they said that they observed the complications during the recovering period from the attack of small-pox, which probably coincided with the desquamating period of the rash. Vaccination also gives rise to infection of bones. Two cases of ordinary osteomyelitis of humerus with two cases of multiple osteomyelitis with pyæmia which ended fatally, have been recorded. The infection occurred when the scab was forming over the vaccinated pustule and from a history of the cases, it was found that the pustule was heavily infected as indicated by severe constitutional symptoms and swelling of the arm. There was one case of arthritis of the knee, which resulted from suppurative osteomyelitis of the tibia (*See picture B.*). This started while she was recovering from a very heavy infection of small-pox and a swelling in the upper end of the tibia was noticed with subsequent swellings in the knee and thigh. It is possible that a spread of infection to the joint, which occurred in this case, may be due to the bad treatment which she had or that the infection spread from the tibia to the joint, perforating through the epiphysial cartilage, which sometimes happens in cases of knee joint. Arrest in the growth of bone occurs due to aseptic necrosis at the metaphysial end of bone, and when it happens in paired bones like the forearm bones and the leg bones, deformities occur due to the unbalanced growth of the one bone, resulting in deformities like the club-hand and the club-leg. In one case of multiple deformities, there was a peculiar case of ulceration of the leg which ultimately ended in an elephantoid condition of the leg for which the patient sought admission. (*See picture W.*).

Discussion—In small-pox infection, two types of pathology of bone have been found: one is an acute inflammatory type, ending in osteomyelitis with all the consequential changes and the other is a gradual absorption of whole or part of epiphysis, with arrest in part or whole of the growing end of bone causing deformities. If both, bones are affected as in paired bones, there is a shortening of the whole limb, and if only one of the paired bones is affected due to the normal growth of the other, there is a deviation of the limb towards the shortened side. Even in single bones, due to destruction of a part of epiphysis, one side may grow more than the other

causing deformity. To appreciate these changes, it is necessary to understand the problem of bone growth in its modern conception. It is well-known in growing bones the metaphysis, the epiphyseal cartilage and the epiphysis are the centres of bone activity, which are controlled by adequate vascularisation, sufficient concentration of Calcium salts and presence of phosphatase enzyme which governs the physico-chemical mechanism of the calcification and all these processes are governed by endocrine balance. In the growth of normal bones, the cartilage cells multiply in an orderly method, enabling all the biochemical processes to go on regularly, forming ultimately new bone and thus adding to the length and circumference of the bone. In all these processes, the process of resorption, tubulation and calcification ultimately, determine the shape and structure of the diaphysis. It is now accepted that the bone cell, which is supposed to have the function of bone formation, is not to be true. It is considered that the bone cell of PURKINJE is nothing but a fibroblast, imprisoned in bone and in a state of quiescence, but this cell has the power of assuming the primitive mesenchymal condition at any time when there is a demand for it, and in this state, the inorganic salts of Calcium may be deposited in it, absorbed, redeposited and re-absorbed according to the influence of the enzymes and circulation under control of endocrines. Thus, it becomes clear that for bone to be deposited, a fibroblastic structure with excess of Calcium is necessary. This balanced development may be altered, and it has been found that with the increased hyperæmia, there is decalcification, and decreased blood supply leads to increased calcification. This condition has been found in cases of acute infective osteomyelitis where, in acute stage of the disease, there is increased hyperæmia, leading to decalcification, and as a result of the growth of organisms and toxins, the epiphyseal cartilage and the metaphysis may be attacked, causing destruction leading to irregularity in growth of bone. In two out of 120 cases of osteomyelitis analysed, arrest in growth of bone occurred and in four cases, there has been an increase in the length of the bone, both conditions causing deformity (KINI)¹¹. In such cases, where there has been an abscess and destruction of bone and epiphyseal cartilage, this becomes easily explainable. In small-pox, such osteomyelitis occurs due to secondary infection, but side by side with acute infective osteomyelitis of bone in one situation of the body, there occurs in small-pox in other situations, aseptic necrosis with absorption of the whole or part of the epiphysis with arrest in the growth at the growing point of the bone. Both these changes are frequently seen in the neighbourhood of the joint. Sometimes, arrest of growth is limited to one bone, whereas in another situation in a joint, both arrest in growth of bone and absorption of epiphysis have been noticed, leading to deformities due to altered architectural changes. Bony ankylosis without suppuration has been found to occur in elbow at the humero-ulnar joint (*See picture K*) with free movement at the radio-humeral joint of the same joint, whereas the other elbow of the same person shows aseptic necrosis and absorption of the epiphysis with alteration in articular alignment but affording fairly free function. The only way to explain these changes which occur is that during the course of small-pox infection, there is increased hyperæmia and an increased hyperæmia leads to decalcification and, with focal necrosis—result of toxins of the small-pox organism,—converts the bony structure into fully-formed fibrous tissue. If these changes are shared by the metaphysis and the epiphyseal cartilage, there is ultimate arrest in the growth of the bone. Where the epiphysis is infiltrated by granulation tissue, this type of tissue

may form a pannus under the articular cartilage, causing fibrillation of the articular cartilage and, when this process occurs in the adjoining surface of the articular ends of the bone, may undergo ankylosis which at first is fibrous, later becoming bony, according to the changes in the circulation and Calcium concentration. The complex nature of these changes, found in one and the same person, makes it difficult to understand the pathological processes involved. Are these changes due entirely to secondary organisms with varied virulence affecting different parts differently, or is it due to a combination of secondary organisms and the small-pox virus playing their parts in different situations, causing different pathology? It would be interesting to study this problem with the help of radiology in cases of small-pox. This will necessitate every infectious diseases hospital to be equipped with a radiographic unit so as to facilitate investigation of this problem as post-mortems in our country are rare. Radiographic examination may be useful in elucidating the changes and understanding the pathology. So far, no work of this sort has been done, and it is suggested that a research in this line is a necessity.

Arrest in the growth of bone in length may occur in other diseases like achondroplasia, where the growth may be interfered with due to insufficient proliferation of cartilage cells or early cessation of cartilage growth or softening of the cartilage and irregular ossification. Such arrest of growth has been found in other conditions like dyschondroplasia. In dyschondroplasia, the arrest in the growth of bone may be due to a combination of factors, governing the growth of bone, and not merely due to vascular disturbance.

Irregularity of growth, producing deformities, occurs in rickets. In renal rickets, there may be a stunting of growth, causing dwarfism or there may be deformities like genu valgum, occurring in later period of child's life and in these cases, the red marrow was found replaced by fat and advanced destruction of the cartilage cell columns. (BROCKMAN)¹.

Osteochondritis is another condition, which may simulate the aseptic necrosis. The changes seen are irregular rarefaction of epiphysis, with fragmentation of nucleus and softening of the epiphysis, which later gets calcified in its deformed condition due to flattening. These changes are seen in several bones such as the head of the femur, tubercle of the tibia, head of metatarsals, semilunar of wrist, scaphoid of foot and capitellum of the lower end of the humerus, etc. This rarefaction is synchronous with increased blood supply and recalcification occurs in the stage of healing, where the blood supply becomes diminished. In these cases, it is unknown to get absorption and bony ankylosis.

Infection of joints may occur due to diseases like pneumonia, dysentery in children and sometimes a peculiar kind of infective arthritis, which occurs in infants in the region of hip, which causes pathological dislocation, later a slow absorption of head and neck of femur (KINI)⁹. In two cases which were seen in acute stage, the organism that was grown was *Staphylococcus aureus*. In 14 other cases recorded, they came with marked deformities with changes described above. Such a change has been found to occur in one hip due to small-pox. (*See picture F*). Typhoid arthritis is rare except in the spine which leads to rigidity. A large number of cases of typhoid are treated in King George Hospital and not one case has been referred for bone and joint changes to the orthopaedic side, thus showing

the rarity of bone infection in typhoid condition in King George Hospital. STILL's disease in children bears no comparison to the joint infection due to small-pox.

Endocrines.—In small-pox, every organ shows the effect of infection. Is it possible that changes are shared by the pituitary, the thyroid, the para-thyroid, the thymus and the adrenals? These have got a definite influence on the bone growth. So far, the recorded post-mortems are silent on the changes noticed in these ductless glands. A systematic examination of these glands might throw some light in the causation of this pathology. It is well known that in growing children, thyroid deficiency produces cretinism and deficiency of pituitary produces Frohlich's syndrome, and adrenalin under-section causes infantilism. In cretinism, epiphysal cartilage does not ossify normally and may remain ununited till the age of 20 to 30 years. Radiographically, a broad transverse shadow at the end of diaphysis, particularly in the region of the knee, is found. This appearance may be due to dense bone.

Signs and symptoms.—From a history of the cases that have been on record, it is clear that the signs and symptoms were not of a very serious nature except local swellings and slight constitutional disturbance. Fulminating types of bone and joint infection have not been on record except in the case of infection in children after vaccination which have ended fatally. It is possible that fulminating types have died, but there is no record of evidence to show the existence of such a complication from small-pox which was responsible for the death. On account of the lack of regulations for certification of death, except in certain cities like Bombay and Calcutta, it is impossible to get any information with regard to these complications, and even in the cities where the deaths have to be certified, they merely stated 'died of small-pox' and as such it becomes difficult to gather any information with regard to these complications. The signs and symptoms of osteomyelitis are the same as of acute infective osteomyelitis, and from the recorded cases, it was evident that it was not of a very serious consequence, because in some cases, where there was heavy infection of small-pox, the patients have lived in spite of the bad treatment that was accorded to them. The results of osteomyelitis are the same, namely sinus formation, death of bone and new bone formation. The most common situations found were in the forearm. Simple joint effusions cause discomfort but not much of constitutional disturbance. In the case of suppurative arthritis, the patients stated that there was a marked constitutional disturbance which was relieved when it was opened or when it burst itself which ultimately ended in ankylosis of the joint. In the case of aseptic necrosis inside the joints, the symptoms were of gradual stiffening of the joints with slight pain resulting in the ultimate deformity with limitation of movements and in some cases, leading to bony ankylosis. When more than one joint or bone is affected, the symptoms are exaggerated. During the course of small-pox, it is better if every practitioner remembers these complications which are likely to arise, so that they may get proper aid in the treatment of these conditions.

Treatment.—It is regrettable to note that the public do not consult a qualified medical man when a small-pox case occurs in the house, and medical practitioners who happen to treat small-pox cases, in their natural anxiety about the small-pox infection, concentrate all their attention on the

constitutional disturbance and very little attention is paid to the rash which is considered as a natural consequence to be left alone. This neglect may be responsible for the complications noted in this paper. It is the duty of every medical man to see that the pustules do not get heavily infected by attending to the hygiene of the body and the local condition of the pustules. Bone and joint infection is a serious complication and requires immediate attention. Small-pox is a difficult disease and when complications arise, it becomes difficult to treat the bone and the joint infections by proper appliances due to unhealthy condition of the skin. It can never be done in a private house and, therefore, it is necessary that all these cases should be treated in the institutions where there are adequate facilities with regard to the treatment of bone and joint conditions. It is necessary that every isolation hospital of a city should have a consulting orthopaedic surgeon, who can help them with regard to the prevention of deformities. Since most of the recorded evidences showed that the complications arose during the time of convalescence, it becomes imperative to see that the acute stage is looked after very well; but there is no single certain method of controlling the rash and the infective condition of the pustules. Various methods of treatment have been advocated during the acute stage and one requires special mention. GOVINDAN NAIR advocated injection of Campolan which seems to be effective in minimising the after-effects of the rash and thus solve the problem of these complications. When the complications of osteomyelitis do occur, treatment is the same as for ordinary osteomyelitis and no delay should occur in emptying the abscess which is formed within the bone. In the case of serous synovitis, a simple aspiration and rest is all that is necessary. In the case of suppurative arthritis, the problem is to diagnose it as early as possible by aspiration and if it is not frankly suppurative, to aspirate the fluid and fill the joint with ether and allow it to evaporate in the joint and then let it out after it had stayed in the joint for a time. This method of treatment has aborted many acute infective processes due to other causes not associated with small-pox and it is advocated in joint infections during the course of small-pox. In cases where frank suppuration has occurred, the joints have to be opened and drained and later to start movements with appliances to promote healing and restoration of function. Active movements of suppurating joints help in the drainage of the joint and thus promote healing, but on no account should movements be pushed to cause excessive pain. In the case of aseptic necrosis of joints, it is quite impossible to control the joint deformities. It would be interesting to get cases early enough to study the pathology and devise methods of treatment in preventing these ugly deformities. So far, all the cases came with marked deformities and in some cases, excision of joints had to be done to restore function (KINI)¹⁰ and others were of purely academic interest and sought admission for other troubles. Two cases shown in the pictures with multiple arthritis came for duodenal ulcer and some cases came for fracture in forearm with a fixed elbow in sound functional position.

Points of interest.—1. Twenty-five cases of bone and joint infections are described of which, 21 are due to small-pox and 4 due to vaccination.

2. Frank osteomyelitis associated with multiple joint involvement by infective organisms, causing suppurative arthritis or leading to aseptic necrosis and absorption.

3. Pure synovitis was rare. Suppurative arthritis always ended in bony ankylosis.

4. Aseptic necrosis of bone has been found both at the metaphysial as well as epiphysial ends of the bones, causing arrest in growth of bone and in some cases leading to bony ankylosis, while in others due to absorption of epiphysis leading to ugly deformities due to architectural changes with fair amount of function.

5. In cases of ankylosis of elbow, excision has given satisfactory results.

6. In hip joint, 3 types of changes have been noted :—(a) Pathological dislocation with changes in head and neck of femur without any absorption. (b) Pathological dislocation with absorption of head and neck of femur. (c) Pathological dislocation with changes in head and neck and ankylosis.

7. No case of early infection of bone and joint, of the type which led to aseptic necrosis, was seen by the author in the early stage of the disease. Every case of osteomyelitis, that was seen, was after a long period of time and the joints were seen with well established deformities.

References :

1. Brockman.—British Journal of Surgery, 1927, Vol. xiv, p. 56.
2. Brown, W. L., and Brown, C. P.—Osteomyelitis Variolosa, J. A. M. A., 81—1414 (Oct. 27) 1923.
3. Cange, A.—Un syndrome osteomyelitique post variolique, Province med. 23 : 573-577, 1912.
4. Chiari, H.—Ueber Osteomyelitis variolosa, Beitr. z. path. Anat. u. z. allg. Path. 13, 1893.
5. Debeyre, A.—Osteomyelitis post varioliques, Ech med. du nord 7 : 182, 1903.
6. Eikenbary, C. F., and Lecocq, J. F.—Osteomyelitis variolosa, Jour. A.M.A., Vol. 96, No. 8, Feb. 21, 1931.
7. Govindan Nair, V.—Treatment of Small-pox with Liver, Jour. Indian Medical Association, July 1935.
8. Huenekens, E. J., and Ridler, L. G.—Osteomyelitis Variolosa, Jour. A.M.A. 87 : 295 (July 31) 1926.
9. Kini, M.G.—Role of Oblique Osteotomy of upper end of Femur in Hip Joint Surgery, Indian Medical Gazette, Vol. xxv, May 1940.
10. Kini, M. G.—Dislocation of Elbow and its Complications. Jour. Bone and Joint Surgery. Vol. xxii, No. 1, 107-117, January 1940.
11. Kini, M. G.—Sequelæ of Osteomyelitis and Treatment of Pathological Fracture with Malunion. Indian Journal of Surgery. Vol. I., July 1939.
12. Lombard, P.—Osteomyelitis after Small-pox, Revue d'orthop. 16 : 490 (Nov.) 1929.
13. Mallory, F. B.—Ueber die Verbreitung der Osteomyelitis variolosa in Knochen-systeme, Ztschr. f. Hailk. 15 : 253, 254, 1894.
14. Musgrave and Sison.—The Bone Lesions of Small-pox, Philippine J. Sc., December, 1910 : April 1913.
15. Sheldon, F. B.—The Bone Lesions of Small-pox, Tr. Am. Roentgen Ray Soc., 1922.

Sulphonamide-P* in the Treatment of Small-Pox

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As a supplement to my first investigation regarding the efficacy of chemo-therapeutic drugs in small-pox, (full reports of which have already been published), I was inclined to try this particular drug in a few cases. My first investigation gave some important data and convincing results were obtained regarding chemo-therapy in small-pox cases. But those drugs that were tried viz., Prontosil, Uleron (BAYER) and M & B 693, are difficult to secure at the present time due to the war conditions and I was, therefore, thinking about to find out some easily obtainable and less expensive substitutes in place of those expensive drugs.

This report, therefore, must be treated as a preliminary one, as I have given trial in a comparatively fewer cases and because the stock of Sulphonamide-P supplied was rather scanty, I was biassed to assay the results by using this drug in the more severe types of the disease, namely confluent cases only, which usually contribute to a high mortality. However, I hope to continue and follow it up with more cases without any selection and personal bias this year, if circumstances are more favourable.

Dosage of Sulphonamide-P (B. D. H.) used.—One tablet (0.5 gm) every 4 hours day and night, i.e., 6 tablets daily for 4 days. Thus, on an average, a patient received 24 tablets or 12 grammes of the drug. Administration of Sulphates were withheld in those who were receiving this drug. This dosage had to be reluctantly followed due to shortage of the drug, and it might be quite possible that this dosage was not sufficient. In the first investigation, a dosage of the Sulphonamides in double quantities was followed.

TABLE A.
Number of cases treated with mortality.

DRUG.	NUMBER TREATED.	NUMBER DIED.	MORTALITY.
Sulphonamide—P	24	12	50.00%
Control Cases	24	13	54.16%
Total	48	25	52.84%

As stated before, all of the cases treated with this drug belonged to the more severe type of the disease i.e., confluent cases, with an equal number of similar control cases. Out of these 24 cases treated with the drug, 22 belonged to the confluent group and two belonged to the hæmorrhagic type which claims 100% mortality usually. Taking out from this table those cases who died within a few hours of admission into the hospital, the actual number of cases who received a fair amount of the drug during treatment comes down to 18 and the corresponding number of deaths is estimated to

* (British Drug Houses Ltd., London.)

be actually 6. Therefore, the corrected mortality in those cases who could be fairly treated by this drug is 33.33%. The mortality similarly corrected for those cases who did not receive this drug and who served as control cases is 50.00%.

In the following table B, are shown the results of mortality after the above corrections have been made in each group.

TABLE B.

Exclusion of patients who died within a few hours of admission into hospital and also those patients belonging to the hæmorrhagic type.

DRUG.	NUMBER TREATED.	NUMBER DIED.	MORTALITY.
Sulphonamide—P	18	6	33.33%
Control Cases	20	10	50.00%
Total	31	16	42.10%

This table definitely shows a much lower mortality in the series of cases who have been treated with this drug. Analysis of this table conclusively establishes the fact that Sulphonamide-P (B. D. H.) is certainly very useful in the treatment of small-pox and this statement is further substantiated by the fact that all the cases who received this drug, during this investigation, belonged to the confluent type, which usually claims a high mortality in the control series. If circumstances are favourable, we would like to try this drug in a fresh series of more cases under more experimental conditions without any personal bias towards selection of cases.

The more important clinical facts, commonly noted in the series of cases treated by this drug, are the following:—

1. Secondary skin sepsis, prolonged pyrexia and eye complications were found to be rare.
2. The toxæmia, itching of the skin and other distressing symptoms, which are so very conspicuous during the second week of the disease, are quickly controlled.
3. The disease processes viz., pustulation, secondary fever etc., seemed to be much modified and the patients began to turn towards better condition earlier and uneventful convalescence seemed to establish earlier.
4. Sulphonamides seem to have a more beneficial effect in the treatment of small-pox when administered early in the disease.
5. The length of stay in hospital of the patients in this group after recovery is found to be comparatively shorter, about three weeks, whereas it is definitely longer, about 4-6 weeks, in the control series of cases who were not treated with this drug.
6. No toxic manifestations after the use of this drug were noticed even in a single case under trial.
7. This drug is found to be useless in the treatment of hæmorrhagic cases of small-pox.

Summary.—1. 24 cases of small-pox, belonging to the confluent type, were treated with Sulphonamide-P, manufactured by British Drug Houses Ltd., London, with an equal number of similar control cases.

2. The diagnosis of every case was doubtless and definite. The patients invariably came to the hospital after development of the rash. Those having rashes with typical characteristics of confluent small-pox were utilised for our investigation.

3. Those cases, who were admitted in hospital in a moribund state and who subsequently died within a few hours of admission after receiving only a few doses of the drug, were excluded from this investigation. The corrected mortality in the drug-treated series was 33.33% and the corrected mortality in the control series, who did not receive the drug was, 50.00%. Therefore, the mortality in the series of cases treated with the drug is definitely lower than that in the control series.

4. Complications during the course of the disease were found to be rarer and the duration of stay in hospital for the recovered patients was comparatively shorter in the drug-treated series.

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