may be vomiting and pains in the back and legs. Convulsions are rare. The eruption usually develops within twenty-four hours. It is first seen upon the trunk, either on the back or on the chest. I have seen it, however, appear first on the forehead and face. At first in the form of raised red papules, they are in a few hours transformed into hemispherical vesicles containing a clear or turbid fluid. There is no umbilication as in the vesicles of small-pox. They are often ovoid in shape and look more superficial than the variolous vesicles. The skin in the neighborhood is neither infiltrated nor hyperæmic. At the end of thirty-six or forty-eight hours the contents of the vesicles are purulent. They begin to shrivel and during the third and fourth days are converted into dark brownish crusts, which fall off and as a rule leave no scar. Fresh crops appear during the first two or three days of the illness, so that on the fourth day one can usually see pocks in all stages of development and decay. They are always discrete and the number may vary from eight or ten to several hundreds. As in variola, a scarlatinal rash occasionally precedes the development of the eruption.

There are one or two modifications of the rash which are interesting. The vesicles may become very large and develop into regular bullæ, looking not unlike ecthyma. The irritation of the rash may be excessive, and if the child scratches the pocks ulcerating sores may form, which on healing leave ugly scars. Indeed, cicatrices after chicken-pox are not so very uncommon. They are in my experience more common than after varioloid. The fever in varicella is slight, but it does not as a rule disappear with the appearance of the rash. The course of the disease is in a large majority of the cases favorable and no ill effects follow. The disease may recur in the same individual. There are instances in which a person has had three attacks.

There are one or two interesting complications of chicken-pox. In delicate children, particularly the tuberculous, gangrene may occur about the vesicles (Abercrombie).

Cases have been described (Andrew) of hæmorrhagic varicella with cutaneous ecchymoses and bleeding from the mucous membranes.

Nephritis may occur. Infantile hemiplegia has developed during an attack of the disease.

The *diagnosis* is as a rule easy, particularly if the patient has been seen from the outset. When a case comes under observation for the first time with the rash well out, there may be considerable difficulty. The pocks in varicella are more superficial, more bleb-like, have not the infiltrated areola about them, and may usually be seen in all stages of development. They rarely at the outset have the hard, shotty feeling of small-pox. The general symptoms, the greater intensity of the onset, the prolonged period of invasion, and the more frequent occurrence of prodromal rashes in small-pox are important points in the diagnosis.

No special *treatment* is required. If the rash is abundant on the face great care should be taken to prevent the child from scratching the pustules. A soothing lotion should be applied on lint.

VII. SCARLET FEVER.

Definition.—An infectious disease characterised by a diffuse exanthem and an angina of variable intensity.

Etiology.—We owe the recognition of scarlet fever as a distinct disease to Sydenham, before whose time it was confounded with measles. It is a wide-spread affection, occurring in nearly all parts of the globe and attacking all races.

The disease occurs sporadically from time to time, and then under unknown conditions becomes wide-spread. Epidemics vary in severity.

Among predisposing factors age is most important. A large proportion of the cases occur before the tenth year. Of an enormous number of fatal cases tabulated by Murchison over 90 per cent occurred in children under this age. Adults, however, are by no means exempt. Very young infants are rarely attacked. A certain number exposed to the contagion escape. In a family of children all more or less exposed one or two may not take the disease, whereas all as a rule, if exposed, take the measles. The susceptibility seems to vary in families, and we meet occasionally with sad instances in which three or more members of a family succumb in rapid succession.

Males and females are equally affected.

Epidemics prevail at all seasons, but perhaps with greater intensity in autumn and winter.

The contagion of scarlet fever is probably not developed until the eruption appears, and is particularly to be dreaded during desquamation. No doubt the poison is spread largely by the fine scaly particles which are diffused with the dust throughout the room. Even late in the disease, after desquamation has been apparently completed, a patient has conveyed the contagion. The poison clings with great persistence to clothing of all kinds and to articles of furniture in the room. In no disease is a greater tenacity displayed. Bedding and clothes which have been put away for months or even for years may, unless thoroughly disinfected, convey contagion. Physicians, nurses, and others in contact with the sick may carry the poison to persons at a distance. It is remarkable that in the case of physicians this does not more frequently occur. I know of but one instance in which I carried the contagion of this disease. The poison probably is not widely spread in the atmosphere. Observations have been recently made which indicate that the poison may be conveyed in milk. The epidemic investigated by Power and Klein in London in 1885 was traced by them to milk obtained from a dairy at Hendon, in which the cows were found to be suffering from a vesicular affection of

the udder. The nature of this disease of the cow is doubtful, however. Crookshank maintains that it was cow-pox, and had nothing to do with scarlet fever.

Some writers maintain that scarlet fever may be associated with defective house-drainage. Possibly the virus may occasionally gain entrance in this way.

The attack does not necessarily protect permanently. There are instances of a second and even a third attack.

Surgical and puerperal scarlatinas, so called, demand a word under this section. While scarlet fever may attack a person after operation, or a woman in childbed, the majority of the cases described as such represent, I believe, only the red rash of septicæmia. In the cases which I have seen the rash was rarely so widespread as in scarlet fever; the tongue had not the special features, nor was the throat affected. Desquamation is no criterion, as it occurs whenever hyperæmia of the skin persists for any length of time. It is interesting to note that these cases have become rare with the gradual disappearance of septicæmia. I. E. Atkinson suggests that these rashes are in many cases due to quinine.

Attempts to determine the specific germ of scarlet fever have so far proved ineffectual. Occasionally streptococci are found in the blood, and in fatal cases they are found in the lymph-glands and in the kidneys. It will no doubt soon be determined whether Loeffler's bacillus of diphtheria exists in the pseudo-membranes in the throat. Cornil and Babes state that it does, and that in the angina without diphtheria there are only streptococci. In some cases the bacillus of diphtheria has been found late in the disease. The point is one of great importance, and could be settled by careful observations.

Morbid Anatomy.—Except in the hæmorrhagic form, the skin after death shows no traces of the rash. There are no specific lesions. Those which occur in the internal organs are due partly to the fever and partly to infection with pus-organisms.

The anatomical changes in the throat are those of simple inflammation, follicular tonsillitis, and, in extreme grades, of pseudo-membranous angina. In severe cases there is intense lymphadenitis and much inflammatory œdema of the tissues of the neck, which may go on to suppuration, or even to gangrene. Streptococci are found abundantly in the glands and in the areas of suppuration. Of changes in the digestive organs, a catarrhal state of the gastro-intestinal mucosa is not uncommon. The liver may show interstitial changes (Klein). The spleen is often enlarged.

Endocarditis and pericarditis are not infrequent. Myocardial changes are less common. The renal changes are the most important, and have been thoroughly studied by Coats, Klebs, Wagner, and others. The special nephritis of the disease will be considered with the diseases of the kidney.

Affections of the respiratory organs are not frequent. When death

results from the pseudo-membranous angina, broncho-pneumonia is not uncommon. Cerebro-spinal changes are rare.

Symptoms.—Incubation.—On this point there is great discrepancy. The period is undoubtedly very variable. From three to twelve days is probably the limit, though it may in exceptional cases be extended. In one case, the circumstances of which made it perfectly clear that I had myself conveyed the infection, the incubation was twelve days.

Invasion.—The onset is as a rule sudden. It may be preceded by a slight scarcely noticeable indisposition. An actual chill is rare. Vomiting and, in young children, convulsions are common. The fever is intense; rising rapidly, it may on the first day reach 104° or even 105°. The skin is unusually dry and to the touch gives a sensation of very pungent heat. The tongue is furred, and as early as the first day there may be complaint of dryness of the throat. Cough and catarrhal symptoms are uncommon. The face is often flushed and the patient has all the objective features of an acute fever.

Eruption.—Usually on the second day, in some instances within twenty-four hours, the rash develops in the form of scattered red points on a deep subcuticular flush. It appears first on the neck and chest, and spreads so rapidly that by the evening of the second day it may have invaded the entire skin. In pronounced cases the rash at its height has a vivid scarlet hue, quite distinctive and unlike that seen in any other eruptive disease. It is entirely hyperæmic, and the anæmia produced by pressure instantly disappears. In some cases the rash does not become uniform but remains patchy, and intervals of normal skin separate large hyperæmic areas. Tiny papular elevations may sometimes be seen, but they are not so common as in measles. At the height of the eruption sudaminal vesicles may develop, the fluid of which may become turbid. The entire skin may at the same time be covered with small yellow vesicles on a deep red background. Pronounced cases of this type were called by the older writers *scarlatina miliaris.*

Occasionally there are petechiæ, which in the malignant type of the disease become wide-spread and large. The eruption does not always appear upon the face. There may be a good deal of swelling of the skin which feels uncomfortable and tense. The itching is variable; not as a rule intense at the height of the eruption. After persisting for two or three days the rash gradually fades. The rash can often be seen on the mucous membranes of the palate, the cheeks and the tonsils, giving to these parts a vivid red, punctiform appearance. The tongue is red at the tip and edges, furred in the centre; and through the white fur are often seen the swollen papillæ, which give the so-called "strawberry" appearance to the tongue. The breath often has a very heavy, sweet odor.

The pharyngeal symptoms vary extremely. There may be—

1. Slight redness, with swelling of the pillars of the fauces and of the tonsils.

2. A more intense grade of swelling and infiltration of these parts with a follicular tonsillitis.

3. Membranous angina with intense inflammation of all the pharyngeal structures and swelling of the glands below the jaw, and in very severe cases a thick brawny induration of all the tissues of the neck.

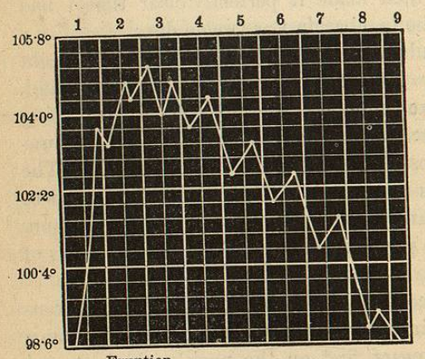

CHART IX.—Scarlet fever (Strümpell).

The fever, which sets in with such suddenness and intensity, may reach 105° or even 106°. It persists with slight morning remissions, gradually declining with the disappearance of the rash. In mild cases the temperature may not reach 103°; on the other hand, in very severe cases there may be hyperpyrexia, the thermometer registering 108° or even before death 109°.

The pulse presents the ordinary febrile characters, ranging in children from 120° to 150°, or even higher. The respirations show an increase proportionate to the intensity of the fever. The gastro-intestinal symptoms are not marked after the initial vomiting, and food is usually well taken. In some instances there are abdominal pains. The edge of the spleen may be palpable. The liver is not often enlarged. With the initial fever nervous symptoms are present in a majority of the cases; but as the rash comes out the headache and the slight nocturnal wandering disappear. The urine has the ordinary febrile characters, being scanty and high colored. Albuminuria is by no means infrequent during the stage of eruption, but the amount is slight. Careful examination of the urine should be made every day. There is no cause for alarm in the slight trace of albumen which is so often present, not even if it is associated with a few tube-casts.

Desquamation.—With the disappearance of the rash and the fever the skin looks somewhat stained, is dry, a little rough, and gradually the upper layer of the cuticle begins to separate. The process usually begins about the neck and chest, and flakes are gradually detached. The degree and character of the desquamation bear some relation to the intensity of the eruption. When the latter has been very vivid and of long-standing, large flakes may be detached. In rare instances the hair and even the nails have been shed. It must not be forgotten that there are cases in which the desquamation has been prolonged, according to Trousseau even to the seventh or eighth week. The entire process lasts from ten to fifteen or even twenty days.

There are cases of exceptional mildness in which the rash may be

scarcely perceptible. During epidemics, when several children of a household are affected, it sometimes happens that a child sickens as if of scarlet fever, and has a sore throat and the "strawberry tongue" without the development of any rash. This is the so-called *scarlatina sine eruptione.*

These slight cases of scarlet fever may be followed by the severest attacks of nephritis.

MALIGNANT SCARLET FEVER.

Ataxic Form.—This presents all the characteristics of an acute intoxication. The patient overwhelmed by the intensity of the poison may die within twenty-four or thirty-six hours. The disease sets in with great severity—high fever, extreme restlessness, headache, and delirium. The temperature may rise to 107° or even 108°, and rare cases have been observed in which the thermometer has registered even higher. Convulsions may occur in children. The initial delirium rapidly gives place to coma. The dyspnœa may be urgent; the pulse is very rapid and feeble.

Hæmorrhagic Form.—In some instances hæmorrhages occur into the skin. There is hæmaturia, and epistaxis. In the erythematous rash there are at first scattered petechiæ, which gradually become more extensive, and ultimately the skin may be universally involved. Death may take place on the second or on the third day. While this form is perhaps more common in enfeebled children, I have twice known it to attack persons apparently in full health.

Anginose Form.—The throat symptoms may appear early and progress rapidly. The fauces and tonsils are swollen. Membranous exudation forms. It may extend to the posterior wall of the pharynx, forward into the mouth, and upward into the nostrils. The glands of the neck rapidly enlarge. Necrosis occurs in the tissues of the throat, the fœtor is extreme, the constitutional disturbance profound, and the child dies with the clinical picture of a malignant diphtheria. Occasionally the membrane extends into the trachea and the bronchi. The Eustachian tubes and the middle ear are usually involved. In cases in which death does not take place rapidly from toxæmia there may be extensive abscess formation in the tissues of the neck and sloughing. In the separation of deep sloughs about the tonsils the carotid artery may be opened, causing fatal hæmorrhage.

As already mentioned, scarlatinal angina, though resembling diphtheria and not to be distinguished from it anatomically, is probably due to the scarlatinal and not to the diphtheritic poison.

Complications and Sequelæ.—(*a*) *Nephritis.*—At the height of the fever there is often a slight trace of albumen in the urine, which is not of special significance. In a majority of cases the kidneys escape without greater damage than occurs in other acute febrile affections.

Nephritis is most common in the second or third week and may develop after a very mild attack. It may be delayed until the third or

fourth week. As a rule, the earlier it develops in the disease the more intense it is. It varies greatly in intensity, and three grades of cases may be recognized:

1. Very severe cases with suppression of urine or the passage of a small quantity of dark bloody urine laden with albumen and tube-casts. Vomiting is constant, there are convulsions, and the child dies with the symptoms of acute uræmia.

2. Less severe cases without any serious acute symptoms. There is a puffy appearance of the eyelids, with slight œdema of the feet; the urine is diminished in quantity, smoky in appearance, and contains albumen and tube-casts. The kidney symptoms then dominate the entire case, the dropsy persists, and there may be effusion into the serous sacs. The case may drag on and become chronic, or the patient may succumb to uræmic accidents. Fortunately, in a majority of the cases the disease yields to judicious treatment and recovery takes place.

3. Cases so mild that they can scarcely be termed nephritis. The urine shows a moderate amount of albumen. There may be tube-casts, rarely blood. The œdema is extremely slight or transient, and the convalescence is scarcely interrupted. Occasionally, however, in these mild attacks serious symptoms may supervene. Œdema of the glottis may prove rapidly fatal, and in one case of the kind a child under my care died of acute effusion into the pleural sacs.

There are instances of œdema without albuminuria or signs of nephritis. Possibly in some of these cases the œdema may be hæmic and due to the anæmia; but there are instances in which marked changes have been found in the kidney after death, even when the urine did not show the features characteristic of nephritis.

(*b*) *Arthritis.*—During the subsidence of the fever, rarely at its height, pains and swelling in the joints may develop and present all the characteristics of acute rheumatism. In all probability it is not however true rheumatism, but is analogous to gonorrhœal synovitis. It may pass on to suppuration, in which case it most commonly involves only a single joint.

(*c*) *Cardiac Complications.*—Simple endocarditis is not uncommon, and many cases of chronic valvular disease originate probably in the latent endocarditis of this disease. Malignant endocarditis is rare. Pericarditis is probably not more frequent, but is less likely to be overlooked than endocarditis. It usually develops during convalescence, and may be sero-fibrinous or purulent. The cardiac complications are sometimes found in association with arthritis. Myocarditis is not uncommon.

(*d*) *Pleurisy* may follow *pneumonia*, though this is rare. More often it occurs during convalescence, is insidious in its course, and as a rule purulent. This serious complication of scarlet fever is not sufficiently recognized. It was one upon which my teacher, R. P. Howard,* in Montreal, specially insisted in his lectures. Sheriff, in a number of the same journal, reports two cases, occurring at the same time in brothers, one of whom died suddenly after a slight exertion.

* Canada Medical and Surgical Journal, December, 1872.

(*e*) *Ear Complications.*—These are common and serious. They are due to extension of the inflammation from the throat through the Eustachian tubes. It is one of the most frequent causes of deafness. The severe forms of membranous angina are almost always associated with inflammation of the middle ear, which goes on to suppuration and perforation of the drum. The suppuration may extend to the labyrinth and rapidly produce deafness. In other instances there is suppuration in the mastoid cells. In the necrosis which follows the middle-ear disease, the facial nerve may be involved and paralysis follow. Later, still more serious complications may follow the otitis; such as thrombosis of the lateral sinus, meningitis, or abscess of the brain.

(*f*) *Adenitis.*—In comparatively mild cases of scarlet fever the submaxillary lymph-glands may be swollen. In severer cases the swelling of the neck becomes extreme and extends beyond the limits of the glands. Acute phlegmonous inflammations may occur, leading to wide-spread destruction of tissue, in which vessels may be eroded and fatal hæmorrhage ensue. The suppurative processes may also involve the retro-pharyngeal tissues.

The swelling of the lymph-glands usually subsides, and within a few weeks even the most extensive enlargement gradually disappears. There are rare instances, however, in which the lymphadenitis becomes chronic and the neck remains with a glandular collar which almost obliterates its outline. This may prove intractable to all ordinary measures of treatment. A case came under my observation in which, two years after scarlet fever, the neck was enormously enlarged and surrounded by a mass of firm brawny glands.

(*g*) *Nervous Complications.*—Chorea occasionally develops in connection with the arthritis and endocarditis. Sudden convulsions followed by hemiplegia may occur. Two instances of progressive paralysis of the limbs with wasting came under my observation at the Philadelphia Infirmary for Nervous Diseases. The history was that of subacute ascending spinal paralysis, but it is probable that they were instances of multiple neuritis. Mental symptoms, mania and melancholia, have been described.

(*h*) Other rare complications and sequelæ are eye affections, symmetrical gangrene, enteritis, and noma.

Diagnosis.—The diagnosis of scarlet fever is not difficult, but there are cases in which the true nature of the disease is for a time doubtful. The following are the most common conditions with which it may be confounded.

1. *Acute Exfoliating Dermatitis.*—This pseudo-exanthem simulates scarlet fever very closely. It has a sudden onset, with fever. The eruption spreads rapidly, is uniform, and after persisting for five or six days