Injuries and disease of the lymphatic system / by S. Messenger Bradley.

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BY

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PREFACE.

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My dear Cullingworth,

I address these remarks, which are intended to partake of the nature of a dedication as well as a preface, to you, because I am thus enabled to thank you for your great kindness in correcting the proof sheets.

As you are aware, this essay was written before Professor Curnow's "Gulstonian Lectures on the Lymphatic System" began to appear in the pages of the 'Lancet,' and when I read the first lecture my impulse was to withdraw my work altogether, but as the publication of Dr. Curnow's lectures proceeded it seemed to me that they did not sufficiently overlap it to render this course necessary. I therefore allow it to see the light, in the hope that it may, to some slight extent, fulfil the purpose with which it was written, viz. supply a gap in English medical literature; in this hope I shall continue to indulge myself until perchance I am disturbed by "the slings and arrows of outrageous" critics.

I have not loaded the text with bibliographical references beyond what is absolutely necessary to support my state-

ments, since any one will find ready access to a copious literature on the subject by referring to such works as Ziemssen's 'Cyclopædia,' Pitha and Billroth's 'Surgery,' Virchow's and Langenbeck's 'Archiv,' &c., &c.

I have in my possession several original drawings and photographs of diseased conditions of the lymphatic system, but I have not introduced them in the text, as, although they would add considerably to the expense of the work, I do not think they would materially enhance its value.

Besides yourself, I have to thank Mr. Priestley for revising the manuscript of the first chapter, for which kind office I beg to tender him my grateful acknowledgments.

You have borne with my faults and shortcomings with a noble patience and forbearance, my dear Cullingworth, and I can only hope that my readers may prove equally gentle in their dealing with,

Yours, ever faithfully,

S. MESSENGER BRADLEY.

C. J. Cullingworth, Esq.

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GENERAL ARRANGEMENT OF LYMPHATIC SYSTEM, LYMPHATIC VESSELS, CAPILLARIES, GLANDS, AND FOLLICLES—STRUCTURE OF EACH—LYMPHATIC ELEMENTS OR LYMPH PULP—PHYSIOLOGY—ABNORMALITIES.

A KNOWLEDGE of the topographical anatomy and histology of the lymphatic system being essential to a true apprehension of the diseases which affect it, I shall preface the pathological portion of this essay by a brief account of its structure and general arrangement, upon which the recent investigations of Recklinghausen, Klein, and Ranvier have shed much light, completing, as it were, the older researches of Hunter, Mascagni, Hewson, and Cruikshank.

The lymphatic system consists of vessels, lymph follicles, and glands, called by the French ganglia. The lymphatic vessels comprising ducts and trunks or capillaries, exist in every organ and vascular tissue throughout the body. In both the viscera and tissues they are arranged in a superficial and deep set. In the trunk and limbs the superficial set is situated immediately beneath the skin, traversing the

subcutaneous fatty layer, and somewhat resembling the subcutaneous veins in arrangement, to which, however, the lymphatics are superficial in position. The deep vessels are less numerous, but larger than the superficial; they accompany the arteries of a limb, and form free anastomoses around the venæ comites. Both the superficial and deep vessels pass to the nearest glands, in the substance of which they intercommunicate; but, although the superficial vessels anastomose with each other very freely, as do also the deep, it is only through the medium of the glands that the two sets communicate together.

With extremely rare exceptions (normally it is probable with none) every lymphatic vessel traverses one or more glands in its course towards the thoracic duct.

In the solid viscera, the superficial vessels are placed immediately beneath the capsule, while the deep, like their congeners in the limbs, run with the blood-vessels. In the hollow viscera they are situated beneath the serous and mucous coats respectively; and in both forms of viscera the two sets anastomose.

All the lymphatics of the body terminate in the left and right lymphatic ducts which open into the internal jugular veins at the root of the neck. The right duct receives the vessels of the right side of the head and neck, the right upper extremity, the right side of the chest, the right lung, the right side of the heart, and the upper surface of the liver. It is only about half an inch long, and a line in diameter. The left lymphatic, more commonly known as the thoracic duct, receives the absorbents from all the rest of the body. It measures from a foot to a foot and a half in length, according to the stature of the individual, and extends along the back of the abdominal and thoracic cavities from its dilated commencement on the second lumbar vertebra to the junction of the left internal jugular and subclavian veins. It measures about three lines in diameter and its course is marked by numerous slight constrictions indicating the position of the valves.

The lymphatic glands are somewhat kidney-shaped; they vary considerably in size, some not being larger than the

head of a pin, others being equal in size to a filbert; they also vary in size at different periods of life, being relatively largest in early life and smallest in old age. Their number varies likewise, sometimes as many as 700 have been counted, at others very much fewer are found. Some few are solitary, but the greater number are collected into groups; they lie along the vessels of the neck, chest, and abdomen; a great number are found in the mesentery, a few smaller ones on the scalp, and congeries of considerable size in the axilla and groin, and to a less extent in the ham and elbow.

The walls of the lymphatic vessels are so thin that the lymph can be seen through, and constrictions are observable at frequent intervals, which indicate the situation of valves, which like the valves of veins, are formed by two semilunar reduplications of the lining membrane.

Structure of the lymphatic trunks.—The lymphatic trunks closely resemble the veins in structure, but are thinner, and possess a more complicated arrangement of muscular fibres, which interlace very freely, like the fibres of the heart, and an endothelial lining, which differs from that of veins in presenting undulating serrated edges. We have, however, the three coats as in veins, the endothelial lining resting on a thin elastic layer, a middle muscular, and an external tunic of connective tissue.

It was at one time believed that the blood-vessels communicated directly with the lymphatics, because an injection often passed from the former into the latter, but it is now ascertained that no such communication exists, although the connection is so very close that the injection would readily make its way by slight rupture from one to the other. In the mesentery of the dog for instance we find lymphatic sheaths enveloping the blood-vessels, the vessels not being directly bathed in lymph, but surrounded with the lymph sheath, as the heart is with the pericardium, or the intestines with the peritoneum.

Lymphatic capillaries.—The lymphatic capillaries, which are very numerous in the skin, in aponeuroses, on the surface of muscles and tendons, in the pericardium, pleura, diaphragm, and all mucous membranes, possess no muscular fibres

whatever, and are formed of a single layer of flat epithelial cells with dentated or, more commonly, sinuous outlines.

Origin of lymphatic vessels.—This, as will be frequently seen in the course of this essay, is a highly important matter, and one that has a notable bearing on the evolution and progress of many diseases; it is at the same time a difficult subject, and although we know the mode in which lymphatics commence in serous and synovial cavities, their origin has not been actually demonstrated in the cellular tissue of the body. Upon both surfaces of the centrum tendineum of the diaphragm, and in the large serous sacs, the lymphatics are seen to commence by open mouths (stomata), by which the juices easily and directly flow along the resultant trunks. The same arrangement, that is to say, this commencement by open mouths, has been demonstrated to exist in the large prevertebral cavity of frogs and other tailless batrachia. This cavity, which is the homologue of the subcutaneous tissue, is separated by a very fine membrane from the peritoneal cavity. There is a peritoneal side, and a lymphatic side, and both are furnished with endothelium. On the peritoneal aspect there are permanent orifices, whilst on the lymphatic aspect we meet with every condition intermediate between complete occlusion and complete patency. The loose connective tissue of the body forms really a vast cavity where the nutritive juices circulate, and not in any special canals, and we may fairly reason by analogy that within this cavity the lymphatics commence, as they have been shown to commence elsewhere, by open mouths; as I have before said, however, this fact awaits demonstration, although it will be assumed in the following pages.

The connection between the lymphatic capillaries and the spaces occupied by the connective-tissue corpuscles, has given rise to much speculation. In the normal condition, the corpuscles, there is every reason to believe, completely block up the spaces they occupy, but in œdematous conditions this is not the case. The walls of the lymph capillaries are undoubtedly in direct continuity with the flat connective-tissue corpuscles, and the point, which is still perhaps an undecided question, is whether the spaces occupied by the

corpuscles are continuous by distinct perforation with the interior of the lymph capillaries.*

Structure of the lymphatic glands.—To examine a lymphatic gland, a section should be made in the long axis of the gland through the hilus, or depression, which they all possess; it will be seen then that the gland is divided into two portions, a cortical and medullary portion. With the exception of the bronchial glands, which are coloured with carbon, they are all more or less deeply stained with the contained blood, sometimes, when congested, being quite red, at

* Since writing the above, Professor Curnow's Gulstonian Lectures on the Lymphatic System have been published in the 'Lancet,' from which I extract the following, *à propos* of the origin of the lymphatics:—"The mode of origin of the systemic lymphatics is thus happily described by Breschet, 'À mes yeux le tissu cellulaire est le point principal d'ou les vaisseaux lymphatiques surgissent; c'est le sol dans lequel leurs racines s'implantent, et dans le profondeur duquel elles se ramifient avec des formes particulières.' That they (*i. e.* the interstices of the cellular tissue) are lymph reservoirs, and that the lymph capillary is their discharge pipe, is placed beyond doubt by all recent investigations. The interstices in the connective tissue are undoubtedly lymph chambers, differing only in size, and not in significance, from the lymph sacs of the frog and the serous cavities of the higher animals. There is no special lymph canalicular system; the serum of the blood passes through the walls of the capillaries in a more or less rapid stream, in accordance with the blood pressure, irrigates the connective tissue, collects in its interstices, and is drained off by the efferent lymphatics, in which the pressure is practically *nil*." Drs. George and Eliz. Frances Hoggan have recently investigated the development and arrangement of the lymphatics of the skin, and related the results obtained in a memoir published in the 'Journal de l'Anatomie' for January and February, 1879. I will quote their conclusions without comment:—"1. Les lymphatiques de la peau sont, chez le fœtus des mammifères, disposés sur un seul plan; mais, plus tard, l'interposition du tissu cellulaire d'un côté, et le developpement des poils et des autres appendices de la peau de l'autre côté, réfoulent les lymphatiques dans les plans nombreux, et rendent leur disposition fort irregulière. 2. Chez l'homme adulte, les lymphatiques cutanés, tous pourvus de valvules, sont divisés en deux categories; les lymphatiques collecteurs ou dermiques, qui sont distribués dans des plans nombreux dans l'épaisseur du derme, et les lymphatiques hypodermiques ou efferents, qui sont disposés en un seul plan à la surface hypodermique de la peau. 3. Les cellules étoilées de la peau de l'homme ne sont point des radicules lymphatiques, mais bien un reste d'une disposition formitive qui subsiste encore dans la classe des poissons et chez la grenouille, ou des couches de cellules semblables, en connexion avec le système sanguine, paraissent servir à la nutrition des parties ou dépourvues de vaisseaux comme cela se fait aussi du reste dans la cornée des mammifères." P. 68.

others, when anæmic, yellow. The cortical portion, which surrounds the medulla everywhere except at the hilus, sends inwards numerous trabeculæ, which imperfectly divide the medulla into loculi; these trabeculæ also exist with a more complex arrangement in the central part of the gland. The whole gland is surrounded with a capsule.

In studying the histology of these organs we have to consider the capsule and its fibrous bands, the cortical substance with its follicles, the medulla and its follicular bands, the sinuses, and the blood-vessels. The capsule resembling the larger lymphatic ducts in structure, consists of white and yellow connective tissue mixed with involuntary muscular fibre, and from it there pass into the substance of the gland trabeculæ, which also contain muscular fibres. These lamellæ or trabeculæ in many places exhibit a sheathing of flat epithelial cells; they are riddled with holes, and contain the follicular substance and the pulp. The substance of the follicular strands or cords consists of a close network of stellate cells densely crowded with lymph corpuscles and nuclei, and traversed by blood-capillaries. The medulla is also formed by these trabeculæ, which, however, no longer follow an uniform direction, but interlace in the most intricate fashion, forming a close network, in the meshes of which a similar pulp is found to that existing in the cortical portion of the gland.

Spaces are left between the pulp and the lamellæ in the cortical portion of the gland, and the pulp and the network in the medullary part; this shrinking away of the pulp leaves clear spaces, broken only by the fine processes of anastomosing stellate cells, which stretch across from the lamellary to the follicular substance; these are known as "lymph-paths." It is along these lymph-spaces or lymph-paths that the lymph travels in passing through the gland from the afferent to the efferent lymphatic trunk.

The blood-vessels.—The larger blood-vessels ramify in the medulla, and passing outwards penetrate the large trabeculæ of the cortex, bifurcating again and again in their substance; capillaries thence emerge, which are collected beneath the capsule into venules.

Lymph pulp.—All lymphatic glands exude a juice in which we find lymphatic cells of various sizes which (like the white blood-cells) exhibit amœboid movements, simple nuclei, blood-cells, fat globules, and numerous granules.

Lymph follicles.—Professor Curnow gives the following account of lymph-follicles :—"The lymph-follicles are found especially along the mucous tract of the alimentary canal. They are most marked on the posterior third of the dorsum of the tongue, in the tonsils, the wall of the pharynx and œsophagus, as the solitary glands of the stomach and intestines, and as the Peyerian patches in the small intestines. But they are not limited to the digestive tract, for they occur in the conjunctiva, in the mucous membrane of the Eustachian tube, larynx, trachea, and bronchi, and more sparingly in the bladder and vagina. They form the Malpighian bodies of the spleen and the substance of the thymus, and some are found in connection with the pleura and peritoneum. Finally, the red or fœtal marrow of bones presents some features which have led modern histologists to include it in the same system.

"Lymph follicles are composed of a reticulum of stellate cells, whose meshes are thickly crowded with colourless, nucleated corpuscles. The supporting or adenoid tissue may be aggregated into masses, as in the Malpighian bodies of the spleen, or uniformly diffused, as in the basic substance of a villus. Sometimes, as in the tonsils, it may be both aggregated into well-defined masses and diffused into the surrounding connective tissue."

Physiology of lymphatic system.—The lymphatic system is the great absorbent factory of the body. "It would appear," says Hermann ('Hermann's Physiology,' translated by Dr. Gamgee, 2nd edition, p. 168), "that, apart from the absorption of those products of oxidation which are really soluble, the unaltered, albuminous constituents of transudation fluids are constantly, or under certain circumstances, taken up by the lymphatics, and the more quickly according to the rapidity with which transudation takes place, *i. e.* according as the pressure of the parenchymatous fluids in the tissue is

greater. Lymph, at least, will flow from an open lymphatic vessel the more quickly according as transudation is increased either by dilatation of the arteries proceeding to the part (by section or paralysis of vaso-motor nerves), or by prevention of the escape of blood (by ligature of the veins, or by compression of them by muscular contractions)—Ludwig, Schwanda. The lymphatics, therefore, may possibly have to be regarded as regulators of turgescence. The condition in which there is increased pressure of the parenchymatous fluids, and which is removed by increased activity of the absorbents, is called *œdema*. We may say that a system of drainage is continually in operation in the tissues, in which fluids are poured out of the blood-vessels by transudation, percolate the surrounding cellular tissues, and finally flow away through the lymphatics. The commencement of the lymphatics are, as a rule, removed as far as possible from the blood-vessels (von Recklinghausen). Absorption from parenchymatous tissue appears to be promoted by pressure, such as that exerted by the contraction of neighbouring muscles (Genersich). Increase of arterial blood pressure has no influence upon the formation of lymph (Paschutin)." In another passage Hermann explains the circulation of lymph thus (p. 170) :—"The motion of the lymphatic fluids towards the blood takes place under a slight pressure (Noll) and very slowly, chiefly on account of the considerable resistance which the lymphatic glands must offer. The forces which sustain this movement can only be guessed at; they are probably—1. Those forces which bring about absorption of the contents into the initial branches of the system, and which are, as yet, unknown; their effect must be to cause a gradual progression of the lymph or chyle. 2. The contraction of the various muscles around the lymph vessels, which, on account of the numerous valves existing in these vessels, forces the lymph towards the larger trunks. 3. The aspiration of the thorax; for the openings of the principal trunks and the greater part of the thoracic duct also lie within the thoracic cavity."*

* I do not think it desirable to encumber the text by obtruding views of my own as to the further functions of the lymphatic system, and would therefore

While such are the functions of the tubes, the lymphatic glands are doubtless concerned in the elaboration of the lymph, and especially in the production and multiplication of the cellular elements.*

Abnormalities of the Lymphatic System.†

Sabatier twice found a large oblong pouch at the junction of the left branch of the thoracic duct.

The number of vessels emptying themselves into the receptaculum chyli is very various. Most frequently there

refer the reader to the Appendix, where I deal with the important part which it plays in growth and development.

* John Hunter formed a clear and accurate estimate of the functions of the lymphatic system; indeed, it was chiefly owing to Hunter's researches in this direction that we formed a proper notion at all. S. Cooper gives a good summary of Hunter's researches and opinions in his Dictionary, in the article on "Absorption." Amongst other things he says, *e. g.* "As these vessels are productive of a great variety of changes in the animal economy, which are very dissimilar in their intention and effect, Mr. Hunter considered them in two general points of view; first, as they absorb matter which is not any part of the body itself; secondly, as they absorb the body itself. The first of these uses, the absorption of matter which is no part of the machine, he observes, is well known, and of two kinds; first, that of exterior matter, comprising every application to the skin and also the chyle; the other interior, comprehending that of any of the secretions, the fat, the earth of bone, &c. These kinds of absorption may take place principally for the nourishment of the body; but they also serve other purposes, and are very extensive; for, besides their salutary effects, they are frequently the cause of disease in a thousand forms." To this I will only add the remark that since many diseases enter and operate through the lymphatic system, it seems but rational to introduce our remedies by the same channels, and so get directly on to the track of the enemy instead of pursuing a roundabout and haphazard route. This view will be further considered as we proceed.

† I am indebted to Breschet for the facts here stated. In his work, 'Sur le Système Lymphatique,' he gives examples of all the abnormalities stated in the text, with a reference to the author who records it. Curnow mentions the following additional abnormalities of the lymphatic system: —"Nülm, of Heidelberg, refers to three cases in which he saw lymphatics terminate, once in the inferior vena cava, and twice in the renal veins; and Petrel has seen them communicating with the portal vein, renal veins, and vena azygos. Stenson mentions one as going into the superior vena cava; Wepfer another into the vena azygos; Schmeidel a third into the internal iliac vein; Verneuil has followed some into the axillary vein, and Meckel several into the vena porta and vena cava superior."

are from five to six vessels, or according to other authorities, three is the more usual number, but all numbers, from a single vessel to a dozen, have been met with.

Abnormalities in the receptaculum chyli are common; it is not unfrequently absent; sometimes it is bilocular, at others trilocular. Two separate receptacula with separate thoracic ducts have also been observed. Again, its position is sometimes transferred to the thorax.

The thoracic duct is very often the seat of abnormalities. Dilatations, flexures, and contractions, are each frequently seen. Again, it is a common peculiarity to find the thoracic duct give off a branch which reunites after a course of a few inches with the parent trunk. These *insulæ*, as they have been termed, are sometimes numerous.

The termination of the thoracic duct is also subject to varieties; instead of a single trunk opening into the left subclavian vein at its junction with the internal jugular, two or more branches sometimes open separately, or a single mouth may empty itself into the jugular vein, or, still more rarely, a communication exists between the azygos vein and the thoracic duct. Similar communications were also found in one instance between the receptaculum chyli and the lumbar veins. A double, and even triple thoracic duct has occasionally been found to exist.

The right thoracic duct appears to be subject to precisely the same abnormalities as the left.

CHAPTER II.

LYMPHORRHŒA AND LYMPHANGIOMA.

INJURIES OF LYMPHATICS AND LYMPHATIC FISTULÆ — DILATATION (LYMPHANGIECTASIS)—LYMPHATIC CAVERNOUS TUMOURS (LYMPHANGIOMA)—MACROGLOSSIA, MACROCHILIA, ETC.—LYMPHATIC ORIGIN OF HYDROCELE, ETC.—DIAGNOSIS—ETIOLOGY—TREATMENT.

NOTHING in the animal economy more justly calls for admiration than the provisions made against accidents. Thus, were it not specially guarded against we should bleed to death every time we cut a finger, and, similarly, if this were the sole mischance against which protection is made, every wound, no matter how trifling, would be followed by an incessant and uncontrollable dribble of lymph. The lymphatics are indeed more plentiful than the blood-vessels, and consequently more of them are severed in every incision through the skin. Nature, however, so contrives it that instead of being a source of peril the outpoured lymph becomes the chief bond of union, for it is by organisation of this material that reparation, in the main, takes place. It does, however, though very rarely, happen that slight wounds, especially in the neighbourhood of joints, are followed by a persistent and troublesome lymphorrhœa; in these exceptional cases we probably have to deal with some constitutional defect.* Just as we meet with individuals of a hæmorrhagic diathesis, in whom the slightest wound is attended with most troublesome bleeding, so in the other class of which we speak the stillicidium of lymph is probably due to a lymphorrhagic diathesis. Putting these rare cases aside we

* A distinction is sometimes made, it appears to me, with insufficient cause, between lymphorrhœa and lymphorrhagia, the former being the result of injury, the latter of disease; in this essay both terms are used indiscriminately.

find that traumatic lymphorrhœa as generally recognised follows wounds or injuries of the thoracic duct, of the larger lymphatic vessels, and of the lymphatic glands. We shall find that in the numerous instances in which lymphorrhœa takes place from the lymphatic capillaries of skin, or elsewhere, it is, with the rarest possible exceptions, dependent on a diseased condition which has led to dilatation, and this form, therefore, will be considered under the head of lymphangiectasis.

Wounds of the thoracic duct.—I can only find the record of six cases of wounds of the thoracic duct, of these two are related by Hoffmann, and the rest by Monro, Guiffort, Bonnet, and Quincke. In addition to these there is a single case on record of rupture of the thoracic duct without injury. Hoffmann's first case was that of a woman wounded through the left side with a knife. Following the wound there was a copious discharge of a spontaneously coagulating fluid, which was observed to be milky during digestion, and clear while the patient was fasting. In his second case the escape of chyle followed the opening of an abscess of the posterior mediastinum. Monro relates a case where the thoracic duct was wounded by a stab; the lymph escaped externally and also into the pleural cavity, interfering with the heart's action. Guiffort's case is of a similar nature. Bonnet gives the history of a Baron Heinden, who was wounded in battle by a bullet, which escaped beneath the left scapula. From this wound there gradually began to flow an excessive quantity of lymph, "tanta in copia effluxisse, ut non solum lintea quintuplicata, indusium lodicesque imbuerit, sed quoque limbos inundaverit." The patient lived for several months, dying at last of exhaustion. Quincke's case was caused by the patient, a man, being run over by a carriage. In this case the pleural cavity became so full of extravasated lymph that paracentesis had to be performed to prevent suffocation, from which, indeed, the patient eventually died.

The *diagnosis* of these cases can only be made with certainty when there is a fistulous opening leading into the thoracic duct. In cases where there is no external opening lesion of the thoracic duct can only be presumably ascertained by what is after all insufficient circumstantial evidence.

Baillie believed that rupture of the thoracic duct does occasionally take place without any injury, in which opinion Copland coincides, and in Dr. Cayley's case, to which I shall now refer, we have actual post-mortem demonstration of such an occurrence.

Dr. Cayley's unique and interesting case seems to show that, under some circumstances, at least, the extravasated chyle has all the irritating properties of bile or urine. The case is that of a young man, æt. 19, who died in the Middlesex Hospital after a few days severe abdominal pain and tenderness, associated with constipation and vomiting, when a post-mortem examination revealed a rupture of the thoracic duct. "The peritoneum in front of the spine was found to be bulged forward; this appearance was produced by the effusion of a large quantity of milky-looking fluid behind it. The thoracic duct throughout its course was found immensely dilated; at its termination it was about the calibre of the little finger; it was distended by a milky fluid resembling that extravasated behind the peritoneum. The receptaculum chyli was much dilated, and on its anterior surface was a small perforation about two inches in length. At the junction of the thoracic duct with the subclavian vein the former suddenly became much narrowed and its coats thickened, and just at its mouth a fibrous granular vegetation was attached to the lining membrane of the vein, which almost completely obstructed the opening of the duct. The body was moderately well nourished, and all the other organs were normal." In this case the extravasated chyle seems to have set up the fatal peritonitis.*

The *prognosis* is not so quickly or certainly fatal as might, *à priori*, be imagined.

We have post-mortem records to show that obliteration of the thoracic duct may exist without giving rise to lethal symptoms during life, and it is probable that a collateral circulation would, in all similar cases, tend to develop until the small right lymphatic duct would be equal to carrying on the entire lymphatic circulation. It is true that all the recorded cases have terminated fatally, but this in some cases appears

* 'Path. Trans.,' 1866, vol. xvii, p. 163.

to have been due to some accidental complication, and occurred months after the initial lesion. We have, indeed, further experimental evidence to prove that obliteration of the thoracic duct does not necessarily tend to death. The researches of Leuret, Lassaigne, and Flandrin* show that the thoracic duct may be tied in horses and dogs without a fatal result. Rudolphi† confirms this statement by two additional experiments. The explanation probably is that these results are partly due to the development of a collateral circulation by the right lymphatic trunk, and partly to communications established with the veins and the lymphatics below the point of deligation. This latter argument gains strength from the observations of Tiedemann and Fohmann,‡ who have noted instances of such anastomoses in the human subject, and also from a case related by Wutzer,§ of a woman in whom there existed a very free connection between the thoracic duct and the vena azygos. A favorable result is of course more probable when the thoracic duct is gradually obliterated than where it is ruptured, for in the latter case there is the added danger of lymphorrhœa. If the escape is trifling no great harm will perhaps ensue; if, however, the lymphorrhœa be considerable, a gradual starvation will slowly carry off the patient, if, as in Cayley's case and Cooper's experiments, to which I shall again refer, there is not a speedier termination from peritonitis. It is manifest that no *treatment* beyond dealing with symptoms can be contemplated.‖

Wounds of the larger lymphatic vessels.—Since wounds of the lymphatics were made the subject of a special thesis by Mings, in 1696, numerous memoirs have appeared upon the

* Leuret et Lassaigne, 'Recherches Physiologiques et Chimiques pour servir à l'Histoire de la Digestion.' Paris, 1825. 8, p. 178.

† Rudolphi, 'Ueber die Tödlichkeit der Wunden des Brustgauges, in der Casperschen Wochenschrift für die Gesammten Heilkunde.' 1835. No. 41, 42, 43.

‡ Fohmann, V., 'Anat. Untersuchungen über die Verbindung der Sangadern mit den Venen.' Heidelberg, 1821. 8.

§ Wutzer, in Müller's 'Archiv für Anat. Physiologie und Wiss. Med.' 1834. P. 311.

‖ For support of all the facts affirmed in the text referring to wounds of the thoracic duct, see a very interesting article by Dr. Gjorgjewié on "Lymphorrhœa," in Langenbeck's 'Archiv' for 1870.

subject, each in its turn drawing fresh attention to the phenomenon of resultant lymphorrhœa. As stated at the beginning of this chapter the only real phenomenon is the rarity of such a casualty.

Hewson relates a case of this kind where "a butcher, who, by letting his knife fall upon his shin, cut some of the large lymphatic vessels which pass over the tibia. From this wound there flowed a considerable quantity of a clear lymph, which, being confined by the dressings, jellied, and then at first sight appeared like a whitish fungus, but being loose could be removed with a spatula."* Hewson, it may be added, cured his patient with tight bandaging, and lint steeped in a solution of vitriol.

Dr. Monro relates a similar case in which a considerable lymphorrhœa followed the excision of a tumour from the upper arm, and which, like Hewson's case, he cured by the application of "Roman vitriol." Speaking of such accidents he says, "I do not observe that chirurgical writers take notice of a phenomenon, which I have several times seen in the cure of wounds, which possibly young surgeons may be at a loss to understand, or to know how to remedy; it is the rising of a fungous substance, from which there is a constant stillicidium of lymph, which prevents a cure, and weakens the patient if it is allowed to continue long." †

Asallini also speaks of such fistulæ as of frequent occurrence, and quotes a case where a slight wound at the inner part of the thigh was followed by a lymphorrhœa amounting to five pounds in the twenty-four hours.‡

Pure traumatic lymphatic fistulæ generally form in the neighbourhood of joints where the lymphatics are large and prone to injury. The internal malleolus and the knee are often the seats of such accidents. I have myself seen a case where a specific ulcer above the inner ankle was followed by much integumental and cellular hypertrophy, and subsequently by the free discharge of a speedily

* Hewson's works. Sydenham Society. P. 198.

† Monro's works. 1781. P. 313. "Histories of the cure of lymphatics opened in wounds."

‡ Asallini, 'Essai sur les vaisseaux lymphatiques.' Turin, 1787. P. 54.

coagulating and clear fluid, which proved to be pure lymph. The lymphorrhœa in this case amounted to about two ounces a day, sometimes more, sometimes less, and continued for several weeks, when antisyphilitic treatment and pressure cured the ulcer and stopped the discharge. This case and Monro's, already quoted, serve to show that lymphatic fistulæ follow other causes than simple wounds; and in addition to these must be mentioned the opening of buboes and abscesses. When a lymphorrhœa is produced by the last-named operation it may take place either from the glands or the vessels; when it follows a bubo it is necessarily purely glandular in origin.

Ex uno disce omnes; I might readily multiply illustrations, but will content myself with quoting a single case of this class, which was kindly sent to me by my friend Mr. T. Jones, surgeon to the Children's Hospital at Pendlebury. The patient, a lad æt. 13, had suffered from a solid (lymphatic) œdema of the left leg since he was seven years old. During the last twelve months attacks of superficial lymphangitis had occurred in the thigh, and terminated in suppuration. The pus formed little abscesses, like "farcy buds," in the course of the lymphatics, and these bursting gave rise to a lymphorrhagic discharge. When I saw him in April of this year the flow was still going on, though only to a slight extent, and the nature of the mischief was at first sight not very apparent. All that could be seen was a row of shallow ulcers, each about half an inch in diameter, extending up the thigh along the biceps cruris. There were also scars of former ulcers on other parts of the thigh, and a dotted row of small abscesses in process of formation. The glands were not perceptibly affected, but some of the superficial lymphatics felt thick and cord-like. Closely watching the surface of the ulcers for some time, drops of a pellucid fluid were observed to slowly exude, and the nature of the case became manifest. Precisely the same phenomena attend a lymphorrhœa sequential to suppurative adenitis, except that, according to Desprès, the quantity is greater in the cases of glandular origin.*

* M. A. Desprès read the paper referred to on the connection between lymphor-

Lymphangiectasis.—I now pass to the consideration of lymphorrhœas dependent upon some antecedent pathological state of either lymphatic trunks or capillaries. This state may be broadly stated to be one of dilatation, or lymphangiectasis.

Assistance to a full comprehension of these affections will be obtained by referring to the parallel morbid states of the vascular system. The veins are subject to varices, the arteries to saccular, fusiform, and cirsoid dilatations, and the capillaries to various states of enlargement and cystic development. Each of these conditions has its double in certain pathological affections of the lymphatic system, and each is occasionally the cause of lymphorrhœa, but while this is so I do not purpose here attempting to divide cases of lymphangiectasis into strictly defined and separate groups, but shall speak of some typical forms of the disease, and then draw attention to their relationship to the angiomata. One of the most frequent forms of lymphangiectasis is met with as a complication and consequence of lymphangitis, the larger tubes become blocked and the afferent vessels dilate in consequence. In other cases the precedent lymphangitis is not well marked, but there is considerable cellular hypertrophy, and the cutaneous lymphatics are found on examination to form extremely free anastomoses associated with great dilatation. I once saw a typical case of this kind at the Manchester Infirmary under the care of Dr. W. Roberts, which he has recorded in the 'Manchester Med. and Surgical Reports' for 1870.

The patient was a man, æt. 45. The disease was situated on the front of the abdomen. He was admitted into hospital in September, 1868, and died of phthisis in May, 1869. He had enjoyed good health up to within two and a half years of his coming into the infirmary; at this time he began to suffer from abscesses (?) in the groin, buttock, and belly. Later a scab was left by one of these abscesses in the left

rhagia and lymphangitis, at the March meeting of the French Academy of Medicine, 1876, of which an abstract appears in the 'Lond Med. Record' for 1876, p. 182. Several cases of traumatic and other forms of lymphorrhœa may be found abstracted in Virchow's 'Jahresbericht' for 1877, p. 321. C. H. Moore also relates two cases of traumatic lymphorrhœa in his article on the "Lymphatics" in Holmes's 'System of Surgery.'

groin, which he picked off, when a pale, water-like fluid began to flow, and continued until, he thought, between two and three pints must have escaped. On admission the skin of the abdomen was very thick, and nodulated in parts; there were numerous vesicles, which gradually extended over the diseased area of skin. As many as 250 vesicles were counted, from many of which a fluid, sometimes milky and sometimes clear, escaped. The flow was discontinuous and apparently irregular, sometimes amounting to several pints in the twenty-four hours, and at others not being sufficient to soak the clothes. It was noticed that as the appetite and health improved the fluid became more milky. Analysis showed it to be identical with chyle when milky, and with liquor sanguinis when pale. The patient twice passed chylous urine. On examination of the skin after death it was found that the cutis vera and subcutaneous tissue were alone involved; these formed a pad from half an inch to one inch thick. Neither the inguinal nor other glands were affected.

On section the patch of skin looked fleshy or glandular. It was traversed by lacunæ, varying from a crow quill to a hair in diameter, which freely anastomosed. The vesicles formed the surface boundary of superficial lacunæ, and it was their rupture which led to the lymphorrhœa. Considering its relationship to chyluria, Dr. Roberts advances the opinion that the disease consists in hypertrophy of the existing lymphatic plexuses, with exudation or rupture of vesicles on the surface, or into the urinary passages, according to their situation.

Let me quote another typical case of this general reticular lymphangiectasis with the development of ampullæ, which bursting, occasion a lymphorrhœa. It is related by O. Weber,* and is that of a lad of nineteen, who, from childhood, suffered from an elephantiasic condition of the scrotum and right lower limb. When two years old large vesicles formed on the scrotum and inner part of the thigh, which, on rupture, discharged immense quantities of lymph. The lad died of scarlatina, and on section of the skin of the thigh it was found hypertrophied throughout its entire thickness, and

* O. Weber on "Diseases of the Lymphatics," in Pitha and Billroth's 'Handbuch der Allg. und Spec. Chir.' Zweite Abtheilung, zweiter Band, p. 67. 1865.

contained an intricate network of dilated lymphatic vessels of the size of a quill pen. Vesicles projected from the surface of the most dilated and superficial tubes, which, by their rupture, had been the source of the outflow. The lymphatics situated on the outer half of the limb were not affected. The muscles beneath were in an atrophied condition, and pus was present in the cellular tissue of the leg.

It is, however, unnecessary to multiply illustrations of an affection which is fully treated of in medical literature, and I will pass on to consider another type, just taking the opportunity of remarking that these reticular dilatations, with the formation of vesicles, are not necessarily of inflammatory origin, but may, indeed, occasionally be due to a very opposite condition, viz. one of paralysis in the lymphatic vessels; thus, *e. g.* Quincke observes, "We must not quite disregard the possibility of an idiopathic dilatation, which may be produced by pathological alterations in the walls of the lymphatics themselves, just as happens in the blood-vessels. A paralysis of the lymphatics seems to be a not very improbable cause of dilatation, since unstriped muscular fibres have been observed in the walls of the lymphatics, and rhythmical contractions of these vessels have been observed in certain parts to assist the onward movement of the lymph stream."*

* "On Diseases of the Lymphatics," by Quincke, in Ziemssen's 'Cyclop. of Practical Med.,' vol. vi, p. 532, Eng. trans. Medical literature is, as I have stated in the text exceedingly rich in illustrations of cases of lymphangiectasis and lymphorrhœa, similar to those already quoted. For a good collection of such cases, *vide* "Krankheiten der Lymphgefässe," in Canstatt's 'Jahrbuch der Gesammten Med.,' 2nd vol., p. 198, and also especially "Gjorgjewié," in Langenbeck's 'Archiv' for 1870 and 1871. To mention a few others: Sidney Jones showed a case at the Pathological Society in 1875 where a lymphorrhœa was associated with elephantiasis of the right leg, and in which one to two quarts of lymph escaped daily. Gubler relates a case in a woman where six pounds of lymph escaped from a varicose condition of the inguinal lymphatics in twenty-four hours. Hilton relates a case in the 'Lancet,' vol. ii, 1866, which is very like Dr. Roberts's; and in the same volume Dr. Day details the history of a case of lymphorrhœa in a child of seven which was due to dilatation. In the 'Med. Times and Gazette,' vol. ii, 1868, a short account is given of a case of lymphorrhœa by Scholtz, and reference made to other cases in the 'Wien. Woch.,' Nos. 63 and 64. In the 'Gazette Méd. de Paris,' 1854, p. 361, Desjardin relates a case of lymphorrhœa in a woman, where the vesicles resembled sago grains, and were situated on the

The most remarkable case of tubular dilatation of the larger lymphatic vessels on record is certainly the one related and illustrated by Breschet in his work on the lymphatic system. The patient, a young man, had been under the care of Amussat for lymphatic œdema of both lower extremities, and died somewhat suddenly. On post-mortem examination it was found that the thoracic duct was dilated sufficiently to admit the nozzle of a pair of kitchen bellows, while the lymphatic vessels in the groins were so enormously distended as to closely resemble hernial tumours, for which, indeed, they had been mistaken during life. The similarity of this case to one of cirsoid aneurism is obvious.

It is not, however, alone the integumental lymphatics which are subject to these varices and other dilatations, but the mesenteric lymphatic vessels and lacteals generally are not unfrequently affected, and their rupture will give rise to a lymphorrhœa which may escape by the urinary passages, causing chyluria, or along the intestinal tract causing an appearance of fatty or milky stools, or it may escape into the peritoneal cavity, when the symptoms will probably be those of a painless ascites.

Lymphangioma.—Another important class of lymphangiectasis approximate the cavernous angiomata by containing large cysts in their interior. These constitute a group by themselves called lymphangiectodes, or lymphangioma. Occasionally they are associated with much hypertrophy, forming monstrous giant growths, when the term elephantiasic teleangectodes has been applied.*

Lymphangiectodes is considered by some authors as invariably congenital in all its forms; thus, *e. g.* Kaposi says, "This form of hypertrophy is always congenital, occurs in acephalous and other monsters, and involves frequently the whole body, or, in viable individuals, is confined to a few

inner side of the thigh; and in the 'Mém. de la Société de Chirurg. de Paris,' Tome iii, p. 139, Demarquay contributes a case of dilatation of the lymphatic *réseau* with abundant lymphorrhagia, and mentions the interesting circumstance that pressure *below* the fistula did not stop the flow of lymph.

* I shall have more to say of these giant growths in the next chapter, when dealing with the subject of elephantiasis, and shall again refer to them in the Appendix.

localities, or to one region of the body. It remains, during later life, of the size and condition it was at birth, or it develops, in after life, to a monstrous deformity."* Against this view of the necessary congenital character of every form of lymphangioma we might oppose many observations, but perhaps it will serve to quote a case fully related by Dr. Tilbury Fox at the Pathological Society, where the disease was entirely developed after birth. The case was that of a young man, æt. 21, who was born in the Mauritius of English parents. When six years old he came to England. At two years of age a lymphatic eruption for the first time appeared. This was confined to the back of the left leg and the perineal region. It showed itself as little pus-points, warty-looking prominences, which gradually enlarged and became aggregated till they formed areas four inches square and half an inch high. When these warts were closely examined they were seen each to contain a little vesicle, which, when pricked, exuded a little clear, watery, albuminous fluid, containing a few lymph-corpuscles, but no blood elements. The glands were not at all affected, and the limb was but slightly hypertrophied. "All the parts of the skin were found increased, viz. the epidermis, the rete considerably, with great over-growth of the interpapillary parts forming the warty element and the fibrous connective tissue. The interesting points found were that the veins were very greatly increased in number, and formed networks in all directions, but they were always distinctly tubular-walled; and secondly, that the lymphatics were immensely dilated, and the reticular juice tracts greatly increased and very prominent. The lymphatics appeared as distinct hyaline tubes, varicose or dilated in cavities of all shapes, and also in slits and gaps in the tissues, but lined throughout with delicate endothelium. These lymphatic tubes were dilated in the enlarged papillæ into great cysts, which contained lymph-corpuscles, and which represented the vesicles seen on the surface imbedded in the papillæ."

Dr. Gjorgjewié also gives a full and interesting history of

* Hebra and Kaposi on 'Skin Diseases.' Translated for the New Sydenham Society. 1874. Vol. iii, p. 159.

a lymphatic cavernous tumour which developed on the inner side of the left thigh, and which did not begin to make its appearance until the patient was ten years old. It was mistaken at first by Billroth, who saw the case, for a cold abscess, and opened accordingly; the consequence was the establishment of a considerable lymphorrhœa, which resisted all treatment, and led at last to the entire tumour, which was perfectly isolated and solitary, being successfully extirpated.*

The larger cystic dilatations of the lymphatics—and, according to Quincke, they are sometimes as large as apples—as a rule are found on the tongue, lips, or neck, constituting the affections styled macroglossia, macrochilia, and cystic hydroma of the neck respectively. These diseases have only been observed in infants, and are probably invariably congenital in origin; the parts so affected attain an unwieldy size, and constitute a repulsive deformity. Gjorgjewié records typical instances of these forms of lymphangiectodes, and also a case of the same disease affecting the whole of the right side of the thorax in a child two months old.† In

* L. c., p. 646.

† Referring to the pathology of lymphangiectasis and lymphangioma, Busey writes as follows:

"The cavernous dilatation is but an exaggeration of the cystoid form, but may find its origin in an expansion of lymph-capillaries; in either case the size of the caverns depends upon the coalescence of smaller cysts or expanded capillaries, through atrophy of the intervening septa. The superficial ampullæ and small cysts found in the parenchyma of the diseased part are, I think, formed in congenital cases in like manner, and are usually the dilatation of the lymph-canaliculi of Recklinghausen, assuming the cystoid form when situated in the parenchyma, and the ampullar when bulging from the surface. The cavernous tumour may result from the continuous coalescence of caverns and cysts by continual atrophy of intervening walls, and the entire parenchyma of a part may be transformed into a cavernous trabecular tissue by extension of the lymph stasis, involving the entire system of lymph-canaliculi. When the accumulation is confined, or extends to the canaliculi of the integument, gradual thickening of the epidermis takes place in consequence of the continuous pressure and constant oscillation of the accumulated fluid, eventuating in the formation of vesicles projecting from the surface. The lymph-canalicular system is without valves, and free intercommunication is procured through the (protoplasmic) processes (of the branched cells of Klein). Ectasia might thus ensue either from stasis resulting from occlusion of neighbouring trunks, or from impermeable glands, or from the constant oscillation of the fluid due to the congenital defect, or absence of valves in the

macrochilia the lip, if it is the upper one, overhangs the lower to a considerable extent; it forms a painless tumour, but may ulcerate; to the touch it feels doughy or slightly elastic. In macroglossia the tongue lolls out of the mouth and seriously interferes with respiration and deglutition. Excision of the tumour in both forms of the disease is the proper plan to adopt, and is as a rule successful.

Microscopical examination of these tumours demonstrates their close relationship to the cystic angiomata. There is a fibrous skeleton forming large loculi, in which lymph cells, the characteristic endothelium of lymph vessels, and some vascular elements, are found.

These forms of lymphangioma are somewhat rare, and it is therefore, perhaps, desirable to quote a case in illustration. I select the following from Busey's work on 'Congenital Occlusion and Dilatation of the Lymph Channels,' in which he has, with admirable industry, collected almost every recorded case of the kind.

G. S—, æt. 7 months, suffered from congenital macroglossia, which about every four weeks was attacked with some inflammation, attended with difficult deglutition, dyspnœa, and considerable enlargement of the neighbouring lymphatic glands. The volume of the tongue was increased after each attack, finally attaining the size of an ordinary apple; felt very tense to the touch; was dark red; its surface was covered with a thick white coating. The strongly-developed papillæ gave to the surface a thickly villous, furry appearance.

The protruding portion was amputated, and on examination its parenchyma was found to have degenerated into a cavernous meshwork, whose trabeculæ were partly formed of white, firm, connective-tissue cords, partly by muscle bundles. The fluid within the meshes of the cavernous tissue coagulated into very white coagula, which looked like fibrin coagula, and consisted of lymph-corpuscles.*

The following is a case of macrochilia copied from the same work.

C. R—, æt. 15, was born with a thick upper lip. He often suffered with swelling of the glands of the neck during childhood, without suppuration ever taking place, and several times the upper lip had been inflamed and much swollen,

capillaries. Weber says the cystoid dilatations have been observed in the thoracic duct, and Lebert refers to ampullar dilatations of trunkal vessels. The ampullar or vesicular dilatations may find their cause in ectasia of the terminal ends of the central lymph-capillary of the papillæ of the skin."—Busey on 'Congenital Occlusion and Dilatation of Lymph Channels,' p. 93.

* Busey, p. 108.

which had subsided, leaving only an increased enlargement of the lip. At the time of the observation (1859) the boy appeared well nourished; the upper lip protruded beyond the lower, and was far beyond its normal size. The buccal mucous membrane turned outwards, was corroded, bled easily; colour dark red, The tumour felt tensely elastic, not fluctuating, was not painful, and could not be diminished by pressure.

The excised portion collapsed very much, and showed to the naked eye a distinct cavernous trabecular structure, and a lymphoid serous fluid could be pressed from the deeper caverns, while coagula were found in the smaller caverns. The trabeculæ were formed in part of connective tissue only, in part also by fibres of the orbicularis oris; the largest cavities were of the size of small peas; the smallest microscopic.*

I am not able to find any recorded case of uncomplicated cystic hydroma of the neck, but *àpropos* of this affection Busey observes that "Billroth, Lücke, Koester, and others have classed the congenital cystic hydroma of the neck among the cavernous lymphangiomata. They consist (Weichselbaum) of a connective-tissue trabeculæ, within whose branched and intercommunicating caverns a serous fluid is contained. This form of congenital cavernous formation occurs most frequently among females, has been usually observed in immature children, and generally complicated with other malformations. The tumour always (Steinwirker) has its principal seat at the lower portion of the occiput and the upper part of the neck, is spheroidal, with a smooth surface, and divided in the median line of the body by a furrow into two symmetrical halves. They are usually composed of two symmetrical cysts, divided into smaller compartments. The cysts are lined with characteristic lymphatic endothelium and contain serum. Koester has proved the direct transition of the cysts into ampullary canals and spaces, and recognised the connection of the latter with the sinuses of lymph-glands."†

There can indeed be no doubt that all these forms of cystic dilatation, with or without cellular hypertrophy, are essentially dependent on lymphatic enlargement and free intercommunication; the hypertrophy naturally resulting from the increased abundance of lymph in the interstices of the tissues. The dilatation may be formed, as Virchow

* Busey, l. c., p. 108. † Busey, l. c., p. 137.

maintains, by cystic enlargement of the lymph spaces, or as O. Weber asserts, by dilatations of the commencing lymphatic vessels, but their lymphatic nature cannot be disputed.

Lymphangiomata have been divided by Wagner into three classes, the simple, the cavernous, and the cystoid.

1. *Simple lymphangiomata,* characterised by dilatation of already existing lymph-paths with hyperplasia. These are congenital forms, and comprise macroglossia and macrochilia.

2. *Cavernous lymphangiomata,* possessing a macroscopic fibrous network forming trabeculæ, which freely intercommunicate and contain lymph elements. These constitute tumours which form on the chest, and in the supra-clavicular and supra-spinous regions. They are not usually congenital.*

3. *Cystoid lymphangiomata,* formed by convolutions and cystic dilatation of lymphatic vessels, finally constituting a single cyst. To these belong the cystic hydromata met with in the neck of newborn children.† So far as I am capable of forming an opinion on the subject, this seems to be an excellent classification, and may be said to settle the dispute as to the necessarily congenital character of all cases of lymphangiectodes.‡

Cystic lymphatic tumours are not so frequently the seat of

* Sometimes, however, they appear to be congenital. Such was a case related by Dr. Reichel, of Breslau, of a male child, aged one year five months, with congenital lymphatic scrotal growths which reached to the symphysis pubes. Post-mortem examination showed it to be lymphatic, with much skin hypertrophy and large cysts, with fibrous network. The disease was styled lymphangioma cavernosum cysticum.

† See 'Centralblatt f. d. Med. Wissench.,' 1877, p. 517. Carr Jackson showed a case at the Pathological Society of lymphangioma in a young man of seventeen. The tumour (called fibro-areolar) occupied the inner side of the thigh, and discharged large quantities of lymph. It entirely developed after puberty. Good drawings are given of the case. See 'Path. Trans.,' 1866, p. 287.

‡ There is some doubt, however, as to the invariably congenital character of macroglossia; thus, *e. g.* Dr. Carl Arnstein relates a case, which he calls lymphadenoma cavernosum, in a girl of twelve, whose tongue was not prolapsed till she was two years old. The prolapsed portion was cut off, and the wound healed by first intention. The portion removed showed immense dilatation of the lymphatics, with lymphoid cell proliferation. *Vide* Virchow's 'Archiv,' vol. liv, 1872, p. 319.

lymphorrhœa as are the other and more common forms of lymphangiectasis, but if rupture does occur the outflow is the same. The quantity is indeed very variable in lymphorrhœa, it not only differs in different cases, but in the same case at different times. A periodicity in the flow has even been observed, increasing during digestion, decreasing during fasting, and so on. In some cases the escape is trifling, not amounting to more than an ounce in the twenty-four hours, in others it is excessive, reaching as much as five or even ten pounds during the day. It need scarcely be said that the constitutional effects will be directly proportionate to the quantity lost.

The fluid of lymphorrhœa has often been collected and analysed; and it is interesting to note that the quantity of fibrin, and therefore the power of spontaneously coagulating, varies widely in different cases, *e.g.* Quincke quotes two analyses, one by Fitzer, and the other by Desjardin, which show this clearly. They are as follows:

	Fitzer's case.		Desjardin's case.
Water . . .	93·68	...	93·99
Albumen . .	4·73	...	4·275
Fibrin . . .	—	...	0·56
Fat . . .	0·29	...	0·382
Salts . . .	0·95	...	1·3
Extractive . .	0·83	...	—
Ashes . . .	—	...	0·73*

Before leaving the subject of lymphorrhagia I wish to refer briefly to the probably lymphatic origin of certain cases of hydrocele, hydrocephalus, pleurisy, and peritoneal dropsy. In a word, I am of opinion that these so-called dropsies are not unfrequently cases of lymphorrhœa. It is well known that the serous sacs of the body, besides being prone to acute inflammatory disease, are subject to certain forms of (so-called) dropsy. A chronic hydrocephalus manifests itself in the arachnoid cavity of a child, or a latent

* L. c., p. 536. See, for other analyses, 'Memoirs on Lymphorrhagia,' *passim*. They do not in any essential particular differ from the above. In Fitzer's case there appears to have been no fibrin, and therefore no spontaneous coagulation. The history of the case, however, clearly proves it to have been one of lymphorrhœa.

pleurisy mysteriously collects, or the tunica vaginalis becomes painlessly distended with hydrocele fluid. How has this happened? Is it not at least probable that in each a lymphorrhagia has taken place? A little hypersecretion, or a little obstruction in the lymphatics at some distance from the serous sac, would alike explain the back flow of lymph through the open stomata of the vessels into the closed bag so near at hand.

I have on two occasions observed hydrocele fluid undergo spontaneous coagulation on removal, and as in both instances the fluid was perfectly clear and apparently free from blood, it is difficult to resist the conclusion that it was true lymph. My own conclusions, drawn from a good deal of experimental observation, are to the effect that hydrocele fluid is of at least three kinds, dropsical serum, inflammatory exudation, and true lymph, the result of lymphorrhagia. Sometimes the fluid drawn from the tunica vaginalis is clear, at others cloudy, sometimes milky, at others variously coloured, yellow, or brown, or green.* Sometimes it contains fibrin and coagulates spontaneously, at others it contains fibrinogen, but no fibrino-plastic substance, and therefore requires the addition of some true serum before it will coagulate.† Now, although it is open to question whether the fluid which does not coagulate spontaneously is of lymphatic origin, the same doubt does not seem admissible when without precedent inflammation or present admixture of blood it does coagulate on removal; and even in the former, which undeniably is the more numerous class of cases, there does not appear to be any difficulty in regarding them as cases of lymphorrhagia, since we have seen that when the flux takes place from external lymphatic vessels spontaneous coagulation is not always to be observed. By parity of reasoning we may argue the

* Velpeau, in his 'Leçons Orales,' says, "La matière contenue dans l'hydrocèle est le plus ordinairement de la serosité pure; quelquefois elle est lactescente. Dans certains cas, elle est d'un vert clair ou très foncé." Vol. i, p. 244.

† I am indebted to my friend Mr. Brooke, at present Resident Physicians' Assistant at the Manchester Infirmary, for making several analyses of hydrocele fluid for me. After all, the origin of the fluid is scarcely to be determined by its coagulability, since this property is only perfectly acquired by the lymph after traversing the glands.

occasional lymphorrhagic origin of certain cases of hydrocephalus, pleurisy,* and peritoneal accumulations, and this perhaps helps to explain the excellent results occasionally obtained by tapping and pressure, at least, in some cases of hydrocele, hydrocephalus, and pleurisy.†

From what has gone before it will be seen that dilatations of the lymphatics are very variously located, but the most frequent situations in which we meet with lymphangiectasis in the superficial lymphatics are the inner part of the thighs, the scrotum, the penis, and the lateral surfaces of the abdomen; while the congenital cystic forms appear in the tongue, the upper lip, and the neck.

Little can be said about the *etiology* of the disease; like cases of elephantiasis and other forms of lymphatic œdema, the dilatations are most frequently met with in warm, moist climates, but in cases occurring sporadically among us there does not appear to be any special factor, unless it be the possession of a lymphatic diathesis, and in some cases a precedent lymphangitis. Where there has been inflammation of the tubes the phenomenon is easy to understand, there is a block, stasis of lymph, backward pressure, and ultimately dilatation under pressure, but the chain of events does not often hang together so easily as this. We meet with every gradation, between the most extreme instances of cystic dilatation, tubular lymphangiectasis, with large and numerous ampullæ, and slight reticular ectasis, which has arisen from a passing attack of angeioleucitis, but it is only in the latter, as a rule, that we can make out the cause. The circumstance that the congenital lymphangiectodes are generally associated with some marked arrest of development, suggests the idea that the cystic dilatations may be due to a similar cause eventuating in a want of specialisation in the lymphatic system of certain parts.

As to *diagnosis*, no difficulty or doubt can exist when

* Gegenbaur states that the pleural and peritoneal cavities are the homologues of the large lacunar lymphatic spaces of Pisces, &c., and are mere differentiations of the general cœlom. This certainly must render them prone to hypersecretion of lymph. Gegenbaur's 'Comp. Anatomy,' translated by J. J. Bell, p. 598.

† I hope to develop this argument at greater length on another occasion, but at present shall content myself with this brief statement of the case.

lymphorrhœa is present, but prior to the escape of lymph the diagnosis must often be doubtful; and of course when the disease is internal, situated, *e.g.* on the intestinal or urinary tract, it is impossible even to guess at the state of things until rupture gives rise to chyluria or fatty stools, as the case may be. Even when the mischief is superficially situated errors are common; dilated inguinal lymphatics have been mistaken for hernia; the disease in the neck and thigh has been diagnosed as abscess; and the congenital forms have been looked upon as strumous enlargements or the result of glossitis. In these cases, the diagnosis is only satisfactorily cleared up by the escape of lymph, or examination of the extirpated structure, and therefore I do not think it necessary to dwell upon it.

Treatment.—The treatment will vary somewhat according to the character of the case. M. Peyromaure Dépord, in an excellent thesis on lymphatic fistulæ,* deals with this question very practically. He divides them into three classes:

1. *Traumatic fistulæ.*—These, he says, are always benign, and are successfully treated by incisions into the cellular tissue round the wound or ulcer, so as to cut off the fistulous tract from the general lymph current. This plan may be combined with the application of iodine or nitrate of silver to the wound itself.

2. *Lymphorrhœa the result of ruptured varices.*—These cases he considers often require change of air and scene; locally he advises caustic applications and methodical bandaging.

3. *Lymphatic fistulæ* following an attack of lymphangitis, accompanied with a rapidly growing tumour. Dépord speaks of this class as a very serious one, and advises extirpation of the tumours. I am inclined to think he refers to cases in either syphilitic or strumous subjects, where there is much tendency to adenopathy, and where the swollen glands often suppurate in a very troublesome way.†

* 'Étude sur les Fistules lymphatiques,' Thèse de Paris, 1871.

† From the description of Dépord the admixture of syphilis appears to be a really grave matter, and this is corroborated by a somewhat similar case to those which he records, related by Sir John Fayrer in his 'Clinical and Pathological Observations in India,' p. 400.

I think the whole treatment may be briefly summarised thus:—Traumatic lymphatic fistulæ are to be treated with pressure, and if necessary, complete division of the feeding vessels; in a word, deal with them after the manner of varicose veins. Idiopathic dilatations are less manageable; if there be any special diathesis, such as syphilis, it must be combated, but beyond this our reliance must be upon careful bandaging. Sinuses may be slit up, and glands excised, but our chief hope is in pressure. Congenital cystic dilatations, such as macroglossia and macrochilia, can only be efficiently encountered by complete removal of the affected parts.

CHAPTER III.

LYMPHATIC ŒDEMA.

SYNONYMS — VARIETIES — SYMPTOMS — ETIOLOGY AND GEOGRAPHICAL DISTRIBUTION — DIAGNOSIS — PROGNOSIS — TREATMENT — HISTORY OF CASES.

Under this head I propose describing those cases of dilatation of the lymphatic vessels which give rise to œdema, of a singularly solid and persistent character, and shall also speak of the hypertrophies of lymphatic origin. This disease, in different degrees of intensity, is variously spoken of as elephantiasis Arabum, boucnemia or bucnemia tropica, spargosis, scleriasis, solid œdema, and glandular disease of Barbadoes;* among many differences of detail the one important factor, that of obstruction giving rise to dilatation, and the two together causing œdema, is always present. This, therefore, may be regarded as the one essential feature, and the disease may be conveniently considered under the title of lymphatic œdema.

It is true that lymphatic œdema is only a symptom expressive of more than one pathological condition, but it is so disproportionately conspicuous and important, that it fixes attention and demands separate study as a fact in itself; therefore, although lymphangitis, which is a common cause of this form of œdema, is separately considered in Chapter IV, it will be convenient to take lymphatic œdema as a substantive disease in itself.

It is too much the custom to regard all cases of œdema, not directly traceable to heart or kidney mischief, as due to

* Besides these appellations, it is described under the title of "andrum" by Campfer, of "hernia" by Prosper Alpinus, and of "sarcocele" by Larrey. The latter term, or more definitely, Egyptian sarcocele, is only used when the scrotum is the part chiefly affected, and is now generally termed "lymph scrotum."

venous obstruction, while, as a matter of fact, local œdemas are far more commonly the result of lymphatic affections than of thrombosis in the veins. It is indeed doubtful whether venous obstruction alone is competent to cause œdema under the usual conditions met with, for as we see in extreme instances of varicose veins, where there is necessarily much venous and capillary stress and stasis, the deep veins are equal to the task of relieving the tissues and preventing œdema, just as the superficial veins are when the deep ones are obstructed. It is true that in some cases of lymphatic œdema the subcutaneous veins have been found dilated, but this cannot be regarded as even contributory to the œdema in any marked degree, since it may exist alone without any swelling of the limb, whereas œdema is a constant symptom where dilatation of the lymphatic *réseau* exists.

A lymphatic origin may be conceded to all cases of œdema where there is no manifest pressure upon, or interference with the return of blood through, the principal vein of a limb (of course excepting cases of visceral origin), and where the œdema is persistent. This persistency, which is so marked and constant a symptom, and which marks it off from simple venous œdema, is readily understood when we consider the different physiological and histological characters of the lymphatics and the veins. The venous blood, propelled by the great cardiac muscle, and aided in its rapid movement by the muscular coats of the arteries, and the action of the surrounding muscles generally, shoots along the veins much as the arrowy Rhone pursues its course; the lymph, on the contrary, with few and feeble forces to aid its circulation, flows as languidly along its proper vessels as the waters in the Dutch dykes, and although experiments are still wanting to demonstrate the exact rate at which it moves, we may be sure that it is so slow that with the added obstacle of the glands through which it has to pass it must every now and then almost come naturally to a standstill. In the superficial vessels the only forces at work are the muscular coats of the larger trunks, and the nutritive changes which go on in the interstices of the tissues, and which osmotically causing a

current into the vessels, must tend to move the lymph onward by reason of the arrangement of the valves. In the deeper vessels the contraction of surrounding muscles, assisted in the chest by the respiratory movements, will act as additional agents.

Yet, in spite of their greater strength, and the swifter motion of the contained blood, we know that the veins do, very often, dilate and become varicose, especially in those situations where gravitation tells most upon them, and where they are least supported by muscles, as in the superficial veins of the legs; it should then be no matter for surprise to find that the lymphatics, in these and other regions, with their thin delicate walls and sluggish circulation, should yield to pressure and become dilated and varicose. This is precisely what happens in lymphatic œdema, though the extent of the dilatation differs widely in different cases. These physiological considerations not only explain the tendency which the lymphatic system has to become varicose, but also the reason of the persistent nature of the resultant œdema; for it is easy to understand how difficult it must be, by pressure or position, to cause a circulation, already sluggish, to become active when the freely anastomosing and short channels of the lymphatics have become dilated to ten or eleven times their normal size, and when much of the fluid lies not only in these varicose vessels, but loosely in the interstices of the cellular tissue.*

Pathology.—Directly or indirectly, lymphatic œdema may always be traced to obstruction; the obstruction may be of inflammatory origin or not, and may be situated in different parts of the system, but it invariably exists, and must be regarded as the true pathological parent of the disease. Just as we must look for the cause of the rising of the Nile far away from the flooded fields of the Delta to the highlands of Nubia, so, in these cases of lymphatic œdema, the obstruction is often to be found remote from the sodden saturated

* The degree of dilatation, as already stated, varies extremely; at times the vessels are but slightly enlarged, at others the superficial lymphatics of the skin may equal in size the thoracic duct. *Vide* 'Bichat. Dernier cours d'Anatomie Pathol.,' p. 299.

tissues in the thoracic duct, or even beyond in the venous system itself. The disease may, indeed, be considered as due to obstruction in four different situations—the venous orifices of the heart, the thoracic duct, the lymphatic trunks, and the lymphatic capillaries.

1. Obstruction at the cardiac orifices of either the superior or inferior vena cava would tend to cause lymphatic as well as venous œdema, since such stenosis would necessarily interfere with the circulation through the thoracic duct by backward pressure. O. Weber has drawn attention to this lesion as an occasional cause of the affection we are considering, in an article "On Lymphangiectasy" in Pitha and Billroth's 'System of Surgery;'* and although such cases must be very rare, the instances to which I refer at the foot of this page are sufficient to prove their occasional occurrence.†

* 'Handbuch der Allgemeinen und Speciellen Chirurgie,' Pitha und Billroth, Zweiter Band, Zweite Abtheilung, Erste Lieferung, p. 63.

† V. Petters ('Lymphangiectasis; Prager Vierteljahrressch.,' Bd. iv, 1861) relates a case in which stenosis of both venous cardiac orifices in a woman of 43 was followed by general and excessive dropsy of a mixed character, *i. e.* partly elephantiasic, partly ordinary dropsy. The case was also complicated with great dilatation (die Weite einer Gansfeder) of the thoracic duct, and considerable dilatation of the lymphatics in the right groin. As a further illustration of this class, *i. e.* of primary obstruction in the venous system, may perhaps be adduced a case, quoted by Professor Curnow in his 'Gulstonian Lectures,' observed by Virchow "in a new-born calf, where, in consequence of thrombosis of the external jugular vein, the mouth of the thoracic duct was occluded, and nearly all the internal organs were dilated to the utmost by varicose lymph-vessels filled with a slightly sanguinolent fluid. The interstices were covered everywhere with broad, bead-like canals, arranged so closely together that the intervening tissue could be scarcely recognised." I think the following case, which I quote from Quincke, may also be classed with this division:—"Rokitansky has described a typical case—a woman, aged 62—with subcutaneous œdema, and very considerable milky effusion into the sacs of both pleuræ and of the peritoneum, with dilatation and hypertrophy of the heart, thickening and shortening of the mitral valve, thickening of the pyloric half of the coats of the stomach and the intestinal villi turgid with a whitish fluid. The subpleural lymphatics of the lungs were distended; the lacteals and the thoracic duct in the following condition:—'They were for the most part, from the intestines to the nearest range of glands, mostly nodularly dilated and stuffed full of a whitish, soapy, unctuous mass, which broke down uniformly in water, to which it communicated a slight opalescent cloudiness. This mass consisted of an agglomeration of fatty granules, crystals of margarine, oil globules, and a few cells, some of which contained nuclei of a considerable size.

Obstruction of the thoracic duct.—Complete obstruction of the thoracic duct will tend to death by anæmia, unless the thorough establishment of a collateral circulation still permits the passage of all the chyle into the venous system; yet this event is often postponed for a considerable time, and varying degrees of occlusion have been revealed *post mortem*, which, during life, gave rise to no lethal symptoms. In most instances these obstructions will give rise to stasis and lymphatic œdema. Some authors have even gone so far as to affirm the frequent occurrence of obstruction and obliteration of the thoracic duct. Thus, Bell observes, "The thoracic duct itself is often obliterated; the main duct is obstructed by tumours of the absorbent glands, or diseases of its valves;" and he adds that in consequence of this obstruction "the adjoining lymphatics dilate, so as to represent the proper thoracic duct."*

The very remarkable case which I have already quoted, as observed by Amussat and related by Breschet, of a youth who had suffered from lymphatic œdema, the result of enormous dilatation of the thoracic duct and other lymphatic channels, was also of this character, for doubtless, in this case, there was obstruction higher up, accounting for the dilatation.† The same authority states that in some cases of aneurism of the aorta the thoracic duct has been found obliterated by pressure.‡

In isolated spots, particularly at the varicose nodosities, the mass was more of a yellowish colour, and adhered to the walls of the vessels. At these parts the vessel was covered with a network, and was here and there quite occluded. The meshes of this network contained agglomeration of fatty granules. The glands were not much enlarged, and were here and there speckled with white.' The receptaculum chyli and vessels entering it were dilated, their coats thickened; the former was lined with a greyish-red reticulated stratum, from which a nodular excrescence here and there protruded, or a filamentous bridge extended. The thoracic duct was occluded by a similar soapy material, partly filled with indurated material, and quite blocked up."—"Diseases of the Lymphatics," by Quincke, in Ziemssen's 'Cyclop. of Pract. Med.,' vol. vi, p. 530, Eng. trans.

* J. Bell's 'Surgery,' 1826, vol. iv, p. 284.

† 'Le Système Lymphatique.' Par G. Breschet. Paris, 1836. P. 260.

‡ Loc. cit., p. 265. Andral, out of 600 post-mortem examinations, found the thoracic duct inflamed three times, and states that such inflammation tends to obliterate the duct. 'Archives Gén. de Médicine,' t. vi, p. 504.

Sir Astley Cooper has recorded three instances of obstruction of the thoracic duct, in all of which life was prolonged for a considerable period of time owing to the chyle finding other channels; in other words, because the collateral circulation was equal to the emergency. The obstruction was caused in each instance by tumours pressing upon the duct; scrofulous glands formed the mass in two instances, in the third the growth was cancerous. Doubtless in all the prolongation of life was due to the gradual obliteration giving time for the establishment of a collateral circulation. When the occlusion is sudden then death, as a rule, seems to follow quickly from rupture of the duct. Thus, Sir Astley Cooper, in the same communication, describes three cases, and alludes to others, where he tied the thoracic duct in dogs, close to its opening into the jugular vein; in every instance death ensued within a few days, and in each case the receptaculum chyli was found ruptured.*

It is probable that many cases of smooth symmetrical lymphatic œdema of the lower extremities owe their origin to a narrowing of the thoracic duct.† Of such a nature I believe a case to have been which was under my care in the Manchester Infirmary in 1878. It was that of an old woman with symmetrical lymphatic œdema of both lower extremities, associated with much debility and a leucocythemic condition

* From the experiments of Lassaigne and Flandrin, however, before referred to, ligature of the thoracic duct in dogs and horses does not seem to prove invariably fatal. Cooper's article is printed in 'Medical Records and Researches,' selected from the Papers of a Private Association.' 1798. P. 86.

† Speaking of occlusion and narrowing of the thoracic duct, Quincke observes, "Narrowing and occlusion of the ductus thoracicus, like dilatation, often give rise to no symptoms whatever during life, especially in those cases of slow occurrence in which, as already narrated, both lymph and chyle readily find collateral routes. In other cases the results of the lymphatic congestion comes to light even during life, especially within the area of the lacteals. Ascitic fluid, often to an enormous amount, is effused, and, in spite of efficient removal by paracentesis, it is rapidly renewed. The fluid drawn off is sometimes clear like lymph (Petters), at others turbid from suspended fatty molecules (Oppolzer), or milky (Morton, Marshall, Hughes). Both appetite and nutrition were defective as the result of the obstructed absorption; the urine was scanty, partly from the same reason, partly from the presence of the ascites. In one case related by Rokitansky, not only the peritoneal, but also the pleural cavities were filled with chylous effusion."—Quincke, loc. cit., p. 531.

of blood. The patient, unfortunately, left the hospital and died about three weeks afterwards without a post-mortem examination having been obtained, so that the diagnosis wants verification. There had been no lymphangitis at any time in her case, but the œdema was preceded by the development of large glands in the right groin, which passed back as if involving the lumbar glands, together with the evolution of the general symptoms of lymphadenosis. The inference seems fair that the large glands pressed upon either thoracic duct or receptaculum chyli, and so obstructed the flow of lymph as to lead to general capillary stasis and consequent œdema. It is difficult, on any other hypothesis, to account for the symmetrical character of the œdema, since the left groin was entirely free from glandular hypertrophy. Rokitansky records his personal observation of a case of complete obliteration of the thoracic duct, though he omits to say whether it was associated with œdema. "We have observed," he says, "the thoracic duct in a phthisical patient, who was worn to a mere skeleton, present an obliteration of this nature, and a conversion into a solid cord."*

3. *Obstruction in the lymphatic trunks of the limb affected.*—Occasionally œdema is caused by pressure from without upon the main trunks without any inflammation of the trunks themselves. Such a case as this I saw once with Mr. Whitehead in a woman who had her left mamma removed for scirrhus cancer. Subsequent to the excision of the breast the axillary glands on the opposite side became infiltrated and hypertrophied, and this was followed by persistent solid œdema of the arm, the cancerous glands clearly pressing upon, and occluding the lymphatic trunks.† More frequently, however, the obstruction results from inflammation, which is one of the commonest of all causes of lymphatic œdema. It is usual after every considerable attack of lymphangitis to find the affected vessels converted into hard, knotty cords, visible to the eye in the early stages of the

* Rokitansky, vol. iv, p. 384. 'Patholog. Anatomy,' translated for the Sydenham Society. Asallini records a similar case, 'Essai sur les vaisseaux lymphatiques. Turin, 1787. "J'ai vu des conduits thoraciques obstrués et remplis d'une substance terreuse ou osseuse."

† I relate this case more fully at p. 53.

affection if the lymphatics be superficial, and readily felt with the finger at a later period; the natural consequence of this condition is œdema, an œdema which may subside as the lymph finds fresh channels or retunnels out the old ones, or may, according as there is a more general invasion of the tubes, be of a truly persistent character.

4. *Inflammation either of the lymphatic capillaries, or of the cellular tissue outside the capillaries in the first instance, but rapidly passing to these vessels.*—One or other of these conditions, and it is often impossible to isolate them, is an even more common cause of lymphatic œdema than the last we have considered. Such cases may chiefly excite attention to the disease in the cellular tissue, as, *e. g.* in the indurated condition, not uncommonly met with, in the cellular tissue of new-born children. Alard was, I think, the first to draw attention to the essential identity of this affection with lymphangitis.* The symptoms, as he points out, consist in a great thickening of the cellular tissue, probably of the limbs, but it may be of the cheeks or abdomen. The disease is often ushered in with pyrexia, and erysipelatous attacks are common and frequently recurrent. The affected parts become much enlarged and very hard and brawny; if incisions are made a gelatinous fluid exudes, the glands are commonly, but not invariably, enlarged, the lymphatics are always dilated, and the changes are limited to the skin and subcutaneous tissue. The affinity, indeed the identity, of this disease with the one under consideration is obvious. Whether the affection commences, then, in the cellular tissue and spread thence to the lymphatics, or actually begin in the lymphatic *réseau* itself, the consequences are very much the same. There is dermitis, lymphangitis, obstruction, and œdema. The inflammation spreading, of course the obstruction and consequent œdema spread too, and thus great tracts of skin, even the covering of entire limbs, may be affected. Hypertrophy of skin and cellular tissue naturally accompany this hyperæmia of the dermic structures, and hence we have in these cases of lymphangitis of the capillaries, obstruction of lymphatics, followed by dilatation of

* Alard, 'De l'inflammation des vaisseaux absorbans.' Paris, 1828.

vessels leading to œdema, with hypertrophy of skin and cellular tissue. In a word, we have all the elements of true elephantiasis Arabum, the resemblance to the skin of the pachyderm being especially close in those cases where the cuticular hypertrophy is very great and irregularly (nodularly) disposed.

It should here be observed that the enormous hypertrophy which so frequently accompanies lymphatic œdema is not necessarily of inflammatory origin. As Kaposi says, "A very chronic persistent œdema may produce increase of the connective tissue and induration."*

The hypertrophy may, and doubtless does, result from the mere passive outflow of lymph; in fact, as the same author states, the hypertrophy results from the presence of the lymph exuded under pressure, a lymph rich in cells, which, together with those of the connective tissue, rapidly increase and multiply. Nevertheless, inflammatory action of apparently an erysipelatous nature does, as a rule, precede the ordinary forms of elephantiasis, the pyrexia disappears, but the dense œdema, so hard and dense as to resemble sclerema, remains. The increase of tissue is mainly confined to the connective tissue, often only involving the cutis to a slight extent. The infiltration proceeds until it is impossible to pinch up the skin into a fold; plicæ form during the progress of the disease in the lines of the normal furrows, until the thickened part overhangs like a bolster. "Sometimes an ulcer is present, varying in size from a sixpence to the palm of the hand, and possessing the characters usually met with in ulcers of the leg, shallow solutions of continuity possessing sharply defined, hard edges, and secreting an offensive, sanious fluid. These ulcers arise not unfrequently from local injuries, or *they are, in certain cases, even the precursors and causes of the elephantiasis.*†

I wish to draw particular attention to the words which I

* Hebra and Kaposi on "Skin Diseases." Translated for the New Sydenham Society, 1874. Vol. iii, p. 143. See also Appendix for further remarks upon this subject.

† Kaposi, loc. cit., vol. iii, p. 138. He also states that he has twice seen cases of lupus pass into elephantiasis. This is interesting, since lupus is an affection, to some extent, of the lymphatics of the skin.

have italicised, as one of the cases shortly to be recorded affords a clear illustration of such an origin.

Two forms of lymphatic œdema are commonly recognised—the tuberculated and the smooth, which are said to differ from one another in several particulars. The *tubercular* variety is said to be asymmetrical as a rule, and generally limited to a limb, or portion of a limb; it is commonly preceded by some slight injury, and clearly ushered in by attacks of lymphangitis, which may or may not affect the most superficial of the lymphatic vessels of the skin, but always invades the deeper layers of the lymphatic network. These recurrent attacks of lymphangitis lead to hypertrophy of cuticle and true skin, which often assume a thoroughly pachydermatous character. The *smooth* variety, on the other hand, is looked upon as more distinctly of constitutional origin; it is generally symmetrical, and there is no special cuticular hypertrophy. This division is adopted by Mr. Jonathan Hutchinson in a very interesting clinical lecture published in the 'Lancet' for August 26th, 1876, on solid œdema; but although it is undoubtedly true that both forms occur, I am not sure that they should be considered as distinct. Of course if there be central mechanical obstruction, say of the thoracic duct, the resultant œdema will be symmetrical, occupying both lower extremities, and as there is not necessarily any preceding or accompanying lymphangitis there will probably be no skin hypertrophy; while, on the other hand, if the œdema be clearly of local origin, arising say from a skin wound, it will necessarily be asymmetrical and there will probably be marked hypertrophy of cutis and cuticle, but the two forms merge so completely into each other that I cannot consider them as essentially distinct. To differ from Mr. Hutchinson in a matter of surgical judgment is always hazardous, but I think the division unnecessary for the following reasons. The smooth form is not always symmetrical, the tubercular not always asymmetrical, in both we occasionally meet with chyluria, attacks of diffuse inflammation are apt to occur in both, so that after a time an œdema which has been smooth, may become associated with a nodulated epiderm; and lastly,

because the tubercular form may pass into the smooth variety under the influence of pressure, as happened in the case under Mr. Lund's care shortly to be mentioned.

I shall reserve the description of the microscopical characters of the affected tissues till I come to speak of this case, but the larger naked-eye pathological features of the disease may be here enumerated. They consist, in well-marked cases, of the following changes :—1. Hypertrophy of epiderm. 2. Hypertrophy of the cutis. 3. Hypertrophy of cellular tissue. 4. The presence of a quantity of gelatinous fluid in the interstices of the cellular tissue and in the dilated lymph channels. 5. Great dilatation of the vessels of the lymphatic network, the tubes being frequently as large as a crow's quill, freely anastomosing, and presenting numerous diverticula and pouches. 6. Occasionally, dilatation of the superficial veins.* It is noteworthy that even in extreme cases of lymphatic dilatation the glands are often found not perceptibly affected, though they may be both enlarged and tender to the touch.† Beneath the fascia, as a rule, everything is normal; occasionally the muscles are somewhat pale

* *Vide* 'De Elephantiasis Arabum,' by Carolus Nahke, Prague, 1839, and Southam's case, 'Med.-Chir. Reports,' 1870. Kaposi gives the following description of the appearances of an elephantine limb :—"On cutting into a limb affected with elephantiasis, the whole of the subcutaneous tissue appears as an almost uniformly yellowish-white, glistening, fibrous, fatty (lardaceous) mass, of dry consistence; or here and there swollen up and trembling like jelly. When pressure is used, or even spontaneously, a considerable quantity of a clear, yellowish-white lymph escapes, which coagulates on exposure to the air." He also states, though this is certainly not correct in all cases, that the muscles undergo fatty degeneration, that the intermuscular septa much increase in size, and that the bones are thickened, presenting stalactitic outgrowths, and are often carious and necrosed in parts. "The structures," he adds, "are pushed asunder by the growth of connective tissue, so that the hair follicles and fat cells are often separated; hence it comes that we have no fat in one part and little else than fat in another. This it was which led Henle, Linz, and Rayer to look upon the disease as a fatty hypertrophy, whereas, in reality, there is an atrophy of fat cells. The lymphatics and the lymph spaces are enormously dilated, and the veins are numerous and of large calibre."—Hebra and Kaposi on 'Skin Diseases.' Translated for the New Sydenham Society. 1874. Vol. iii, p. 140, &c.

† *Vide* C. J. Hille. Thèse de Paris. 'Diss. rarioris morbi elephantiasi partialis similis historiam sistens.' Lip., 1828. He relates an interesting case of elephantiasis originating in erysipelas, attacking the left leg, and accompanied by glandular enlargement in the axilla, on the scalp, and in the forearm.

and atrophied, but this is by no means always the case, and when met with may probably be attributed to want of exercise and to the continuous pressure exercised by the encircling and swollen tissues.

Etiology and geographical distribution.—Lymphatic œdema in its more typical form is most common in hot, moist climates; thus it is, and has long been known to be, endemic in Barbadoes, in certain parts of India, Egypt, Cochin China, Asiatic Turkey, South America, and Japan. It is, however, frequently seen in temperate climates, and in some parts of Spain it is as truly endemic, according to Alard, as in any tropical country. "It appears to be proved," says this same authority, "that the most general causes of this malady are—first, the sudden impression of cold upon a body previously overheated; second, the access of the cold night air through open windows; and third, the abrupt change from heat to cold," which is a roundabout way of saying sudden chills are the most general cause.*

In this country nothing but the most general causes can be assigned, it is certainly not hereditary, and beyond being, perhaps, most common in individuals of a lymphatic habit, it cannot be said to be associated with any special diathesis. It has been observed in company with syphilis by Hutchinson,† and with carcinoma in two cases by myself; and it is probable that there may have been in each instance a true causal connection, the syphilis and the carcinoma mechanically obstructing the lymph paths by infiltrating and blocking the intercalated glands, but in the great majority of cases neither syphilis nor cancer exists, and therefore they can only act as very occasional and exceptional causes. In many, probably in most, instances the disease commences in an injury, and therefore the resultant lymphangitis may be looked on as altogether the most common cause of the disease. It has been observed in the young, the middle aged, and the old of both sexes, but it is commonest in the male sex and in early adult life.‡

I do not think that more can safely be said about its

* Alard, loc. cit., p. 366.

† See Hutchinson on "Solid Œdema," 'Lancet,' ii, 1876, p. 281.

‡ Tilbury Fox says the proportion of males attacked is 75 to 25 per cent. of

etiology as it crops up sporadically amongst us, but in tropical countries there is a totally different cause assigned (which may eventually prove to be correct), in the presence of a minute parasitic nematode. It may be affirmed with absolute confidence that this cause is not operative in cases met with in England; certainly in the cases shortly to be related no such parasite existed, but this does not militate against the truth of its parasitic origin in those districts where the disease is endemic.

The parasite in question, called the *Filaria sanguinis hominis*, has not been met with in every case of elephantiasis in hot countries, but it has been found sufficiently often to justify the opinion, according to its discoverers, that the two stand to one another in the relation of cause and effect.* Filariæ have been twice found in a lymphatic abscess of the arm, in the blood of a patient suffering from nævoid elephantiasis, in a hydrocele of the spermatic cord, and in very many cases of chyluria, a disease which we know to be closely associated with elephantiasis.

The discovery of these parasites in the human body was made independently by two observers, viz. by Wücherer in Bahia in 1866, and by Dr. T. R. Lewis in India in 1870. The *Filaria sanguinis hominis* is an exceedingly minute nematode worm, averaging $\frac{1}{3000}$th of an inch in diameter, or about the size of a red blood-corpuscle, and therefore may very easily escape detection unless looked for with great care and good glasses. When present they may exist in immense numbers. Dr. Magalliaes, of Rio, has discovered fine microscopic nematode worms, which are supposed to stand in genetic relation with filariæ, in the drinking waters of that district, whence he infers that the ova are introduced into the human system by the stomach. It is stated that after leaving the human system they select the mosquito as their intermediate host where they grow to maturity. This adult

females. He also says it is commonest between 25 and 50.—Tilbury Fox on 'Skin Diseases,' 3rd edition, p. 361.

* For an account of the literature on this subject see an interesting paper by Sir John Fayrer in the 'Med. Times and Gazette' for February 8th, 1879; and also Lewis on "The Nematoid Hæmatozoa of Man," in the 'Quarterly Journal of Microscopical Science' for April, 1879.

form is called the *Filaria Bancroftii*. The cycle of changes, or alternation of generations, then, through which the creature passes, is as follows:—*Ovum* in water, *Filaria sanguinis* in man, growing up to *Filaria Bancroftii* in mosquito, whence ova are again deposited in the water.*

Diagnosis.—The diagnosis of lymphatic œdema will rarely be difficult, if due attention be paid to the peculiar hardness and persistent nature of the swelling. The symptoms will of course somewhat differ in those cases where the œdema is the offspring of lymphangitis from those where central obstruction is the main cause. In the former the symptoms will be more acute, originating probably in a blow or slight abrasion; the first thing noticed by the patient is a puffiness of the skin, it may be of the foot, leg, thigh, scrotum, abdomen, arm, shoulder, sometimes, but not uniformly, accompanied with the red lines of inflamed lymphatics. The swelling, which pits on pressure, is often, indeed generally, associated with severe pain, of an ephemeral but recurrent character. Attacks of erythema, or what is regarded as erysipelas, often intervene, which on subsidence leave the

* Since the above was written Dr. Lewis has published a small illustrated book on this subject, entitled 'The Microscopic Organisms found in the Blood of Man and Animals, and their relations to Disease' (Calcutta, 1879), which is reviewed by Dr. Bastian in 'Nature' for May 15th, 1879.

I have not seen the book, but from the review it appears that Dr. Lewis throws the greatest doubt upon the genetic relationship between the adult and larval forms; and, indeed, is inclined to think that the adult form of this helminth (*Filaria sanguinis hominis*) has not yet been discovered. He also seems to prove, according to his reviewer, that Manson's observations as to the mosquito serving for intermediary host are incorrect. Some passages which Dr. Bastian quotes really tend to make one question the grave pathological significance of the filaria when present in the human blood; thus it appears that nematoid helminths are common in the blood of some Indian birds, *e.g.*, Dr. Lewis says, "I have examined a considerable number of the ordinary Indian crow, and have found that the blood of nearly half of those which have come under my notice have contained embryo hæmatozoa of this character. Sometimes they are in such numbers as to make it a matter of surprise how it is possible that any animal can survive with so many thousands of such active organisms distributed throughout every tissue of its body. *The birds did not appear to be affected in the slightest degree by their presence.* In rats, too, he finds that the blood of 29 per cent. contains innumerable organisms, probably "bacilli," "*without any special symptoms being manifested.*" The italics are mine.

affected part ever more and more hypertrophied. At the first onset, and during each recurrence of active symptoms, the patient is subject to rigors, attacks of vomiting, and intense thirst. This last symptom generally precedes an exacerbation of the disease by an interval of some days, and infallibly points to a fresh outbreak of activity. So much fluid is drunk whilst the thirst lasts, that copious sweats always succeed the seizure. By-and-bye these acute symptoms pass away, leaving the affected part larger and harder, but not otherwise interfering with the health of the patient, who probably, after carrying the cumbersome disease about for years, succumbs to some other malady.

Those cases of lymphatic œdema, on the other hand, which depend upon the occlusion of the thoracic duct, or other main trunks, differ from the above in the more insidious onset and evolution of the malady, and in the frequent absence of those attacks of erysipelatous dermitis which are so characteristic of the first class. When fully developed, however, the condition of the part is much the same in both, with the exception that the elephantiasic character of skin is, as a rule, much more marked in the case of inflammatory origin. Lymphatic œdema may be mistaken for venous œdema, for mere hypertrophy of skin, as in certain cases of scleroderma, or for increase in the development of subcutaneous fat. From the first it is to be distinguished by the much firmer, more brawny nature of the enlargement, by its greater persistency, by the absence of phlebitis, and, as a rule, by the implication of the skin itself. From scleroderma the diagnosis is not always to be readily made. As a rule, there is absolutely no œdema, however, or pitting in cases of scleroderma, and then a differential diagnosis may be established, but in other cases it is probable that scleroderma commences in a true lymphangitis of the more superficial tubes, followed quickly by effusion and organisation of lymph. When this is the case, the two diseases must be regarded as essentially the same.*

From those somewhat rare cases of localised overgrowth of

* This is the view taken by Rasmussen, who has written a monograph on the subject.—'Edinburgh Medical Journal,' 1867.

the subcutaneous fat, &c., of a limb, the same means will generally serve to settle the question. It must be confessed, however, that cases do occur where the hypertrophy of a part is much more largely due to such increase in fat and cellular tissue than to mere œdema, although œdema does exist; such cases should unquestionably be ranked as true specimens of lymphatic œdema, where the associated lymphangitis of the deeper tubes has induced this hypertrophic growth of connective tissue and perhaps of fat, just as lymphangitis in the more superficial tubes is so prone to lead to dermic and epidermic growth.

Lymphatic œdema is occasionally, though very rarely, associated with such deep discoloration of the skin as to constitute veritable instances of Addison's disease; this does not complicate the diagnosis, but taken in connection with the fact, that bronzing of the skin has been met with in cases where the supra-renal capsules have not been affected, it is very interesting, and to some extent suggestive of a further function of the lymphatic system. The instances in which this complication has been noted, have generally been cases where the lymphatic glands were largely implicated in the general disease.*

Prognosis.—Little need be said *re* this head. The disease is not in itself fatal to life, or is only fatal in rare cases by intercurrent erysipelas. If it is associated with profuse lymphorrhagia, or if the pressure producing the œdema lies upon main trunks, it will tend to death by anæmia, but as a rule it is very chronic. Tilbury Fox, quoting Waring, says that in 218 cases it lasted between twenty-six and fifty-five years.† A cure may be regarded as probable in cases not very far advanced, and when the disease is due to a specific taint; even in very advanced and old standing cases, a cure is sometimes effected after months of treatment.

* M. Féréol, of the Hospital St. Louis, relates such a case in the 'Gaz. des Hôpitaux' for 1867, p. 512. He does not state the condition of the solar plexus. Dr. J. M. Rossbach, of Wurzburg ('Virchow's Archiv.,' August 1st, 1870), relates a case of scleroderma associated with Addison's disease, and Dr. Hilton Fagge details a case in the 'Pathol. Trans.' for 1869 of scleroderma, or morphœa, as he terms it, of a somewhat similar nature.

† Tilbury Fox, 'Skin Diseases,' 3rd edit., p. 362.

Treatment.—Since Carnochan, of New York, advocated and practised ligature of the main artery of a limb affected with elephantiasis, this mode has been frequently repeated and often vaunted as curative of the disease.

Dr. George Fischer, of Hanover, has collected twenty-one cases of elephantiasis so treated, and in 'Virchow's Archiv.,' for 1869 (vol. 46, p. 328), gives a detailed account of their history. Erichsen in his last edition quotes these cases, and in a brief summary states that nine out of the twenty-one were cured by the operation.

Buchanan explains the *modus operandi* of the ligature thus :—"Tying the main artery does not reduce the size of a normal leg, but it does that of an elephantiasic one, because the organs of absorption act differently upon normal and abnormal tissues. The activity of absorption as a rule is in inverse proportion to that of circulation. When the force of circulation is weakened, the process of absorption is unusually energetic. This applies particularly to non-malignant deposits, and absorption being once started will often go on of itself. Thus, when a blister starts the absorption of an old effusion, that absorption will sometimes continue unaided; and this is why, in elephantiasis after the operation, collateral circulation being soon established absorption of the morbid material goes on." I can corroborate the truth of a portion of this statement, that referring to the continued progress of absorption of a part when once set going, from what I have noticed in the treatment of nævi. It is not unusual in these cases to find that when the growth begins to diminish in consequence of the use of injections, the disappearance continues without any further interference. Carnochan, of New York, who, as I have stated, was the first to suggest treating elephantiasis by ligature of the main vessel of the limb, and who was the first to test the value of the advice by putting it in practice, seems to have based his arguments on different grounds from Buchanan, and to have regarded the disease as especially affecting the blood-vessels and tissues supplied by the blood-vessels. His first case of ligature of the femoral artery for elephantiasis Arabum proved successful, and he has since repeated it with

equally good results. In 1867 he tied both carotids in a case of elephantiasis Græcorum (of which he gives drawings both before and after the operation), with very marked benefit.

A careful examination of the cases collected by Fischer, compels us to admit that the operation has certainly cured several cases which proved irresponsive to other methods of treatment; further, that the cure in these instances must be directly attributed to the deligation of the vessel, and not to position or continuous pressure by bandages, &c., as in more than one instance these methods had been perseveringly tried before recourse was had to the ligature. Vanzetti, *e. g.* in the 'Gazette des Hôpitaux' for 1867, relates the case of a girl, aged twenty-one, whom he cured of elephantiasis of the right leg after pressure with bandages had proved ineffectual, by digital compression of the femoral artery, employed on four separate occasions, the first three times the compression being continued for twelve hours consecutively, on the last occasion for two hours. The limb speedily began to diminish in size, and seeing her three years afterwards he found that the cure had become and continued complete. This plan of compression must be considered preferable to ligaturing the artery, since an operation is avoided, and no possible harm is done, even if no good is effected.

And yet it must be admitted that it is difficult to understand these successes, when we consider the true nature of the disease. How can ligature of the femoral artery favorably affect elephantiasis of the leg, a disease confined to the lymphatic system, the skin, and cellular tissue? The blood supply is, for a time, diminished, but the disease is independent of the blood supply, and very soon, moreover, the new channels which collateral circulation develops, will positively increase the quantity of blood sent through these very affected parts. Buchanan says that the short time which elapses before collateral circulation is fully established serves to start absorption, and then it goes on of itself, but it is really difficult to believe that this is a sufficient explanation; and Sir John Fayrer, who has tied the femoral artery for elephantiasis three times, altogether disbelieves in its value. He urges the unphysiological

nature of the operation, and attributes all the good, which he believes to be temporary, to rest in bed and the bandaging which the limb undergoes.*

Here I must leave this question with the observation that while it is difficult to understand why the operation should succeed, it is even more difficult to doubt that it occasionally does succeed.

Inunction and bandaging constitute an important part of the treatment of elephantiasis. This mode of treatment has been in vogue from the remote past. The Arabian Rhazes recommends bandages and unguents to the affected limb, and very many cases are recorded where benefit and even a cure have thereby been effected; and Francis Adams, the learned translator of 'Paulus Ægineta,' in his commentary upon the chapter treating of elephantiasis, gives a most interesting sketch of the various methods of treatment in use among the ancients, from which it will be seen that friction with unguents formed an essential part of the treatment of both the elephantiasis Græcorum and Arabum.† It seems unnecessary then to give instances of benefit derived from this plan, and it will be better to describe the mode of application. The limb should be bandaged—Martin's elastic bandages answer the purpose perfectly well—from the toes upwards, and the limb should be elevated. Night and morning the bandage should be removed and friction with the hand employed. A drachm of Unguentum Hydrargyri should be placed upon the palm and well rubbed into the parts affected, the hand moving only in one and that an upward direction. This should be continued until some tenderness of the gums is noticed, when the ointment should be omitted, and friction with an oiled hand substituted. Iodide of potassium should be administered in doses varying from gr. ij to gr. v three times a day; and in those cases where a syphilitic taint is present, this treatment will probably prove successful. Fayrer, for instance, relates an instructive case of a Hindoo, aged 22, who

* 'Clinical and Pathological Observations in India.' By Sir John Fayrer. 1873. P. 396.

† 'Paulus Ægineta.' Translated by Francis Adams. Sydenham Society. Vol. ii.

suffered from elephantiasis of the right leg and foot, sequential to an attack of syphilis a year before. The hypertrophic leg was much and deeply ulcerated. On Jan. 23rd, 1867, the measurements were, instep 18½ inches, above ankle 14¼ inches, below knee 11 inches. On April 29th, 1869, or more than two years later, all which time he had passed in hospital, the measurements were, at instep 8¼ inches, above ankle 7⅜ inches, below the knee 10 inches. The treatment consisted in systematic bandaging of limb day and night, in rubbing in Unguentum Plumbi Iodidi, in occasional blistering, and in the administration of iodide of potassium, and cod liver oil. In February, 1868, great improvement had taken place, but he was (unintentionally and unnecessarily) salivated by the inunction of Unguentum Hydrargyri Biniodidi. Though the leg further and sensibly diminished, it left him very weak for a long time. The Unguentum Plumbi Iodidi was, after recovery from the salivation, again resorted to, and continued up to the time he left hospital, when the swelling had almost completely disappeared and the skin become soft and pliant.

With the exception of producing salivation, I think the treatment in this case may be taken as a model of the method we should pursue in general cases of elephantiasis. It will probably be wise in some cases either to add small doses of mercuric chloride to the medicine, or to rub in some Unguentum Hydrargyri; this, however, should not be carried far enough to produce salivation. In cases which resist this plan of treatment, I should be inclined to try digital compression of the femoral artery.*

* The pressure should be continued for a long time before we can hope for a permanent cure. Thus Dr. Gelasco, of Guipuscoa, relates a case in 'Anfiteatro Anatomico Español' of Feb. 28, 1873, where a complete cure was effected by bandaging the limb for a whole year. Besides iodide of potassium and mercury, iodine appears to exercise a real influence over the disease at times. Thus, "at a meeting of the Academy of Medicine in Madrid on Dec. 12, 1872 ('El Siglo Medico,' March 9), Dr. Olavide presented two patients, the subjects of elephantiasis Arabum, whom he had treated by tincture of iodine, used both internally and externally. The first patient was a man whose parents had been similarly affected. When he came under Dr. Olavide's care, the circumference of his leg was seventy centimètres; when he was presented to the Society it was scarcely

When elephantiasis affects the scrotum, the disease is very successfully dealt with by operation, the whole of the diseased structures being dissected away, and the penis disentombed from the hypertrophied tissues. When affecting the face or trunk, where pressure can only be imperfectly applied, we must (unless we follow Carnochan's example and tie the carotid) trust mainly to internal remedies. Should it prove that in certain districts the disease is of parasitic origin, the treatment would rationally be directed to the selection of some remedy which would act as a parasiticide.

In conclusion it may be stated, that the success attending the treatment of lymphatic œdema must always largely depend upon the cause in each particular case; as a rule, it may be affirmed that those cases dependent upon deep-seated or central obstruction, such as stenosis of the caval orifices, or obstruction of the thoracic duct, are not amenable to any treatment, and will receive benefit from none: they are essentially and of necessity incurable. Those cases, on the other hand, which owe their origin to inflammatory action, be it in the cellular tissue of a part, or in the primary lymphatic vessels, will probably be cured by suitable means—pressure, for example, will almost surely prove of benefit, and we may, perhaps, understand how ligature of the femoral artery sometimes proves curative if the disease has originated in a dermitis which the operation may favorably affect.*

fifteen. The treatment consisted in the external application of tincture of iodine by means of compresses, and the internal administration of the same remedy, commencing with doses of six drops, and gradually increasing the quantity till it reached a drachm. In a fortnight after commencing this treatment the circumference of the leg had diminished by one half" ('London Med. Record,' May 14, 1873). The second case was equally successful.

* I do not think, however, that pressure will effect much when the disease is far advanced. Pressure alone will rarely cure a varicose condition in the veins, which are more easily and thoroughly compressed than the lymphatics, and which have stronger walls. If the use of the elastic stocking is given up the veins immediately once more bulge out and yield; so, likewise, we probably do not often succeed in curing cases of dilated or varicose lymphatics by pressure, although it is a proper remedial measure to employ. If the dilatation prove to be clearly limited to a single lymphatic channel, it will be a proper and a prudent plan to treat it as a varicose vein, and secure its obliteration by inserting pins underneath it at regular intervals, and thus compressing it by means of a silken ligature.

Summary.—Lymphatic œdema is a disease very commonly met with in many hot countries, but not unfrequently in temperate and even cold climates. Consisting essentially in obstruction at certain points, and in a dilated condition of the cutaneous and subcutaneous lymphatics at others, with resultant hyperplasia of epiderm and derm, it may present every degree of hypertrophy, from slight swelling to gigantic enlargement of a part. It may be either smooth or nodulated, the distinction between the two not being a valid or important one, as it only depends upon a greater hypertrophy of epidermic cells in the one case than in the other, and both conditions may be present in the same individual and even in the same limb.

There is evidence which tends to show that, in certain districts, notably in the West Indies, in India, and Cochin China, the disease is of parasitic origin—the parasite being a minute nematode worm, the *Filaria sanguinis hominis*, which finds its way into the system by the channel of drinking water.

In Europe there is no evidence that such a cause exists, and there is distinct proof that cases occur in which no parasites are present. Such cases generally occur in patients of the lymphatic habit, in whom the disease has generally commenced as a chronic lymphangitis, with obstruction to the circulation of the lymph as a result. The disease is most common in youth and early adult life, more common in men than women, but is not confined to any age or either sex. It is not hereditary or contagious. It is rarely in itself a fatal malady, patients generally living for many years; it may kill, however, by exhaustion, from discharge of pus, or pus and lymph, or by intercurrent attacks of erysipelas, or by anæmia. The treatment mainly consists in applying pressure, and friction. Iodide of potassium, mercury, and iodine, have all proved of service; and although not supported by ratiocination ligature of the main artery of the affected part has been so frequently followed by success that we must accept the operation as a genuine remedy in some cases.*

* Hebra subdues local inflammatory action with local and general antiphlo-

I shall now proceed to mention some typical cases of lymphatic œdema, which illustrate the various ways in which the disease originates in obstruction of main trunks, and obstruction resulting from lymphangitis, either of the larger lymphatic vessels, or commencing in the lymphatic capillaries. Of cases caused by venous stenosis, before referred to, as insisted on by O. Weber, I have neither seen, nor have I been able to meet with, the record of such cases beyond those mentioned in the footnote on page 34.

Cases, too, of œdema dependent on obstruction or dilatation of the thoracic duct I shall not dwell upon; I have briefly referred to the most interesting and best authenticated of them in the previous chapter. During life it would be impossible to diagnose these cases confidently, if of an unmixed character, and when, on the other hand, the obstruction of the thoracic duct is only part of a general condition, the state of things will be tolerably clearly evidenced by these epiphenomena. I will at once then proceed to give in detail a few cases which depend upon the more frequent causes of lymphatic œdema.

I adduce the following in illustration of a lymphatic œdema resulting from external pressure on the main lymph trunks.

Case 1.—Mrs. M—, æt. 50, a widow, of the lymphatic temperament, had her left breast removed for cancer by Mr. Whitehead in May, 1870. She made a good recovery, but three months later noticed a swelling in the right axilla. The tumour proved to be a mass of enlarged axillary glands. This was followed by an enlargement of the arm of the same side, extending from the fingers as high as the axilla. The integuments were exceedingly brawny and firm, though they pitted on continued pressure. There was considerable pain. The limb continued to increase, in spite of pressure and punctures. Some clear fluid escaped from the punctures, but in no great quantity, and the flow soon ceased. The patient died about twelve months after the limb first began to swell, and, on examination, it was found that the limb was the seat of very considerable hypertrophy of skin and cellular tissue, and that there was no pressure whatever upon the axillary veins, or upon the venous system in any part. The axillary glands were converted into a dense conglomerate mass of scirrhus, through which it was perfectly clear no

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gistics, then removes the crusts with warm water and oil, afterwards rubbing in some strong mercurial ointment. He keeps the affected limb raised, and, when the patient can bear it, applies tight and methodical bandaging.

lymph could flow, and hence the explanation of the œdema being due to passive obstruction of these large vessels was tolerably easy and sure.

The next case, translated from Alard's work, is taken as an extreme type of lymphatic œdema (elephantiasis Arabum) resulting from a lymphangitis in the upper extremity.

Case 2.*—An Italian nun, who had been subject to a tubercular eruption on her neck and chest from infancy, was attacked when fourteen years old by a general outbreak of the eruption, accompanied with smart pyrexia. The symptoms passed away, but recurred to some degree at every menstrual period. At seventeen years of age the right arm became affected; the eruption was accompanied with swelling and very acute pain. The acute symptoms subsided, but the swelling, which reached from the metacarpus to the middle of the humerus, persisted, and in the course of the next seven years attained, by steady and gradual enlargement, such enormous proportions that she could not stir without some one carrying her arm. Despite the enormous size and weight of the limb the muscles continued free and unaffected, so that she could do needlework with the affected hand when the limb was supported. The colour and sensibility of the part were unaffected. Exacerbations occurred every two or three months, when the pains became excessive, the limb grew hot and red, and exceedingly hard in parts. The attack generally passed off with violent diaphoresis, or by the escape of a serous fluid from some part of the limb, amounting at times to as much as forty pounds in a few days. The poor woman died at twenty-six years of age, probably in consequence of being bled, after suffering from the disease for at least ten years.

After death a great quantity of the same fluid which escaped during life flowed from the limb; the quantity altogether being estimated at eighty pounds. The arm, removed at the shoulder-joint, weighed one hundred and twenty pounds, which, together with the eighty pounds, would make the entire limb weigh two hundred pounds; more than double the rest of the body put together. It measured eight feet in circumference and three feet in diameter!† On examination it was found that the changes were strictly limited to the skin and cellular tissue, both of which were enormously hypertrophied. Neither the arteries nor veins nor capillaries were in the smallest degree affected. The glands were unnaturally large, and filled with wide spaces; but the most remarkable changes were presented by the lymphatics of the skin and cellular tissue. These vessels were so enlarged as to give a loose reticular look to the parts on section, as if composed of wide loculi, freely anastomosing, and filled with viscid fluid, which coagulated on its escape. These loculi proved indeed to be the immensely dilated lymphatic vessels, on the cutaneous surface of which numerous pouches existed, some of which had given way, and from which the fluid had escaped at different times during life.

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* This case I have abridged from Alard's work on the absorbents. The rest were either under my care or that of my colleagues.

† "Sa grandeur etait, pour la circumference de onze palmes et quatre doigts,

The following case of lymphatic œdema, of such a pronounced type as to have been constantly and correctly designated elephantiasis Arabum, was under the care of Mr. Lund in the Manchester Infirmary, and is illustrative of lymphatic œdema dependent upon lymphangitis of both lymphatic capillaries and large vessels. The notes of the case are in the main copied from the hospital register-paper kept by Mr. Lund's resident dresser, Mr. R. C. Birch.

Case 3.—M. H—, carter, of Todmorden, æt. 28, was admitted into the infirmary on January 6, 1879.

Previous history.—Up to date of present illness patient has always enjoyed good health. No hereditary taint of any kind. Has been a temperate man, and never had syphilis.

Rather more than a year ago his left knee began to swell, and became very painful. The swelling gradually descended to the foot. The enlargement did not steadily increase, but after remaining stationary for a week or two at a time, a fresh attack of pain would usher in renewed swelling. This mode of progression has continued up to the present time. The knee was certainly the first part to suffer, and the pain all along was much more pronounced there than elsewhere.

Present condition.—Patient is pale—markedly of the lymphatic habit—but well developed and cheerful. The left foot and leg for some distance above the knee are the seat of a more or less solid œdema, pitting on pressure, but not in all parts. The limb is very tender to the touch, lies on its outer side, and cannot be moved by the patient. The swelling of the foot and ankle is chiefly œdematous, but at the calf the integuments bulge abruptly backwards, overhanging the lower portion of the limb like a bolster; here the swelling is hard and brawny, and does not pit on pressure.

The integument over the calf is of a dark brown colour, and is plicated transversely. There are several sinuses about the knee-joint which discharge sero-pus, but dead bone cannot be detected. On the front of the knee there are several slightly elevated portions of skin, of a livid hue, with fluid beneath. From these bullæ there radiate elevated lines like covered canals. Circumference of knee twenty-one inches; circumference of calf twenty inches. The right leg is œdematous to a slight extent, but is not painful. Circumference of right calf sixteen inches. No tumour can be detected in the abdomen. Urine acid, 1015; lithates; no albumen.

January 20th.—An elastic bandage to be applied to the affected limb.

28th.—Bandage reapplied once every day. Free and fœtid discharge from the sinuses. The knee now measures eighteen inches in circumference and the calf seventeen inches and a half.

Nearly a month later—that is, February 20th—there is the following entry:—

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son diamètre etait de quatre palmes et un doigt . . . le palme de gênes contenait neuf pouces deux lignes, mesure de France."—Alard, op. cit., p. 193.

Pain very severe in the knee when the limb is dressed; suppuration still very free. The leg apparently partially dislocated outwards by its own weight.

February 24th.—Dead bone was to-day detected in the knee-joint, and the limb was amputated at the junction of the upper with the middle third.

March 6th.—Stump has not been painful since the operation; no rigors. Temperature has varied between normal and 103° F.

The right limb, meanwhile, was painlessly increasing in size, the enlargement beginning in the foot and spreading up to the abdomen; the lower part of the abdomen has also of late become the seat of a solid œdema.

No noteworthy change occurred after this up to the date of the man's death, a fortnight later, from exhaustion.

Prior to death various sections were made of the skin and subcutaneous tissue of the amputated limb, and after being stained, were examined with the microscope. The changes were clearly confined to the skin and subcutaneous tissues, and to the naked eye resembled somewhat closely a pure fatty hypertrophy. The microscope, however, revealed very plainly that the changes were essentially lymphatic. The lymphatic tubes were choked with cells, which were also accumulated in large numbers outside their walls and in the peri-vascular spaces. In some situations organisation of the exuded lymph had apparently progressed almost to fibrillation. There was also much real hypertrophy of cellular tissue, and to a slight extent of derm and epiderm.

A post-mortem examination was made by Dr. Simon, Acting Pathological Registrar to the hospital, but without leading to any very clear solution of the cause of the œdema of the right leg. The œdema of the left side was manifestly traceable to the lymphangitis; but this was not so clear on the right side; and my own view of the case during life was that the lymphangitis, commencing in the neighbourhood of the knee-joint, by extension of inflammation from that source, had spread up the lymphatic trunks as far as the thoracic duct, which it had partially occluded by inflammatory exudation, and hence, the œdema on the right side, and on the left *below* the knee (which was certainly the starting point of the lymphangitis), was directly due to obstruction at higher points of the lymphatic system. Dr. Simon was not able to confirm this diagnosis by his examination of the dead body; nor was he able to confute it, as, owing to the extremely soft condition of the thoracic duct, he was unable to trace it in its entirety from the receptaculum chyli to its termination. To some extent then the exact cause of the œdema on the right side must remain *sub judice*, though I confess that the above explanation seems to me to furnish the most natural solution to the difficulty. The left knee-joint was completely disorganised, the cartilage eroded and almost gone; the bones rough and the seat of caries necrotica; the crucial ligaments absorbed. Here was evidently the origin of the evil, and, as we see not unfrequently in cases terminating in speedy resolution, the joint affection was the starting-point of the lymphangitis; the lymphangitis led to the œdema. This much is clear, the rest must be left as open to doubt. This case I take to illustrate a twofold origin of lymphatic œdema; due on the left side to progressive lymphangitis, and on the right to central obstruction in the thoracic duct.

For the following case I am indebted to my friend Dr. Massiah, who had charge of the girl in the Cheadle Convalescent Hospital, where by his kindness I had an opportunity of seeing her :—

Case 4.—Frances P. D—, a farm servant, æt. 17 years, plethoric, has solid œdema of the right forearm, hand, and left leg; acne of face and neck, with thickened patches in the integuments of the forehead and cheeks resembling the œdema of the limbs, and feeling like spots of lupus.

The right forearm is more congested than the left, weaker, and generally thickened, exceeding in circumference that of the left by one and a quarter inch; the integument cannot be pinched up, and scarcely pits on firm pressure. In the postero-ulnar aspect of the middle third is a long depressed scar, almost exactly corresponding in position and extent with one on the opposite limb. The hand is spade-shaped, with plump, firm dorsum, and thickened, conical fingers. The arms are apparently unaffected, equalling each other in circumference and soft consistence. The leg is enlarged in its lower half only, measuring one inch more in circumference than the right; the congestion and firmness, though evident, are not so striking as in the upper extremity. There are no enlarged glands in the axilla or groin, and she denies any enlargement of the labia or thigh. There is no thickened vein in either limb.

History.—Both forearms have been scalded, but not the leg; the right six years ago, when she was eleven years old, and the left three years afterwards. The right was two years in healing, and has since the injury frequently been the seat of erythema and swelling, attended with pyrexia. During the last six months the attacks have been more severe and prolonged, and the thickening has become permanent. The front of the forearm and the dorsum of the hand were affected before the back. In the left limb two attacks occurred around the scar and one above the elbow on the inner aspect, leaving no evidence of their occurrence. The right forearm varies in size and colour, increasing after exposure to wind or cold, and becoming more turgid and hotter at night in bed. The attacks are more frequent in winter than in summer. Last summer, whilst haymaking, and soon after menstruation had begun, acne of the face appeared, and has continued since with occasional attacks of erythema. The leg suffered for the first time about ten days ago, when it was inflamed for a few days, the redness subsiding, the swelling remaining. The right leg is unaffected. The urine is non-albuminous, and the organs generally healthy. She has had no previous illness, and has become much stouter lately. Treatment by Pot. Iod., hot air baths, and elastic bandage has been ineffectual.

The history of this case is interesting. A girl, previously healthy, is scalded, and subsequently becomes subject to attacks of erythema followed by solid œdema; in other words, the scald initiates a superficial lymphangitis, which produces in turn a lymphatic œdema. Perhaps more often than not

erythema is of this nature; and certainly, as Dr. Grimshaw, of Dublin, has pointed out, this is the case with erythema nodosum.

For an account of Case 5 I am indebted to my friend Dr. Dreschfeld, who paid much attention to the poor man—it is in many respects a parallel case to the one quoted from Alard. The failure to find the right lymphatic duct is to be regretted, as it leaves the diagnosis somewhat doubtful, but I think we are justified in regarding this as a case in which that important vessel was obliterated.

Case 5.—Wm. S—, æt. 58, coach-painter, came first under my charge in September, 1874, when the following brief notes were taken:

Previous history.—Has always had good health, and only suffered from slight attacks of cough. Has been married twenty years, and has five children, all grown up and healthy. Has always been temperate; never had syphilis; never suffered from the effects of lead. Twelve months ago noticed swelling of face, and shortly after swelling of right arm; the swelling extended gradually from arm to hand, and increased in spite of treatment; has no pain in the affected parts.

Present condition.—Patient presents a most remarkable appearance: the whole of head and neck, the whole of the front of thorax, the upper part of back, and the whole of the upper extremity appear very much enlarged. The skin over face, neck, and thorax is reddened, while that of right arm has its normal colour. On pressure the skin of the whole of the head, neck, and thorax feels excessively firm, and does not pit on pressure. The same may be said of the skin covering the upper part of arm, whilst that of lower part of arm and the hand pit on pressure. In the right axilla are felt a number of hard tortuous cords. The lower limit of the thickened skin covering the thorax is formed by a line corresponding to the line of rib; the skin below is perfectly normal. Along the margin of the thickened and healthy skin on the thorax are seen a number of tortuous, dark red lines, which feel like small hard cords. The glands in both axillæ and in the neck cannot be felt; the inguinal glands are felt, but not enlarged. Examination of thoracic and abdominal organs reveals normal relations. Tongue clean; appetite good; bowels regular; urine normal. The sensibility of skin intact.

The case was looked upon as a combination of solid œdema and scleroderma. The skin of face, neck, and thorax resembled the skin seen in cases of scleroderma, while the right arm was in a state of hardened œdema. The presence of tortuous nodular cords at the periphery made it probable that the process commenced round small lymphatics.

The treatment adopted consisted in the administration of iodide of potassium and the application of vapour baths, and it was found that all the parts—the affected as well as the healthy ones—perspired freely. The patient, however, experienced no improvement.

In January, 1875, the patient ceased attending the out-patient room, but presented himself again in June of that year, when his condition was noted to be much worse. The skin over head, neck, and thorax was in the same state as before, the swelling of the right arm had increased, and now the left arm had also become very much swollen. The greater portion of the left upper extremity was in a state of solid œdema; the wrist and hand, however, were affected with ordinary œdema. The patient suffered from slight cough and great dyspnœa; his voice was also affected. Punctures of the different parts of skin made with a fine needle gave exit to a clear fluid, which on microscopic examination showed the presence of a sparing quantity of leucocytes and a few red blood-corpuscles. The dyspnœa becoming very distressing, the patient was admitted an in-patient to the Infirmary, under Dr. Morgan, in November, 1875. His condition, however, in no ways improved, symptoms of pneumonia of the right lung came on, and he died December 14th, 1875, chiefly from the inability to breathe, the skin round the neck forming a sort of tight cuirass.

The following is a brief summary of the post-mortem record:

Skin of head, neck, and chest, and also of arms, formed a solid casing of a quarter of an inch thickness. The subcutaneous tissue of an almost cartilaginous hardness.

No enlargement of any lymphatic glands.

A quantity of serum in both pleural cavities; lungs congested; the right lower lobe consolidated; bronchi dilated.

Pericardial sac contained some fluid; the heart covered by a fine network of lymphatics; heart flabby, otherwise normal; no valvular defects.

Liver normal; spleen enlarged and soft.

Kidneys smooth; capsule peels off easily. On section a number of small white patches of the size of pin-heads seen in the cortical part of kidney.

The thoracic duct was found pervious.

The right thoracic duct could not be discovered in the hypertrophied mass of cellular tissue. The lymphatics in neck, axilla, are diminished in size, and embedded in the hypertrophied tissue.

The head was not allowed to be examined.

The naked-eye examination was supplemented by a microscopic examination of the skin and kidneys. Portions of skin from neck and thorax showed the layer beneath the epithelium immensely thickened and converted into bands of fully formed fibrous tissue. The subcutaneous tissue showed the same fibroid change. Portions of skin taken from the arm showed a mass of small, round, and spindle cells, which surrounded the small veins and lymphatics in the lowest layer of the cutis, and in the subcutaneous tissue, causing almost total obliteration of the lumina of these vessels. The trabeculæ of fibrous tissue in this locality were found thickened, and the spaces formed by them filled with embryonic cells. In the lower strata of the subcutaneous tissue the fibrous tissue showed fewer changes, and the trabecular spaces were filled only with serum.

The kidney was healthy in its structure; the white spots consisted of an accumulation of leucocytes. These patches were situated in the intertubular spaces, and pushed the tubules aside, without, however, causing any other changes.

Sometimes lymphatic œdema is universal, when of course there is enlargement of the whole body, but this rare condition has been already referred to in the last chapter under the head of Macrosomia, and is again spoken of in the Appendix.

CHAPTER IV.

SIMPLE LYMPHANGITIS.

DIVISION INTO RETICULAR AND TUBULAR—SYMPTOMS—PATHOLOGY—VARIETIES—LEADING TO ARTHRITIS—CAUSED BY ARTHRITIS—DIAGNOSIS—PROGNOSIS—TREATMENT—SYNONYM: ANGEIOLEUCITIS.

I HEAD this chapter Simple Lymphangitis to distinguish this from the septic forms of inflammation of which I propose to treat in the chapter following. The symptoms and general features of simple lymphangitis are well known, for the affection is one frequently seen. The glands are generally implicated; but as adenitis also often exists as an independent disease, I shall defer the consideration of this complication until I come to speak of glandular affections.

Simple lymphangitis may be of idiopathic or traumatic origin, but the latter is more usual Almost any injury suffices in certain constitutions to start a lymphangitis; it may be a twist, sprain, scratch, or slight abrasion, or it may be sequential to the most extensive wounds and still retain its simple character. It generally commences at the site of injury, but occasionally a portion of sound skin intervenes.* The inflammation is sometimes pretty clearly confined to the lymphatic *réseau,* when it may be termed "reticular" (Curnow), at others it more especially affects the larger vessels; sometimes it considerably implicates the contiguous skin, giving rise to erythematous blushes, at other times the deeper vessels are involved, when the cellular tissue always suffers, and we have a cellulitis developed. As, however, the cases in which the skin and cellular tissue are implicated are generally associated

* Velpeau says lymphangitis arises in three ways:—1, by contiguity of tissue, *i. e.* the lymphatics become inflamed by being in contact with an inflamed part; 2, by obstruction of their contents; 3, by absorption.

Continued experience and observation prove the accuracy of the Master's words: the two first forms will arrange themselves under the head of simple; the third under that of septic lymphangitis.

with some septic infection, I shall deal with them in the next chapter, and confine myself here to reticular and tubular lymphangitis.*

Symptoms.—Reticular lymphangitis may attack any part of the superficial lymphatic *réseau*. From the tendency which lymphangitis has to affect the external rather than the internal parts of the vessels, there is, as a rule, a greater or less implication of the skin and the skin capillaries. Most people at some time or other have suffered from reticular lymphangitis—a prick from a needle, or knife point during an operation, an irritated "back friend," a trapped finger, will start the mischief, and in an hour or two the previously sound finger is fiery red, and throbbing painfully. The lymphatic capillaries are acutely inflamed, with capillary stasis and hyperæmia.† Ninety-nine times out of a hundred the mischief ends in a little suppuration, or in absorption; in the hundredth instance septic lymphangitis and constitutional troubles follow. I think the best treatment in these cases, and in the closely allied forms of paronychia, is to freely disinfect the sore place, if there is one; if this be done promptly, no ill effects need be anticipated, and there is no more searching and efficient agent at our command than bromine. I am in the habit of employing bromine, in a saturated solution, in all these cases, and though the application is very painful at the time, the pain soon subsides, and the result is very satisfactory. Water dressing, and, if necessary, a central incision may supplement the use of bromine. This is all the treatment required. Erythema is reticular lymphangitis with much capillary hyperæmia, and erythema nodosum is the same thing with some transient lymphatic œdema superadded.

Tubular lymphangitis.—When the main lymphatic vessels belonging to the superficial set are inflamed, wavy, or nearly straight, lines are to be seen leading from the points of injury

* Referring to reticular lymphangitis, Curnow says that "invasion of the trunks is by no means uniform."

† Exposure to the sun is a frequent cause of reticular lymphangitis. I have often seen this result happen when in a boating excursion men have rolled up their sleeves and left their bare arms exposed for some hours to the rays of a hot sun. The œdema accompanying the lymphangitis in such cases is, at times, considerable.

to the nearest gland, which is always tender and swollen. As a rule the lymphangitis terminates here; and Moore, in his article on Diseases of the Lymphatics, in Holmes's 'System of Surgery,' strongly insists on this being invariably the case, but it is now well known that in some instances the inflammation extends beyond this barrier, and may spread up to the next gland or chain of glands, and even at times beyond them. When tubular lymphangitis is superficial it is manifest to the eye, hence the aphorism, "angeioleucitis is seen, phlebitis is felt;" but angeioleucitis is not seen when the deep set of lymphatics is inflamed, though it may be felt quite as much as phlebitis, and therefore this saying is not worth much. Some degree of œdema, at times trifling, at others considerable, always accompanies tubular lymphangitis. The pain is generally very acute, both along the course of the vessels and in the affected glands. There is often, too, considerable pyrexia.

Certain changes take place in the lymph, in the vessels, and in the surrounding cellular tissue, which have been carefully studied by Nélaton, Tessier, and others. 1. The *lymph* coagulates, forming a somewhat pink-coloured thrombus, somewhat less firm than a venous thrombus. The thrombus adheres to the walls of the vessel, which it blocks, and often obliterates, thus leading to the establishment of a collateral circulation. Instead, however, of becoming organised, the clot may be reabsorbed, or, lastly, may soften and suppurate in the centre, though it is often still kept from the general lymphatic circulation by peripheral boundaries of lymph.* 2. The *vessels* themselves become dilated, partly from relaxation of their walls, and partly from the obstacle to the onward lymph current. They also become thickened, which thickening may proceed until the very opposite condition to that of relaxation is produced in the complete obliteration of the tube. At the same time the endothelium often disappears,

* Suppuration of the contained lymph is not a common occurrence; but I have met with instances, and Duply may be mentioned as recording a typical case, where a number of small abscesses formed in one of the lymphatic vessels of the forearm. In this case there was no external wound. *Vide* Ranking's 'Abst.,' 1867, Part 2, p. 262.

and the internal coat becomes opaque and uneven. 3. The *cellular tissue* outside is always affected, exudation takes place from the vessels, and hyperplasia of the connective tissue ensues: this leads first to the characteristic lymphatic œdema, and then goes on either to resolution, to a sclerosis of the connective tissue, or to suppuration.

The extra-vascular connective-tissue-changes sometimes constitute the chief peril in tubular lymphangitis. I will quote a case in point which I saw this winter with Mr. Frank Holmes. A delicate girl of 18 was seized one evening with pain and a feeling of stiffness about the throat. Each side of the neck became acutely sensitive, and a red line was noticed on each side passing along the anterior borders of the sterno-mastoid muscles. These lines became more and more painful, and by-and-bye hard and knotty. Cellulitis, which had all along accompanied the lymphangitis, now increased in severity, until the whole neck appeared as if set in a brawny œdematous collar. Severe constitutional symptoms manifested themselves, and dyspnœa became so urgent that it was with a view to performing tracheotomy that I was asked to see the case. Before, however, resorting to this measure, I freely incised the brawny tissues directly in the middle line, and passed a director deeply into the cellular tissue on either side. At the moment the tissues appeared sodden, but pus formed in a short time, and the discharge becoming free, the girl soon recovered.*

There is another danger besides cellulitis attendant and dependent on lymphangitis, and that is arthritis.

Professor Verneuil has drawn special attention to this complication, and I can support the accuracy of his testimony.† The disease "originating in the subcutaneous

* Mr. John Marshall, F.R.S., gives a good account of cases similar to the above in the 'Lancet' for Feb. 15, 1879. He calls the disease "subfascial suppuration in the neck," and recommends the same line of treatment as that resorted to in the case mentioned in the text.

† Verneuil's views appear in the 'Revue Mensuelle de Méd. et de Chir.,' Paris, 1878, ii, pp. 816—821, and in an English dress in the 'Lancet' for Jan. 4, 1879, under the head of "Hydrarthrosis and Arthritis of the Knee." Nicaise relates a curious case of lymphangitis with purpuric spots and consecutive arthritis and hygroma in the 'Rev. Mens. de Méd. et de Chir.,' 1878, ii, p. 822.

lymphatic *réseau*, and assuming the form of lymphangitis of the large vessels," spreads by contiguity of structure to the synovial membrane of the joints, which joint is generally the knee. Verneuil mentions five cases of the kind, four of which proved fatal. In one a small wound on the foot was the commencement of the mischief, then followed lymphangitis with abscess formation, or, as in one case, erysipelas ensued. The advent of arthritis was sudden and severe, the fluid being often purulent from the beginning—though this was not always the case. Verneuil advocates early incisions and urges the necessity of caution in treating lymphangitis near the knee. The following case, which was under my care, is of this description:

A boy, æt. 14, weak, thin, and delicate-looking, knocked his shin against a rail, and the next day was attacked with lymphangitis of the large vessels on front of the tibia. The red, knotted cords of the lymph vessels could be readily seen and traced to the knee. On the fourth day the boy had a severe rigor, and the same afternoon the knee-joint became swollen and acutely painful. He was admitted into the infirmary three days later under my care. Temperature 103° F.; pulse 120. Fretful look from pain and worry. He had not slept for some nights, and was very ill. The knee-joint was greatly swollen, and the inflamed lymphatics could still be distinguished leading from the original abrasion. I made an opening into the joint two inches in length, and evacuated twelve or thirteen ounces of healthy pus. I then hyperdistended the articulation with a No. 30 solution of carbolic acid, and had the limb placed upon a splint. A drain tube was inserted, and dressings of glycerine and carbolic acid employed. Suppuration continued in diminishing quantities for a fortnight, when it ceased. The temperature rapidly fell, as did the pulse, and the boy made a steady progress to complete recovery, with a movable knee-joint, and left the hospital a month after entering it as well as ever he was in his life.

In addition to the development of arthritis from lymphangitis, we must recognise the development of lymphangitis from preceding joint mischief; indeed, I am inclined to think this is the more common sequence of the two. The inflammation may very readily pass from the synovial sac along the open pathway of the contiguous lymphatic vessels, nor does it always remain confined to their channels, but may, and often does, traverse the lymphatic walls, and invade the surrounding web of areolar tissue, producing a true cellulitis. I have frequently seen this accident follow synovitis of the knee-joint, and am inclined to regard it as one of the most

pressing forms of danger in cases of suppurative inflammation of an articulation.*

We occasionally, but happily only rarely, witness instances of suppurative arthritis sequential to gonorrhœa ; and the most probable explanation of this accident is that it is due to direct conveyance of the pus, &c., from the urethral mucous surface along the lymphatic vessels, whence it travels towards some neighbouring joint. When lymphangitis does complicate cases of gonorrhœa the first invasion is more frequently not of this serious nature, but of the more simple variety ; the method of attack is, however, probably the same in both. In the same way I think we may explain, the joint affections in acute rheumatism, *i. e.*, by supposing that the *materies morbi* travels chiefly by the lymphatic vessels, hence the tendency to serous inflammation, the poison being poured from their open mouths into the different serous sacs of the body.

The important fact as to whether the arthritis prove suppurative or not in these cases seems to depend largely upon two causes, the nature of the initial lesion, and the habit of the patient. If the initial lesion itself suppurate, and the patient be delicate and anæmic, the danger of arthritic suppuration is imminent. If, on the other hand, the initial lesion do not suppurate, and what is still more important, if the patient be plethoric and healthy, there is good reason to hope, even if arthritis should supervene, that it will be of a simple non-puriform character.

If suppuration occurs, it does not necessarily follow that there should be any systemic septic infection, so long as the pus does not putrefy ; in other words, so long as no germs are present, micrococci or bacteria, so long will the

* Billroth hints at the occurrence of such cases when he says, " We meet with cases of cellulitis, both in acute and chronic suppuration of joints, without being always able to demonstrate any direct communication with the cavity of the joint. I think that this suppuration of cellular tissue must be explained by the absorption of the quickly formed poisonous pus by the lymphatics of the synovial membrane and its conduction into the periarticular cellular tissue; this is always accompanied by swelling of the neighbouring lymphatic glands."—Billroth's 'Surgery,' vol. i, p. 312; translated for the New Sydenham Society.

mischief be simple and non-infective. This, indeed, constitutes all the difference between simple and septic lymphangitis, between non-infective and erysipelatous inflammation. However the lymphangitis may spread, however diffuse the mischief may become (and the contiguous skin tissues are sure to be implicated), the disease is not contagious, and should not be termed erysipelas unless there is putrefaction; this term should be reserved for those cases of skin and lymphatic inflammation associated with putrefaction, and infective from the liability of the septic germs being carried from the wound through the system. This argument, however, will be further developed in the next chapter, and therefore need not now detain us.

Diagnosis.—The diagnosis of simple reticular and tubular lymphangitis is perfectly easy. We have chiefly to distinguish it from phlebitis and erysipelas. If the red lines are present they will in themselves be sufficient to establish a correct diagnosis, as they clearly follow the course of the lymphatics rather than the veins; they are also much smaller than the contiguous veins, and more numerous. If the red lines are absent the extreme pain, starting from the wound, when a wound exists, and extending up the limb to the nearest gland, which is always tender to the touch, will suffice to clear up the difficulty. Soon the inflamed lymphatics become corded and knotty to the feel, and some œdema of the part shows itself.* Pyrexia is always present in cases of lymphangitis; and, as a rule, is of a more severe character than that accompanying phlebitis. From erysipelas simple lymphangitis is to be distinguished by the redness not being uniform but in lines, at least when it assumes the tubular form; in the slighter degree of constitutional affection; and lastly, which I regard as the one really important fact, in there being no *contagium*, a circumstance capable of

* These phenomena are, perhaps, most typically illustrated in cases of lymphangitis of the penis consequent upon a gonorrhœa or balanitis. The main dorsal lymphatic vessel becomes acutely inflamed and very painful. Frequently no red line is to be seen, but soon a raised knotty cord appears, patent to the eye and to the finger, while the prepuce and integuments of the penis become œdematous, the œdema often being very considerable, and lasting a long time.

proof in the absence of putrefaction. From erythema it is not necessary to distinguish it, inasmuch as erythema can scarcely ever be present without some reticular lymphangitis, and superficial reticular lymphangitis almost inevitably invades the integumental structures. Between erythema and erysipelas, I repeat, I can find no hard and fast line except the contagiousness of the latter, which property is due, as I believe, to the presence of putrefaction and the consequent presence of a *contagium vivum* or organic germs.

Prognosis.—With the exception of cases where a suppurative arthritis is engrafted upon a lymphangitis, or a suppurative lymphangitis follows an attack of arthritis, the prognosis is almost invariably favourable. The symptoms, as a rule, subside as quickly as they developed, and in a few days the patient is himself again. As will be seen in the next chapter, there is all the difference in the world in the matter of prognosis between the simple and the septic forms.

Treatment.—The treatment is both local and general. Locally hot fomentations, assiduously applied, are the best remedies in the stage of acute pain: when this subsides, the parts affected may be painted with a strong solution of nitrate of silver, or collodion, and swathed in cotton wool. Collodion will often allay the itching, which is at times an almost intolerable nuisance; or if this fail, an alcoholic solution of benzoic acid, a scruple to an ounce, will generally succeed. Later, when we are dealing with the results left in thickened cords and œdematous tissues, pressure is our most potent remedy. There are several ways of employing this agent; in slight cases systematic bandaging, with an ordinary flannel, or what is better, an elastic bandage, will suffice to disperse the thickening; in others, it is needful to assist the dispersion of the inflammatory products by methodical kneading of the part, *massage* as it is termed—this I have found of real service. In more obstinate cases it is well to try to remove the sequelæ of the disease by means of the inunction of a small quantity of unguentum hydrargyri, say 3j daily, persevering until the gums are slightly touched. Internally, salines should be administered during the stage of pyrexia, subsequently tonics are useful, chief among which is iron.

CHAPTER V.

SEPTIC LYMPHANGITIS.

ITS DIVISIONS — GLANDERS — ANTHRAX — SNAKE-BITES — DISSECTION WOUNDS—ERYSIPELAS—ITS PATHOLOGY AND VARIETIES—LYMPHATIC PERITONITIS — TREATMENT OF SEPTIC LYMPHANGITIS — THE LYMPHATICS IN ZYMOTIC DISEASES—THE PLAGUE, TYPHUS, DIPHTHERIA, AND TYPHOID.

We have only to remember that immediately beneath the skin there are millions upon millions of open-mouthed lymphatic capillaries to understand the important part which the lymphatics play in many forms of septic infection. Once beneath the surface there is no lack of convenient channels for a poison to sail away in, any body small enough to squeeze itself into the tiny openings will here find ready conductors, while soluble substances naturally take to these channels as their readiest conduits. It is probable that many zymotic diseases, such as plague, diphtheria, and typhus, which invade through the respiratory tracts, make their entrance into the system by the lymphatics, but I purpose now rather dealing with examples of septic lymphangitis afforded by the two animal poisons, glanders and malignant pustule, and with such purely human diseases as dissection wounds and erysipelas, and shall but passingly refer to other maladies in which the lymphatics are affected. Septic lymphangitis is common to many diseases, which yet differ notably from one another, the difference being due to the different nature of the *materies morbi*. What the exact nature of the poison is remains doubtful in many, perhaps in most cases, though "in vaccinia," according to Dr. W. Roberts, "smallpox, diphtheria, erysipelas and glanders, the virus has been

proved to consist of minute particles having the character of micrococci."*

The poison after a time, of course, enters the blood-current, and then ceases to be a pure lymphatic disease, but it is still through the medium of the lymphatics that its effects are chiefly manifested, and therefore, though doubtless in some of the instances which I mention there is a superadded septicæmia, I do not consider this in any way renders it illogical to speak of these affections as cases of septic lymphangitis.

First of all, then, under this head I will speak of glanders, as it affects the horse, and as it affects the human subject.

The origin of glanders is involved in obscurity, but whether or not it ever arises *de novo* in the horse it is quite certain that it is always the result of contagion in man.

Again it is true, that the exact nature of the poison is unknown, but numerous observers agree in stating that bacteria are always present in the nasal discharges (although they are not invariably to be found in the blood), and Chauveau asserts that the active infective properties are contained in the solid particles, and not in the fluid serum. Be the precise nature of the poison what it may, its presence is characterised by a regular chain of symptoms: the mucous membrane of the nose and neighbouring parts inflames and ulcerates, lymphangitis ensues, with much general pyrexia; and, if the case do not speedily terminate, it is marked by a very general suppurative lymphangitis, constituting what is called farcy, which is nothing more than the chronic form of glanders, "bearing about the same relation to the other phenomena," as Bollinger remarks, "that the erythema and specific papules do to syphilis."

In the acuter forms glanders somewhat closely resembles acute tuberculosis, it is characterised by the development of a very similar neoplasm, microscopically consisting of "a vascular delicate stroma, filled throughout with numerous

* Dr. W. Roberts on "Contagium Vivum," in the 'Brit. Med. Journal,' Aug. 11th, 1877.

round cells crowded together in clusters, and presenting the appearance of pus corpuscles or ordinary granulation cells."* It further resembles miliary tuberculosis in its tendency to ulceration, in its early adherence to the course of the lymphatics, and in its remarkable fatality.

Farcy, as I have stated, is nothing more or less than chronic glanders, and it is perhaps impossible to have a better or truer description of the disease than that given by Youatt.

It is, as he clearly shows, an affection of the absorbents and their glands. "There is no assignable spot on which thousands of their little mouths do not open. In the discharge of their duty they not only remove that which is become useless, and often that which is healthy, but that which is poisonous and destructive.

"They open upon the surface of every glanderous chancre. They absorb a portion of the virus which is secreted by the ulcer, and as they pass it along their little tubes, they suffer from its acrimonious quality; hence the *corded veins,* as they are called by the farrier, or more properly the thickened and inflamed absorbents following the course of the veins. At certain distances in the course of the absorbents are valves, and these belly out and impede or arrest the progress of matter towards the duct.

"The virus in these places causes swellings, which are very hard, even of a scirrhous hardness, more or less tender, and with a perceptible heat about them. They are observed about the lips, nose, neck, axillary spaces, and thighs. Suppuration and ulceration next ensue. The ulcers are rounded, with elevated edges and pale surfaces: they are true chancres, and discharge a virus as infectious and as dangerous as the matter of glanders. While they remain in their hard, prominent state, they are called *buttons,* or *farcy buds,* and they are connected together by the inflamed and corded absorbents. In some cases the horse will droop for many and many a day before the appearance of the corded veins or buds; his appetite will be impaired, his coat will stare, he will lose flesh.

* Bollinger on "Glanders," in Ziemssen's 'Cycl. of Pract. Med.,' vol. iii, p. 335.

"The horse may then rally and appear to be restored to health. By degrees, however, the affection soon becomes general; the myriads of capillary absorbents that pervade every part become inflamed and enlarged, and cease to discharge their functions: hence arise the enlargement of the substance of various parts, swellings of the legs, chest and head. Few things are more unlike and perplexing than the different forms which farcy assumes at different times. One of the legs, and particularly one of the hind legs, will suddenly swell to an enormous size. At night the horse will appear to be perfectly well, and in the morning the leg will be three times the size of the others, with considerable fever, and scarcely the power of moving the limb. At other times the head will be subject to this enlargement; the muzzle particularly will swell, and an offensive discharge will proceed from the nose."*

The course of glanders in the human subject a good deal resembles the malady as seen in the horse, and like it may be divided into an acute form called glanders *par excellence*, and a chronic form called farcy.

Acute glanders.—Occasionally the virus, which is always to be traced to a diseased horse, soaks through the unbroken cuticle, or affects through the medium of the respiratory tract; very usually, however, there is a wound, or abrasion, affording immediate ingress to the poison.

There is a premonitory stage lasting from three to fifteen days; and the disease, if fatal in the acute stage, generally destroys life within sixteen days after its outbreak. If there be no wound the disease is not always easy to recognise, generally resembling typhoid; at a later stage, however, characteristic neoplasms form, which distinguish it. In the ordinary form the wound becomes inflamed and painful, and a lymphangitis quickly ensues, which runs up to, and sometimes through, the nearest gland. As in all cases of septic lymphangitis, the invaded gland becomes in its turn the seat of inflammatory change. The tissues become somewhat œdematous and the skin is implicated; erysipelas, in a word, develops, and this rapidly passes into a suppurative state, the

* 'Youatt on the Horse,' 4th edition, 1878, p. 213.

abscesses being scattered up and down the body, or it may be that pemphigus, blebs, or painful pustules tending to ulceration, form, which "are often spread so extensively over the surface of the body that hardly any part remains free."* The nasal passages are generally affected in a like manner, though, as in the horse, the nasal symptoms may remain in abeyance till near the close of the illness.

Chronic glanders and farcy.—As an illustration of the disease in its more chronic form I cannot do better than quote a case recorded by Travers in his work on constitutional irritation, and which is copied into Holmes's 'System of Surgery' in the article on Animal Poisons.*

Nimrod L—, a healthy hackney coachman, æt. 32, inflicted a chap on the inside of the right thumb, by inserting it into the nostril of a glandered horse to pull off a scab. He remembered to have afterwards wiped the thumb with a wisp of hay. In the space of six hours he was seized with violent pain and swelling of the thumb; it inflamed rapidly. On the third day he was suddenly taken ill, whilst driving, with cold shivers and giddiness, and stated that he entirely lost the use of his limbs for seven hours. At this time his arm pained him much all the way up, and on the following day it was streaked with red lines and excessively swollen; the armpit was also much swollen and tender. In the evening of the fourth day he was carried to Guy's Hospital, where he lay during twenty-four weeks. Superficial collections of matter formed successively in the course of the absorbents. The corresponding portion of the integuments sloughed, leaving extensive ulcers which discharged an unhealthy and fœtid matter. The glands at either angle of the lower jaw and those of the groin became swollen, and he was much afflicted with pain between the eyes and down the nose, and ulceration of the membrana narium attended with discharge. During the progress of the local disease he had much constitutional illness. He totally lost his appetite, and was oppressed with nausea, complained of severe pain with swimming in the head, and occasionally wandered in mind. He had also much pain through the whole course of the spine, especially in the region of the kidneys. His urine was thick and discoloured, and fœtid; his motions were slimy and purulent. Expecting to die, he quitted the hospital and lay at home the remainder of the twelvemonths in a state of great emaciation from the continued discharge of his sores, and his inability to take food or procure any refreshing sleep, even with the assistance of opiates, which he took habitually. At the end of the twelve months his health gradually returned, the arm began to heal, and he became comparatively hearty, and resumed his occupation, though with much inconvenience, owing to the distortion of his hand by the retraction of the thumb and fore-finger, in the

* Bollinger, l. c., p. 356.

† "Animal Poisons," by Alfred Poland, in Holmes's 'System of Surgery,' vol. i, p. 705.

cicatrization of a long line of abscesses, reaching to the middle of his upper arm. After six weeks this cicatrix ulcerated afresh, and healed slowly. He became subject to wandering pains in the head, both sides of the neck, loin, and groin; was not so strong and so fleshy as formerly, but had a good appetite. He had a great heaviness and disposition to sleep during the day; and at the end of two years and a half from the breaking out of the disease, considered his constitution broken, and despaired of ever being again the man he was.

This is a graphic picture of the disease in its most chronic form, and well worthy of careful study. Sometimes farcy proves quickly fatal, but more frequently it is a long and trying malady, as the above case serves to show. The nature of the lymphatic mischief is so clearly traced in this case that I shall not dwell upon it.

Pathological anatomy.—Post-mortem examinations in cases of glanders and farcy show the disease to be essentially a septic lymphangitis with secondary implication of many of the tissues and viscera; thus, the skin, dura mater, frontal and nasal sinuses, the lungs, muscles, cartilages, bones, the lining membrane of joints, the spleen, and liver are found to be the seats of the neoplastic formations before referred to. The virus acting, after the fashion of all animal poisons, like a ferment, seeks an outlet through any part of the lymphatic system in which it travels throughout the entire body, eventually, of course, entering the general blood-current with the lymph stream, when septicæmia is added to the lymph poison.

Treatment.—The treatment of glanders may be very briefly summarised. It resembles in general outline the treatment proper to all cases of pyæmia and septicæmia, that is to say, fresh air and plenty of it, abundant use of disinfectants, early opening of all abscesses, free stimulation and frequently-administered fluid nourishment, opium to relieve pain, quinine and wine as antipyretic and tonic combined, and an energetic destruction of the primary lesion with some powerful caustic, such as potassa fusa.

Anthrax.—Closely allied to glanders is the affection I now refer to, which is variously styled anthrax, charbon, contagious carbuncle, and malignant pustule. While, however, the poison of glanders is not definitely ascertained, it is demonstrated that anthrax depends upon the presence of

filamentous bacteria, the *Anthrax bacilli,*" which are pathognomonic of the disease, and are constantly present in the carbuncles.

The virus is derived from some diseased animal, dogs, rabbits, sheep, guinea pigs, and, like the poison of glanders, infects the system through the lymphatics. Whether there be a wound or not it is by the open mouths of the lymphatics, cutaneous or subcutaneous, mucous or submucous, that the poison enters the human body, and it is still in the lymphatic vessels and glands that its effects are in a great measure seen. As in all inflammatory lymphatic affections, we find in anthrax a marked tendency to erythema, erysipelas, and cellulitis, while in the multiple carbuncles of anthrax we have a special resemblance to the farcy buds of chronic glanders. The post-mortem evidences again are not dissimilar; there is the same cloudy swelling and engorgement of spleen, liver, and lungs, the same signs of lymphangitis and adenitis, the same infiltration of muscles, cellular tissue, and bones. In a word, septic lymphangitis is the common and characteristic feature of both diseases, which differ in minor details owing to a difference in the "contagium vivum." In anthrax, as in glanders, we are aided by the occupation of the patient in framing a diagnosis. In the one case the patient works among horses, in the other he is probably engaged in dressing skins. When a local sore is followed by lymphangitis in an individual thus occupied we must regard it as portentous. In glanders a positive diagnosis is arrived at by grouping together the evidence afforded by the previous history, the lymphangitis, the nasal ulcers and rhinorrhœa, the multiple abscesses along the course of the lymphatics, the character of the neoplasm, and the general nature of the illness. In anthrax there are much the same symptoms minus the nasal affection, with the substitution of multiple carbuncles for multiple abscesses, and above all, plus the presence of the peculiar bacteria. It is certainly worthy of note that both occasionally occur without any local manifestations, without there being any initial lesion; as in those rare cases of syphilitic infection where a *bubon d'emblée* announces the invasion of the system, so in

glanders and anthrax the virus may infect the system without any open sore. In glanders the poison in these rare cases enters through the respiratory passages, and produces its first effects upon the lungs through the pulmonary lymphatics; in anthrax the poison is probably announced by the advent of a malignant œdema of the eyelids.

In anthrax as in glanders the prognosis is exceedingly grave, but hopes and chances brighten as the disease becomes more chronic, and, as in the latter disease, treatment mainly consists in early destruction of the local sore, in free stimulation, in fresh air, in large doses of quinine, and in the liberal use of disinfectant washes, gargles, &c.*

Snake bites.—Some other animal poisons affect the human subject through the lymphatics, but I can here only passingly refer to them. Suffice it to say, that while such is not the mode of action of the poison derived from rabid animals, it is in this manner that the poisonous virus of many healthy animals operates; not solely, however; the extreme rapidity, with which *e. g.* some snake bites kill, suffices to indicate a hæmal rather than a lymphatic situation, but in others which are less lethal in their effects, the lymphatics, and the planes of cellular tissue, are the principal fields of operation. Such is the case, for example with the poison of the viper or adder which is the only poisonous serpent found in England. I shall quote the few remarks I have to make on this subject, from Lawrence's lectures on surgery. "The bite of the viper," says this author, "produces troublesome local symptoms, but is not dangerous and still less fatal, though it may have caused death in some exceptional cases. Fontana found that three vipers could not destroy a dog of sixty pounds weight. The poison does not act on the sound skin, or mucous membrane; thus it may be taken into the stomach with impunity. A student swallowed the poison of four large vipers without injury, and no effect was produced on a pigeon by taking the poison of ten vipers. Like the poison of hydrophobia it must be introduced into a wound. In many experiments on dogs, punctures with lancets charged

* For further information on anthrax, I would refer to Bollinger's article in Ziemssen's 'Cyc.,' vol. iii.

with venom, even from the most poisonous Indian snakes, failed to produce any effect, although the bite of the animal was rapidly fatal.

The local effect is considerable swelling, rapidly extending along the limb and to the trunk, the skin being mottled or dark purple and livid; inflammation and suppuration of the cellular tissue may supervene. The general symptoms are vomiting, torpor, and loss of consciousness, sometimes a state resembling intoxication; enfeebled action of the heart."*

The treatment consists, if there be time, in rapid deligation of the limb and removal of the virus by suction. Failing this, free stimulation seems to be the principal indication until the symptoms of collapse subside. The local signs are of course to be treated on general principles.

Septic lymphangitis following dissection wounds.—It is a happy circumstance that dissection wounds as a rule are harmless, and lead to no further consequence than the same wound would if inflicted by a clean instrument; at other times, however, very grave consequences ensue. As in all cases of septic infection, there are two factors to consider; the soil and the seed; two students are infected with the same virus, the one has a trifling lymphangitis, the other sinks from the severity of the attack; again, the quantity of the poison absorbed is a very important matter in determining the result. Burdon Sanderson has demonstrated the fact, that the gravity of septicæmia is in direct proportion to the quantity of "pyrogen" (as he calls it), or septic material introduced, and, as I have pointed out elsewhere,† we see the same thing every day in vaccinia (which may be regarded as a kind of benign septicæmia), where the prophylactic power is directly proportionate to the number of vesicles, *i.e.* the quantity of pyrogen. Knowing the astonishing rapidity with which bacteria and allied organisms increase and multiply, I confess these facts are puzzling, and difficult to explain in harmony with the germ theory of disease, but for the present we have nothing to do with this,

* 'Lectures on Surgery,' by W. Lawrence, F.R.S., p. 271.

† 'B. M. Journal,' February 23rd, 1878, p. 256.

and may return to the consideration of the phenomena of septic lymphangitis.

Although the poison derived by putrefaction from a dead body, and that obtained by the same means from among still living tissues, differ in important respects, yet clinically they may conveniently enough be grouped together under the same head.

The precise period when a dead body becomes infectious, or when a patient developing septicæmia becomes himself capable of transmitting the disease to another, is difficult, indeed it is thought impossible, to ascertain. Such a moment must occur, but there is said to be nothing to mark its advent. The nature and cause too of the change are not known with precision. Dr. Roberts thinks that "under a certain concurrence of conditions in and about the wound, a modification takes place in the vital endowments of the septic organism, whereby it acquires a parasitic habit, which enables it to breed in tissues of degraded vitality, or even in the healthy tissues, and in this way to produce the infective endemic pyrexia which we sometimes witness in the wards of our large hospitals."* How far and in what respect I differ from this opinion will appear when I come to deal with erysipelas.

I will illustrate my remarks on septic lymphangitis following dissection wounds by the recital of two cases, one mild, the other severe, drawn from my own observations. The first case is, indeed, one of personal experience, and happened about eight years ago.

It was in December, 1871, that I pricked my finger one day whilst dissecting, but took no notice of the puncture at the time. In the night following the accident I awoke with violent pain and throbbing in the finger and up the arm. I tossed about till daybreak, when I saw two thin red streaks on my arm running from the finger to the elbow. The pain was extreme; thirst excessive; temperature 102° F. A tender, enlarged gland could be felt just above the inner condyle. During the day the pain and red line extended up to the axilla, where a second tender and swollen gland made its appearance. The symptoms deepened in severity for the next twenty-four hours, when fluctuation could be detected in the axillary gland. An incision evacuated about half an ounce of pus, and somewhat relieved the pain, which, however, still continued severe. I had two or

* Dr. W. Roberts on "Contagium Vivum," in the 'Brit. Med. Journal,' August 11th, 1877, p. 171.

three rigors during the day and vomited several times. On the third day I was decidedly easier, the red lines were fading, and both lymphatic vessel and gland tenderness markedly subsided. The fourth day I was convalescent.

This is a case, then, of septic lympangitis, where the mischief remained throughout confined to the lymph-system. The next is a case of severe septic lymphangitis passing on to true septicæmia; it occurred in the person of the late Curator of the Medical School of Manchester.

Walter S—, æt. 44, pricked his thumb while dissecting a tiger for the museum, and two days later began to suffer pain at the seat of injury. On the fourth day he called to see me, when I found a small quantity of thin fluid discharging at the root of the thumb-nail. The lymphatics were perceptibly affected, the skin was cool, the tongue dry, pulse 100; but, perhaps, the most noticeable symptom was the intense mental depression. I freely incised the thumb, and sent him home to bed: this was August 22nd, 1875. From this time his general condition grew worse up to the 26th, when an ill-defined, or rather an undefined, abscess appeared in the cellular tissue of the arm. On being opened several ounces of pus were discharged, which lay loosely in the tissues unconfined by any limiting membrane. Each day fresh abscesses of the same diffluent character appeared on the chest, abdomen, legs, and feet. He was very restless, and passed gradually from a condition of prostration into one of muttering delirium, which ended in death on September 11th, twenty-four days after the reception of the poison.*

I do not know any work where the effects of dissection wounds are more admirably treated than in Travers's work on 'Constitutional Irritation.' He gives, in full detail, the history of twenty-one cases, fourteen of which proved fatal in periods varying from forty hours to eighteen days. One can scarcely suppose that the treatment, which mainly consisted in a Sangrado system of bleeding and purging, can have materially tended to lessen this heavy mortality. In all the cases there was cellulitis, in some this extended along the fascial planes of the trunk, giving rise to suppuration from axilla to ilium; in others it was limited to the neck and axilla, the intervening cellular tissue in the arm escaping; in others there was suppurative lymphangitis and adenitis extending from the pricked or cut finger up to the armpit; empyema ensued in one case; pustules and blebs formed in others; metastatic abscesses were sometimes observed; cutaneous erysipelas was met with in the majority.

* From a lecture on "Septicæmia," by the author, in the 'Lancet' for May 27th, 1876.

Travers was of opinion that four different textures were affected, individually or collectively, in these cases. These were—

"Inflammation of the absorbents and their glands, superficial or deep seated, or both.

"Inflammation of the veins.

"Inflammation of the cellular membranes, phlegmonous, erythematous, erysipelatous, gangrenous.

"Inflammation of the thecæ of tendons and fasciæ of muscles."

He proceeds to give an account of these different affections, and his description is so good that I will crave permission to quote it so far as regards the absorbents.

"Inflammation of the superficial absorbents," he remarks, "is at first seldom accompanied by inflammation of cellular substance, except of that in which the vessel lies; the swelling is inconsiderable; the blush is confined to the raised, swollen, cord-like, absorbent lines, so is the chief pain [he is describing tubular lymphangitis]; but above the bend of the elbow, and in the axilla, the glands are swollen and acutely tender to the touch. From the wounded finger or hand a sensation of heavy pulsatile pain shoots upwards along the arm, and the absorbents are conspicuous from the base of one or more of the fingers, upon the dorsum of the hand and wrist, along the radial or ulnar side of the forearm to the bend of the elbow, and thence to the axilla. *Sometimes the lines are lost between the elbow and axilla.* In a short time the inflammation, if acute, extends to the fascia enveloping the flexor muscles, and the whole limb becomes swollen, heavy to the sensations of the patient, tense to hardness, and acutely sensible to contact, even the lightest. The pain in the first stage is of a nature so intolerable that it often occasions delirium, and in failure of active measures, has sometimes been followed by fatal collapse and exhaustion."

His account of deep-seated lymphangitis from dissection wounds is equally clear. "A very slight transitory, visible inflammation of the superficial absorbents following an injury to the finger, is sometimes accompanied by acute pain and tenderness to the lightest touch, of the inner side of the

upper arm and axilla, shortly a deep seated and firm swelling, marked by a vivid blush, occupies the channel of the large vessels from a little above the elbow to the hollow of the axilla. The depending position of the limb, which is more tense than swollen, cannot be borne for an instant. The disease terminates in humeral, or axillary, or pectoral abscess, properly so called. There is inflammation of the deep-seated absorbents, and the slight and transient blush in the course of the superficial vessels, if present, is sympathetic."* I adopt this description of Travers's as both graphic and accurate. Some of the cases which he relates are not so much instances of lymphatic absorption and inflammation as of venous absorption and septicæmia. In these cases a very rapidly fatal issue is imminent, but this rapidity is not in itself characteristic of lymphatic absorption.

On the contrary, in all forms of septic lymphangitis, dissecting wounds, farcy, erysipelas, the unfolding of the typical symptoms is often slow—days elapse between the reception of the poison and the onset of constitutional symptoms. I am inclined to regard this as characteristic of many diseases which invade the system through the lymphatics; the evolution is thus gradual, owing probably to the slow nature of the lymphatic circulation; so long as the virus remains in the lymphatics so long will the symptoms be confined to these structures; thus, in the plague, the buboes often precede the general symptoms by a considerable interval, and in syphilis we commonly find that the virus is so long retained in the lymphatic vessels and glands, that several weeks elapse between the appearance of the initial lesion and the first manifestation of somatic infection. This is the case too in most forms of septic lymphangitis, *e. g.* after receiving a dissection-wound some days often elapse before we have intimation that a general poisoning has taken place; thus, in the case of Searson, four days elapsed after the receipt of injury before he complained to me of being ill, and Sir James Paget himself, who suffered severely from the same cause, worked, and worked hard, from morning till night, for

* Travers on 'Constitutional Irritation,' 2nd edition, p. 349.

three days after absorbing the virus before the mischief clearly declared itself.* It is not essential that there should be a wound preceding these cases of septic lymphangitis which result from dead or putrefying bodies. It is indeed the rule rather than the exception for septic matter to be absorbed through an unbroken surface; thus, *e. g.* most zymotics are absorbed through the respiratory tract, gonorrhœa through the unbroken mucous lining of the urethra, syphilis through the covering of the glans or body of the penis. Similarly the poison of which we are now speaking is often absorbed without breach of surface. Sir James Paget was affected in this way; for, speaking of his own case, he says, "Whatever the virus was it soaked through my skin; I had no wound or crack of any kind." And such was the case in some of the instances recorded by Travers.

I need not dwell now upon the pathology of the affection; we evidently have a lymphangitis plus a special poison, but of this, and of the treatment, I shall have something more to say after treating of erysipelas. Before, however, passing to this subject I must briefly allude to the septic lymphangitis which sometimes accompanies a gonorrhœa, and gives rise to the so-called gonorrhœal rheumatism.

"The joints most frequently affected in gonorrhœal cases are those of the lower extremities, particularly the knee, in which the disease is obviously synovitis, more or less acute, as in rheumatism. The ankle and foot frequently suffer with the knee. Those of the upper extremities and back are occasionally involved. As in common rheumatism, the affection passes from joint to joint, or it may leave one set of articulations to appear in another, and may reappear in its original seat."† In all the cases of gonorrhœal rheumatism which I have seen, there has been some peri-urethritis, with œdema and obvious lymphangitis; the latter spreads first to the inguinal glands, which become inflamed and tender, and thence arise foci for fresh infection. The poison selects, indeed, the serous and synovial sacs on which the

* 'Clinical Lectures and Essays,' by Sir James Paget, p. 328.

† Lawrence's 'Lectures on Surgery,' p. 497.

lymphatics open, and the analogy is so clear between this form and true acute articular rheumatism that, as I have observed in the former chapter, it is difficult to resist the inference that in both we have a poison operating through the channels of the lymphatic system.

The synovitis is not necessarily suppurative in the gonorrhœal form any more than in other cases where it follows lymphangitis, but there will be a tendency to suppuration whenever this event happens in a strumous subject.

Erysipelas.—The propriety of considering erysipelas as a disease of the lymphatics may, perhaps, be disputed, but since the lymphatics in the skin or cellular tissue are the parts primarily and chiefly affected, and since it is by the lymphatic channels that the poison travels from one part to another, and so manifests its characteristic feature of diffuseness, it appears legitimate to place this disease among the examples of septic lymphangitis. In this view, indeed, I am not singular, for the French school generally, and Nélaton particularly, adopt it, and, among others, Pleger has proved that it is by the lymph streams, which are disposed in a certain manner in the meshes of the cutis, that the poison of erysipelas spreads from part to part.* Billroth remarks, "The exciting poison spreads easily along the superficial lymph vessels in the cutis, like fluid in blotting paper, and it may also spread more deeply through the subcutaneous lymph vessels, when it afterwards gives rise to both local inflammation and to mischief in the nearest lymph glands, as evidenced by streaky redness of the skin and tenderness and swelling of the lymph glands."† The redness characteristic of erysipelas is indeed due to the perivascular lymphangitis exciting some blood capillary inflammation and consequent dilatation, and thus the implication of the blood-vessels

* *Vide* Tessier, Orth, Zuelger, Lukomsky, Tillmanns, Velpeau, Nélaton, *passim.*

† To Nunneley, more than to anyone else, the credit is due of clearly establishing the *rapport* which exists pathologically between these three affections; and in his essay on erysipelas he adduces arguments to prove the erysipelatous nature besides of puerperal fever, diffuse inflammation of serous and mucous membranes, diphtheria, and phlegmasia alba dolens.

is secondary in time and secondary in importance. The lymphatic nature of the malady is further evidenced by the fact that the nearest lymph glands are always affected, invariably enlarged, almost invariably tender. If this view be granted it is easy to understand the circumstance that erysipelas is sometimes confined to the skin, sometimes to the cellular tissue, and that it sometimes affects both, for we have learnt that there is little or no communication between the superficial and the deep lymphatics, except through the medium of the glands; hence it follows that inflammation commencing in one set does not necessarily spread to the other, and thus, clinically, we have a cutaneous, a cellulo-cutaneous, and a cellular erysipelas.

Assuming, then, as proved, that these diseases are identical, and further, that they are examples of lymphangitis, we have next to inquire into the character of the erysipelatous poison. There is no question connected with erysipelas more interesting than this. Is it a true specific poison, or is it capable of being generated in the decomposing fluids of every wound with perfect impartiality? Clinical evidence, and to some extent experimental research, are altogether in favour of regarding it as a specific poison, just as variola or scarlatina are specific. If the fluids of a wound in a state of putrefaction be injected into the cellular tissue of a healthy animal, septicæmia will probably follow and prove fatal, but in no instance has genuine erysipelas followed such experiments. The large experience gained in the hospitals of Paris during the Franco-Prussian war affords similar evidence; the disease spread terribly, but erysipelas was only engendered by erysipelas. Again, there is direct experimental evidence to prove the production of genuine erysipelas in healthy animals by inoculation with fluid from an erysipelatous wound.*

* The most recent researches on this subject are by H. Tillmanns, of Leipzig, who, after detailing the work done by Willan, Ponfick, Orth, Bellieu, Zuelger, and Lukomsky, relates his own observations with considerable detail. His conclusions in regard to bacteria are, that they are present in some and absent in other cases of erysipelas, and he therefore infers that the disease is independent of them.

Have we any knowledge of the real nature of this poison? Orth* was, I think, the first to answer this question in the affirmative, by endeavouring to prove that the erysipelatous poison was dependent upon micrococci which were carried from the surface of wounds into the lymphatic system. This view was confirmed by Zuelger,† Lukomsky,‡ Roberts,§ and Tillmanns,‖ all of whom bear witness to the invariable presence of these bodies, and all of whom agree in regarding them as the chief malefactors. Admitting, then, their presence as proved, are we justified in regarding these micrococci of such serious portent? My own conviction is that we are apt to overrate their significance.

After careful and numerous investigations of the microscopic characters of the fluids derived from undoubted cases of septic erysipelas, I have come to the conclusion that, while minute spherical bodies do undoubtedly abound, the same, or at least bodies practically indistinguishable from them, are found in abundance in many diseases, and to a less extent even in health; and further, that many of these bodies which appear possessed of Brownian movements, are either atoms of fibrin, or, what comes to the same thing, are *débris* from the lymph corpuscles and the white blood cells, and not independent organisms. It is, I believe, unquestionably true that these bodies are very numerous in cases of erysipelas, more numerous, probably, than in other affections, but is this sufficient to establish their relation to erysipelas, as cause to effect, with scientific accuracy? I think not, and am therefore induced to seek for some other test of the septic nature of erysipelas apart from the mere presence of micrococci.¶ Have we such a test? I am inclined to say that

* *Vide* Orth, "Untersuchungen über Erysipel.," 'Archiv. für experimentel, Pathologie und Pharmacologie,' Band i, s. 81.

† Zuelger, 'Handbuch der Spec. Pathol. und Therap.,' art. "Erysip.," in Von Ziemssen.

‡ Virchow's 'Archiv,' Band lx, s. 418; Lukomsky.

§ W. Roberts, loc. cit.

‖ Tillmanns, 'Experiment. und Anatomische Untersuchungen über Erysip. Separat-Abdruck aus der Verhandlungen des 7 Chir. Congress.'

¶ I do not wish it to be inferred from what I have written that I deny the serious import of micrococci, or that they may be, after all, the *vera causa* in

in the existence of putrefaction we have the test required. Now, while fully admitting that in associating the septicity of erysipelas, as I do, with the development of putrefaction in the wound, we do not advance our knowledge of the specific nature of the poison, I am yet inclined to think that this view, if it can be proved correct, is not without some practical value.

In order satisfactorily to prove the dependence of septicity on putrefaction in cases of erysipelas, it would be necessary to show on the one hand that no case of contagious erysipelas ever developed from contact with a case of simple lymphangitis; and, on the other hand, it would be necessary to demonstrate the existence of putrefaction in every case of contagious erysipelas, or clear evidence of contact with such a case. The last clause is important, as it is well known that erysipelas once in a ward may spread from case to case, affecting impartially the wounded and the sound. It is clear that only very extensive observations can suffice to establish the truth of this rule, and I am fully aware that my own observations, though numerous and uniformly tending to prove its accuracy, are insufficient for demonstration. My contention, however, is, that the distinction between simple lymphangitis and erysipelas is merely this: both are examples of lymphatic inflammation, but the one is aseptic the other is septic; the one is unattended with putrefaction or its products, and is not contagious, the other is the offspring of putrefaction and is contagious. Thus,

the production of erysipelas. Perhaps they are. We certainly have a specific poison, whether it be a "contagium vivum" or not, and the micrococci may be this poison, or may, at least, carry it. Kohl informs us that there are micrococci and micrococci, and if they are the active producers of so many and varied diseases as they are credited with causing, this must needs be so. I do not deny the plausibility, even the probability of all this. What I do deny is that it is as yet proved, and worthy of acceptation as a scientific fact. The powers of the microscope are unequal to the task of differentiating between the sheep and the goats in this case, and, as far as I can see, are likely to remain so. If this is, then, correct, my contention is that it is desirable to have some practical and easily applied test of the contagiousness of the erysipelatous form of septic lymphangitis; and this test I try to show is supplied by the presence or absence of putrefaction in the wound.

we often find after an amputation that the lymphatics of a limb inflame, there is a slight œdema, there is a rise in temperature, but not a great one, there are no sweats or rigors, the tongue continues moist; by-and-bye the stump sloughs, putrefaction takes place, and synchronously with this change the lymphangitis becomes diffuse, the constitutional symptoms deepen in severity, and unmistakable erysipelas supervenes.

I will now proceed to quote a couple of cases from my hospital notes in support of my argument, though from different points of view, that erysipelas waits on putrefaction, and is never developed *de novo* without it.

I had a case under my care at the Infirmary in 1878, of a woman, aged 48, who had sustained a severe (oblique) compound fracture of both bones of the leg; so extensive was the injury to the soft parts, and so great the exposed surface of bone—at least five inches of tibia being laid bare—that I urged amputation. The patient, however, refused permission, so we proceeded to do the best we could for her. The wound was thoroughly cleansed with a strong solution of carbolic acid, afterwards carefully dried, and dressed with glycerine and carbolic acid. The same dressings (always taking care that no water touched the parts) were employed throughout the case. The patient remained in hospital for five months, when she left with the wound entirely healed, and the bones firmly united. Throughout the case there was never any putrefaction, and for the first two months there was an entire absence of suppuration; subsequently a few drops, not more than three or four, escaped during the day. It was interesting to watch the bones unite with lymph, which was first of all clear, afterwards was seen to fibrillate, and finally to ossify: there was no exfoliation of bone.

During her residence in hospital this patient had three attacks of erysipelatous inflammation of various parts of the body—never, however, of the injured leg; the attacks were sharp, and accompanied with local œdema and general pyrexia. She had been subject to these attacks all her life, and one of them had left her face terribly scarred. Regarding it as a case of pure and simple idiopathic lymphangitis with implication of skin, *i. e.* erythema, I never removed her from the ward, which was always full, and contained forty beds. Is it not probable that had this been true erysipelas, *i.e.* had it been contagious, some of her neighbours, many of whom had open wounds, would have suffered during one of the attacks?

Certain it is that no special precautions were taken to prevent such a casualty, and equally certain is it that no such casualty occurred.

My second illustration is intended to support the argument from another point of view.

In the spring of 1877 a man, lying in Treasurer Ward under my care with amputation of the leg, developed lymphangitis the third day following the operation. The red lines ran from the stump up to the thigh, when they were lost in the inflamed and tender inguinal glands. The next day the redness was diffused, and involved part of the limb; there was some œdema. The wound, not being putrefactive, as proved by Nessler's test and the microscope, I allowed him to remain. So things went on for four days, when one day we detected putrefaction; the same day the general symptoms became much more severe, and the erysipelas extended to a considerable distance. Two days later first one and then a second patient in the same ward manifested symptoms of erysipelas; the one had a simple fracture of the tibia, the other had been operated on for a large and intractable hydrocele. Now, although this is not conclusive evidence of the fact, I think it a fair inference that for the first week the patient was only suffering from simple, non-infectious lymphangitis, and that the change to contagious erysipelas was contemporaneous with the advent of putrefaction in the wound.

Mutatis mutandis, the same arguments which go to establish the essential identity of cutaneous erysipelas with septic lymphangitis, and the dependence of the latter on putrefaction, serve to prove that phlegmonous erysipelas and cellulitis are of the same nature. In phlegmonous erysipelas there is always a wound, there is always putrefaction, but the septic inflammation has extended not only to the cutaneous, but to the deeper lymphatics, while in cellulitis, which is almost entirely confined to the deep lymphatic vessels and surrounding areolar tissue, the skin escapes.* In both these forms of septic lymphangitis a cordon is apt to be formed by the barrier of coagulated lymph poured out, by which means the patient may be saved from systemic infection. It is quite foreign to the object of this essay to describe in detail the characters of these two affections, so well known and so accurately treated of in most of the works on surgery, but I may be permitted to make some general remarks upon the subject. If my views upon the question at issue be eventually

* The rapidity with which cellulitis spreads is in itself sufficient to show that it travels by vessels rather than by tissues.

proved correct a very close analogy will have been established between pyæmia and erysipelas. Thus, it will be admitted that, excluding cases of contagion, all instances of surgical septicæmia and pyæmia are the result of previous putrefactive changes in the wound—this is the great truth, apart from all theory, lying at the very foundation of antiseptic surgery—and thus, in like manner, erysipelas will be shown to be a septic lymphangitis, the result equally of putrefaction, plus, it may be, the evolution of some specific poison. In erythema, which is a simple lymphangitis with vascular hyperæmia, and in erysipelas, which is a septic lymphangitis with the same capillary disturbance, the poison will contaminate the entire system much more quickly than if it remains confined strictly to lymphatic channels; for there will be a passage of some of the virus directly into the blood current. This is probably the explanation of the otherwise paradoxical circumstance that lymphatic infection is sometimes very rapid in giving rise to general symptoms, and at others very slow; for the systemic sympathy will be manifested quickly when the perivascular paths or spaces are entered, and slowly when the lymphatic vessels proper are selected and adhered to.

Septic lymphangitis is of exceptional severity when it attacks the peritoneal or pelvic lymphatics; thus, for example, we know that peri-metritis following parturition, or pelvic cellulitis following lithotomy, both of which are forms of erysipelatous angeioleucitis, are among the most fatal of diseases.

The lymphatic origin of many cases of puerperal fever, indeed, compels us to pay special attention to the peritoneum in its relation to the lymphatic system. Like the other serous membranes of the body, the peritoneum is nothing but a large lymph space with numerous "stomata" which open directly into the lymph-canalicular system, and thence into the subjacent connective tissue. It is manifest that this membrane is most favorably disposed for lymphatic infection; a blow on the parietes of the abdomen, a bubo in the groin, uterine contents of any kind undergoing decomposition, kidney diseases, may any one of them start a lymphangitis which will speedily assume the characteristics of diffuse

peritonitis. The features of the disease are so typically represented in puerperal peritonitis, that I shall select this affection to serve for all.

Puerperal peritonitis is of two kinds, simple and pyæmic, which correspond to the two divisions we have adopted of lymphangitis into simple and septic. Simple puerperal peritonitis without pyæmia (a very rare disease by-the-bye) is a purely local inflammation arising from traumatic causes during delivery. It is not contagious, and though generally deadly is not invariably so. In fatal cases there is often a lapse into the septic form. In septic peritonitis "the process extends, as may be traced anatomically, through the lymphatics which convey the material they take up to the blood, and in this way excite inflammatory processes in the large lymph spaces, more particularly the peritoneum."* The channel is the same in both forms, but in the latter there is the superadded sepsin or, to use Sanderson's term, pyrogen.

As in all other varieties of septic lymphangitis the exact nature of the poison is disputed, and likely to be so for some time to come, but while this question awaits solution we may yet arrive at the important fact that here, as in erysipelas, and as in surgical septic lymphangitis, putrefaction is an invariable and a necessary precursor of the mischief. Bauer observes, "The opinion has been repeatedly advanced that the infection of the puerperal woman is due to the presence of lower organisms, and the actual conditions observed authorise this view, in so far that on the inner surface of the uterus, in the contents of the lymph vessels, in the effusion, and in the pus-corpuscles, bacteria abound in great quantities, the contents of the lymph vessels consisting of pus and bacteria." We have seen that in one example of septic lymphangitis, but as yet in one alone, viz. anthrax, the dependence of the disease upon a special and peculiar form of bacteria has been demonstrated. A similar explanation may be given in the future to all the other forms, but as yet

* Bauer on "Diseases of the Peritoneum," in Ziemssen's 'Cycl.,' vol. viii, p. 277.

all that we are justified in stating is, that in all there is the common factor, decomposition, in the wound, which decomposition implies at least the *presence* of bacteria.

Summarily, then, septic puerperal peritonitis is "to be regarded as an accidental disease of a wound, a pyæmic disease, in which the septic matter is first taken up by the lymphatics and conveyed onward by them. On the blood taking up the putrid material from the lymph vessels there arises a general infection—an actual septicæmia" (Bauer).

Pathological anatomy reveals very characteristic lesions: the uterus is coated with a sloughy, fœtid, and diphtheritic membrane, while the uterine, periuterine, subperitoneal, and retroperitoneal lymphatics are all dilated and filled with pus. The lymph glands of the mesentery and neighbourhood are the seats of hyperplasia and suppuration. "The fluid of the parenchyma of the uterus, the broken-down lymph thrombi, are rich in granular masses; they consist partly of bacteria, which are also found in masses in the pus-corpuscles, and similarly in the effusion, in the serous cavities, and in the pericardium."

The *symptoms* are easy to read: peritonitis, with intense depression and prostration, a jaundiced hue of skin, vomiting, diarrhœa, fœtid discharge, tympanitis, meteorism, make up a group of symptoms which cannot be mistaken. The mental condition varies widely; sometimes there is muttering delirium, sometimes maniacal excitement, more frequently the mind remains clear to the last.

As the *prognosis* is invariably fatal, nothing need be said about *treatment*, beyond insisting upon the absolute need for a long and strict quarantine on the part of nurse and medical attendant, together with the duty imposed upon them of destroying, or at least, in the most thorough manner disinfecting all articles of bed furniture and wearing apparel which can possibly have been in contact with the source of infection. I have, indeed, but little to say generally on the subject of treatment of septic lymphangitis, but this little may here be introduced.

Treatment of septic lymphangitis.—The pain, whether in the lymphatic vessels or lymphatic glands, which is some-

times intense and long continued, is most effectually relieved by fomenting with flannels wrung out of water as hot as can be borne, to which a little laudanum has been added. If persistently applied these means will palliate, and by-and-bye subdue the pain. I cannot say that I have been able to determine whether the local application of nitrate of silver, tincture of benzoin, or collodion, does any good. It is really difficult to come to a decision on this point; some cases seem to show that these agents have a real power in checking the advance of mischief, and in subduing the existing skin inflammation, others seem to demonstrate their complete futility. There is, however, no harm in employing them, and as they may do good they should be used. Collodion has certainly one merit, and that not a small one; it relieves the itching which is often so troublesome. As to the injection of carbolic acid, again, I have too little experience to speak with confidence; the injection certainly gives pain, and I have not been able to satisfy myself that it does good. The practice would, however, be rational if the injections were of sufficient strength to act as germicides, but as nothing short of a saturated solution of carbolic acid can be relied on for this purpose, and as local death as well as systemic poisoning is likely to be caused by such an agent, this remedy must be used with caution. The most valuable remedies we possess are fresh air, quinine, and opium. It need hardly be said that abscesses, wherever and whenever they appear, should at once be freely opened; this is of course imperative, and after evacuating their contents they should be dressed antiseptically, but of general remedies those mentioned are by far the most important.

Quinine should be given in sufficient doses to bring down the temperature two or three degrees. An adult may take 10 grs., and, if this prove ineffective, 15 grs. may be given after an interval of twelve hours. A few large doses are of incomparably greater value than small repeated doses. A nightly draught containing from 10 to 15 grs. is the best method of administering the drug.

Every available means should be taken to procure a thorough current of fresh air through the chamber. A

plentiful supply of pure air is, indeed, probably as important an agent as any, except it be a good nurse. Her price is above rubies. Opium (subcutaneous injection of morphia is the best mode of exhibition), again, is invaluable in relieving the pain and restlessness which are often so distressing; an allowance of stimulants, which must be prescribed in proportion to the needs of the patient, which must be gauged by his habits; and food, that is, beef-tea and its congeners, should be given at frequent intervals. It is, in a word, altogether a question of supporting the strength. If this be done successfully the patient will float into smooth waters, if not, he will succumb. In some cases iron is of undoubted service; from fifteen to thirty drops of the muriated tincture of iron should be given three times a day, but I cannot speak of this remedy with the confidence in its virtues that some writers do.

Nunneley, in his excellent essay on erysipelas, speaks highly of the value of camphor and turpentine given internally, and quotes a striking case in which the latter was given to a young woman of 21 years of age, in apparently a hopeless condition from erysipelas of the head and face. The coma was profound, but the girl completely recovered under the administration of turpentine, taking five ounces of the oil in five days, besides six drachms in an enema. I am also inclined to attach some value to the local application of belladonna in cases of cutaneous erysipelas, as recommended by Bryant and other authors, but I have nothing to add of my own to the conventional and well-approved treatment of the different forms of septic lymphangitis. Not that I should wish it to be understood from this that one treatment is as good as another, and that a principle of *laissez faire* may safely be adopted. Far from it, and especially in regard to local treatment, I do not think the importance of judicious and vigorous action can be over-estimated. There is much probability in the theory that be the poison in these cases what it may, it is constantly being generated in the wound and thence absorbed into the system; that, consequently, if we can destroy this factor we shall with it destroy the *gravamen* of its results. Widely diverse as our local remedies are, they

all, at least all the efficient ones, agree in this, they are antiseptic—iron, iodine, creasote, all are antiseptic—anti-putrescent. They agree in this, if in nothing else, that they break up the putrescent series directly or indirectly; and so it is also with nitric acid, chlorinated soda, arsenical solutions, and the actual cautery, which are more or less in vogue in the allied disorder, hospital gangrene. I would certainly place these agents, that is to say, distinctly anti-septic (germicidal) bodies, in the first rank of remedies in the treatment of septic lymphangitis where there is an open wound. In cases of ordinary severity perhaps carbolic acid is the most generally useful of the entire class, but when there is much sloughing, when *e. g.* a condition akin to hospital gangrene exists, I should put my faith in bromine as a more efficient and useful weapon.*

Before leaving this part of the subject, I should like to draw brief attention to the part which lymphangitis plays in some of the more important and deadly zymotics, such as the plague, typhus, typhoid, and diphtheria.

There is much reason for attributing a special and prominent part to the lymphatics in the evolution of the plague. Authors who have had opportunities of observing epidemics of this fell disease, agree in stating that the characteristic buboes which form in the groin, the axillæ, and the neck, are confined to the lymphatic glands;† and post-mortem evidences prove that the chief manifestations of the disease are within the lymphatic system.‡ "Even," says Dr. Milroy, quoting Clot Bey, "in cases which have proved fatal before the out-

* I would beg to refer the reader to a highly interesting and thoughtful essay by Dr. M. Goldsmith, of the U.S. Army, on 'Hospital Gangrene, Erysipelas, and Pyæmia,' in which he warmly advocates the employment of bromine, "pure or in concentrated solution," as by far the most effectual means of checking the progress of these maladies. From my own experience I can in a great measure corroborate what he says as to its extreme utility in the case of large sloughing wounds and fungating sores generally.—*Vide* Dr. Goldsmith on 'Hospital Gangrene, &c.' Louisville: Bradley and Gilbert, 1863.

† Dr. Milroy writes:—"Clot Bey remarks that the buboes in the plague are always formed by swollen lymphatic glands."—Article on the "Plague," by Gavin Milroy, M.D., in Reynolds' 'System of Medicine,' p. 325.

‡ Milroy.

ward appearance of any buboes, some of the lymphatic glands were always found on dissection to be affected." It has been often observed, too, that attacks of lymphangitis or perhaps more strictly of adenitis, have preceded outbreaks of the plague. Thus, Dr. Dickson, on the authority of Dr. Cabiadis, states, in reference to the recent outbreak of Oriental plague, "that two or three months previously to the manifestations of the plague in Mesopotamia, *glandular swellings, free from fever,* prevailed in that country."* As to the etiology of the plague, we are very much in the dark; for while some attribute it to marsh malaria, others are inclined to look for its origin in the physical and moral wretchedness of the individual, and especially in his poverty; while, again, others regard it as the offspring of an animal poison, possibly emanating from the diseased flesh of camels and other animals. It is beyond our province or our power to settle this question as to the *vera causa* of plague, but it seems at least clear that, whatever its origin, it may be regarded, as at first, an example of septic lymphangitis.

Again, in regard to typhus, we have much the same evidence to show how seriously the lymphatic system is affected.

There is in typhus, as in the plague, an early and general implication of the glandular system, but in typhus the blood itself is infected at an earlier date. There is, indeed, some reason to believe that typhus and plague are very closely related, *e. g.* Virchow, remarking on the present epidemic of plague in the East, observes, "We know that the characteristic symptom of typhus is not only swelling of the lymphatic glands, but also the tendency to ulceration of the latter. If the same could be proved of the plague we might say that both diseases are connected; but we have no right to do this so long as the only outward similitude of both processes consists in the swelling of the glands."†

Billroth has made the condition of the lymphatic glands in

* Dr. Dickson on the "Plague," in the 'British Medical Journal,' March 8th, 1879.

† Professor Virchow on the "Plague," in the 'Brit. Med. Journal,' March 8th, 1879.

typhus the subject of a very full and copiously illustrated monograph, and to this I must ask permission to refer my readers for further information.*

Diphtheria also presents points of resemblance to erysipelas, not only in its diffuse character, but also in involving the nearest lymph glands. Dr. Aitken remarks, "The lymphatic glands to which the lymphatics of the pharynx lead are found in cases of diphtheria to be larger, redder, and moister than natural; and if the disease has continued long, they become brittle, pale, and of a brightish red colour on section, characteristic of inflammation of their substance. When the discharges from the pharynx are fetid, and the mucous membrane sloughy, not only are the glands behind the angles of the jaw enlarged, but the connective tissue in which they are placed is the seat of the effusion of serum, and even the exudation of lymph, so that very general swelling of the parts is the result."†

Lastly, in typhoid fever the lymphatics play an important *rôle*. The most characteristic lesions of typhoid are found in the lymphatic system; thus, "the abdominal complications of typhoid are mainly due to lesions of the solitary and aggregate glands of Peyer, and to enlargement of the mesenteric lymphatic glands. This lesion in the ileum is especially recognised as the 'anatomical sign' of enteric or typhoid fever" (Aitken).

Klob describes a peculiar and fatal affection of the bowels, lymphatic glands, and lacteals, in the 'Allgemeine Wiener Medicinische Zeitung' for Dec. 15th, 1874, which to some extent resembles typhoid fever, but differs from it in some important particulars. The patients after exhibiting signs of peritonitis for the most part died comatose. The most important post-mortem changes were found in the spleen and lymphatic system. The spleen was much enlarged and very soft. All the lacteals, lymphatic vessels, and glands of the abdomen were inflamed; the thoracic duct was filled with blood; the mesenteric glands were enlarged, soft, and engorged, and the lymphatics connecting the two were the

* Virchow's 'Archiv,' vol. xxi, 1861.

† 'Science and Pract. of Med.,' Dr. Aitken, 5th edit., vol. i, p. 567.

subjects of marked hyperplasia. Klob considers the cases to belong to a group related to pseudo-leukæmia (*i.e.* lymphadenosis) on the one hand, and to typhoid fever on the other. These references to the nature and extent of lymphatic infection in some zymotic diseases, though brief, are sufficient for our present purpose, as they serve to show to what a large extent the lymphatic vessels are made the channels for conveying the different poisons throughout the system. I may, perhaps, have an opportunity of amplifying my views upon this subject at a future time, but shall for the present at least here leave the question.

CHAPTER VI.

ADENITIS.

SIMPLE—SYPHILITIC—SCROFULOUS—TUBERCULAR VARIETIES.

I NOW pass on to speak of diseases of the glands, and first, of the various kinds of inflammation of these organs. As has been already pointed out, the glands are very generally affected along with the lymphatic vessels; but they are also independently attacked, and it has been thought more convenient to defer the consideration of these diseases to the present moment. I purpose treating in this chapter of simple, syphilitic, scrofulous, and tubercular adenitis.

Simple adenitis may be preceded and induced by lymphangitis, when as, *e. g.* a corn or a pinched finger leads to an inflamed gland in groin or axilla; or it may occur independently of any affection of the afferent vessels. Even in septic adenitis there may be no traceable affection of the tubes; thus in Paget's case, the swelling of the axillary gland was the first symptom of infection, but this is the rare exception. Whether occurring apart from lymphangitis or as its sequel, the symptoms are the same; the gland, be it popliteal or inguinal, axillary or cervical, swells, and becomes hot and tender. Pyrexia is present in proportion to the extent and severity of the local inflammation. There is a great tendency to suppuration, but the affection may also terminate in resolution or in a chronic hypertrophy.

When the gland suppurates, the softening commences at the centre in all acute cases, but when the process is a slow one, the cellular tissue outside the gland is prone to become first affected. When the suppuration advances from the

afferent vessels we find both these and the lymph paths, and lymph sinuses, together with the whole cavernous structure of the gland, loaded with pus. Cornil, who has made a special study of the lymphatic glands in disease, says that all the cavities of the gland are filled with pus, like the pores of a sponge with water.*

Finally, both the cavities and the surrounding cellular tissue become converted into puriform islets choking the reticular structure of the gland. In such a condition it is easy to understand with what difficulty lymphatic circulation must go on; there must, indeed, be frequent and absolute stasis. Thus it happens that to some degree adenitis becomes protective to the system when the inflammation is of a specific type, as will be seen more fully in Chapter VIII. Every attack of adenitis, however slight, imperils and impedes lymphatic circulation, and leaves the gland as a rule permanently damaged as a transmitter of the incoming lymph; the first gland thus becomes a barrier, and often, as, *e. g.* in the case of virulent bubo, a perfectly efficient barrier against the further passage of the poison.

The stasis of lymph must of course tend to œdema, and thus we generally find that adenitis is followed by some swelling of the parts below; though unless several glands are affected the degree of œdema will be inconsiderable.

Instead of suppuration, however, resolution may occur. This is more to be hoped for if the patient is not markedly lymphatic in habit, and if the cause is entirely removed; as it can easily be, *e. g.* in the case of a corn. It not unfrequently happens, however, that even in these cases some permanent enlargement of the gland continues as a witness for the remainder of life of the attack of adenitis.

This simple form of adenitis is sometimes caused by direct violence, as by a blow on the gland itself, or the inflammation may, as has been stated, be sympathetic; thus a corn on the foot, or an ulcer on the penis, or a balanitis, may any of them occasion an attack of inflammation of the femoral or inguinal glands.

* "Des altérations anatomiques des ganglions lymphatiques," par V. Cornil, in the 'Journal de l'Anatomie,' Aug., 1878.

It is not necessary to deal with septic adenitis as a disease *per se*, it does not differ, so far as regards the adenitis, from the simple form; the further significance of the condition has been considered under the head of septic lymphangitis, but I must, before speaking of the other forms, say a few words about the general mode of invasion, symptoms, and treatment of simple adenitis.

As may be inferred from what has gone before we find that adenitis has three modes of invasion: 1. By the lymph vessels themselves becoming inflamed, and thence spreading the flame to the gland. 2. By contiguity of inflammatory action in the surrounding cellular tissue. 3. By certain irritants being conveyed along the lymphatics to the glands, without producing any angeioleucitis on their way. We have examples of the first form in adenitis following erysipelas and dissection wounds; and of the second in many forms of traumatic adenitis where the cellular tissue receives the primary injury, and also in many cases of strumous adenitis when the mischief has commenced outside the gland; of the third mode of attack we have illustrations in syphilitic and cancerous adenitis.* From whatever direction the gland is attacked, the symptoms of inflammation observe the same order, and lead to an acute or subacute adenitis, or in some cases to a mere hypertrophy of the gland substance.

Acute adenitis is early announced by swelling and tenderness of the gland attacked. The pain is of a lancinating character, increased by pressure and movement. It soon becomes excessive, and there is pyrexia. The skin shortly becomes red and glazed over the swollen gland, and if the cellular tissue has hitherto escaped it now becomes involved,

* Syphilitic adenitis is not always unaccompanied by lymphangitis; it sometimes happens that a penile chancre is followed by acute lymphangitis of the body of the organ with much pain, œdema, and manifest thickening of the lymphatic tubes; the dorsal vessel in particular can often be felt as a thick tender cord, running from the chancre towards the groin, where it terminates in the sympathetically affected gland. When this happens it is often difficult and indeed impossible to retract the prepuce to examine the chancre from time to time, but if free and frequent sub-preputial injections of black-wash or lead lotion be employed no fear need be entertained of the integrity of the glans being endangered.

and adds much to the enlargement of the part. Fluctuation is detected (when the inflammation terminates, as it so often does, in suppuration) in a few days, sometimes being superficially, at others deeply situated. If an incision be now made into the abscess, some healthy pus is evacuated which differs much in quantity according to the position of the suppurating focus. If the pus be derived from the cellular tissue between the gland and the skin it is small in quantity, and its evacuation does not materially lessen the tumour; if, on the contrary, it be in the gland itself, or in the planes of cellular tissue beneath the gland, then the quantity escaping is generally considerable, and the decrease in the size of the tumour very marked.

Besides terminating in suppuration, adenitis may end in resolution, as before stated, or in chronic thickening and enlargement of the gland.

Resolution may be always hoped for when the inflammation is sub-acute, and the patient otherwise healthy; it is much favoured by rest and cold, though sometimes still better by heat. Resolution is frequently incomplete, but the gland remains hard and large though no longer tender. Some fixation to the surrounding structures also takes place, rendering the gland much less freely movable than before the attack, and it is ever after prone to inflame on slight provocation.

I have often seen patients who have been the subjects of repeated attacks of simple adenitis, in whom each attack has left fresh mischief behind, *e.g.*, burrowing sinuses and chronic suppuration of gland and surrounding cellular tissue, and in whom much difficulty has been experienced in healing the residual ulcers. The discharge in these cases is sometimes considerable, and often offensive. The best method of dealing with such a state of things is, I believe, the following:—First slit up all the sinuses, and scrape away the lining granulation tissue; if there be blue overhanging edges, rub them away with potassa fusa, and then wash out the abscess and sinus cavities with some antiseptic. I owe Dr. John Day, of Geelong, Australia, a debt of gratitude for suggesting a method of disinfection in such cases, which I certainly think superior to all others. In a little pamphlet he kindly sent

me he urges the value of nascent oxygen as a disinfectant for the use of wounds. He also states, what I find to be perfectly correct, that nascent oxygen is given off from peroxide of hydrogen on coming into contact with pus. This interesting fact he turns to surgical account. Most of the essential, and some of the fixed oils possess the property of absorbing atmospheric oxygen and converting it into peroxide of hydrogen. Amongst others, oil of turpentine, oil of lavender, eucalyptus oil, benzine, kerosin, &c., possess this property in a high degree. He therefore suggests as a clean and perfectly unirritating application, a mixture composed of benzine 14 parts, oil of turpentine 2 parts, and oil of lavender 1 part. This may be applied on lint to wounded surfaces with the best results, owing to the property possessed by the freely formed peroxide of hydrogen of liberating nascent oxygen on coming into contact with blood or pus. The disinfectant known as "Sanitas" probably owes its virtues to similar properties. Dr. Day further states, that the agents mentioned are also capable of liberating iodine from iodide of potassium; for example, if a solution of iodide of potassium be poured into some lint saturated with the benzine and turpentine, it becomes gradually stained brown, and slowly and steadily deepens in colour. This I find to be the case, and I am therefore strongly inclined to advocate this dressing for such sores as those to which I now allude—unhealthy and offensive cavities left after the evacuation of matter from suppurating lymphatic glands. The part should be dressed daily with dry lint saturated previously in the mixture given in the formula above; and if additional stimulation is needed, a solution of iodide of potassium (water and iodide in equal parts) may be poured onto the prepared lint. I find this dressing answer better than either iodoform, or glycerine and carbolic acid, or, indeed, any other application I have tried in the peculiar cases to which I refer.

I have thought it necessary to say thus much as to the treatment of suppurative simple adenitis; some further reference will be made to the subject under the subsequent headings, and I may now pass on to syphilitic adenitis, as I have nothing of interest, beyond what common sense

dictates, to say about the diagnosis and prognosis of these cases.

Syphilitic adenitis.—Under this head I shall consider the various forms of bubo (with the exception of the simple sympathetic form already dealt with) met with in the groin—these are the virulent bubo, the multiple bubo, and the "bubon d'emblée;" or, as it might be termed, the primary bubo. In all the course may be acute or chronic, painful or painless, all *may* suppurate, but the first-named is the only one which does so of necessity. Both glands and surrounding tissue are often involved in the inflammation. "When adenitis and peri-adenitis are combined, the former is usually primary."*

The glands may be affected in one or in both groins—the position of the initial lesion has something to do with this. Auspitz states, that "a chancre situated on the sulcus coronarius gives the highest percentage of double adenitis, chancre on the outer lamella of the prepuce the next highest, and chancre on the orifice of the urethra the lowest percentage."†

Virulent bubo.—This term is applied to those cases of adenitis which, following a chancre, nearly always a soft one, inevitably go on to suppuration; and in which the discharged pus is capable either of auto-inoculation, or of producing a chancre, similar to its parent, in a healthy individual. This form of adenitis generally follows the appearance of the chancre in the course of a week or ten days; it is accompanied with acute pain, the gland soon becomes red as well as tender, and swells to a considerable size; very generally the cellular tissue about the gland is affected as well as the gland itself. The cell proliferation is great, and all the cavities of the gland are completely choked until no further passage of lymph is possible. The further progress of the case differs according to the patient's constitution. In the otherwise healthy a free opening is quickly followed by recovery; in less healthy, especially in strumous subjects, the skin becomes

* See Dr. H. Auspitz, "On Buboes in the Inguinal Region," translated in the 'Amer. Journal of Syphilog. and Dermat.,' 1874, p. 146.

† Loc. cit., p. 277.

much undermined, and forms blue, overhanging edges, while the gland itself, large, and riddled with sinuses, is detected at the bottom of the wound, as a partially loose, rocking mass. The capability of auto-inoculation distinguishes this from any other form of adenitis.

Multiple bubo.—This form of bubo is rather a condition of inguinal adenopathy than of inguinal adenitis, and is the almost invariable sequel of the indurated or "*par excellence*" the infecting chancre. It is later to appear than the former, three or four weeks often elapsing between the appearance (itself late) of the initial lesion and the advent of glandular infiltration. The multiple bubo is as a general rule painless; it may, like any other chronic painless swelling, be irritated and become painful and acutely inflamed, but, as a rule, the hypertrophy proceeds slowly from gland to gland, until all the superficial inguinal glands are affected without giving rise to any pain at all. The glands rarely attain a larger size than that of a small walnut; they are very hard, and freely movable. The existence of an indurated sore, and the slow and painless progress of the adenopathy, are sufficient to establish a diagnosis. The pathological anatomy of the gland does not differ in any essential from the condition described as marking the previous form.

Bubon d'emblée.—The existence of this form, which I would propose to term the primary bubo, has been disbelieved in by some syphilographers, but personally I entertain no question as to its occasional occurrence. There is no more reason why the poison of syphilis should not be absorbed through an unbroken cuticle and conveyed without local lesions along the lymphatics to the nearest gland, than that the poison of variola or any other undoubted "contagium vivum" should not enter the system without evident breach of surface. But not only is there no *à priori* reason against such an occurrence, there is positive evidence that the phenomenon does happen. I have myself seen a case in a gentleman of most careful and observant habits, where impure coïtus was followed in the course of a month by an inguinal adenopathy, without any trace of cuticular lesion, which was followed by general systemic infection.

When this accident does happen some doubt will probably be felt at first as to the character of the enlargement, the circumstance that it is slowly followed by the invasion, first, of the gland next in order, and then, one after another, of the entire chain, will probably clear up the diagnosis before an outburst of secondaries renders its nature unmistakable.

Treatment.—As a simple adenitis resulting from an injury or from simple lymphangitis (sympathetic adenitis) may terminate in resolution, our efforts should be directed to bring about so desirable a result. Rest, absolute rest if possible, I place in the fore front of the treatment. The patient should not be allowed to leave his room or his sofa until the acute symptoms have subsided. Leeches, from four to twelve, according to the extent of inflammation and the strength of the patient, may be applied, followed up with warm fomentations. After careful observation I am inclined to prefer warm applications to cold ones in these cases, as being equally calculated to favour resolution, and as being incomparably more agreeable to the patient. Should the inflammation have proceeded too far for resolution to take place, then the hot applications (whether poultices or fomentations, matters not) will do good by promoting suppuration. I advise this method of procedure after a very fair and prolonged trial of many methods which have had strenuous advocates : of strong mercurial solutions (Malapert and Reynaud), of silver nitrate (Sir Henry Thompson), of a seton (Bonnafont), and of acetate of lead (Zeissl). If fluctuation occurs, then the treatment of a simple adenitis and that of a virulent bubo are the same. The gland should be *freely* opened from end to end, and all the pus evacuated. With this view it has been suggested to exhaust the cavity with a syringe, but I have not seen the necessity of resorting to this method.*

After expressing all the pus from the abscess cavity, the wound should be dressed at first with lint soaked in glycerine

* Grünfeld was, I think, the first to advocate this plan, and, consequently, highly lauds it. Out of fifty cases so treated twenty-seven were cured; the rest required further surgical interference. The average period of time occupied was about three weeks. I cannot call this a brilliant result. *Vide* 'Schmidt's Jahrbücher,' June, 1870, p. 278.

and carbolic acid (1 in 8), and as soon as suppuration has subsided, with iodoform—iodoform 1 part, cerat. cetacei 7 parts. Light pressure with a spica bandage should also be employed. This treatment will suffice to conduct the majority of cases to a successful issue; but should the skin become undermined, should sinuses burrow here and there, as they will at times, or should the gland itself become, as it were, dissected round by suppuration of its environing cellular tissue, further treatment is required.

For such a condition of things nothing better can be done than to adopt the treatment before suggested under the head of simple adenitis—slit up the sinuses, destroy the blue overhanging edges with potassa fusa, and apply dry lint, previously rendered antiseptic by being passed through the solution of benzine, turpentine, and oil of lavender. Pressure with a pad and spica bandage completes the dressing.* The caustic should be rubbed upon the tissues until a black sticky pulp is formed, which separating speedily leaves healthy granulations. The same agent is efficient in removing the gland itself, should this step prove necessary; if due care be exercised, however, the gland may be more speedily, and quite as safely extirpated with the knife.

It not unfrequently happens that adenitis, whether simple or virulent, whether leading to suppuration or stopping short of this, leaves a chronically enlarged and, to some extent, a painful gland behind it; and we must now consider how this state is to be dealt with.

Here again I might refer at length to a vast variety of treatments adopted and supported by respectable authorities: to Ricord's plan of covering the tumour with mercurial ointment, to Reynaud's treatment by puncture with white-hot irons, to Von Sigmund's iodine applications, &c.; but I will rather content myself with detailing the method I have found most successful.

* I once had a remarkable case, which my friend Mr. W. Whitehead saw with me, of a gentleman who consulted me with inguinal buboes and troublesome fistulæ. We traced the fistulous tracks from within an inch or so of the umbilicus down to the glands in the groin, which were enlarged and painful, and from thence backwards to a fistula in ano, which proved to be the *fons et origo mali!*

When suppuration has ceased and the gland continues large and somewhat tender, or when such a condition long exists even without suppuration, I am in the habit of injecting tincture of iodine into the substance of the gland by means of a subcutaneous syringe. From five to ten minims should be injected, the fluid being distributed over different parts of the gland. The injection should not be repeated for a week, and not then if absorption is proceeding; for I have repeatedly noticed, that when absorption is once started, no matter how, whether by iodine or electricity, or "massage," or pressure, it goes on uninterruptedly until all the hypertrophied structure has disappeared. Even if this plan of injection do not lead to absorption, it will probably promote suppuration so that the tumour will, though by another means, be equally successfully removed. Sometimes, it is true, no good results from this treatment, then I try pressure; the best means of applying it with effect being a sufficiently strong and well-fitting truss. Unguentum Hydrargyri may be smeared upon the gland prior to adjusting the truss, but I do not think it does any good. Of "massage," as applied to the treatment of inguinal adenopathy, I know nothing personally, any more than I do of what the French call *écrasement*, which is an attempt to procure dispersion of the glandular hypertrophy by very violent handling and squeezing of the tumour. I am, however, quite inclined to believe that both these methods may occasionally prove of service.

Volkmann's spoons will sometimes prove valuable, used to scrape away the granulation tissue from the lining of old sinuses. Should none of these methods succeed, I should be inclined to have recourse to repeated blistering, or (I believe) Maissoneuve's method of introducing caustic *flêches* into the substance of the gland, but, as I have said, I have never found such a course necessary.

Neither the multiple bubo nor the primary bubo calls for any local treatment, as neither of them tends to suppurate or is favorably affected by local treatment, and as both are the expression of the first stage of systemic infection.

Scrofulous adenitis.—Perhaps the commonest sign of scro-

fula is glandular swelling, ending in slow suppuration and caseation. Every one is familiar with the scarred necks of strumous folk who have suffered and recovered from this complaint. It is pre-eminently a disease of childhood and early adult life, and its tendency is markedly towards elimination and recovery. If we examine a gland in a comparatively early stage of strumous adenitis, we find that it cuts somewhat like a potato and shows a marked increase of the connective tissue of the gland; this embryonic form of connective tissue is largely increased along with evident cell proliferation in the follicles, while the reticular structure of the gland is separated into small islets. M. Cornil, whom I have previously quoted, says, in the memoir referred to, "the scrofulous change is consecutive to chronic irritation of mucous and cutaneous surfaces in a predisposed subject. It consists essentially in a chronic inflammation of the connective tissue of the lymphatic glands, and in the formation of fibrous bands which intersect the glands and separate the reticular structure into islets." "Subsequently to this process the circulation in the gland diminishes, and the islets undergo caseation. This caseation with sclerotic change are the last terms of this scrofulous evolution."

There can be no doubt that these changes simply amount to chronic inflammation in subjects of a peculiar diathesis. The tendency to inflammation is one factor, the tendency to caseation is another. "To sum up in a few words," says Billroth, "what is usually meant at the present day by scrofulosis; it may be described as a disposition to chronic inflammation of the membranes, bones, and joints, in which inflammatory process may lead to the development of granulations, suppurations, and caseous degeneration. Individuals are very commonly called scrofulous in whom swellings of the lymphatic glands, even if resulting from temporary irritations, run on for a long time, or even increase independently of any fresh peripheric stimulus."* I do not think I need add anything to this description of a complaint so common and well known as strumous adenitis, but may at once proceed to the question of treatment.

* 'Billroth's Surgery,' vol. ii, p. 107, translated for the New Sydenham Society.

Treatment of strumous adenitis.—I need not detail the general or constitutional treatment which is so all-important in these cases, or dwell upon the importance of fresh, and especially sea air, combined with proper and sufficient food, and proper and sufficient clothing, but shall confine myself to the consideration of local applications, as they alone are subjects of dispute.

Every means should be tried to prevent suppuration, but if it occurs, as most probably it will, the matter should be at once evacuated through a sufficiently large opening to allow of the shreddy flakes of fibrous tissue and inspissated pus being at once thoroughly removed: the aspirator is therefore a bad instrument, because it does not permit of the extraction of these membrane-like substances. After complete evacuation the gland should be dressed with glycerine and carbolic acid, for with the dry antiseptic lint before mentioned, and a firm compress applied. The hypertrophy and sclerosis left behind may often wisely be left alone; if the constitution improve, time will deal with these remnants very efficiently and satisfactorily; if, on the other hand, the health grows worse, then it is still more desirable not to interfere. Occasionally, however, the hard and hypertrophied glands are a real trouble to the patient; and then, if desired, attempts may be made to promote their absorption by the injection into their substance of a few minims of tincture of iodine. In some cases, when the number of affected glands is small, and the prospect of obtaining a cure by evacuation is small, extirpation may be practised. In this way I have successfully removed scrofulous glands from the groin and the axilla, as well as from various parts of the neck. Billroth warmly commends this method, as does also, among others, Mr. Rushton Parker, who details sixteen cases so dealt with, all of which were successful.*

Tubercular adenitis.—To what extent primary tubercular adenitis occurs I am not able to say; accepting the doctrine of

* 'Liverpool and Manchester Med. and Surg. Reports,' 1873, p. 47. Velpeau was one of the earliest advocates of enucleation of enlarged glands with the knife, and in his 'Leçons orales' gives a detailed description of the mode of operating in removing glands from various parts.

Buhl that tuberculosis is essentially infective, the result, that is, of the absorption of broken-down caseous matter, which is carried from one part to be laid down as a focus for fresh inflammatory action in another, primary glandular disease of this kind can hardly be said to exist. Be that as it may, when tubercular adenitis has developed, it is considered by some writers to be distinguished from scrofulous adenitis by signs sufficiently well defined. It is, they say, in tubercular deposits (and tubercular adenitis forms no exception to the rule) that the so-called giant cells are so freely formed; truly, their significance is lessened by finding them in growths of a simple non-tubercular character, but still they are stated to be especially abundant in tubercular adenitis. Besides this, according to M. Cornil, there is a marked difference between the tubercular and scrofulous affection in this, that in the former the changed and atrophied new cells do not separate from the reticulum to form distinct islets, as they do in the latter, but are incorporated with it.

I have thought it right to note this distinction between the tubercular and scrofulous affections of the glands, as insisted upon by some scientists; at the same time it is necessary to state that Schüppel, who is a good authority on the subject, entirely discredits the existence of any radical difference between the two—which doctrine, from a clinical point of view, I am compelled entirely to endorse. This being so, it need not be said that there is nothing to add either under the head of symptoms or treatment to what has been said when speaking of scrofulous adenitis. I may add that my friend and colleague, Dr. Dreschfeld, has abundantly demonstrated the links which bind scrofulosis to tuberculosis, and has also demonstrated the plentiful presence of giant cells in typical cases of caseous degeneration.

CHAPTER VII.

LYMPHADENOSIS.

DEFINITION OF LYMPHATIC DIATHESIS—SYMPTOMS, COMPLICATIONS, PROGNOSIS, DIAGNOSIS, AND TREATMENT OF LYMPHADENOSIS—CASES.

REGARDING lymphadenosis as a true diathesis, as indeed the strongest expression of the lymphatic temperament, I have sought for a good definition of this habit of body, but with imperfect success.* Laycock, whom I will quote, and who paid considerable attention to the subject of cachexiæ and diatheses, gives a very insufficient and not entirely reliable definition of this habit, which he classes with the adipose diathesis. More investigation in the matter of diathesis is needed, and would, I think, repay the time and trouble spent in the research. Paget's matured observations lead him more and more to believe in the universal heredity of cancer; however remote, there is a cancerous progenitor—the blue bar of the rock pigeon crops out after ever so many generations of pouters, fantails, and carriers—through a long course of time children may grow up and show no sign of cancer; but when it does appear it is inherited. There is a cancerous habit, and for this, as I have ventured to suggest on more than one occasion, the term epitheliosis should be used. In the same way there is a tuberculous habit and a scrofulous diathesis for which tuberculosis and scrofulosis are good and accepted terms; and thus, lymphadenosis may, I think, be considered as marking the lymphatic

* Lymphadenosis has several synonyms: *e.g.* it is described under the heads of Hodgkin's disease, adenia, lymphomata, pseudo-leukæmia, and vascular sarcoma of the lymphatic glands.

diathesis in its most accentuated form,* and differentiating it at the same time from the scrofulous. Laycock's definition of the lymphatic diathesis or cachexia is as follows :— "The lymphatic cachexia is a complex form with both a strumous and arthritic element. Its characteristics are large bones, largely developed head, and vascular system; early deposits of fat under the skin, in the omentum, the mammæ, the face. With these there is a want of osseous sympathy, a feeble muscular power, imperfect digestion, unsound teeth, acid breath, and other strumous signs. The predispositions are to tubercular disease in the early years of life up to twenty-five; to irregular gout after forty-five. Very often the accumulated fat is suddenly absorbed, leaving the individual thin and lank; or the contrary takes place, and the individual rapidly becomes loaded with fat— both changes occurring in consequence of depressing agencies."†

This definition cannot be accepted. Lymphatic dyscrasia, I am of opinion, often exists without any evidence of struma, and without any arthritic mischief. It is not necessarily associated with a largely developed vascular or osseous system, and indeed the contrary is more often the condition met with. Lastly, there is no marked tendency to either tuberculosis or gout. As Cuvier observed to the youth who defined a lobster as a red fish that walked backwards, the definition is inaccurate, since it is not red, it is not a fish, and it does not walk backwards. Before attempting to find a better definition, it is necessary to particularise the precise meaning of the word *diathesis* or *dyscrasia*, as here employed; and to distinguish between it and the word *temperament*, which is also frequently used. Temperaments may be defined as constituting certain constant differences between

* Jaccoud is of much the same opinion. Speaking of lymphadenosis he says, "The picture of this disease is exactly like that of the lymphatic form of leucocythæmia, but is wanting in the leucocythæmia." On account of this close resemblance he considers there are two varieties of one diathesis, which he styles the lymphogenic diathesis (diathèse lymphogène). Jaccoud, 'Pathol. Int.,' vol. ii, p. 1067.

† 'Med. Obs. and Research,' Laycock, 2nd edit., p. 103.

men and men *compatible with health*, and consisting of differences in the relative proportions of certain parts of the organism which thereby exercise a preponderating influence upon functions of the economy.* Diatheses signify such innate and hereditary constitutional conditions as to *necessarily* lead to the outbreak of some local or general disease peculiar to the diathesis.† According to this definition, diathesis signifies a more marked degree, a greater intensity of temperament. Probably the old division of temperaments into the sanguine, lymphatic, bilious, melancholic, and nervous, is as good as any more recent classification.‡ M. Richeraud gives a fairly good description of the lymphatic temperament ('Nouveaux Elémens de Physiologie,' 6th ed., t. ii, p. 516); he says, "in this temperament the body is of considerable size, owing to the excessive development of cellular tissue. The muscles are soft, the skin pale, the hair fair or ash coloured, the pulse feeble, slow, and soft. All the vital actions more or less languid, the memory imperfect, the attention not sustained."§ This on the whole may be taken as a fair definition of the lymphatic habit.

Now we have only to accentuate this description a little to have a sufficiently accurate picture of the lymphatic diathesis. General flabbiness of mind and muscle characterises this condition. Everything is an effort, "the grasshopper is a burden," and the spirits are miserably low and depressed. Generally acid dyspepsia is a troublesome symptom, and the glandular system early shows a tendency to hypertrophy. In this stage the condition may divaricate either into leucocythæmia or into genuine lymphadenosis.

* This is very similar to Halle's definition of temperaments, *vide* 'Dict. des Sciences Méd.,' t. 54, p. 460.

† For definition of diathesis, see Laycock, op. cit., p. 88.

‡ For a statement of the opposite view *vide* 'Physiologie des Tempéramens,' par F. Thomas, Paris, 1826.

§ H. M. Husson, in his 'Essai sur une nouvelle doctrine des tempéramens,' 2nd edit., credits the lymphatic system with playing a predominant part in the body. He remarks:—"Les maladies de la constitution lymphatique attaquent ou les glandes ou les vaisseaux blancs. Ainsi le cancer, le scrofule, le carreau, l'endurcissement du tissu cellulaire, les dartres, les différents espèces d'hydropsies, les bouffissures, les croûtes lymphatiques, &c., &c., sont les affections les plus communes à ce tempérament" (p. 25).

It may be objected that this use of the words temperament and diathesis is too arbitrary, and that if followed up rigorously every living being must be classed in some temperament or another, and consequently as showing proclivity to some forms of disease. This is to a great extent true, but nevertheless the phraseology has decided advantages if not pushed to fanciful extremes. Billroth says "It could serve no good purpose to exclaim against the use of the words 'dyscrasia' and 'diathesis.' It will do no injury to science if we continue to use these expressions in the accepted sense. It is still convenient to have a designation for these things, since the latter are not imaginary, but are founded upon observations verified during centuries, although the interpretation has become variously changed in form in the course of time."*

What then are the characters of this supreme expression of the lymphatic diathesis, termed Lymphadenosis? It is necessary to define this complaint a little more fully.

Definition.—Lymphadenosis is a disease primarily of the lymphatic system, characterised by the enlargement of the lymphatic glands; sometimes of one or more groups, sometimes of all the glands in the body. There is a marked absence of tendency to suppuration even when the glands attain a great size. Anæmia is always present. The spleen is generally enlarged. There is no leucocythæmia, but the number of red corpuscles is often diminished.

This generalised hypertrophy of the lymphatic glands most frequently commences in the cervical glands, especially in the submaxillary glands; a sort of glandular collar slowly encircles the neck, and gradually, as fresh glands are invaded (infected), the enlargement creeps down the sides of the neck. In some cases, but these are exceptional, the mischief does not extend further; more frequently other groups become affected, the axillary, the inguinal, and the mediastinal chains being those most often invaded. M. Hip. Larrey states that the French soldiers are peculiarly prone to develop this disease, and that in them it is often confined

* Billroth, op. cit., vol. ii, p. 104.

to the glands in or about the neck;* but, in England it is more general to find that the disease invades other chains. These glandular tumours increase, for the most part, painlessly, and are wonderfully slow to suppurate. I have seen a large lymphadenoma undergo caseous degeneration, and so naturally eliminate itself; but this is rare—as a rule they neither suppurate nor degenerate. As they enlarge and press upon and towards each other, they become gradually fused into one mass, and no longer constitute separate tumours. They may even infiltrate the skin almost after the fashion of malignant growths. The size of the separate tumours, especially in the neck and the axilla, is sometimes very considerable. I have seen a lymphadenoma removed from the neck, five inches in length and three in breadth, which weighed a pound.

Pari passu with the glandular hypertrophy the health slowly fails; for a time, sometimes even for a long time, there is no marked depreciation of health and strength, but sooner or later this does take place, and if, as is almost always the case, the malady progresses, the patient becomes more and more anæmic and debilitated, and finally dies from exhaustion, unless a more speedy termination has occurred from pressure of the tumours upon some vital part, such as the larynx, or trachea, or large blood-vessels.† The symptoms steadily deepen and very generally tend to death; the end may not come for some years, but, as a rule, it occurs within two years of the first manifestations; so that this disease, when once fully developed, must be regarded as (though perhaps somewhat less terrible because as a rule less painful) almost equally deadly with cancer.‡ It is not uncommon for a patient

* M. Hip. Larrey, 'L'adénite cervicale,' Paris, 1852. He also states what is interesting, that it appears to be a disease of recent evolution among French soldiers, since his father, the celebrated Baron Larrey, never met with it. It would be instructive to know what difference there was then in a soldier's necktie, and whether, supposing the statement to be correct, the phenomenon may fairly be attributed to the introduction of the rigid stock.

† Trousseau in his chapter on Adénie quotes the case of a young married woman who developed lymphadenosis in the third month of pregnancy, and for ten months continued in perfect health. He also states that in this case there was (as was proved post mortem) no hæmatic lesion or any affection of liver or spleen.

‡ Gowers gives details of 50 fatal cases: in 18 it lasted less than 1 year; in

suffering from lymphadenosis to fall a victim to some intercurrent disease; indeed, so commonly does this happen, that pleurisy, thrombosis, Bright's disease, pneumonia and erysipelas, must be regarded as complications of the disorder.

Post-mortem examination often reveals an even more extensive infection than had been anticipated. The *spleen* is generally affected to some extent; occasionally it is very hard, at other times it contains nodular growths "like bacon fat or suet" (Gowers); it is also often found adherent to other organs.

The *liver* is less frequently affected than the spleen, but is still now and then the seat of similar changes. "Occasionally the *retro-peritoneal glands* in front of the spine, surround and compress the solar plexus. When this is the case there may be bronzing of the skin, although the supra-renal bodies are healthy."*

The *kidneys* are affected in a considerable number of cases. So, likewise, is the *alimentary canal* itself. The *bones* even participate, their canals becoming filled with lymphoid cells. On the other hand, the *pancreas*, the *ovaries*, the *testes*, and the *heart* are, as a rule, unaffected, though the last-named organ is sometimes very small, and sometimes presents an example of intense fatty degeneration.

General and microscopical appearances of the glands.—The glands, which on section present a whitish or yellowish-grey appearance, differ widely in consistency, sometimes being very hard, at others very soft. The distinction between the cortical and medullary portions is entirely lost; but there is, as a rule, a marked absence of caseous degeneration, and when this happens the disease will be found associated with other evidences of struma. A juice may be expressed from the softer glands, the hard ones exude none.

On examination with the microscope, "all the cellular elements are found increased, the lymph cells in the alveoli, the connective-tissue cells of the trabeculæ, the capsules of the alveoli, and the network; thus the structure of the gland

15 between 1 and 2; in 6 between 2 and 3; in 6 between 3 and 4; in 3 between 4 and 5, and in 1 for more than 5. Reynolds's 'System of Med.,' vol. iv.

* Gowers, loc. cit., p. 316.

is gradually but entirely changed; the whole organ becomes a mass of lymph cells, although a fine network is generally preserved, into which the hard connective tissue of the capsule and of the trabeculæ is also transformed, while the blood-vessels are preserved and their walls greatly thickened; the cellular infiltration may be so great that an exact distinction between lymphoma and glio-sarcoma may be impossible at some points."* The main distinction between the hard and soft varieties consists in the larger development of fibrous tissue in the former; in the latter giant cells have occasionally been found, without other evidence of tuberculosis, which is only an additional proof of the slight value to be placed on the existence of giant cells as evidence of tuberculosis.

Etiology.—Enough has already been said to indicate that diathesis must be regarded as the most important predisposing cause to lymphadenosis, while some local irritation should probably take precedence of other exciting causes. In the case of the French soldiers, already referred to, this seems to be traceable with sufficient probability to the stiff military stock, and that local irritation is largely operative in starting the glandular enlargement, is a belief also entertained by such competent observers as Trousseau, Billroth, and Gowers.† Though not unfrequently associated with evident scrofulosis, the disease we are considering often makes its appearance at a later date than is common with scrofula. Hippocrates said: "Struma post annum vigesimum non fit," and ten centuries have only confirmed his accuracy; but lymphadenosis very often commences quite late in life. The most common periods are, however, early and late adult life.‡ Though not confined to either sex, it is three times more common in males than females. All lowering and

* Billroth's 'Surgery,' vol. i, p. 628.

† Trousseau, who considers that the disease is dependent upon a special diathesis, attributes much importance to sources of irritation about the nose and ears, &c. "In twelve cases of adenia," he says, "there were four in which there existed lachrymal tumours, a chronic coryza, and an otorrhœa" (vol. iii, p. 207). Wunderlich in a great measure agrees with Trousseau, but regards adénie as the first stage of leucocythæmia.

‡ Southey gives a table of 20 cases of adenoid disease, in 8 of which it commenced

depressing agents, such as cold, damp, insufficient food and clothing, predispose to the disease, which is therefore most frequently met with amongst the poor.

Symptoms.—Lymphadenosis can never be diagnosed until the glandular enlargement has made considerable advance: this hypertrophy, then, which generally begins in the neck, but may be first seen in the groin or the axilla, must be regarded as the earliest reliable symptom. The enlargement is often painless, but when unusually rapid is generally associated with sharp, shooting pains. In the young there is nearly always pyrexia, and even in adults the temperature generally rises. Gowers says fever is present in two thirds of all the cases. The course and even the character of the ensuing symptoms will be largely determined by the situation of the hypertrophied glands. If in the neck, cerebral, laryngeal, and tracheal symptoms will manifest themselves at a comparatively early date; if in the thorax, dyspnœa will be the most marked symptom; if in the abdomen, dyspepsia and various intestinal troubles will ensue; if in the groin, considerable œdema of the legs may follow. These symptoms are, in a word, the result of pressure and irritation, or both combined; thus, in the neck, pressure on the trachea may cause the most distressing dyspnœa, while irritation of the pneumogastric nerve gives rise to a troublesome and almost incessant cough. It is indeed to avert death from pressure that the surgeon is often induced to extirpate some individual tumour which threatens life, though he knows by so doing he cannot stay the progress of the general disease. In a word, he acts much as he does in cancer, removing a local trouble though with no hope of doing more than ward off impending death for a short time.* Dyspnœa, when it occurs, is often an early, always a distressing

between 9 and 15 years of age; in 3 cases between 15 and 25; in 2 between 25 and 35; in none between 35 and 45; in 6 between 45 and 55; and in 1 between 55 and 65, 'Barthol. Hosp. Reports,' 1873. Billroth somewhat dogmatically asserts that it never develops after 30, though of course it may be met with late in life.

* Trousseau relates how at the request of Amussat he once performed tracheotomy in the case of a gentleman with immense cervical adenia. The operation was most difficult owing to the size of the glands, and though he introduced a tube the

symptom; it is occasionally associated with a painless effusion into the pleural cavity, which is probably of the same passive character as the œdema of the lower extremities.

Along with the glandular hypertrophy, and the complications arising from pressure exercised on various parts, there is a progressive anæmia—sweatings are frequent and troublesome; the heart is weak, and syncope is not uncommon; while the blood often becomes distinctly paler to the naked eye, and has even "been compared to diluted claret" (Gowers); in which case the number of red corpuscles will be found notably diminished, although there may be no increase of white corpuscles. The patient almost always suffers from marked depression of spirits, or is hysterical; the nervous depression indeed is not unfrequently by far the most distressing of all the symptoms. The skin is pale and often moist.

Prognosis.—Lymphadenosis, when far advanced, is justly regarded as a highly, if not a certainly fatal disease; statistics would almost incline one to regard it as leading to death equally quickly with cancer; but I am strongly inclined to think that there is a tendency to exaggerate the gravity of the malady in its earlier phases. If the spleen be not implicated, if only certain groups of glands be affected, *e. g.* the cervical, axillary, and inguinal, and if the temperature be normal and steady, a fairly hopeful prognosis may be given. As may be gathered from the cases of E. H— and T. N—, recorded at the end of this chapter, there is every reason to believe that a complete recovery is possible; if, on the contrary, the spleen be much enlarged, if there be leucocythæmia, if the thoracic and abdominal glands participate in the disease, or, and this is a point to be especially attended to, the temperature be high and irregular, the prognosis is exceedingly bad, indeed, may be said to be uniformly fatal.

If this opinion be correct, it is manifestly of the first importance to make as early a diagnosis as possible.

Mode of termination.—In fatal cases, asthenia may be

patient died next day from pressure exercised upon the bronchi by enlarged bronchial glands; and although he recommends tracheotomy he justly considers it a forlorn hope.

regarded as the most common cause of death—the explanation probably being that, owing to the degraded state of the general glandular system, there is an insufficient supply of fresh healthy blood poured from the thoracic duct—next to asthenia, pressure exercised by the enlarged glands upon such vital parts as the trachea, bronchi, or œsophagus, ranks as the most usual cause of death. Hæmorrhage occasionally kills when the disease assumes a rapidly infiltrating form, as when a gland, having perforated its capsule, bursts into some blood-vessel. When not directly fatal, death is often ushered in by some intercurrent disease such as pneumonia or pleurisy, induced in a great measure by the lymphadenosis. In cases terminating favorably the enlarged glands may resume their former healthy dimensions, or remain permanently enlarged, but without showing any disposition to progressive hypertrophy.

Diagnosis.—The diagnosis of lymphadenosis consists in differentiating it from leucocythæmia, from struma, and from cancer. From leucocythæmia the diagnosis is to be made by an examination of the blood—the red corpuscles are diminished in number in lymphadenosis while there is no change in the number of white corpuscles—if a general glandular enlargement is associated, as it may be, with a marked increase in the white blood corpuscles, then leucocythæmia exists along with lymphadenosis; the former being not necessarily, or even probably caused by the latter, but both being due to a general dyscrasia, the lymphatic dyscrasia in its most pronounced form.

From struma, which like leucocythæmia, may, and not unfrequently does complicate the disease, a diagnosis is to be made by noting the remarkable immunity from suppuration which the (perhaps) enormously hypertrophied glands evince; the very opposite condition obtains in struma, here there is an early and strongly marked tendency to suppuration, and slow degeneration of cell growths and pus into caseous matter. Again, in struma the glands do not attain the size which they do in lymphadenosis, and only a small number (*e. g.* a single chain) of glands is affected at the same time; in lymphadenosis, on the contrary, several distant groups are

as a rule invaded, and perhaps the entire gland system throughout the body. Lastly, the growth is smooth and even in lymphadenosis, nodulated and uneven in struma.

From cancer, lymphadenosis is to be distinguished by its being primarily a glandular affection, a circumstance of extreme rarity in carcinoma; by the usually painless character of the enlargement; by the earlier age at which the disease makes its appearance; by the general freedom of the skin from the growths below; by the tendency which lymphadenosis has to attack the spleen, and to spare the other viscera; and lastly, by the fact that the type of the cell growth is lymphoid in lymphadenosis, and epithelial in carcinoma.

Pathology.—To some extent we have already indicated the pathology of the disease. Clinically, Wilks places it between tubercle and cancer, and Gowers fairly sums up all that can be positively said as to its pathology in the statement that "in order to explain the phenomena of Hodgkin's disease, it is necessary to assume the existence of a general dyscrasia affecting the lymphatic tissues, of different intensity and different operation in different cases, but existing in all."* This may be held as demonstrated—the enlargement is of two kinds, inflammatory and hypertrophic. "Hypergenesis," says Trousseau, "of the cellular elements of the gland is then, it appears, the principal anatomical fact in adenia."†

Treatment.—It is in the early stages of the disease that treatment may be expected to prove more than palliative, yet this treatment is rather general and medical than special and surgical: *imprimis*, all sources of irritation should be removed, the soldier's stock should be abolished, the girl's tight collar put aside, the ill-fitting or heavy truss should be exchanged for a lighter article, the carious tooth should be extracted.‡

Then careful attention should be paid to the hygienic conditions of the patient, good food and fresh air being

* Gowers, loc. cit., p. 342.

† Trousseau, loc. cit., p. 204.

‡ Larrey regards dental caries as an undoubted and frequent cause of the disease, loc. cit., p. 320.

the chief essentials. Remedially cod liver oil, iodine, and phosphorus hold the first places.* Cod oil is always indicated when there is the least taint of struma; and iron, Bravais's dialysed preparations being perhaps the best form to exhibit, should be given persistently. Iodine or iodide of potassium occasionally appears to be of service, but more good is likely to be obtained from the administration of phosphorus, owing to its property of inducing fatty degeneration of certain lowly organised tissues. If phosphorus be given, I should advise that the liquid solutions—alcoholic or etherial—be selected in preference to the solid forms. With the addition of glycerine a one per-cent. solution of phosphorus may be easily prepared, which will keep, without depositing, for any length of time, and of this doses may be given ranging from the one-fiftieth to the one-fifteenth of a grain twice or thrice daily. If by these means little or no effect is produced upon the glandular enlargement, then I am decidedly of opinion that an attempt should be made at extirpation. At a later period of the disease ablation of individual glands is occasionally practised to arrest impending death from pressure, just as we remove a carcinomatous tumour to relieve present distressing symptoms, without any hope or idea of staying the progress of the disease. In the earlier stages, however, operative interference may be employed with other and far brighter views. There is much reason to hope that if we can excise the affected glands there will be no further invasion of the system. M. Larrey, speaking from a large experience, observes: "La conclusion essentielle de ce fait général, la conséquence logique des succès obtenus par la chirurgie dans l'ablation de ces tumeurs cervicales chez les soldats, n'est ce pas evidemment qu'elles representent dans beaucoup de cas une affection toute locale, due à des causes simples et indépendantes d'une maladie scrofuleuse, ou de toute autre diathèse morbide."† Without going so far as to embrace the truth of the final assertion contained in this passage,

* Southey recommends the Woodhall Bromo-Iodine Spa as likely to prove beneficial.

† Larrey, loc. cit., p. 364.

which indeed I believe, for reasons before stated, to be quite erroneous, I can yet accept with entire agreement the assertion that early extirpation when feasible is often followed by a future and a final immunity from the disease.

When the disease has attacked several groups—cervical, axillary, inguinal, and perhaps mediastinal, it is obvious that this treatment can no longer be employed; still, in addition to the administration of internal remedies local measures may be employed, some at least of which are occasionally of real service, and to these I will now briefly allude, taking them in the following order:—Cold, injections, blisters, frictions, caustics, pressure, "massage," "écrasement," and electricity.

Cold applied by means of an ice-bag, or an ice-poultice (*i. e.* a linseed poultice in which are mixed lumps of ice), is occasionally useful when inflammatory symptoms are somewhat acute, and the local temperature high; beyond relieving pain, and perhaps for a time arresting cell-proliferation, this remedy is, however, of little value.

Injections have been very largely employed—many agents have been advocated, acids, alkalies, iodine—the latter I have myself used frequently, and am of opinion that in true lymphadenosis the remedy is perfectly useless. I say this although I am a warm advocate, as several of my published papers show, for the employment of iodine injections in many cases of glandular enlargement.

Counter-irritation, in the form of blisters or a seton, is a good deal used in France, and has been highly commended by M. Lavanier amongst others; having no personal experience of this remedy, I cannot speak as to its value.

Caustics.—I should certainly condemn these agents as in every way inferior to the knife, except in the pain they produce and the danger they provoke, in both of which respects they take precedence.

Pressure.—Of pressure, whether obtained by suitable bandages, or by frictions, or by methodical kneading (massage), or by crushing (*écrasement*), I must speak more respectfully. All these modes of employing pressure seem to have been occasionally attended with success. The most

judicious method of employing pressure will, to some extent, depend upon the locality of the adenopathy. If it be cervical, either frictions with a little Unguentum Hydrargyri, or persistent kneading of the part for twenty minutes each day, will be the best method of application. If it be inguinal, I should use a nicely fitting truss with a large pad, or a piece of sheet-lead fixed with a spica bandage.

Velpeau speaks highly of the very rough handling involved in the term *écrasement*. He recommends that the tumour should be seized between the fingers, or, better still, between two pieces of covered wood, and firmly compressed from the circumference. He further states, that under this treatment he has seen old-standing adenopathies quickly dissipated, after having previously resisted all other treatment.

Electricity.—Billroth states that he has employed the constant current in cases of lymphadenosis with success. I have no personal knowledge of the efficacy of this treatment, but certainly see no objection to its adoption. Gowers, on the other hand, speaks disparagingly of this remedy, but states that good has been effected by the administration of arsenic, of quinine, of iodide of potassium, of mercuric chloride, and of phosphorus. I may add that the same author discourages surgical operations in this malady when the temperature is high, and when the blood contains less than sixty per cent. of its normal proportion of red blood corpuscles; to both of which propositions I cordially subscribe.

As illustrating the milder types of lymphadenosis, and further as showing its occasional curability, I here record briefly the two following cases:

T. N—, æt. 34, a solicitor, of the lymphatic diathesis as defined at the beginning of this chapter, contracted a gonorrhœa in the spring of 1872, for which he consulted me. There was no peculiarity about the gonorrhœa except that it was followed by lymphangitis of the superficial lymphatics of the penis, which led to double inguinal adenopathy. The urethritis coming to an end I did not see him again for some time; in 1874, however, he consulted me, and then I found a very considerable glandular hypertrophy. He had left business feeling unequal to work, and stayed altogether at home. The entire chain of glands in both groins was much enlarged, several individual glands being of the size of pigeons' eggs; they were also tender to the touch. The cervical glands were also enlarged, and the submaxillary were so markedly affected that he looked as if he were growing

fat and developing a double chin. His spirits were wretched; he was as melancholy as Jaques, and moped all the day through. I examined his blood under the microscope, and found a marked diminution in the proportion of red corpuscles.

He went on from bad to worse, and I certainly thought he was drifting into leucocythæmia. The spleen, however, was not enlarged, and the liver dulness was normal in extent.

In casting about for a cause I was puzzled how much to attribute to heredity. His father was a healthy looking man, and his mother, though weakly, was not apparently of lymphatic or strumous habit, but his only sister was suffering from Addison's disease. I did not attend her, but Mr. N— informed me that such was the diagnosis made by, I believe, Dr. Wilks, and confirmed by Dr. Wilkinson, who attended her in Manchester. I could only suppose that a taint was cropping up in the second or third generation. As an excitant there was the gonorrhœa, which had clearly initiated the adenopathy, and without which it is probable the diathesis would never have been evoked.

The treatment I pursued in this case was such as I have spoken of in the text. My patient lived in the house, but in a room with an open window; he drank abundance of milk; he took Fer Bravais and Phosphorus in solution; he was allowed a pint of good claret daily, and when he gained a little strength he was sent to the seaside. Suffice it to say that after a few months the improvement was so pronounced that he returned to business, which he has, with nothing but the brief interruptions of short holidays, continued to attend to ever since, and at the present time, beyond being a somewhat melancholy gentleman, who sighs for very wantonness, he is as well as ever he was in his life. There is no enlargement of the cervical or submaxillary glands, but the inguinal glands are still somewhat more prominent than they were before the attack.

The second case I wish to mention is that of a girl in whom a different plan of action led to an equally satisfactory result.

E. H—, æt. 21, milliner, of lymphatic temperament, and the child of a lymphatic mother, noticed that a lump was beginning to form in her neck about the middle of 1874. The tumour was gradually succeeded by others, which appeared below the clavicle and in the axilla on the same side. At this time I saw her, and considered her to be suffering from evident lymphadenosis. The enlarged glands were smooth and elastic, and were not painful at first; subsequently the supraclavicular gland became tender to the touch, and she began to cough. On examination the lungs were found healthy and the spleen was apparently normal in size, but the glands in one groin were large and so were the pelvic glands. She was low spirited and feeble, with languid circulation and clammy hands. In the course of the ensuing winter the gland, which she first noticed as being enlarged, became more and more painful, eventually softened in the centre and then broke through the skin, discharging some thick cheesy matter. This was the only gland which at any time showed the slightest disposition to suppurate. She did not emaciate, but she was very pale and good for nothing, and her cough was most troublesome. Being of opinion that the cough was due to

pneumogastric irritation from the nucleal tumour I resolved, if permitted, to excise the painful gland. This I accordingly did in the early part of 1875, and found myself very much tempted at the time to proceed with the dissection and shell out a number of large glands at one sitting; I desisted, however, feeling convinced that there would be no end to such a procedure, and contented myself with enucleating but the one. The wound quickly healed, and I was pleased to find that the cough ceased; at the same time she was on general tonic regimen—drinking beer and eating beef, taking iron, and getting plenty of fresh air and exercise. I also gave her phosphorus in the form of an alcoholic solution of one per cent. strength; of this she took four minims in orange water three times a day for about three months with rare intermission. Without wearisome detail, suffice it to say that she steadily improved, and in the course of twelve months became, and has since remained, perfectly well, though there is still slight axillary and subclavicular glandular enlargement.

CHAPTER VIII.

SYPHILITIC AND CANCEROUS INFECTION OF THE LYMPHATIC SYSTEM.

UNDER this heading I proceed to speak of the mode in which the system is infected by the syphilitic poison and the cancer cell.

Syphilitic lymphatic infection.—The virus of syphilis after being received upon the abraded or sound cuticle, makes its way into the system through the orifices of the lymphatic capillaries. Should the local disturbance be considerable at the point of impact, acute inflammatory action ensues, and in all probability the virus is promptly dislodged along with much pus through the quickly forming ulcer or chancre; in such case we have a so-called soft or non-infecting chancre. The virus, however, probably travels beyond this point along the lymphatic tracks to the nearest inguinal gland; here for a time a stand is made against the further encroachment of the poison, indeed it may be that a final and successful stand is made, in which case, rapid cell proliferation leads to suppuration, and in the pus which escapes, the virus itself is discharged. In such a case we have what is termed a virulent bubo. If, however, instead of giving rise either at the point of primary impact or in the secondary affected gland to acute inflammatory symptoms, the poison lies dormant, or only gives rise to slow and little observed cell proliferation, another train of symptoms will result. In this case, the base of the initial lesion will become indurated from chronic inflammation with a densely packed body of cells, while in the gland similar changes will ensue. M. Collin has examined the glands at this stage and says that "the adenitis is characterised by tumefaction, and

by proliferation of the cells and nuclei of the sinus, at the same time by a slight cirrhosis or thickening of the connective tissue."*

These changes are slowly but surely repeated in the gland or glands next in succession. The barrier formed by the blocking of the lymph path at length breaks down, some cells escape from the outskirts of the blockade, or it may be the fluid itself (the "intercellular substance," as Billroth terms it) suffices to carry the poison along the efferent tube to the next gland, where a precisely similar scene is enacted; step by step, gland by gland, the poison slowly creeps on, on, weeks, it may be months, being occupied in the journey, until it arrives at the thoracic duct, and so (on an average in about two months) it is poured into the blood-vascular system, where its presence is announced by the outbreak of the syphilitic fever and an explosion of secondary manifestations. Even after it has entered the general circulation, however, it is in the lymphatic system that the poison continues to operate in a very great degree. The tonsils, which are but a congeries of lymphatics, ulcerate, the posterior cervical glands become affected, and it is in the cellular tissue (which is so largely composed of lymphatic vessels) of the internal organs that the poison gives rise to the later and more important lesions of syphilis. Thus, while some of the poison circulating in the blood gives rise to the various cutaneous syphilides, which are so many efforts to eliminate the virus, the greater part still continues to travel slowly along the paths of the lymphatics, and thus occasions the characteristic glandular and visceral disturbances. The final effects of the poison, *i. e.* the tertiary symptoms, all alike characterised by exudation, circumscribed or diffused, of a gummatous substance, differ from the earlier in no longer giving rise to sclerosis, but rather to a catarrhal affection of the glands. M. Collin, in the paper before quoted, says, that at this stage "the glands are white and hard, and exude a puriform liquid on scraping. On section the lymph vessels, sinus, and cavernous structure of the gland are all filled with large globular cells, which might be derived from the

* M. Collin, in the 'Journal de l'Anatomie et de Phys.' Paris, 1878.

endothelium, or might be the progeny of the lymph cells themselves. "In this form," he adds, "the adenitis may be said to be catarrhal in contradistinction to the former cirrhotic form." We have not here considered the exact nature of the syphilitic virus, whether it be a "contagium vivum" or not, nor is the correctness of the theory here adopted at all affected by this part of the question; it may, however, be remarked that analogy strongly supports the view of the virus really being of this nature. Lostorfer some years ago affirmed that he had discovered a cell peculiar to syphilis, a discovery very soon pronounced to be worthless, other observers affirming that the bodies he referred to were constantly met with in other diseases, and even when there was no disease present. I am myself inclined to think that we are not in a position to dogmatise on this subject; the bodies observed have the appearance of micrococci, bodies so minute that the highest powers of the microscope cannot satisfactorily analyse them. To the microscope many cells, notably embryonic cells, appear absolutely identical, and yet have a widely different life history: in pathological structures, too, the same holds good, many totally different structures possessing cells which are undistinguishable from each other by the microscope. Indeed, it is the macroscopic, rather than the microscopic examination which not unfrequently reveals their true nature. Hence it follows that the actual existence of a syphilitic "contagium vivum" is in no way invalidated by the detection of *apparently* identical bodies in diseases of a non-syphilitic nature.*

We may go further, and say there is much the same evidence for regarding syphilis as dependent on germs as there is for so regarding erysipelas; in both, micrococci, or bodies undistinguishable from micrococci, exist, though to a very different extent; but in neither does it appear possible by the use of the highest powers of the microscope to classify and distinguish these minute bodies.

Confirmation of the views adopted as to the manner in which the syphilitic virus travels and attacks different tissues

* For further remarks on this subject see paper by the author in the 'Liverpool and Manchester Med. and Surg. Reports' for 1876, p. 150.

and organs is afforded by the experimental evidence of inoculations.

The so-called non-infecting chancre is auto-inoculable—and so is the matter from the virulent bubo; both, too, reproduce similar chancres on sound individuals; at the same time, inoculations made with the blood or other secretion in such cases have invariably proved sterile.

Though the typical infecting chancre, on the other hand, is not auto-inoculable, it is inoculable in other individuals. Inoculations with the patient's blood and saliva have been frequently practised with results varying according to the distance of time from the date of infection. Thus, they have proved invariably unsuccessful when performed before the outbreak of secondary symptoms has announced the presence of the virus in the blood; while, after this has occurred, both the blood and saliva of the syphilised individual are capable of conveying the poison, and the secretions from secondary sores are found to possess a similar infective power.

These facts seem to me only explicable on the theory which I here advance.

Lymphatic infection of cancer.—Secondly, we must consider the mode in which carcinomatous infection takes place through the lymphatic system. It is well known that while cancers travel chiefly by the lymphatics, primary carcinoma is very rarely met with in the lymphatic glands, if, indeed, it is ever found there. Nor need this surprise those who are familiar with the histology of the glands and the neoplasm in question; the round, uniform lymph cells, so closely resembling white blood-corpuscles, differ *toto cælo* from the oval, or irregular, brightly nucleolated cancer cells, which are so manifestly of an epithelial type.

The epithelial cells thus naturally suggest themselves as the most probable parents of the various cancer cells, while the propinquity and close relationship of the lymphatics to the skin and cellular tissue, readily explain their selection of these vessels for travelling from point to point. It is thus evident that carcinoma does not necessarily originate in the connective-tissue corpuscles, but rather by an atypic proliferation downwards of the epithelial elements,

the connective tissue being secondarily affected; at the same time, it is true that, except in some cases of skin cancer, it is difficult to trace this progress. Meanwhile, such a distinguished authority as Billroth entertains no doubt of the invariably epithelial origin of the epitheliomatous division of carcinoma. "I must regard it," he observes, "as impossible for an epithelial cancer to occur primarily in a bone or lymphatic gland. The observations that I know to this effect do not seem to me sufficient proof, because the skin and mucous membrane are so near; there may have been an insignificant carcinomatous disease of the skin or mucous membrane as a starting point of the disease, without its having been noticed."* Thus in cases of what is looked upon as primary lymphatic cancer, it seems probable that the genesis of the new growth has been really in the dermic tissues, and that the abnormal cell or cells have been thence conveyed to the lymphatic gland, where they increase and multiply, and rapidly give birth to a tumour which attracts attention as the principal and probably single evidence of cancer. It is true that cancer cells have not often been observed *in transitu*, that is, in the lymphatic vessels between the primary focus of disease and the infected gland, but after the glands have become perceptibly infiltrated, the afferent vessels have always been found loaded with cancer cells.

It does not seem necessary, indeed, that there should be any direct conveyance of cancer cells to insure cancer infection; it is at least probable that the cancer juice itself may answer the purpose. The cells seem to impress their qualities upon the juice so that it becomes equally potential with the cell elements in propagating the disease. So perfect indeed is this property of imprinting its special characters upon its surroundings that the secondary growths are faithful reproductions of the original neoplasm.

Now, whether the infection be carried by the juice or by an actual cell or cells, the further development in the gland must happen in one or other of the following ways; either by

* Billroth's 'Surg. Pathology and Therapeutics,' translated by Dr. Hackley, 1875, p. 650.

(endogenous) multiplication of the imported cells, or by conversion of the lymph cells into cancer cells. The first method is easy of comprehension, nor is the latter method at all improbable; for while it would be irrational to look for the evolution of lymph cell into cancer cell *suâ sponte*, as it were, it is not irrational to conceive such an evolution under the influence of "a cross" between the cancer cell and the lymph cell, when, in scientific jargon, the spermatic influence of the former would be impressed upon the latter; it seems likely enough that under such influence the resultant cells would approximate to the epithelial rather than to the lymphoid type.

Dr. Creighton, who finds in the pathological states of the female breast homologies with its physiological conditions at different periods, attributes not only carcinoma to altered epithelium, but also argues that the cells of sarcoma represent a morbid type of epithelium.

He maintains that the waste epithelial products of the gland by their accumulation either in the acini, or in the peri-acinous connective tissue, give rise to tumours. He also endeavours to prove that the character of the tumour—that is, whether it turns out to be encephaloid, or scirrhus, or enchondroma, depends upon the position of the cells and the precise stage of physiological unfolding of the gland mimicked by the neoplasm. Thus, "if the epithelial waste products distend the acini, encephaloid cancer results; if, on the other hand, they infiltrate the surrounding tissue, scirrhous cancer is produced. Coming still nearer to the full excitation, and parallel with the mucous changes in the vacuolated cells, myxoma is developed; while the highest state of excitation is marked by the formation of enchondroma."*

Dr. Creighton thinks that the neighbouring lymphatic glands are secondarily infected by the pigment cells, which act either upon the lymphoid cells, converting them into their own likeness, or undergo rapid self multiplication. These views of Dr. Creighton's bear so forcibly upon the general question of glandular infection by cancer, that I have thought

* Dr. Creighton, 'On the Phys. and Path. of the Breast.'

it desirable to refer to them, although they are not as yet generally accepted.

The arrest which takes place in the gland first invaded, is easy to explain, for there is no free passage for the encumbered lymph through the gland; it must pass through or between cells closely packed. "The cells of the gland are like the particles of a charcoal filter," says Creighton, "the lymph percolates through them, and wells out on the other side, as it were, filtered and purified." In cancerous infection, instead of being filtered and purified, the change is one of vitiation and degradation.

I am not aware of any observations which come so near an actual demonstration of the mode of infecting lymph glands with cancer, as those made by Dr. Hoggan and reported by him in the 'Path. Trans.' for 1876.

Inter alia, he states, "By prolonged exposure to the contagion of the plug of cancer cells within the lymphatics, the endothelial cells, which form their sole wall, become cancerous, their nuclei begin to swell and become more pellucid, while, although the cells retain their shape and position, they seem to change their nature." Again, he remarks:

"The one thing needful for the development of secondary cancers from the lymphatics is the presence of groups of secondary cells in close proximity to cancerous lymphatic walls.

"When a secondary or lymphatic cell becomes infected, it gradually increases in size in all its elements, and if originally irregular in shape becomes egg-shaped. The cell substance proper becomes more pellucid and refuses to stain in colour, appearing to become vacuolar, which, however, it does not, but rather reminds one of the external swelling undergone by a pellet of hard gelatine, when it is first steeped in water. This swelling goes on until the cell has reached a comparatively enormous size, when the substance proper seems to melt away as a fluid, thus fixing its nucleus (or nuclei), which now become the actual cancer cell.

"The nucleus of the wandering (or lymph) cell thus having become the cancer cell, may increase in size to above 200 times the size of the original cell."

If this be accepted as reliable testimony, I do not see what is wanting to complete the description of cancer evolution in lymphatic glands. I think, too, *àpropos* of this question, we should refer to Mr. Bryant's experiments of grafting pieces of a negro's cuticle into the granulating sore of a white man, as very significant of the evolution of carcinoma and of morbid neoplasms generally. He found that the pigmented character of cell was communicated to all the newly formed cicatricial cells of which the dark cells were the parents.* The implanted cells, like a flying column, or rather a body of hostile settlers, obtain their supplies from the enemy's country, but after a short residence imprint their stronger nature and special characteristics upon those native to the soil with whom they come in contact.

In Mr. Bryant's case the pigmented cells formed a patch twenty times the size of the transplanted grafts in ten weeks, which would be a creditable rate of progress even for such rapidly growing neoplasms as the carcinomata.

Briefly summarising these views as to lymphatic infection —in syphilis we have a virus, possibly a "contagium vivum," invading the body through the lymphatics, finally passing into the blood current, self-multiplying, and vitiating the fluids in which it lives and moves and has its being. In cancer the disease depends upon an hereditary dyscrasia, *epitheliosis*, which predisposes certain, probably injured, epithelial cells to assume the morbid habit of their (perhaps) remote ancestor; these altered cells (or juices) travel downwards to the connective tissue, where they readily gain access to the lymphatic system, and thence travel freely from part to part, the vicious likeness of the parent cells being perpetuated either by actual endogenous cell growth or by "crossing" with the lymph cells; and thus, as one vicious lad may infect a school, so a single cancer cell may be the direct cause of a general dyscrasia.

* Bryant's 'Surgery,' 2nd edit., vol. i, p. 163.

CHAPTER IX.

LYMPHATIC METAMORPHOSES, REGRESSIVE AND PROGRESSIVE.

Having, in the preceding chapter, discussed the manner in which the lymphatics are affected and infected by the poison of syphilis and such neoplasms as cancer, I must now proceed to consider the other metamorphoses to which the lymphatic system is subject.

Regressive metamorphoses of lymphatic glands.—The lymphatic glands are subject to the various degenerations met with elsewhere, *i. e.* we find them undergoing an atrophic change, as well as fatty, calcareous, caseous, and pigmentary metamorphoses.

In old age the glands habitually waste, sometimes even totally disappear. This atrophy is simply due to a lessened blood supply (anæmia producing aplasia), and can scarcely be regarded as a morbid process.

The common result of inflammatory change is to induce *sclerosis* of the gland structure. This sclerosis must not be mistaken for fibromata, which occasionally, though rarely, occur as new growths in the lymph glands. The sclerosis resulting from adenitis may persist as such, or may, and more frequently does undergo a further, fatty change. This *fatty* metamorphosis may transform the whole gland into adipose tissue, constituting what has been termed a pseudo-lipoma. It is rare to find the lymph glands in a state of *fatty* degeneration, except as the result of inflammatory action.

The *amyloid* change sometimes accompanies similar changes elsewhere, as *e.g.* in the spleen or kidneys; I have also seen

it in cases of prolonged suppuration from caries in the neighbourhood of the lymph glands. Virchow states that it "consists on the one hand in a thickening and narrowing of the arteries of the gland so that they convey less blood, and on the other hand, in the conversion of the small cells contained in the individual meshes of the follicles into corpora amylacea, so that afterwards, instead of a number of cells in any mesh of the follicles, a single large corpus amylaceum is met with. Thereby the gland acquires, even to the naked eye, the appearance as if it were sprinkled all over with little spots of wax, and when examined microscopically it looks as if the contents of the follicles were a pavement of closely set stones." (Virchow's 'Cellular Path.,' translated by Dr. Chance, p. 382.)

Such changes must of course interfere with the passage of lymph, and hence lead to a diminished supply of fresh cells to the blood stream. The amyloid degeneration affects the internal, and especially the bronchial glands, more frequently than others, though single glands in the neck and elsewhere are occasionally the seat of this metamorphosis (O. Weber).

The most frequent and most important of all the degenerations is the *caseous*, to which, however, reference has already been made under the head of strumous adenitis. Suffice it now to say that at first there is a diffuse inflammation of a chronic character; then the gland enlarges, and on section, either the whole or part of it is converted into a cheesy substance with large admixture of fat cells. The degeneration may be regarded as the result of lymph stasis, and interference with the circulation of the blood in a diathetic patient, giving rise to molecular death. In this degeneration the trabeculæ themselves may sympathise.

Eventually the caseous change may become one of regular *fatty* degeneration, or may pass into a *calcareous* metamorphosis. Occasionally the glands are the seat of *pigmentary deposits;* and in the case of the bronchial glands, this is indeed a condition frequently encountered.

Progressive Metamorphoses.—Besides the hypertrophy which the lymph glands undergo in inflammation in certain

fevers, such as typhoid, &c., and during pregnancy, they are the seat of certain neoplasms—fibroma, enchondroma, sarcoma, and carcinoma.

All these formations are, as a rule, of a secondary kind, primary glandular tumours of all forms are rare, except in the tonsils, when they seem to be as frequently primary as secondary. Thus, *e.g.* O. Weber states that, out of 1003 tumours of all sorts, 14 were tonsillar; and of these 7 were primary, and 7 secondary. The primary tumours were epithelioma and medullary sarcoma; the secondary were all epithelioma.

Glandular neoplasia are developed either from the lymph cells, or from the fibrous network of the glands; medullary sarcomata and carcinomata are formed from the first; enchondromata and fibromata from the second source.

Fibromata are extraordinarily rare, though they have been met with in association with fibromata elsewhere.

Enchondromata are also very rarely met with, and are almost always of a secondary character. Weber, however, states that he once removed such a formation from behind the parotid, which he believes to have been primarily developed from a lymphatic gland.

Lymphomata are best divided into simple lymphomata and lympho-sarcomata.

In *simple lymphomata* we merely have increase of the lymph cells and the reticulum; such progressive metamorphoses are illustrated by the ordinary hypertrophy of lymph glands, as, *e. g.* is often seen in the tonsils and the intestinal follicles.

In *lympho-sarcomata* the cells increase in greater proportion than the reticulum, and appear larger than ordinary lymphoid cells. We must distinguish between the hard and soft forms of lympho-sarcoma. The *soft* lympho-sarcomata have a fluctuating soft consistence, and a very thin reticulum. Giant cells have been found in them.

The *hard* lympho-sarcomata are the usual forms assumed in lymphadenosis, but both forms are met with. The fibrous network and envelope of the gland are more prominently developed, but the nature of the cells resembles the former

variety. They give rise to metastatic tumours in the spleen, heart, and tongue.

Carcinomata.—As stated in the preceding chapter, it is doubtful whether primary glandular cancer ever really occurs; it is certain that if it does it is an extremely rare occurrence.

Paget says: "As a primary disease, scirrhous cancer of the lymphatic glands is very rare; the cancer which most frequently appears first in them is the medullary."*

I once saw, with Mr. E. S. Bishop, an interesting case of scirrhous cancer of the inguinal glands, which I may here mention. The patient was an old man, suffering from symptoms of intestinal obstruction, on account of which I was consulted. There were a couple of very hard tumours in the groin, one in each, which had been mistaken for herniæ, but which were, I ascertained, glandular enlargements. Rallying for a time he again fell ill, and died in a month or two with symptoms of brain disease. On examination after death the inguinal tumours proved to be scirrhous cancer of the inguinal glands, and at first it looked as if they were the only diseased parts; on further investigation, however, it turned out that each inguinal tumour was connected by a cord (lymphatic tube?) running beneath the parietal peritoneum to meet its fellow in the walls of the abdomen close to the umbilicus. At this spot there was a nodule of scirrhus, and thence I suppose the glands had been originally infected. Pursuing the examination, further deposits were found in the liver and the lungs; the brain was not examined. Here then was a case which, had it not been for the autopsy, would probably have been classed as a case of primary carcinoma of the glands. I am of opinion that no credence should be given to such a diagnosis unless confirmed by a thorough *post-mortem* examination.

Though primary cancer is rare, secondary cancer in all its forms—epithelioma, scirrhus, encephaloid, colloid—is very frequently met with in the lymphatic glands.

* Paget's 'Surg. Path.,' edited by Turner, 1863, p. 604.

APPENDIX ON GIANT GROWTHS.

The subject of giant growths, mostly congenital, which has been alluded to in the text of this essay, is so interesting in many respects, that I have thought it desirable to add a few words concerning it in this appendix, and at the same time to give a brief abstract, in the form, as it were, of a catalogue *raisonné*, of the cases collected by Busey in his work on 'Congenital Occlusion and Dilatation of Lymph Channels.'

Without going so far as to say that all giant growths are due to lymph stasis, which would manifestly be overlooking the important part played by the blood-vascular system in many remarkable hypertrophies, it may be affirmed that in by far the majority of such cases the chief fault is in the lymphatic system, the hyperplasia being for the most part the result of organisation of exuded and stagnant lymph. This lymph is capable of building up not merely such lowly tissues as the connective, but is transformable into bone and fibrous tissues; thus a most important part in nutrition, in growth and development, is played by the lymphatic system, and it is not surprising to find that a disturbance of equilibrium is followed by eccentric and frequently monstrous developments.

The cases are as follows. In each instance I have appended the reference as given by Busey, and have specified the sex and age whenever these particulars are mentioned in his compendium.

Case 1.—Female, æt. 1. Nodulated elephantiasis (congenital, but increased up to death) of right leg. Died of enteritis. *Autopsy.*—Peyer's and mesenteric glands enlarged; large multilocular cystic tumour taken for devastated lymph glands in abdomen; vesicles contained lymph; thoracic duct not discovered; tubular lymphangitis. (Busey.

Case 2.—Female, æt. 46. Immense hypertrophy of right leg; lymphorrhœa; recurrent attacks of erysipelas. (Med.-Chir. Trans., Lond., vol. ii, p. 63, 1817.)

Case 3.—Male, æt. 25. Left leg below knee elephantiasic; nodulated; non-congenital. (R. J. Graves, Dub. Hosp. Reports, vol. iv, p. 521, 1877.)

Case 4.—Female, æt. 52. Elephantiasis of left leg; recurrent erysipelas; lymphorrhœa; ligature of femoral; non-congenital. (Kappeler, Chirurg. Beobacht. aus dem Kantonspital Münsterlingen, p. 260, 1865, 1870.)

Case 5.—Male, æt. 28. Elephantiasis of right leg; non-congenital; traumatic; lymphangitis; amputation. (Prof. Bryk in Cracow. Oester Zeitschr. für pract. Heilkunde, vol. xv, No. 11, p. 325.)

Case 6.—Fœtus. Giant growth on scalp of lymphatic origin; lymphangioma. (H. Steinwirker, Dis. Inaug., Halle, 1872.)

Case 7.—Male fœtus. Giant growth on head; lymphangioma. (Cited by Steinwirker, Dis. Inaug., Halle, 1872.)

Case 8.—Male, æt. 11 days. Elephantiasis of leg. (Monatschrift für Geburtskunde,' Bd. 29, 30, 1867, p. 346.)

Case 9.—Female, æt. 10 months. Immense lymphatic hypertrophy of right leg; much venous stasis. (St. Barthol. Hosp. Reports, vol. v, p. 147, 1869.)

Case 10.—Female, æt. 15 years. Elephantiasis right thigh and leg; congenital; much venous stasis. (Ibid., vol. v, p. 150.)

Case 11.—Male, æt. 3. Lymphangioma in axilla; congenital. (Monatschrift f. Geburtsk., Bd. 29 and 30, 1867.)

Case 12.—Female, æt. 6. Elephantiasis of right arm; congenital. (Busey.)

Case 12A.—Child, æt. 20 months. Doubtful case of lymphangioma on back of neck and thorax. (American Journ. Obs., vol. iv, p. 719.)

Cases 13, 14, 15, 16, 17, 18, 19, 20, 21, 22.—All cases of giant growths of fingers and toes, the pathology of which is left doubtful.

Case 23.—Male, æt. 19. Elephantiasis of right leg. (Lancet, vol. ii, p. 140, 1858.)

Case 24.—Female, æt. 6. Giant growth (distinctly lymphatic) of left hand; congenital. (Kappeler, l. c., 1865, 1876, p. 246.)

Case 25.—Child, æt. 10 months. Elephantiasis of leg. (Chicago Med. Journal, vol. xxvi, p. 707, 1869.)

Case 26.—Male, æt. 7½. Lymphatic hypertrophy of fingers of right hand. (Gazette des Hôpitaux, No. 116, October 3rd, 1857, p. 463.)

Case 27.—Female, æt. 14. Giant growth of finger. Doubtful pathology. (Busch, in Langenbeck's Archiv für Klein Chir., vol. vii, p. 174, 1861.)

Case 28.—Male, æt. 20. Giant growth of left foot. Doubtful pathology. (Busch, l. c.)

Case 29.—Child, æt. 3. Giant growth of finger. Doubtful pathology. (Annandale, Malformation of Fingers and Toes, p. 5.)

Case 30.—Male, æt. 16. Giant growth of left arm and especially left hand; chiefly hypertrophied fat; amputation. (MacGillivray, Aust. Med. J., vol. xvii, p. 9, 1872.)

Case 31.—Female, æt. 16. Hypertrophy of toes. Doubtful pathology. (Annandale, l. c., p. 8.)

Case 32.—Sex not stated. Congenital hypertrophy of toes. Doubtful pathology. (Lancet, vol. ii, 1864, p. 549.)

Case 33.—W. T., æt. 19. Giant growth of index and middle fingers of left hand; chiefly hypertrophy of fat and skin. (Virch. Arch., vol. lvi, p. 421.)

Case 34.—Male, æt. 20. Giant growth of left side of thorax and arm. Doubtful pathology; congenital. (Ibid., p. 416.)

Case 35.—W. C., æt. 15. Hypertrophy of left arm, &c. Doubtful pathology. (London and Ed. Journ. of Med. Sc., vol. iii, p. 198.)

Cases 36 and 37.—Cases of giant growths of toes and fingers of doubtful pathology; all congenital. (Ibid.)

Case 38.—Male, æt. 78. Giant growth of right arm and right leg. (La Lancette Française, Mg. 8, 1858, p. 215.)

Case 39.—Female, æt. 3. Hypertrophy of left lower limb.

Case 40.—Female, æt. 16. Giant growth of second and third toes; bones, &c., all enlarged. (Cited by Busch, l. c.)

Case 41.—Male, æt. 19. Elephantiasis of left leg; scattered lipomata; congenital. (Revue Photographique des Hôp. de Paris, 1872, p. 283.)

Cases 42, 43, 44, 45, 46 and 47.—All cases of giant growth of fingers and toes. (Reported by Adams, Monthly Journal of Med., vol. xx, p. 170. Annandale, l. c., and Curtis, Med.-Chir. Trans., vol. xxvii, p. 337.)

Case 48.—Female, æt. 10. Enormous hypertrophy of whole of right leg and foot, subsequently of left arm and hand. Died of phthisis; no autopsy. (Virch. Archiv., vol. xl, p. 353.)

Case 49.—Male, æt. 7. Enlargement of leg commenced at two years of age; lymphorrhœa. (Trans. Clin. Soc. Lond., vol. ii, p. 104, 1869.)

Case 50.—Male, æt. 17. Lymph varices and lymphorrhœa from left thigh. (Demarquay, Mem. de la Soc. de Chir. de Paris, Tome iii, p. 139.)

Case 51.—Female infant. Elephantiasis of right lower limb; lymph varices. (Paterson, Edin. Med. Jour., vol. xvi, p. 1012.)

Case 52.—F. N., æt. 19. Elephantiasis of right thigh; abscesses; lymph varices; lymphorrhœa; non-congenital; tuberculosis. (Thilesen, Zeitschrift f. Klinische Med., Bd. vii, p. 447, 1856.)

Case 53.—Male, æt. 22. Elephantiasis of right thigh; lymph varices; lymphorrhœa; lymphangitis; not congenital. (Lancet, 1866, vol. ii, p. 37.)

Case 54.—Male, æt. 3. Lymph varices of perinæum. (Hamilton, Buffalo Med. Journ., vol. vi, p. 11, 1850, 1851.)

Case 55.—Male, æt. 29. Lymph varices of perinæum; congenital; lymphorrhœa. (Zambaco, l'Echo Med., Tome iii, p. 66.)

Case 56.—Male, æt. 28. Lymphorrhœa from left thigh; not congenital. (Archiv f. Klinik Chirurg., Langenbeck, Bd. xxx, p. 674.)

Case 57.—Male, æt. 18. Lymph scrotum; not congenital. Died of phthisis. (Müller, Hufeland's Jour., Feb., 1822, p. 81.)

Case 58.—Male, æt. 10. Lymph scrotum and lymphatic fistulæ. (Hensen, Archiv f. die Gesammt. Phys. des Menschen und der Thiere, Bd. x, p. 94, 1875.)

Case 59.—Calf, new-born. Case related by Virchow of occlusion of thoracic duct from thrombosis of external jugular vein. (Virch. Archiv, vol. vii, p. 130.)

Case 60.—Male, æt. 19. Amussat's case, cited by Borschet, of a youth with

enormous lymph varices in groins and dilatation of thoracic duct. (Breschet, Le Système Lymph., Paris, 1836, p. 200.)

Case 61.—Male, adult negro. Enormous lymph varices in groin. (Amer. Journal Med. Sciences, vol. xvi, p. 436.)

Case 62.—Male, æt. 15. Very similar case to Amussat's (Case 60). Not congenital. (Gaz. des Hôpitaux, July 5th, 1864.)

Case 63.—Male adult. Probable lymph varices in groin. (Petit Gaz. des Hôp., 1864, p. 482.)

Case 64.—Male, æt. 30. Probable lymph varices in groins; lymphangitis; lymphatic œdema. Probably not congenital. (A. David, Inaug. Thesis, Paris, 1865.)

Case 65.—Female, æt. 16. Lymph vesicles on abdomen; lymphorrhœa; probably not congenital. (Fetzer, Archiv f. Phys. Heilkunde, 1849, p. 128.)

Case 66.—Male, æt. 45. Lymph vesicles on abdomen; lymphorrhœa. Died of phthisis. (Manchester Med. and Surg. Reports, vol. i, p. 104, 1870.)

Case 67.— ——. Hypertrophy of scrotum and thighs; lymphangiectasis; lymphorrhœa; not congenital. (Verneuil, Bull. de la Soc. Imp. de Chir. de Paris, 2nd series, vol. viii, p. 312, 1868.)

Case 68.—Male adult, Hindoo. Lymph scrotum; not congenital. (Med.-Chir. Trans., vol. xlv, p. 189, 1862.)

Case 69.—Female, æt. 7, living. Giant growth of right lower limb; cyanosis; lymphorrhœa; not congenital. (Trans. Clin. Society London, vol. ii, p. 116, 1869.)

Case 70.—Child, æt. 2. Macroglossia; congenital. (Virch. Archiv für Pathol. Anat. und Phys., vol. vii, p. 126, 1854.)

Case 71.—C. R., æt. 15. Macroglossia; congenital. (Observed by Billroth in Langenbeck's Clinic.)

Case 72.—G. S., æt. 7 months. Macroglossia; congenital. (Billroth.)

Case 73.—Female, æt. 10. Lymphatic angioma of nose and eyelids; not congenital. (Le Courrier Méd., No. 50, December 12th, 1874, p. 394.)

Case 74.—Male, æt. 15. Macrochilia; congenital. (Pitha and Billroth, Surgery, vol. ii, Div. 1, part ii, p. 268.)

Case 75.—Male, æt. 2 months. Lymphangioma of right half of thorax and lumbar region. (Langenbeck's Archiv, vol. xii, p. 685.)

Case 76.—Male, æt. 17 months. Lymphangioma in perinæum as large as an infant's head; congenital. (Virchow's Archiv, vol. lxiv, p. 497, 1869.)

Case 77.—Female, æt. 19. Lymphangioma of left groin and thigh; not congenital. (Langenbeck's Archiv, Bd. xii, p. 646, 1870.)

Case 78.—Male, æt. 22. Lymphangioma of right half of thorax; not congenital. (Bryk, Œster. Zeitschr. für pract. Heilkunde, vol. xv, p. 141, No. 41.)

Case 79.—Female, æt. 50. Lymphangioma of lymphæ; probably congenital. (Bryk, l. c., p. 249.)

Case 80.—Female, æt. 14 months. Lymphangioma on mons veneris; congenital. (Bryk, l. c., p. 208.)

Case 81.—Female, æt. 32. Lymphangioma of vulva; not congenital. (Phil. Med. Times, September, 1875, p. 801.)

Case 82.—Female, æt. 32. Lymphangiectodes of vulva and adjoining parts; lymphorrhœa; probably not congenital. (Carl Hecker, Die Elephantiasis, 1858.)

Case 83.—Female, æt. 25. Enormous lymphangioma of buttock; congenital. Very carefully reported, with detailed account of structure of tumour, and wood-cuts. Died of tuberculosis. (Archiv für Klin. Chir., vol. xvii, p. 357.)

Case 84.—Male, æt. 31. Elephantiasis of right thigh; lymph varices; lymphorrhœa; lymphangitis. (St. Thomas's Hosp. Reports, new series, vol. v, p. 295.)

Case 85.—Female, æt. 1. Probable occlusion of thoracic duct, with resultant dilatation and rupture of lacteals and intestinal lymphatics generally. On tapping large quantities of chyle escaped. Patient alive at date of observation. (Winiwarter, Jahrbuch der Kinderheilkunde, &c., vol. xi, Nos. 2 and 3, 1877, p. 196.)

Case 86.—Female fœtus. Giant growth of right lower extremity. A preparation. (Cuny, Dissert. Inaug. Grissen, 1865.)

Case 87.—Male, æt. 9. Giant growth of left leg and foot; congenital. (Toledo, Med. and Surg. Journal, vol. i, p. 129, 1877.)

Case 88.—Female, æt. 23. Lymph varices; lymphorrhœa; left thigh and adjoining parts; not congenital. (W. Petters.)

Busey gives the history of each of the above cases *in extenso*, and comments upon the most remarkable. It will be seen, by glancing at this synopsis, that they are not all cases of giant growth, nor are they all congenital. They do, however, comprise the majority of cases of giant growth which have been recorded, and enable us to form an opinion as to the cause and nature of such monstrous development. In order to illustrate the degree to which such growths may attain, it will be desirable to select one as a type, and relate it a little in detail. For this purpose I select No. 48 in Busey's work, which he describes as the most extraordinary instance of giant growth on record.

Augusta B—, æt. 10. The right leg was nearly as large as the rest of the body, and appeared like the leg of a well-nourished, strong man. The foot was colossal for even such a leg, and the toes were enormously enlarged. The bones of the foot were everywhere enlarged. The colour of the leg was a fresh flesh, the foot had a purplish hue. Temperature of leg normal; foot cool. The skin appeared shining; was neither dry nor flaccid, not traversed by ectatic veins or œdematous, possessing normal resistance, and showing no indications of disease. The right leg measured 28½ inches in length, the left 21 inches; the right was 16 inches in circumference, the left 9½ inches. In addition to this condition of the leg large lipomata were situated on the back and above the crest of the ilium. The posterior wall of the left thorax was stained with a diffuse superficial nævus, and in the centre of the sternum lay a network of varicose cutaneous veins, which extended downwards to the umbilicus; a similar one occupied the anterior external side of the left humerus. The lymph glands upon the left side of neck and along the inferior maxilla were hard, movable tumours, united in strings, and some-

times crowded in groups. Between the left nipple and shoulder were two uneven, small, flat, movable tumours, and in the axilla, and upon the inner side of the left arm, was a network of hard, nodulated, movable, thin cords, over which the skin was occupied by light yellow-coloured vesicles, from hemp-seed to bean size. Similar nodules and vesicles were situated on the inner aspect of the left arm, which was also of giant dimensions as compared with the right.

The abnormal conditions were observed at birth. The child was otherwise healthy, grew fast, and walked at eleven months of age. She continued well up to four, when an erysipelatous attack invaded the left arm. These attacks subsequently became recurrent, sometimes resembling erysipelas, sometimes lymphangitis. The giant growth continued to increase from birth to death, which occurred in her tenth year, from phthisis pulmonalis. No autopsy.

Although there is no *post-mortem* record in this case, it so closely resembles others in which an examination has been made, that it may be unhesitatingly taken as an example of the size to which such growths may attain. Now, in nearly all these cases the only active pathological agent is evidently the lymphatic system, the lymphatic capillaries more particularly, the blood-vascular system is in the great majority of instances in no way affected or disturbed. It is evident that the loss of equilibrium is due to a lymphatic error, and is directly caused by the presence of lymph in the tissues in abnormal quantities. Does not this fact suggest a more important rôle for the lymphatic system in normally conducted growth and development than is usually assigned to it? does it not indeed serve to show that many of the more simple tissues, such as the fibrous, areolar, and osseous, are in a great measure fed, maintained, and developed by the circulation of the lymph ?

In a better fashion the lymphatic circulation resembles a stream which, receiving the sewage from one district, serves not only to carry this refuse away, but in its passage supplies nourishment to other districts through which it travels.

This at least is the inference which I deduce from a study of these giant growths, and this view of the physiology of the lymphatic system I must leave to future observers to confute or to confirm.

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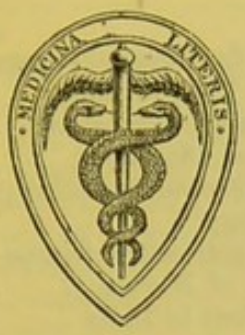

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