tency, present a smooth, pale surface, scattered with fine striæ and slightly yellowish spots. Later, they are firmer than natural; their capsule is thickened and their surface mammillated; their size is at first normal or exaggerated, but they gradually become atrophied, in virtue of the tendency of the tissue of new formation to contract, and, according to the greater or less extent of the nephritis, this atrophy will be general or partial. In one case, the cortical substance was only two millimetres in thickness, the columns of Bertin were small and atrophied, and the whole medullary substance was of a yellowish and lardaceous appearance. Consecutive to the changes in the stroma, an alteration occurs in the active elements of the kidneys. The Malpighian corpuscles, compressed by the connective tissue, are soon atrophied, and several of our observations make mention of this atrophy together with adhesion of the capsule to the renal parenchyma. The epithelium gradually undergoes fatty degeneration. In addition to this form of degeneration, we sometimes find amyloid, lardaceous, or waxy degeneration, which partially obstructs the diminution in volume; but the latter is always an indirect alteration similar to that occurring in cirrhosis of the liver due to syphilis."

With regard to the diagnosis of this form, and that produced by the abuse of alcoholic stimulants, Lancereaux says: "Interstitial parenchymatous inflammation due to the immoderate use of spirituous liquors is more general; it leads to more complete atrophy, and does not usually occasion upon the surface of the organ the deep and cicatricial depressions of syphilitic inflammation."

Circumscribed Form, Gummy Tumors.—Gummy tumors, though rare, still exist in the kidneys as in other organs. In one of Lancereaux's cases, upon the surface of the kidneys, and in the thickness of the cortical substance, were found small tumors of the size of a pea, of firm consistency, of a yellowish color, and presenting, under the microscope, the usual cellular and nucleolar elements of gummy deposit.

Cicatrices upon the surface of the kidneys are the result of the advanced stage of the preceding forms, and are due to the absorption of the normal elements of these organs. "They present a strong resemblance to the depressions and cicatrices which succeed hæmorrhagic deposits, but the latter may be recognized by the ordinary integrity of the fibrous capsule, and the presence of the coloring matter of the blood. They stand in some relation to the blood-vessels, and are constantly associated with disease of the heart."

Syphilitic affections of the kidneys may be attended or not with albuminuria. In the latter case, the prognosis is not necessarily serious; in the former the contrary holds good, the usual symptoms produced by uræmia may ensue, and, although the affection is usually of long duration, the termination is commonly fatal, and death often takes place suddenly from coma.

CHAPTER XX.

AFFECTIONS OF THE NERVOUS SYSTEM.

No department of syphilography has been studied so extensively and so thoroughly, within the past ten years, as that relating to the effects of syphilis upon the cerebro-spinal axis. Syphilitic nervous affections are very numerous, and are now generally conceded to be of frequent occurrence. Our knowledge of them has been extended, and facility and certainty in their diagnosis increased by numerous monographs and reports of cases which have been published, especially during the last five years.

My limited space compels me to describe these affections briefly, and I shall be unable to refer in detail to the writings of various authors.

Syphilitic nervous affections may be developed as early as the sixth month and as late as the twentieth year after infection.

They are seen more frequently in men than in women, and are most common between the ages of twenty and thirty, simply because syphilis is most likely to be contracted at this period of life. It seems to be an established fact that nervous phenomena are likely to follow a course of syphilis in which the external manifestations have been insignificant, or so slight as to have been entirely overlooked.

Syphilis does not primarily attack nervous tissue, but begins in surrounding or investing structures. For instance, lesions of the meninges, or of the bones, induce softening or induration of the brain. These lesions are peculiar in their distribution; they rarely involve an entire hemisphere, or all parts of any particular region; they are limited in extent and unsymmetrically arranged. Thus, one hemisphere may be involved in two places, and there may also be a lesion of the cord, or the surface of the brain may be attacked at the same time with one or more of the large cerebral arteries, and, as a result, irregular and incongruous nervous symptoms are exhibited. Associated with hemiplegia, there may be optic neuritis, mydriasis, or paralysis of one of the cranial nerves, or even paraplegia.

The brain is more frequently attacked than the spinal cord. Our knowledge of the effect of syphilis upon the cerebellum is very limited.

The prominence and constancy of some of the nervous phenomena of syphilis enable us to recognize them as distinct affections, namely, subacute meningitis, hemiplegia, epilepsy, paraplegia, and aphasia, and certain others of minor importance.

Predisposing Causes of Syphilis of the Nervous System.

Nervous symptoms are especially likely to appear in persons of a neurotic or neuropathic constitution, which may be hereditary or acquired. Chorea, migraine, apoplexy, melancholia, and neuralgia are common features in the family history of such individuals. Those who have previously had some simple nervous affection are particularly liable, when infected by syphilis, to the development of specific nervous symptoms. Protracted mental anxiety, depressing emotions, sexual excesses, the abuse of alcohol and of narcotics, have been known to act as predisposing causes. Of diseases, those accompanied or followed by cerebral congestion, also malaria and other conditions producing cachexia, may act indirectly. Sunstroke and injuries of the skull may be included, as well as the gouty diathesis, particularly in elderly persons, and in those in whom gouty cerebral symptoms have been prominent.

The inadequacy or the absence of treatment, in relation to the invasion of the nerve centres by syphilis, should be observed. In reading the histories of cases thus far reported, it is found that in many no treatment at all had been attempted, in some the treatment had been insufficient, while in very few had it been carried to the extent which we deem necessary in even the slightest cases.

The nervous phenomena of syphilis generally originate in lesions developed in one or more of the following structures:

1. The Cranial Bones and Vertebræ.
2. The Dura Mater.
3. The Arachnoid and Pia Mater.
4. The Brain and Cord.
5. The Arteries.
6. The Nerves.

Affections of the Bones.

Any lesion seated on the inner surface of the cranium or vertebræ, may excite inflammation of the membranes, and may finally lead to morbid changes in the brain itself and in the spinal cord. The most frequent lesions are nodes, exostoses, caries, and necrosis.

Although nodes may occur early in the course of syphilis, these are generally considered tertiary lesions. In one instance I have seen multiple nodes developed on the external surface of the cranium, ten months after syphilitic infection; the presumption is that similar growths may appear as early on the inner surface. We may, therefore, expect grave disturbance of the nervous system during the first year and as late as the twentieth, since syphilitic osseous lesions are known to be developed even at this advanced period. The phenomena may be referred to pressure, or to inflammation of the brain substance, and are of the most varied character, including paralyses, convulsions, ataxic symptoms, and mental disturbances. Cases

have been observed, in which extensive destruction of the skull bones has occurred, even with partial loss of the dura mater, without the production of cerebral symptoms.

A remarkable case reported by Gama, in which there was destruction of the bones of the face, including the ethmoid, caries of the frontal bone, erosion of the dura mater, disorganization of the arachnoid, and localized superficial softening of the anterior hemispheres, which were bathed in pus, presented as the single nervous symptom, severe pain in the head.

It is interesting to notice that large portions of the cerebral mass in the anterior basal region, which was the part involved in the foregoing case, have been removed in surgical operations for injury, without producing any bad symptoms.

The membranes of the brain may be the seat of hyperæmia, which produces no permanent alteration, or the process may become chronic and result in structural changes.

Affections of the Dura Mater.

The dura mater being a fibrous membrane, is peculiarly susceptible to the syphilitic influence. The changes, which usually consist of thickening due to increased cell-growth, roughening of the inner surface of the membrane, and abnormal vascularity, are generally not striking. In some cases the membrane has a brownish-red color and gelatinous appearance, yet its structure remains firm.

The extent of the structure involved and the amount of thickening vary, but are generally considerable.

The dura mater may be exclusively affected, or the disease may invade the inner table of the skull and the arachnoid, or the dura mater may be secondarily affected by processes beginning in the arachnoid and pia mater. In the case of nodes of the inner table, the dura mater is found thickened and abnormally adherent.

The syphiloma may form a circumscribed tumor, or may be diffused over a large area.

In his atlas, Lancereaux[1] gives an excellent illustration of gummatous infiltration into the dura mater.

The portion of the membranes enveloping the brain is more often involved than that covering other parts. There may be but one focus of disease, or several; in the latter case they are, as a rule, unsymmetrical.

Syphilomata of the spinal dura mater have an origin, and pursue a course, similar to those of the cerebral.

Affections of the Arachnoid and Pia Mater.

In simple hyperæmia of the pia mater, the arachnoid may not be involved, but when the process advances to cell-proliferation it is

[1] Atlas d'anatomie pathologique, pl. 41, Paris, 1874.

impossible to demonstrate a line of demarcation between the two membranes.

In most cases, the affection of these membranes consists of congestion and visible enlargement of the vessels, followed by increase of connective tissue and consequent thickening; but sometimes gummatous infiltration supervenes, constituting a gummous meningitis.

More or less change in the subjacent nervous tissue always follows, and the lesion may involve the dura mater and the cranial bones.

This is perhaps the most frequent syphilitic nervous lesion. It is found in single or multiple patches, distinctly circumscribed, of round or oval shape and of various sizes.

When multiple, the patches are scattered irregularly, most frequently at the base, in the anterior and middle fossæ, less frequently on the convexity of the brain, seldom on the cord and medulla, and exceptionally on the cerebellum.

Affections of the Brain and Cord.

The changes in the brain and cord are always secondary to lesions of the bones, of the meninges, or of the vessels, and consist of two kinds of softening, the red and the white, which are similar to these lesions when non-specific.

The softening is likely to be more superficial when the lesion begins in the meninges than when it originates in the bones.

A primary vascular lesion on the basal surface will produce much more serious and extensive structural change in the brain than one at the vertex, for the reason that, in the latter situation, the vessels anastomose freely, whereas in the former, each vessel is distributed to a region which has no other source of nutrition.

Affections of the Arteries.

Although the effect of syphilis upon the cerebral arteries had been referred to by several English authors, our knowledge of the subject was meagre and unsatisfactory until the appearance of the excellent monograph by Heubner, in which he gives a minute description of the various morbid changes.

These changes, which are chiefly subendothelial, consist of thickening of the lamellæ of the endothelium, between which and the membrana fenestrata is soon deposited a finely granular substance, with a few nuclei, some in process of division, as well as a few nucleated spindle-shaped and stellate cells. In the normal condition this part is nearly free from cells and nuclei.

Subdivision and fresh proliferation of cells constitute the subsequent changes. An important point of distinction between atheroma and the syphilitic process is, that, in the latter, the development of cells is more active than that of intercellular substance.

As the process continues, the endothelium becomes separated from the membrana fenestrata, the interposed cells become compressed and

flattened, and, by their fusion, probably result in the formation of giant cells. The endothelium becomes thickened, and encroaches on the lumen of the vessel. Owing to the irritation produced, small round cells, perhaps derived from the vasa vasorum, are observed. While the essential lesion is limited to the locality mentioned, adjacent parts may become secondarily involved, and these small round cells may be seen in the meshes of the tunica media and tunica adventitia. The new growth gradually becomes organized, and is supplied with nutrition by newly formed capillaries, most clearly seen in a transverse section.

The subsequent morbid process is a subdivision into layers of the new tissue between the membrana fenestrata and the endothelium. At the same time a new membrana fenestrata is formed beneath the endothelium, which is regarded by Heubner, not as an essential part of the syphilitic process, but as due to increased activity of the endothelium.

In the early stage of this lesion, very slight impediment to the blood current results, but, as contraction of the lumen of the artery goes on, white blood-corpuscles are deposited along its inner wall, until a perfect thrombus may be formed. Occasionally the vessel still remains slightly permeable.

There are several points of distinction between atheroma and this syphilitic lesion. The latter is much more rapid in its course, and usually occurs much earlier in life. In atheroma the calibre of the vessel is seldom diminished, while in syphilitic endarteritis complete stenosis may result. Atheroma generally involves more extensive surfaces and a larger number of vessels than the syphilitic lesion, and, moreover, in the latter, there is no tendency to calcific degeneration, so common in atheroma, which, unlike the product of the syphilitic process, is incurable.

It is the opinion of Heubner, with which we and other observers, particularly the English, agree, that this process is not at all specific in its nature, since the cells are similar in structure and arrangement to those of certain sarcomata and gliomata. The syphilitic virus seems to excite irritation of the endothelium, which results in the condition previously described. The resemblance of this lesion to gummata or granulation tissue is very marked. We have observed an instance in which it existed in the left Sylvian artery, continuous with a gumma completely encircling that vessel.

Although this arterial lesion may occur as early as the first year of syphilis, it is usually developed much later, having generally been found associated with nodes and gummata of the liver and testes. As a rule, it is to be expected at about the third year of syphilis, but may occur as late as the twentieth. (Heubner.)

The arteries most frequently involved are the large vessels at the base of the brain, and, for reasons already given, the danger to an extensive portion of the cerebral mass from defective nutrition, is much greater than in disease of arteries distributed to the convexity.

The changes in the arterial wall may be so slight, that unless opened longitudinally, the vessel shows to the naked eye no evidence of abnormality, yet there may have been sufficient interference with the circulation to have caused decided nervous symptoms. In such cases, the process being limited to the internal layers of the tunica intima, there is little rigidity of the vessel and no external change, hence the necessity of careful and thorough examination of all the vessels of the brain. Several cases have been recorded, in which the symptoms indicated vascular lesions, but at the autopsy nothing abnormal was found, although probably a slight sub-endothelial change was overlooked.

The morbid change is rarely confined to a segment of the artery, but usually involves its entire circumference, and generally from an inch to an inch and a half of its continuity. Several vessels may be involved in different stages of the lesion, or only one may be affected.

In advanced stages of the morbid process, the vessel is found to be thickened, rigid, and slightly compressible, and may even have a nodulated appearance, due to excessive cellular development and invasion of the outer tunics at certain points. A thickened artery of small size may present several rounded expansions within the limit of an inch.

Longitudinal sections of an artery which is affected to an extreme degree shows roughening of its inner surface, which has lost its normal gloss and color, being dull gray where the lesion is recent, and brownish where it is older.

Thrombi, with or without distinct laminæ, are found, some very thin and friable, others firm and fully occluding the vessel.

Friedländer and Köster believe that the cellular infiltration of the tunica intima, and, in proportion to the intensity of the process, of the other coats of the artery, is not peculiar to syphilis, but is found in inflammatory, tubercular, carcinomatous, and other growths. They compare the process to that of organization of a thrombus, and conclude that the new cells of the intima are derived from the vasa vasorum.

While Heubner admits that the cellular infiltration of the outer coat is derived from the vasa vasorum, he is positive in his opinion that the cells found in the inner coat are furnished by proliferation of the epithelial lining of the vessel, due to irritation by the syphilitic poison. He thinks that it is a gummatous affection beginning in the intima, independently of inflammatory processes without the vessel.

Baumgarten of Königsberg has studied the subject carefully, and though agreeing in the main with the former observers, he thinks that Heubner is right in his belief that the infiltrating cells have two sources. The growth in the outer coats he considers gummatous and peculiar to syphilis, while that in the inner coat he thinks is non-specific; in other words, the cells from the vasa vasorum form a gumma, while those derived from the endothelium form a tissue resembling ordinary granulation tissue.

In the thesis of Rabot, another variety of syphilitic arteritis is described, on the authority of M. Charcot, who calls it "syphilitic periarteritis." The details are given of an autopsy made upon a syphilitic woman, thirty years of age, at which, among other lesions, was found upon the trunk of the left Sylvian artery, near its origin, a nodosity as large as a haricot bean, whitish in color, irregular in form, and appearing to involve the external tunics of the vessel. Similar lesions were found on other arteries, but they were much more numerous on those of the base than on those of the convexity. Microscopic examination of these tumors showed that they were the result of an acute arteritis, producing thickening of the internal coat, with infiltration of connective tissue cells into the tunica media. The new tissue consisted of fusiform cells in the midst of a finely granular fibrillated substance. The internal elastic tunic was intact, while the tunica muscularis was infiltrated with round embryonic cells, and permeated by capillaries. Similar young cells were found throughout the external coat, chiefly around the vasa vasorum, which were much enlarged. Contraction of their walls and the formation of thrombi had produced occlusion of the vessels.

Charcot leans to the opinion that this is a true syphilitic periarteritis, but refrains from a positive statement until he has made further observations.

I have seen similar changes in the left middle cerebral artery coexisting with a gummy tumor.

In a discussion on visceral syphilis at the Pathological Society of London, Dr. Gowers showed the basilar, middle, and posterior cerebral arteries of a syphilitic man, which presented several nodules, found on microscopic examination to consist almost entirely of small round and fusiform cells imbedded in a delicate fibrillated stroma. The primary change appeared to have been in the tunica adventitia, with subsequent invasion of the tunica media. The suggestion of Charcot is sustained by this observation, and we are therefore disposed to believe in the existence of a syphilitic periarteritis.

An acute syphilitic inflammation of the arteries has been described by Dr. Moxon.[1] At the autopsy of a syphilitic man, he found, among other characteristic lesions, that the basilar artery, which was much increased in size and diminished in calibre, presented a milky appearance, resembling boiled macaroni. The walls were soft and had the appearance of fresh lymph. The microscope showed swelling of *all of the coats*, in and between which were numerous closely aggregated corpuscles, resembling pus-corpuscles. The lesion was abruptly limited and had a smooth surface.

Affections of the Nerves.

The *cerebro-spinal* nerves may be involved in the various affections of the meninges; they may be encircled by gummy tumors, or

[1] London Lancet, Sept. 25, 1869.