

**On naevi materni and dilatations of the vessels of the integument / by
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NÆVI MATERNI

AND

DILATATIONS OF THE VESSELS OF THE INTEGUMENT.

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Read on Thursday, January 17, 1850.

I AM induced to offer a few observations upon the intimate structure of those spots or markings of the integument known as *nævi materni*, because I attribute the very great discrepancies in opinion, both as to the symptoms by which they are characterised and the course which they ultimately take, to a want of accurate information as to the immediate seat of the disease in its several varieties. The word *nævus*, which corresponds exactly with "mother-spot," or "Mutter-mahl," is the Latin expression for any congenital mole or mark on the body, and was formerly applied to two very different conditions of the integument: the one, a simple discolouration, dependent upon the accumulation of pigment-cells under the cuticle; the other, a soft red spot, caused by a varicose or dilated state of the cutaneous bloodvessels. Of the former, but little need be said; it is, as Dr. Bateman described it, a superficial stain-like spot of yellowish-brown or brownish-black hue, and sometimes covered with long hair, when it resembles in a slight degree the skin of the rat or mouse: always congenital, and enlarging only in accordance with the growth of the body, it rarely requires surgical interference. The great pathological point of interest connected with this subject is, that when melanosis attacks the skin as a primary disease it is always in one of these dark-coloured spots or moles that

the morbid accumulation of pigment is first observed: the knowledge of this fact should deter us from unnecessarily irritating them by acupuncture needles or by caustic.

The latter, or vascular *nævus*, designated in modern surgical works by the barbaric term of "teleangiectasis," consists of a congeries of bloodvessels, and has its seat either in the cutis or in the subcutaneous areolar tissue, where it was described by Petit under the name of "loupes variqueuses." I read in a surgical manual that it is doubtful whether this is always a congenital affection, or whether it may be developed in after-life. There is no doubt upon the matter: infants are frequently born with these *nævi*; but in a very great number of instances the disease is first noticed a few days or a few weeks after birth as a bright red spot, perhaps not larger than a pin's head, either imbedded in, or projecting from the skin. The cutaneous *nævus*, of more florid red colour the more superficial its seat, resembles, as it enlarges, a small thin-walled bladder, filled with blood, and surrounded by dilated and tortuous vessels, visible through the delicate transparent integument. By pressure, which is the more easily effected if the *nævus* be placed over a bone, the blood can be squeezed out, when the natural colour of the skin is partially restored; but soon the blood is seen re-entering the dilated tubes, and

its bright red colour is restored: after a time it becomes slightly raised above the level of the skin, and extends deeper into the subjacent parts. The superficial vesicles may give way from a blow, or from some strain or effort, and hæmorrhage will ensue; but this is easily controlled by slight pressure, the blood trickling down without force, as from an inelastic-walled sinus. The same remarks apply to nævi of the mucous membrane of the eyelid or mouth: in these situations, however, their growth is more rapid, and they are more elevated and extend deeper.

The subcutaneous nævus which, though seated in the subcutaneous areolar tissue, always involves the cutis to some extent, consists of a dilatation of those vessels which pass from the deeper part to supply the skin. When of any size, it appears as a soft elastic tumor, frequently of bluish-black colour over the most prominent part; pressure diminishes its size much, but the blood can seldom be squeezed out entirely, and when the pressure is relaxed the blood slowly distends it to its former condition. When elevated, it is painful upon pressure, as may be known from the fact of the child crying and endeavouring to remove the part from the examination of the surgeon, or from its never lying upon the side of the disease during sleep. After a time it may form for itself a cyst of condensed areolar tissue, which, though capable of yielding slowly, puts a limit to any sudden distension. Though small at first, and often uncertain as to the period of activity, these nævi never lose their disposition to increase: one of the most striking instances of their rapid growth I witnessed in a child only five weeks old, over whose sternum and thorax there was a large subcutaneous nævus, involving the skin, and measuring two inches in breadth and two inches and a half in length. The definition of nævi, given by Lassus, and quoted by Mr. S. Cooper, is graphic and correct—namely, that “they are an organic malformation of the skin, the natural texture of which does not exist, but a plexus of vessels is substituted for it, not endued with the natural sensibility of the cutis itself.” But the inference drawn from this definition, that “they generally continue stationary during life, and may be regarded rather as deformity than as dis-

ease,” is incorrect in the extreme, and is only explicable upon the supposition that the pigment stains are referred to in the latter sentence. There is scarcely any exception to the rule that a true vascular nævus, once formed, will grow, with different degrees of rapidity and at irregular intervals, as far as we know, indefinitely. It seems to act like a contagious disorder, spreading amongst the vessels in its immediate neighbourhood; consequently, the larger its circumference, the quicker, *cæteris paribus*, is its increase, and the more widely spread the tendency in vessels apparently healthy to take on the same morbid action.

Mr. Cooper observes that the nævi familiar to us as vascular cutaneous or subcutaneous swellings, occurring usually in those parts of the body where the circulation is most active—namely, the skin of the face and head, the chest, or upper extremities—“are either of the same nature as the disease well known by the name of aneurism by anastomosis, or bear a considerable resemblance to it.” Now, under the name of aneurism by anastomosis, Mr. John Bell described “a species of aneurism resembling some of the bloody tumors which appear in new-born children,—a disease originating from some accidental cause, marked by a *perpetual throbbing*, growing slowly but uncontrollably, and rather irritated than checked by compression. To how many has it happened to witness in young children, patients of this hospital, pulsating nævi connected with the ramifications of arteries? I cannot recal to mind a single case, and am consequently at a loss to appreciate the statement of the late Mr. Liston, that “some of the large nævi in children pulsate synchronous with the heart’s action.” A pulsating tumor, however, occurs, as Mr. J. Bell remarked, in adults, and in those situations where the circulation is most active, such as the integuments of the head or face, and more particularly the lip.

As aneurisms by anastomosis are very uncommon, I will briefly state the particulars of a case which I had the opportunity of seeing and examining three years ago. A gentleman, forty years of age, consulted Mr. Lawrence for a pulsating tumor, occupying the right half of the lower lip. He stated that it was congenital, and had in

creased slowly up to the present time. Some time ago the right facial artery had been tied by another surgeon, and during the operation profuse hæmorrhage took place from a vessel towards the side of the tumor. No perceptible diminution in the swelling ensued,—a result which will not surprise any accustomed to view, in an injected subject, the free anastomosis of the coronary arteries of the right and left side of the face. Mr. Lawrence extirpated the whole pulsatory mass with the knife Jan. 11th, 1847. There ensued very little more hæmorrhage than would have taken place after extirpating a cancer of the lip. The ends of the coronary arteries and of one smaller vessel were tied, and the patient recovered without an unfavourable symptom. Mr. Lawrence kindly gave me the tumor to examine, and I injected it with mercury. It was composed of arteries in the natural state of the diameter of a large pin, dilated for about an inch of their course into great sinuses or canals, the cavity of which equalled that of the radial artery in the adult. They freely communicated one with another, and were lodged in the natural structure of the lip, to which they were attached by loose areolar tissue. Upon the divided surface there were the cut orifices of eight arteries, some of them of considerable size. The walls of these dilated arteries were thin, but I failed in detecting anything remarkable by microscopical examination. Here, then, is an instance of aneurism by anastomosis. It is a pulsating swelling connected with a few arteries of some considerable size. It is obvious that there exists a wide difference between this disease and the nævus of infants, as commonly seen, which consists in a pulseless red vascular spot, seated in or under the integument, and composed of dilatations of the capillaries which constitute the skin.

Therefore, *aneurism by anastomosis* consists in a dilatation of several arteries for a certain part of their course.

Nævus maternus is composed of a congeries of capillaries.

The two diseases are essentially distinct, and require different modes of treatment.

There remains a third variety of vascular tumor, of which there have been of late in the hospital some good examples. The first case of this kind which

fell before my observation was in the year 1845.

A delicate young man, æt. 20, an undergraduate at Oxford, consulted Mr. Lawrence for an oblong, pulseless, blue-coloured, vascular tumor, of four years' duration, situated in front of the abdomen, over the inferior ribs of the right side. It was firm, having been frequently cauterised. The blood, when squeezed out by pressure, did not readily flow in again.

The patient attributed the disease to the rubbing of the braces; indeed, his attention was first directed to the part by the irritation which he experienced in walking. The whole mass, including some diseased integument, was extirpated by the knife: one small cutaneous artery only was tied, but the bleeding was inconsiderable. The tumor, upon examination, was found to consist of a number of tortuous and dilated vessels, which I concluded, from the thinness of their walls, the collapsed state of the cut extremities, which were healthy, the want of pulsation during life, and the general varicose appearance of the part, to be *veins*. They contained a thin watery yellowish-red fluid, which, under the microscope, was seen to contain blood-discs in small quantity, altered in shape, and jagged at their edges; granules, probably the remains of decomposed blood-discs; epithelium, and fatty matter.

The wound healed without a bad symptom, and the gentleman left town in a fortnight.

Now in a vascular tumor removed recently in the hospital by Mr. Lawrence, which closely resembled, in its general characters, the vascular swelling just described, I was interested in observing several of those hard concretions known by the name of phlebolithes. Phlebolithes, or vein-stones, are confined to the venous system, and their presence in such a tumor may be taken as very conclusive evidence as to the character of the vessels affected. It is the opinion of the best pathologists that vein-stones form in consequence of a limited sub-inflammatory process, which determines a coagulation of the blood in distinct layers; the coagula, for the most part spherical in shape, continue for a length of time subject to an interchange of action and reaction with the passing current of venous blood, and there is deposited in them

phosphate of lime and magnesia, until the whole clot is transformed into an earthy mass. They form, then, originally, not external to, but within the vein. I believe that the same phenomenon has never been observed in the arterial system.

It has been remarked of these venous tumors, that although they have a tendency, in common with other similar degenerations affecting the vascular system, to indefinite increase, they manifest an occasional disposition to invest themselves in a capsule of the areolar membrane with which they are surrounded: their further growth then becomes limited, and they may remain stationary for many years; but we have no fair grounds for anticipating, under any circumstances, a spontaneous action determining to a permanent cure.

In connection with these venous swellings, affecting the integument and the subjacent areolar structure, I may mention a morbid degeneration of the veins of muscles, an instance of which was witnessed a few days ago in the dissecting-room attached to this school. A large portion of the vastus externus muscle, below the broad tendon of the gluteus maximus, was converted into an irregular soft bluish-black mass; the muscular fibres, pale and wasted, being separated and pushed aside by tortuous and dilated veins. In the mass, which measured about four inches in length and two and a half in breadth, there was no increase, either in number or size, of the arterial ramifications; but the small veins, not capillaries, were enlarged to five or six times their natural diameter: the coats were thin; the tissues in which they ran loose and healthy. Let it not be thought that in bringing forward a case of varicose veins in muscle I am wandering from the subject: the affinity between the dilatations of arteries and veins, whatever may be their size, and the condition of the capillaries constituting an ordinary nævus, is considerable. In further illustration of these points I may mention a case which I saw many years ago, the particulars of which are firmly impressed upon my memory:—A little girl, the daughter of a physician, had a soft congenital swelling, with undefined edge, the size of half a walnut, over the right deltoid muscle. As it was increasing in size, it was examined by several surgeons, who con-

cluded, from its situation, its softness, the freedom from pain, and other symptoms, that it was a fatty tumor. Its removal being thought advisable, an incision was made through the integuments of the shoulder, in the belief that there would be brought into view a lump of soft fat, surrounded by a loose capsule; but the incision was continued down to the fibres of the muscle without displaying any thing morbid, and it became obvious that the mass, whatever might be its nature, was situated deep under the deltoid muscle, in the vicinity of the shoulder-joint. Now I scarcely need remark, that, as a general rule, the deeper seated a tumor the more unfavourable is its character; and the idea immediately suggested itself, that in the present instance it might prove a medullary growth, which would involve the loss of the whole upper extremity. The deltoid muscle was divided longitudinally, when a vascular mass was discovered imbedded in its substance: the bleeding was inconsiderable, and for the most part venous; and the morbid structure was readily removed. The case terminated perfectly well, and I understand that the patient, now full-grown, has little or no scar left to commemorate the event.

If we group together the different vascular tumors to which allusion has here been made, and which include, as far as I know, all the varieties affecting the skin and subjacent soft parts, we may arrange them in the following order:—

1. Aneurisma per anastomosem, which pulsates synchronous with the heart's beat: a true aneurism of the smaller arteries, involving all their coats and their entire circumference.

2. Nævus, affecting the capillaries either of the skin (cutaneous) or of the subjacent areolar tissue (subcutaneous), the common nævus of infants, which does not pulsate.

3. The venous swelling, which likewise does not pulsate, and which has been observed in the subjacent areolar tissue and in muscle.

I regret that it is not in my power to describe from microscopical examination the condition of the walls of the dilated vessels. It would be highly interesting to ascertain whether there was any change in the elastic coat of the vessels, which would explain the reason

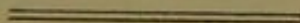
of their yielding to the pressure of the current of blood.

It so happens, however, that the means employed for cure are such as to destroy the diseased parts *in situ*. It rarely happens that a surgeon willingly undertakes to remove by the knife from infants, all of whom bear the loss of blood badly, a tumor composed entirely of vessels: the mere division of the skin is followed by a flow of blood sufficiently profuse to blanch the child; and the further steps in the operation become obscure and tedious. Even in those cases in which extirpation becomes necessary at a more advanced period of life, the structures have been mostly blended, hardened, and changed from what they formerly were, by the previous application of the ligature or of caustics.

In the case of venous tumors I have observed that the tortuous and dilated vessels become ultimately adherent one to another, and that portions of the tubes, containing blood, are cut off, and isolated by such adhesions: the blood, no longer in the current of the circulation, undergoes change; the blood-discs become jagged at their border, then they resolve themselves into granules, and which, ultimately separating, float free in a serous fluid, thinner than the serum of the blood, in consequence of a

secretion of water from the walls of the cysts into which these isolated portions of the veins are converted. The walls of the cysts, which retain little or no trace of their normal characters, become thinned and absorbed where adherent, so that communications are established between adjacent cysts; and when a tumor thus formed is cut open, it resembles a common cystic tumor, the cysts containing a fluid, which, though originally blood, has lost its red colour by the disintegration of the blood-discs, and has become thinner from the influence of the secretion from the cyst-wall. From such a tumor it would obviously be impossible to squeeze out, during its connection with surrounding structures, the whole, or even any great part, of the fluid contained in its cells: blood could be expelled only from those vessels which were continuous with the surrounding healthy veins. It is possible, therefore, that some doubt might be entertained as to the nature of such a swelling, both from the characters which it presented when *in situ*, and the appearances brought to view by examination after removal.

I have purposely avoided entering upon the question of treatment, as it would lead me far beyond the proper limits of the present communication.



The first part of the paper is devoted to a
 general discussion of the problem. It is
 shown that the problem is equivalent to
 the problem of finding a path of
 minimum length in a certain graph.
 This is done by showing that the
 problem can be reduced to the
 problem of finding a path of
 minimum length in a certain graph.
 The second part of the paper is
 devoted to the construction of an
 algorithm for finding a path of
 minimum length in a certain graph.
 The algorithm is based on the
 principle of dynamic programming.
 The third part of the paper is
 devoted to the analysis of the
 algorithm. It is shown that the
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