

In Tables I. and II. we have seen that the hospitals in our own country vary, as a whole, in their salubrity as far as limb amputations are concerned—in relation to their size, and the degree of aggregation or isolation of the sick. We know of no other general cause that can explain this general result, and when we compare the mortality from limb amputations in the large and metropolitan hospitals of London, Edinburgh, and Glasgow, of 1 in every $2\frac{1}{2}$ operated upon, with the amputation death-rate in the smaller or provincial hospitals of Bristol, Norwich, Leeds, Aberdeen, &c., of 1 in every 4 operated upon, or the diminishing death-rate in the still smaller hospitals of Canterbury, Shrewsbury, Truro, Paisley, &c., of less than 1 in every 5 or 6 operated upon, we confess, in the words of Mr. Holmes and Dr. Bristowe, that the death-rates in our large British hospitals, as compared with the death-rates in our smaller British hospitals, “are evidently enormous, and surely *not* to be explained by differences either in the constitution of those operated upon, or in the nature of the injuries or diseases for which they are admitted.”

An amputation, for example, of the thigh or of the forearm, for injury or for disease, is assuredly the same operation, and called for by the same circumstances, whether it be performed within the walls of a metropolitan or of a cottage hospital; but the differences in the results of such operations upon a large scale in these diverse localities are, in the language of Mr. Holmes and Dr. Bristowe, truly “enormous.” And if the death-rate in such limb amputations in our smaller hospitals, and still more in isolated houses and dwellings in the country (see Table I.) is “the normal rate” of mortality of limb amputations, then is not the excess over that normal rate observed in our large hospitals a painful and preventable waste of human life, capable of being averted by new hospital arrangements? One chief aim, let us not forget, of all surgical as well as all medical science, is the prevention of all preventable deaths.

(To be continued.)

CLINICAL OBSERVATIONS ON LESIONS OF ARTERIES AND SOME EFFECTS OF THE DELIGATION OF THEIR TRUNKS;

CONCLUDING WITH A CASE OF ENCEPHALOID CANCER
OF THE LEG TREATED BY LIGATURE OF THE
POPLITEAL ARTERY.

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(Concluded from p. 41.)

ENCOURAGED by the foregoing results, I thought that a vascular cancerous growth of the leg, which was draining the patient to death by repeated losses of blood, might on a similar principle be treated, and with this view I ventured to ligature the popliteal artery. Assuming the growth to receive a larger blood-supply than normal tissue occupying equal space, it was not unreasonable to suppose that a sudden diminution of the arterial current would sensibly reduce its vitality, or, in common parlance, “starve it out.”

How far this was accomplished will be seen by a perusal of the following case, which I report *in extenso* :—

CASE 6.—Sarah H—, aged fifty-four, was admitted into the Royal Free Hospital, under my care, on Sept. 5th, 1868.

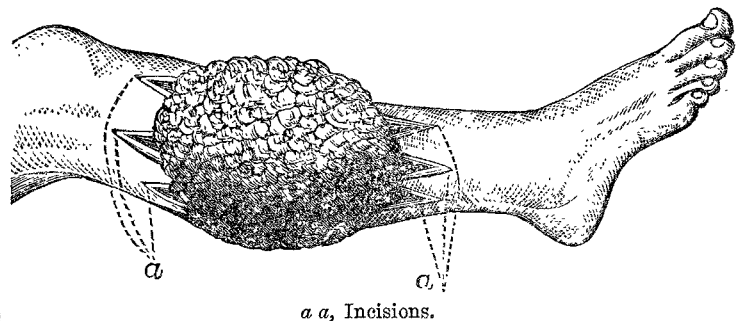
History.—By occupation a dressmaker, unmarried, of healthy extraction, she had enjoyed good health until twenty-four years of age, when a swelling appeared in the right groin. This suppurated and burst, leaving an open sore for several months, which subsequently healed. Ten years later an ulcer formed on the right leg; and, as soon as this began to heal, the left became similarly affected. These ulcers for a time alternately healed and broke out; but

ultimately that on the right leg closed, and gave her no more trouble. The left one, however, remained in a chronic state until the end of last year, when it gradually lessened to the size of a fourpenny-piece. About this time the menstrual function ceased, and soon afterwards she felt a throbbing pain and sense of fulness in the cicatrix tissue, followed, a few weeks later, by a substance sprouting from the sore. Pain now began to subside; but the growth steadily increased, and by the end of March had attained the size of an egg. Occasional bleeding from its surface rendered it less exuberant for the time being, and was always followed by a sense of relief. Continuing to enlarge, the tumour spread beyond the cicatrix of the old ulcer; and latterly hæmorrhage became so frequent and excessive that she came to the hospital to seek admission, when she was in the following condition :—

General condition.—She had lost flesh, was pallid, anæmic, and dejected, with a small compressible pulse, coated tongue, irritable stomach, and confined bowels. The temperature of the body was low; skin of a yellowish tint; expression of countenance anxious, and she had occasional pain in the lumbar region. The intellect was unimpaired; organs of special sense normal; lungs emphysematous; heart's action feeble—sounds harsh and sharp; urinary and generative organs apparently healthy; veins and lymphatics free from disease.

Local condition.—Occupying nearly one-half of the circumference of rather more than the middle third of the right leg was a new growth. This projected about an inch above the plane of the surrounding skin, and overlapped it. The surface (covered with arterial blood) was fragile, pulpy, painless, and very vascular, and seemed to spring from the deep structures, in its out-growth receiving a constriction from the fascia of the leg. A probe could be hooked beneath this all round; and on making muscular traction, slight mobility was noticed in the tumour; hence implication of the extensor and peroneal muscles. She complained of a sense of fulness at the seat of disease, and nervous pains referred to the branches of the anterior tibial, musculo-cutaneous, and external saphenous nerves; and as to position, the knee was semiflexed, and the toes pointed.

Progress and treatment.—Although suspicious of the real nature of the disease, I thought it right to remove all constriction from the exuberance; and having inserted a director beneath the fascia, I freely divided that structure and the superjacent integument at six points, when each wound widely gaped. This was followed by cessation of all nervous pains and the sense of fulness complained of; but in a fortnight the growth had so considerably increased as to present the appearance depicted in the following figure :—



a a, Incisions.

Microscopic examination.—Several portions of the structure, having been subjected to the action of dilute acetic acid, were now placed under the field of the microscope, and examined, with the following result :—Nucleated cells (caudate); free nuclei in abundance, embedded in a semi-fluid intercellular substance; stroma—i.e., a delicate nucleated membrane, intersecting the growth in all directions; granular and fatty matter.

The character of the disease being now unmistakable, I proposed to ligature the popliteal artery, and the patient having consented, on Sept. 22, 1868, chloroform was administered, and I operated in the following manner :—The body being nearly prone, with the knee extended as far as possible, an incision five inches in length was carried from the apex of the popliteal space along the posterior margin of the semi-membranosus muscle; next, the fascia lata was incised, and the muscles were drawn aside by retractors;

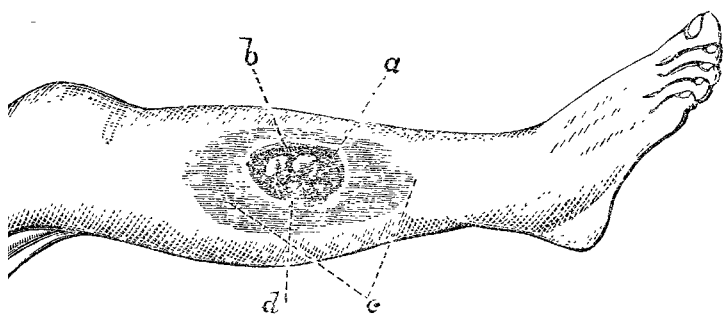
then, partially flexing the limb, the fat was carefully divided, the internal popliteal nerve hooked away, and the artery sought for on the upper part of the popliteus muscle. Independently of pulsation, the vessel could be definitely felt under the finger, as was proved by compressing the femoral. The aneurism needle (armed) was now passed between the vein and artery, and, hooking around the vein, was made to lift it gently from the artery; with the tip of the left forefinger the former was spread out in the concavity of the needle, and, its outer margin having been defined, a minute puncture was made in the connective tissue to allow the point to pass through; the needle was then turned upon itself to encircle the artery, and the ligature having been disengaged, the needle was withdrawn and the former secured. The wound was now closed, and the limb, having been fixed to a lateral splint, was invested with cotton wool and oiled silk.—Ten hours after the operation she was comfortable, and only complained of slight numbness in the toes. The growth was reduced in size, and of a spleen colour.

Sept. 23rd.—9.30 A.M.: Has slept well during the night. Pulse 84. Temperature of feet: right, $92\frac{1}{2}^{\circ}$; left, $93\frac{1}{2}^{\circ}$. Growth is now black and gangrenous.

27th.—Temperature of extremities is equal. Numbness absent.

In THE LANCET of October 3rd, 1868, there appeared a short notice of this case, and to describe the changes in a few words I will just quote a passage from the report:—"First the bright vascular surface gradually assumed a congestive venous character, and ultimately became black and gangrenous, the dead surface tissue being thrown off. In the next place the subjacent layer of vascular prominences became bloodless, and exfoliated as white, circumscribed, fibrinoid patches, varying in size from a pin's head to a large-sized shot."

On the seventh day after the operation the growth was not more than one-third its original size. This continued wasting until nothing was left but the stump or matrix, which seemed to arise from the interosseous membrane, extensor and peroneal muscles. In the meantime the popliteal wound suppured, and the ligature came away on Oct. 8th (sixteenth day). The extensive ulcerated surface left by the destruction of the outgrowth proceeded to granulate and cicatrise up to a certain point, when it became stationary. On Oct. 30th the popliteal wound was sound, and the limb presented the appearance here depicted.



c, Cicatrix tissue. a, Callous edge of ulcer. b, Granulations upon matrix. d, Fossa communicating with carious fibula.

Subsequently small portions of bone exfoliated from the fibula; but the patient continued to improve until Dec. 20th, when a change occurred. Her appetite now fell off, and the cicatrix tissue surrounding the granulations gave way, and ulceration extended over the newly-healed surface. On probing the ulcer, the fibula was found spongy and carious, and several loose pieces were extracted. To keep the muscles at rest, the limb was slung up with lateral interrupted splints, which permitted the dressing of the ulcer without disturbing the leg.

Jan. 2nd, 1869.—Her health is unsatisfactory, her appetite is failing, and she is losing flesh; although she suffers no pain in the limb, the matrix, if anything, is increased by the out-growth of large flabby granulations. These, however, do not yield the same microscopic appearances as the original growth, but resemble ordinary strumous granulations.

6th.—Was attacked with rigors this morning, followed by thirst, sickness, vomiting, and tenderness in the course of the femoral vein. Pulse 140; respiration 38. Odour of

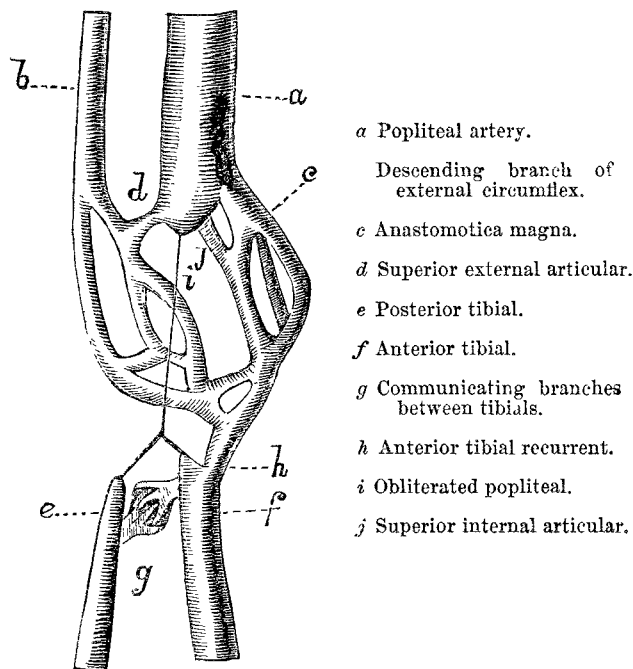
breath saccharine; ulcer glassy, and all its secretion is arrested.

10th.—Had an attack of hæmorrhage this afternoon, which seemed to well up from the deep part of the ulcer. This was soon controlled by pressure. Is very weak and low, evidently sinking.

13th.—9 A.M.: Had a recurrence of hæmorrhage; but it had ceased before Mr. Murphy reached the ward. When I saw her a few minutes afterwards, she was moribund, and died at 1.30 P.M.

Autopsy, twenty-four hours after death.—Head: Brain healthy.—Chest: Lungs emphysematous. Heart soft, friable, and atrophied; cavities on right side contained fluid black blood; left chambers empty; vegetations on aortic and mitral valves. Pericardial scars. Weight 5 oz.—Abdomen: Liver fatty; capsule adherent; weight $2\frac{1}{2}$ lb. Kidneys cystic; structure fatty; weight—right 5 oz., left 6 oz. Spleen large; weight 12 oz.—Veins: Superficial epigastric veins as large as a crowquill; tortuous and plugged; coats as thick as an artery. Femoral vein plugged throughout; firmly adherent to artery; coats greatly thickened and much congested; plugs extending into the common iliac vein. The anterior tibial vein contained pus.—Affected limb: Part of the middle third of the fibula was soft, spongy, carious, and easily breaking down under pressure; peroneal and extensor muscles (corresponding to, and continuous with, external ulcer) covered with granulations; matrix of growth found springing from interosseous membrane and periosteum; œdema of foot.

The popliteal artery is occluded. Anastomatic circulation is carried on by the anastomotic magna and superior internal articular arteries communicating directly with the anterior tibial recurrent, and by the descending branch of the external circumflex artery receiving the superior external articular and inosculating with a branch of the anterior tibial recurrent. The posterior tibial artery is supplied by the inosculation of some muscular twigs arising from either artery, and passing across just opposite the anterior tibial recurrent. Posterior artery is small and contracted. (See Fig.)



a Popliteal artery.

Descending branch of external circumflex.

c Anastomotic magna.

d Superior external articular.

e Posterior tibial.

f Anterior tibial.

g Communicating branches between tibials.

h Anterior tibial recurrent.

i Obliterated popliteal.

j Superior internal articular.

In conclusion, I may refer to a few points which seem to me important in this interesting case.

Our patient for years had suffered from ulcerated legs, which heal at a critical period of life. We have therefore contemporaneously the removal of a safety-valve in the healing of a chronic ulcer and the cessation of the menstrual function; thus, *primâ facie*, a condition of the body susceptible to the invasion of a new growth. But, so far as I am aware, it is unusual for encephaloma to spring from ulcers or cicatrices like epithelioma, and in this case the selection of the site of a healing ulcer may perhaps be regarded as exceptional.

During the progress of the disease she complained of a sense of fulness in the growth, and pains referred to the course of the cutaneous nerves. These symptoms were un-

doubtedly due to pressure, as was clearly shown by the relief experienced after attacks of hæmorrhage, and by gaping of the incisions, which were carried through the fascia and integument for the removal of tension.

Pointing of the toes was dependent upon undue yielding of the extensor and peroneal muscles (by the invasion of their fibres), and, as a consequence, contraction of their opponents, the flexors.

Rapidity of growth, repeated hæmorrhage, and absence of localised pain may be considered characteristic features of encephaloid disease after the tumour has been relieved from the pressure of the fascia and integument.

The microscope may be then said to complete the diagnosis.

Now as to operation. Was it advisable to ligature the popliteal artery or to amputate the limb? I think that the shock of an amputation in her impoverished condition would of itself have proved fatal. Therefore I resorted to the minor operation.

The ultimate issue of this case does not in my mind militate against the practical application of the principle advocated, seeing that the patient's life, which was fast ebbing away before the operation, was by it prolonged for a period of nearly four months.

The accidental accession of phlebitis, in a constitution impaired by degeneration of the heart, liver, and kidneys, placed her beyond recovery, and latterly sudden hæmorrhage from one of the anastomotic vessels further reduced her. The idea of ligaturing the femoral artery was abandoned because of her moribund condition; indeed, at no period after the invasion of phlebitis was there any prospect of recovery.

Caries of the fibula was probably due partly to pressure, and partly to death of the periosteum with the growth.

In the operation three points are worthy of notice—

1st. The great depth of the wound arising from the semi-flexed position of the knee after long disuse, obviated by a free external incision.

2nd. The tension of the popliteal boundaries obviated by partially flexing the knee.

3rd. The mode of applying the ligature by lifting the vein from the artery just far enough to enable the operator to perforate a fine web of tissue, and then (turning the needle upon itself) to encircle the artery without disturbing the nutrition of either vessel by a more extensive dissection.

The point at which the artery was ligatured rendered the operation difficult, but the importance of controlling the current close to the bifurcation was the chief consideration.

As to diet and medicine. The former was of a most nutritious kind, with a fair allowance of stimulants; and the latter consisted of tonics to assist in supporting the vital power, sedatives to relieve pain, and disinfecting lotions to cleanse the ulcerated surface.

Guildford-street, June, 1869.

ON THE STRUCTURE OF THE ADULT HUMAN VITREOUS HUMOUR.

BY DAVID SMITH, M.D., M.R.C.S.

THE RELATION OF THE VITREOUS HUMOUR TO INTRAOCULAR TENSION.

(Concluded from vol. i. 1869, page 841.)

ANOTHER agency which consumes the formative material contained in the aqueous fluid of the eye is the nutrition of the crystalline lens and its capsule. In early life the growth of the crystalline body is considerable, and at every age, but especially in youth, it is subject to a certain amount of tissue-change. As this body is completely isolated within the aqueous capsule, nutriment can reach it from no other source than through the medium of the fluids of the anterior and posterior hemispheres. The pabulum on which it lives is the albumen dissolved in these fluids; and whether or not that substance passes through a modification in its transmission through the vitreous tissue and capsules of the lens, a regular repletion of the fluids of the eye is required to supply the necessary amount of forma-

tive material, without which it would die. As showing the relation between the demand for nutriment possessed by the crystalline lens and the regular repletion of the aqueous capsule with healthy fluid, when, from inflammation of the choroid and subsequent occlusion of many of the vessels of the ciliary processes, both the quantity and quality of the aqueous fluid poured out by these organs is lowered, or, in other words, when atrophy of the globe supervenes, the crystalline lens invariably becomes opaque from molecular death of its substance.

The relation which the amount of fluid bears to the demand made upon it by the nutritive processes going on within the aqueous capsule is also shown by the diminution of that fluid in senile atrophy. In this instance the aqueous fluid of the eye, which contains the formative material on which the tissues within the capsule live, follows the example of all other nutritive fluids of the body in diminishing as the reparative processes within the eye become less active. Hence the eyes of the aged have a shorter range of refraction than those of youth and vigorous manhood, which is partly attributable to the diminished quantity of the aqueous and vitreous humours.

Thus, then, in health, a constant relation subsists between the nutritive changes going on within the aqueous capsule and the amount of fluid by which it is distended. The tear and wear of these parts are, no doubt, small as compared with more active tissues of the body; but the percentage of formative material dissolved in the fluid is also small, and more than likely bears a relative proportion to the nutritive requirements of the tissues. In performing its twofold purpose, the physical and the vital, the aqueous fluid is constituted so as to fulfil both efficiently. Of the physical—in refracting the rays of light,—it must possess a certain degree of transparency and specific gravity; in forming the eyeball into a sphere, it must distend the aqueous capsule to give the latter the character of a solid: and of its vital functions—it must be regularly replenished by a proper selection of formative material, of which it must possess a certain percentage for nutritive purposes. The membranous septa through which the fluid filters in its passage into the aqueous capsule, seem to possess such a degree of porosity and elective affinity as to give transmission to that proportion of water, salts, and albumen most fitted to fulfil this duplex purpose.

But our knowledge of the principles which regulate the repletion of the aqueous capsule in disease bears out the statement that it is conducted with due regard to the vital processes which are perpetually in operation within it. Here also the same general rule exists: the greater the demand for formative material, *ceteris paribus*, the greater the supply. Thus, when the vitreous humour is undergoing inflammatory action, a great proliferation of new products within it takes place, and to meet the demand occasioned by this morbid process, the current of fluid into the humour is accelerated, and, as a consequence, the formative material is increased. Again, when a foreign body is lodged in the vitreous humour, an excitement of the nutritive processes immediately takes place in and around the humour, which ends in the influx of a large amount of plastic material, and ultimately in the encystment of the foreign body. Now, in these cases the fluid may be poured into the humour under the same conditions as in health—i. e., through the medium of the capillaries of the ciliary processes and the structureless membrane of Zinn, without breach of either; but, as illustrating the relations of the supply of vitreous fluid to the requirements for it, these membranous septa not only allow the transmission of a more rapid current into the humour, but they give passage to a fluid containing a higher percentage of solid material. In no other way can the morbid processes referred to be accounted for. But again: when a cataract is undergoing absorption after the needle-operation, an excitement takes place in the vessels from which the aqueous fluid is derived, and, as a consequence, the currents of fluid into and out of the aqueous chambers necessarily become accelerated, all of which processes seem to be instituted for the purpose of dissolving and carrying away the degenerated products of the crystalline body. No doubt in this case the increased amount of fluid which penetrates into the aqueous capsule carries with it increased material for repairing the waste; but as the epithelial cells of the crystalline lens are broken up, the reproduction of the latter is impossible.