guished from other similar white patches due to exudations on its brush-like feathered edge. After emerging from the anterior surface of the lamina cribrosa, the bundles of transparent nerve-fibres bend away on all sides (quaqueversally) from a central point, and, curving over the edge of the choroidal foramen, spread out on the inner surface of the retina. In doing this, they leave a central void, a little hollow—the physiological pit. This pit is usually in the centre of the nerve-disc, but not always so; and, when eccentric, the vasa centralia usually also perforate the disc eccentrically. A normal physiological pit never, however, is so eccentric as to touch the contour of the disc.

The physiological pit is, then, a small, gentle, funnel-like hollow in the centre of the nerve-disc, perforated by the vasa centralia, appearing as a bright hollow spot, in which, with an enlargement of twelve or fifteen linear, the meshes of the lamina cribrosa and the ends of the bundles of opaque nerve-fibres are plainly discernible.

Blood-Vessels.—At a variable distance from the eyeball, the trunk of the optic nerve is pierced by a branch of the ophthalmic artery, which soon gains the axis of the nerve, and, running forwards through the lamina cribrosa, perforates the optic nerve-disc, in which it divides into two primary branches, which bifurcate, and, passing across the boundary of the disc, are distributed to the retina. In the disc we can distinguish first a short vertical piece of the arterial trunk, and next the branches making a large angle with the trunk, and following the surface of the disc. The capillaries of the nerve-trunk, and those distributed to its disc-like intraocular end, are very numerous; they are sufficiently so to redden the disc when they are distended with blood—a thing which no amount of hyperæmia of the retinal capillaries ever does in this membrane.

The very slight diminution which the arteria centralia undergoes, from its origin to its final division in the disc, shows that it mainly ministers to the nutrition of the retina. It gives, however, in its course, *small* twigs for the nutrition of the nerve outside the eyeball; and these, reinforced by others derived from minute nameless arteries distributed to the sheath, ramify in the septa between the nerve-bundles.

The veinlets accompanying the primary branches of the arteria centralia in the retina do not, as a rule, coalesce in a single trunk in front of the lamina cribrosa; but they pierce this separately, and first unite in or behind it.

Sheath.—In the arrangement of its sheath, the optic nerve differs from all the other large nerve-trunks. They have but one tightly fitting tube of connective tissue—the external neurilemma; but the optic nerve has a double sheath. It has a thin tightly fitting sheath, representing the sheath of other nerves, from the inner surface of which septa are produced inwards between the nerve-bundles, constituting the internal neurilemma or frame, which holds the bundles together, and carries the nutrient blood-vessels.

In front of the lamina cribrosa, in the nerve-disc, the neurilemma is of the more delicate kind, to which Virchow has given the name *neuroglia*. Its fibres have two principal directions—one transverse to that of the nerve-bundles, and therefore parallel to those of the lamina cribrosa; the other vertical to the front of the lamina and free surface of the nerve-disc. These last fibres correspond to the radial connective tissue fibres in the retina. This sheath itself and its septal prolongations consist of common connective tissue—fibrillated bundles, with corpuscles interspersed. In front, this division of the sheath blends with the lamina cribrosa, and with the inner third of the sclerotic.

The outer sheath is continuous posteriorly with the dura mater, so that coloured fluids injected into the space between the two sheaths soon find their way backwards into the cranial cavity. In front, the outer sheath is continued into the outer two-thirds of the sclerotic. The outer and inner tubes are loosely connected by a very open areolar tissue, composed of curling fibres and coarser bundles with large fusiform nucleated corpuscles imbedded in them. These give the interstitial or areolar spaces the appearance of having an epithelial lining. They play an important rôle in neuritis, and in the evolutions of morbid growths.

The space between the sheaths has been lately described as a lymphatic cavity. In severe injuries of the head, blood is sometimes extravasated into it.

In describing the sclero-choroidal foramen, I mentioned the occasional excess of pigment here giving rise to a dark circle around the nerve-disc, visible in the living eye. The presence of pigment in the disc itself is still more exceptional. I do not allude to pathological formations, but to congenital conditions. In some mammalia, however, the neuroglia of the optic disc is always granule-pigment, dotted along the connective tissue fibres and in corpuscles. In these eyes, the pigment-corpuscles are often most numerous along the vessels and in the loose tissue in the sheath close to the globe; but the greatest deve-

lopment of pigment here is in birds, from whose optic nerve entrance a large plaited membrane stands forwards into the vitreous body towards the back of the lens, with a forward and downward inclination. The upper edge lies below the level of the fovea centralis. Its general figure is four-sided; but it varies somewhat, as do also its size and the number of plaits.

It is a vascular sheet, consisting of larger vessels and a very close capillary net overlaid with a pigmented epithelium resembling that of the choroid. Its base blends with the lamina cribrosa, and is perforated by the escaping bundles of nerve-fibres. I am unable to offer you any account of its functions. Before the ciliary muscle was known, it was formerly thought to be the factor of accommodation; against this, however, is the absence of muscularity. H. Müller suggested that it may subserve the nutrition of the vitreous humour, in the absence of a retinal vascular system. But there are very large eyes with correspondingly bulky vitreous humour and no retinal vascular system, without pectens; and this throws doubt on Müller's suggestion. Although reaching its maximum development in birds, the pecten is not restricted to them. It is present in lizards. In the gecko, iguana, and chameleon, it is a little sword-like process, having an intimate structure identical with that of the bird's pecten, but externally unlike this in its surface being smooth, and not plaited. Some snakes also have pectens; I have found it in the boa constrictor and viper, but absent from the common snake.

A METHOD OF ANTISEPTIC TREATMENT

APPLICABLE TO

WOUNDED SOLDIERS IN THE PRESENT WAR.

By JOSEPH LISTER, F.R.S.,

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HAVING been requested to furnish some rules for the antiseptic treatment of wounded soldiers in the present war, I venture to suggest the following plan, in the hope that it will combine efficiency with the simplicity and facility of execution essential under such circumstances.

Wash the wound thoroughly, and also the surrounding skin, with a saturated solution of crystallised carbolic (phenic) acid in water, one part of the acid to twenty of water, introducing the fluid by means of a syringe, and manipulating the parts freely so as to cause the lotion to penetrate into all the interstices of the wound; and at the same time squeeze out such clots of blood as it may contain. The fluid should be introduced repeatedly to insure its thorough penetration. Tie any bleeding vessels with properly prepared antiseptic catgut, cutting off the ends of the thread near the knot. If the surgeon do not possess this article, the arteries should, if possible, be secured by torsion; but for the sake of cases in which a ligature would be absolutely indispensable, some silk or linen thread should be kept steeping in a strong oily solution of carbolic acid, or, if very fine silk be used, it may be rendered antiseptic by steeping for a few minutes in the watery solution. When silk or linen is employed, the ends of the ligatures should be left projecting at the wound. While the antiseptic lotion is in the wound, extract if possible any foreign material that may have been introduced, such as a bullet or a portion of the patient's clothes; and if any spicula of bone exist entirely detached from the soft parts, remove such as can be readily reached, disregarding those which are of very small size or inconvenient of access.* Then place upon the wound two or three layers of oiled silk smeared on both sides with a solution of carbolic acid in five parts of any of the fixed oils—olive, almond, linseed, etc.—the oiled silk being made large enough to cover the raw surface completely and slightly overlap the surrounding skin. Next apply, without loss of time, lint, charpie, or cloth (linen or cotton), well steeped in the oily solution of the acid, the cloth or lint being folded sufficiently to produce a layer at least a quarter of an inch in thickness, and extending a considerable distance, say three inches, beyond the oiled silk in all directions, the outer layer being made somewhat larger than the rest, so that the margin of the mass of cloth may be thin. Cover the oily cloth with a piece of thin gutta-percha tissue sufficiently large to overlap it on all sides by an inch or more, and retain it securely in position

* Gun-shot wounds should not be stitched; but, where sutures are required, silk, steeped in oily solution of carbolic acid, will answer sufficiently well. After the introduction of the last stitch, distend the wound once more with the watery solution, by means of the syringe, and then continue the dressing, as in the text.

by a roller steeped in the antiseptic oil. Round this again wrap a still larger piece of folded cloth, say a folded towel, also steeped in the oily solution of carbolic acid, and cover it with a piece of oiled silk or gutta-percha.

With a view to the intelligent application of this dressing, it will be well to state briefly its *rationale*. The watery solution is applied in order to destroy once for all any septic particles that may have been introduced into the wound; and the oily solution is employed to prevent the spread of putrefactive fermentation into the wound from without. The oiled silk, which is but slightly permeable to carbolic acid, protects the raw surface from the irritation of the acid in the oily cloth, and permits it to heal as under a scab. But though the ultimate office of the oiled silk is to protect the wound from the irritation of the antiseptic, it must itself be antiseptic at the time of application, and is therefore smeared with the oil, which in the course of no long time loses its carbolic acid by diffusion into the wound beneath. The substantial and widely extending oily cloth serves as a store of the antiseptic; but the bloody and serous discharge soaking into the porous cloth tends to wash away the oil and deprive the dressing of its antiseptic character; hence the necessity for the gutta-percha, which prevents the discharge from making its way directly outwards from the wound, and so establishing a road for the penetration of putrefaction inwards. At the same time the gutta-percha, though impermeable to watery or oily fluid, being readily permeated by carbolic acid, permits the antiseptic ingredient to pass in through it from the outer cloth and act upon the discharge that flows out beneath the overlapping margins of the gutta-percha. The outer cloth is intended to be changed as occasion may require, in order to keep up the supply of the antiseptic, while the gutta-percha and all beneath it constitute a more permanent application. The layer of gutta-percha or oiled silk outside the external cloth is to prevent the oil in that cloth from being wasted by soaking out into the surrounding articles of clothing, etc.; or, still worse, neutralised chemically by the penetration inwards of putrid blood or other discharges from the ambulance waggon or bedding. The circumferential part of the deeper cloth will, in consequence of its thinness, be kept completely antiseptic by the carbolic acid which passes inwards through the gutta-percha, while the deeper layers of the thicker portion over the wound will probably in a few days be destitute of antiseptic, and therefore of stimulating properties; hence the oiled silk, though desirable in order to insure the absence of "antiseptic suppuration", is by no means an essential part of the treatment, and if none of it be at hand the procedure may in other respects be conducted in the same way without it. Again, if the surgeon have no gutta-percha at his disposal, the risk that would otherwise arise from the permeability of the dressing may be overcome by frequently changing an external antiseptic cloth, or by treating its surface every few hours with the antiseptic oil.

The changing of the outer cloth will require care in order to avoid raising the edge of the gutta-percha along with it, and so admitting septic air towards the wound. It may be done with perfect security by having the cloth consist of two parts, one covering each half of the gutta-percha, and, as one half is raised, throwing a stream of watery solution (1 to 40) with a syringe upon the margin of the gutta-percha, a fresh oiled cloth being at once applied before the other portion of the former cloth is removed. If sufficient time cannot be spared for changing the outer cloth in this careful manner, it will be better for the surgeon to content himself with pouring fresh oily solution upon the exterior of the cloth without disturbing it, taking care that the oil enter well beneath its margins. I would advise that this should be done in preference where a large number of wounded have to be treated by one surgeon.

The strong oily solution (1 to 5) would irritate the skin if used continuously: after the first dressing a solution of half the strength should be employed, and after a few days it may be reduced to 1 to 20 if excoriation should occur.

The times of changing the outer cloth, or treating it with fresh oil, should be in accordance with the amount of discharge. During the first twenty-four hours the effusion of blood and serum is necessarily profuse, and it will be well that fresh oil be applied to the outer cloth within twelve hours of the first dressing, or even in six hours if there should be unusual oozing. On the second day, also, in the case of a large wound, two dressings in the twenty-four hours will be desirable. After this, if all go well, the discharge will diminish quickly, and a daily renewal of the antiseptic supply will be sufficient; and when five or six days have passed, to apply the oil once in two days will be all that will be required. This, however, should be continued after discharge has ceased entirely, till sufficient time has passed to insure that the wound has healed by scabbing, or at least has been converted into a superficial sore.

The earlier the case comes under treatment the greater will be the

prospect of success, but even after the lapse of thirty-six hours it need not be altogether despaired of.

In the case of compound fractures, the essential objects of the treatment may be attained by using splints constructed of stout iron wire bent into the form of the margin of a lateral splint, and strengthened by cross pieces here and there. Such splints can be readily extemporised by the surgeon himself, by help of two pairs of wire-forceps. The splints should be applied one at each side of the limb, without any padding opposite the seat of injury except the dressing above described, but padded elsewhere with any suitable soft material, an interval being left between such padding and the dressing. The outer layer of oiled-silk or gutta-percha should be applied outside the splints, so that all that will be requisite in order to apply oil to the outer cloth will be to take off the oiled silk with its retaining bandage, and pour on the oil through the ample intervals between the wires. Or the splints might be applied immediately external to the bandage that retains the deeper layer of gutta-percha, leaving the outer cloth to be wrapped round external to the splints, cotton or charpie imbued with the antiseptic oil being tucked in under the splints to keep the margins of the gutta-percha in apposition with the limb, the cotton being changed as often as the cloth itself.

For the sake of the general healthiness of the atmosphere of the crowded military hospitals, it is extremely desirable that even superficial granulating sores should be treated antiseptically. This may be done consistently with rapid healing by washing the sore with watery solution of carbolic acid (one to twenty), and covering it with two or three layers of oiled silk smeared with the oily solution (one to twenty), with well overlapping folded cloth steeped in similar oil, and over all a piece of gutta-percha tissue and bandage.

I have suggested in the above method the employment of such materials as are likely to be accessible to the surgeons of both armies. Other means exist, in some respects very superior. But the supply of these is at present limited, and those who possess them probably understand their use.

REPORT ON THE ORGANISATION AND EDUCATION OF THE PROFESSION IN GREAT BRITAIN AND AMERICA.

By N. PINCKNEY, M.D., Surgeon, United States Navy,
Delegate to the British Medical Association from the Navy Department and
Medical Association of the United States in 1869.

[We have been favoured with the following extracts from a report on the action of the British Medical Association, and on the organisation and education of the profession in Great Britain, by Dr. Pinckney, who visited this country as a delegate to our Association last year. A correspondence between Dr. Pinckney and Dr. Chadwick was published in the JOURNAL of August 14th, 1869. After expressing his gratification at the cordial reception offered to him at Leeds, Glasgow, and Exeter, and his wishes for the continued and extended confraternity of the profession in the two countries, Dr. Pinckney continues as follows.]

The British Medical Association was established thirty-seven years ago. It is, as in our country, the representative body of the profession at large. The colleges of surgery and schools of medicine had, until 1854, the entire control over what constituted the preliminary education to entitle a person to enter upon the study of medicine. It is not to be questioned that under this system a large number of incompetent men found their way into the ranks—men who could never hope to meet the high and responsible duties which the profession involves, and a conscientious performance of which the security of the public demands. The standard of the profession as a great science was thus greatly lowered, and the community at large became the unfortunate victims. Every effort was made to check the tide of this grievous public and professional wrong, but without avail. Finally, the tocsin was sounded, and the whole energy of the profession was aroused to provide a remedy for the evil. The Association, in its representative capacity, applied all the means in their power to construct a dam which would effectually resist the on-sweeping tide. They were Argus-eyed. Quietly yet persistently they entered the field, determined to vindicate the honour of the profession by elevating the standard of attainment. Great were the difficulties that surrounded them. But they were nothing daunted. With a heroism that cannot be too highly praised, and a self-devotion never excelled, the strong men, backed by the weight of the body, went to work in good earnest to see what