COMMON ULCERS OF THE CORNEA AND THEIR TREATMENT.

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Ulceration has been defined[1] as "a progressive destruction of the tissues in which the solid parts seem to melt away into a liquid discharge without the separation of visible portions of dead tissue." This is a condition we frequently observe in the cornea, especially in those cases which do not readily respond to treatment, and is to be distinguished from an abrasion, which is a loss of substance, the result of traumatism, but in which there is no inflammation, though this may, and frequently does, occur subsequently. Ulcers of the cornea, at times called superficial keratitis, are many and various, as will be at once recalled on perusing a classification such as this, a slight modification of that adopted by Juler,[2] viz. :—

(1) *Primary Keratitis.*—(*a*) Simple superficial ulcer; (*b*) phlyctenular keratitis; (*c*) fascicular keratitis; (*d*) herpes cornea; (*e*) dendritic keratitis; (*f*) filamentary keratitis; (*g*) bullous keratitis; (*h*) rodent or Mooren's ulcer; (*i*) suppurative keratitis, including ulcus serpens; (*j*) neuroparalytic keratitis; (*k*) keratitis e lagophthalmo.

(2) *Secondary Keratitis.*—(*a*) Secondary to conjunctival affections, *e.g.*, catarrhal granular or purulent conjunctivitis; (*b*) secondary to affections of the lids, *e.g.*, entropion trichiosis; (*c*) or following on a previous disease, *e.g.*, an atheromatous ulcer developing in an old glaucomatous eye.

It is only the phlyctenular and suppurative forms of keratitis which, forming the largest percentage of this type of affection met with in our practices, this paper deals with. Before discussing them, let me briefly recall the structure of the cornea. It is described as consisting of four layers, viz.: (1) The anterior stratified epithelium; (2) the substantia propria, including Bowman's membrane; (3) Descemet's membrane; (4) the posterior epithelium.

The anterior epithelium is the continuation of the conjunctiva over the substantia propria. Bowman's membrane was formerly

[1] "Science and Art of Surgery," Erichsen, vol. i.
[2] "Ophthalmic Science and Practice," Juler. p. 120.

described as a separate elastic layer, but now it is considered to be the anterior homogeneous layer of the substantia propria; which latter structure is continuous with the sclerotic, and contains between its lamellæ a number of lacunar spaces, freely connected with each other in the planes and through the bundles; by means of this, the lymph system of Recklinghausen, the nutrition of the cornea is maintained, for there are normally no blood-vessels in the structure. Descemet's membrane or the posterior elastic lamina is the immediate posterior relation of the substantia propria, and is continued at the circumference of the cornea into the ligamenta pectinata. The dimensions of the cornea are about 11 mm. vertically, 12 mm. horizontally, 0·8 mm. thick, except towards the periphery, where the thickness increases to about 1·1 mm. Now a loss of substance in the epithelium can be replaced by regenerated epithelial cells, but should the ulcer have extended through Bowman's membrane, eroding the substantia propria, then the gap thus formed can only be filled up by scar tissue, for the corneal lamellæ do not regenerate. And this scar tissue is more fibrous[1] and so more noticeable after inflammations than that resulting from wounds. So in treating these cases it behoves us to do so in such a manner that the eye recovers with the least possible amount of damage to the corneal tissue. For we must remember in answering the oft-repeated question, "Will it hurt the sight?" that the larger the ulcer is the greater will be the amount of scar tissue necessary to replace the loss of substance, and therefore the larger will be the resulting nebula, which will interfere with and distort the rays of light in their path to the retina. These forms of keratitis have several symptoms in common, the intensity of which varies in different cases, viz., pain, photophobia, giving rise to more or less blepharospasm, lachrymation and injection of the conjunctiva, and which are fraught with much distress to the sufferer, recalling to our minds the words of Warburton: "Of all the distressful calamities to which man's life is subject sickness is the most afflictive."

Phlyctenular keratitis is most frequently met with in children, though it is occasionally seen in young adults, and the sufferers are nearly always of that debilitated type which was formerly designated strumous. The ulcer results from a phlyctenula, itself the consequence of an embolus[2] of dead tubercle bacilli being carried to the

[1] "Pathology of the Eye," Parsons, vol. i.

[2] *Transactions of the Ophthalmological Society*, vol. xxvi., p. 243.

margin of the cornea, and which, possessing some toxin in a low form of virulence, causes the formation of the phlyctenula in the cornea, rupturing and exfoliating its outer wall, which probably consists of corneal epithelium, for the vesicle is stated by some authorities to be situated on Bowman's membrane, by others to be deep to that structure; the ulcer appears as a definite, more or less circular, loss of substance in the cornea, its size varying in each individual case. These ulcers, individually, are amenable to treatment, and when healing a leash of vessels is usually observed extending from the conjunctiva to the ulcer. But difficulty arises from the fact that they recur, a fresh one frequently appearing shortly after recovery from the previous one. Recently, some work has been done on the opsonic index[1] to tubercle in these cases, which shows that the index varies considerably in different cases, being frequently normal. In the writer's cases in which the index has been taken it has been found normal in each case.

The treatment to be adopted is general more than local, for it is the health of the patient that is at fault, the sufferer being frequently an underfed or improperly-fed child, who spends a good deal of its time indoors, and often sleeps in a small, badly-ventilated room, with two or three other persons. Therefore we prescribe plenty of fresh air, exercise in the open air and in the sunshine as much as possible, plenty of good food and a tonic, such as cod-liver oil, syrup of iodide of iron, or syrup of phosphate of iron. The local treatment consists in bathing the eye frequently with a simple lotion, boracic being that most frequently used, instilling a little atropine, and keeping a pad over the eye, with a light bandage. But some surgeons prefer simply dusting calomel on the eye; this occasionally causes some irritation to the eye, if the powder is not pure; while others content themselves with applying atropine; dionine[2] also has its advocates, and certainly great benefit frequently results from its use; while others advise counter-irritation, by applying iodine or a seton to the temple.

The value of the general treatment is shown by this case: A child who had been attending as an out-patient for three months with this affection, and which was complicated by the ulcer having become septic, and who showed no sign of recovery, was admitted to hospital, where she naturally obtained the benefit of good food

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[1] *Transactions of the Ophthalmological Society*, vol. xxvi.; *Lancet*, December, 1906, Paton and Nias.

[2] *British Medical Journal*, May 12th, 1906, Henshelwood.

and hygienic surroundings. Virol in dram doses was given as a tonic, and locally warm boracic lotion and atropine ointment were applied, with the result that in ten days she was discharged cured, and the ulcers completely healed up.

Unfortunately, these ulcers frequently become infected, and then the disease assumes that more severe condition which forms the other type of ulcer to be discussed in this paper, viz., primary suppurative keratitis, which appears as a definite, more or less circular, loss of substance on the surface of the cornea, the edges and floor of which are opaque, owing to the presence of leucocytes and pus corpuscles. This condition is met with in two forms : (1) A form of ulceration which results from infection by various micro-organisms, of an abrasion of the cornea, such as that caused by traumatism, or of a ruptured vesicle occurring in a debilitated subject. This type is usually met with in the young, but may be seen at any age, especially amongst those whose employments expose them to injuries of the cornea. (2) That type described by Saemisch, in 1870, as ulcus serpens, owing to its tendency to creep over the surface of the cornea, and called by the older writers hypopyon ulcer. The sufferers from this ulcer, however, are usually elderly persons, broken down in health and with feeble recuperative power. Parsons[1] states that the consensus of opinion on the formation of this ulcer is that it commences as an infiltration of the superficial epithelium at the centre of the cornea, which goes on to destruction and disintegration of the cells, thus forming the ulcer, which by spreading peripherally and deeply will cause great destruction of the corneal tissue, and which by eroding the cornea will perforate through into the anterior chamber, and then by direct extension to the iris and ciliary body set up panophthalmitis, and so loss of the eye. In illustration of this, an elderly woman presented herself at the hospital with a large septic corneal ulcer in the right eye. She was taken in, the eye gently bathed with boracic lotion and a pad and light bandage applied. Next day, on removing the bandage, it was seen that the cornea had elongated and the lens had been extruded and was adhering to the dressing, and panophthalmitis had set in. A concomitant condition of this ulcer, and occasionally of an affected ulcer when of a severe type, is the presence of a purulent-looking material, consisting of a fibrinous coagulum, laden with leucocytes, in the anterior chamber, known as hypopyon. This being sterile is not true pus, and it is

[1] "Pathology of the Eye," Parsons, vol. i.

on account of the presence of this material that the condition used to be called " hypopyon ulcer." The micro-organisms responsible for these ulcers[1] are streptococci, bacilli, &c., which may be associated with one another or with the pneumococcus. But in the case of ulcus serpens, Uhthoff and Arenfeld,[2] in 1896, showed that the *Pneumococcus lanceolatus* of Fraenkel was the main cause, it being most frequently found alone,[3] or else mixed with other micro-organisms. In these ulcers the usual symptoms may, or may not, be as marked as one would expect; but in addition there is often œdema and hyperæmia of the lids, with some chemosis. The treatment of this severe affection must be energetic; a good aperient is administered, then the lachrymal sac is to be examined to see if therein should be the source of the infection. Bathing the eye with a weak antiseptic lotion is of great value, for it soothes the inflamed member and washes away the *débris*. Various lotions are in use for this purpose. Sulphate of quinine is recommended by Lawson,[4] weak perchloide of mercury has its advocates, and boracic lotion used warm frequently gives good results. Atropine is instilled into the eye for the twofold purpose of giving it physiological rest and of preventing adhesion of the iris to the cornea should the ulcer perforate. Hot fomentations are useful in causing an increased blood flow, which will dilute the toxins. Should there be much pain and signs of iritis two or three leeches to the temple give marked relief. Dusting the ulcer with iodoform powder is well spoken of. Should the keratitis not soon yield to the treatment, and the hypopyon be increasing, then the ulcer itself, the focus of the disease, must be attacked, with the hope of destroying the micro-organisms contained in it. This can be conveniently effected by cauterising it, for which purpose we have three agents, viz., absolute alcohol, pure phenol, and the actual cautery, and it is the last-named which, being the most powerful, gives the best results, the action of which is well described by Ovio.[5] The cautery, at a dull red heat, should be made to lightly touch the edges and floor of the ulcer, then atropine instilled and a pad and a bandage applied. The effect of the

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[1] " Pathology of the Eye," vol. i., p. 213, Parsons.

[2] *v. Graefe's Archiv. fur Ophthalmologie*, xlii., 1, 1896, Uhthoff and Arenfeld.

[3] *Annali di Ottalmologia*, vol. xxxv., fasc. 1-2, E. Salveneschi.

[4] *Transactions of the Ophthalmological Society*, vol. xxv.

[5] *La Clinica Oculistica*, November, December, 1905, January, 1906, G. Ovio; *Annali di Ottalmologia*, vol. xxxv. (1906), fasc. 1-2, pp. 58-64, G. Ovio.

cautery can frequently be enhanced if subsequent to its application a paracentesis of the anterior chamber be performed. One has frequently seen cases of septic corneal ulcer that have resisted ordinary measures for days rapidly recover after one application of the cautery. The value of paracentesis is well illustrated by the following case: A patient, aged 16, suffering from an infected ulcer, who had been treated for three months with lotions, atropine, eserine and the cautery, but all to no purpose, was finally admitted to hospital and paracentesis performed. Seven days later the ulcer was healed. A method of treatment for these ulcers that is rarely employed nowadays is that known as Saemisch section, yet recently one performed this operation in a patient suffering from a large septic ulcer, with a hypopyon filling half the anterior chamber, which absolutely resisted treatment, evacuating only half the so-called pus, yet next morning there was no sign of hypopyon and the anterior chamber had reformed, the ulcer appeared cleaner, and was completely healed a week later. After paracentesis absolute quiet is advisable to rest the eye and give it the full value of the relief from tension. As a general rule the condition of the eye will now rapidly improve and the ulcer heal up, leaving more or less of a nebula as a permament monument of its destructive power. But in those unfortunate cases in which, in spite of all our treatment, the ulcer continues its wayward course, finally inflicting on the sufferer that hopeless condition, panophthalmitis, we are forcibly reminded of Shakespeare's words:—

> Diseases desperate grown
> By desperate appliance are relieved or not at all;

for we have only the last resource of surgery, namely, enucleation, to perform.