follows a night's rest, but this is from disuse of the partly paralysed muscles and soon wears off, unlike the condition caused by over-exertion. The moral as applied to the more dangerous paralysis of the respiratory muscles need not be dwelt upon.

The first few days out of bed, after a severe attack of diphtheria, are the only safe test of complete recovery—not merely because paralysis may yet supervene or recur, but still more owing to the possible persistence of latent heart-weakness. It is a time when over-caution on the part of medical adviser, nurse, and patient is impossible.

SOME OBSERVATIONS ON THE PATHOLOGY AND TREATMENT OF CORNS.

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General Remarks.—A corn may be defined as a small circumscribed overgrowth of the epidermis, appearing commonly on the foot or toe, running a chronic course, and giving rise to considerable pain.

From a surgical standpoint, perhaps, a corn may be considered an affair of small moment, but, from the point of view of the sufferer, matters stand in a very different light; for, in addition to the pain and discomfort to which these little tumours invariably give rise, they often render locomotion difficult and sometimes impossible, and at times unfit the sufferer for performing his duties in life.

Under such circumstances, it is difficult to understand why the treatment of this disease should have been so neglected by bonâ fide practitioners of the healing art as to have fallen almost exclusively into the hands of irregular practitioners. To my mind this apathy and indifference is all the more remarkable, as some time ago circumstances led me to study these little tumours in detail, and the work which I have hitherto done in this direction has proved as interesting as it has been instructive, and, as I venture to hope, by no means barren in practical results. This, then, must be my excuse for venturing to offer a few observations on such a very commonplace disease.

Pathology.—The morbid history of a corn may be appropriately studied under the headings of anatomy, histology, and physiology.

Anatomy.—The superficial appearance of a corn must be well known, and needs no special description here. The central cup-like depression, the circumferential raised rolled ridge, the dirty yellow colour, and general lack-lustre appearance should be familiar to even the most casual observer. When, however, one
of these growths is completely severed from its surroundings and carefully examined, it is at once apparent that there is much more in a corn than meets the eye superficially. That which is visible on the surface of the skin only constitutes a portion—a minor portion, in fact—of the diseased tissue.

Corns are usually described as being conical in shape; the apex being directed deeply towards the true skin, while the base projects on the surface. This description may be taken as true with regard to growing corns of moderate duration; but it by no means holds good for all, or even for the majority of cases. The fact of the matter is that corns vary much in shape, which is determined to a large extent by their degree of maturity and situation. In the initial phases of its development, a corn assumes the form of a stunted cone, the apex of which projects on the surface, and the base of which, presenting a slightly convex outline, rests on the surface of the true skin. In the so-called "soft" variety of corn, which is met with in the clefts between the toes, this condition of affairs persists throughout the life history of the corn. But in corns of the ordinary type—the so-called "hard" variety—the condition of affairs just described very soon becomes altered, and, indeed, entirely reversed. Still preserving the conical shape, the base, which becomes more or less concave, presents on the surface; while the apex, considerably blunted, projects deeply towards the surface of the true skin. The corn seems to penetrate and become embedded in the subcutaneous tissue, carrying the dermis before it. Corns, when met with in this stage of their development, have been somewhat fantastically likened to nails which have been driven into a board. Hence the terms Clavus (Lat. = a nail) and Clou (Fr. = a nail), which have been applied to them. As development goes on, yet another change in the shape takes place. All old corns tend to assume a discoid shape, and when associated with the formation of a bursa beneath, approximate more or less to the shape of a bi-concave lens.

But the naked eye anatomy of a corn can be best studied by examining a series of sections cut vertically through the centre of the growth. The surface so produced usually presents a smooth, glistening, waxy appearance, not unlike cartilage; but sometimes appears fibrous and asbestos-like. On close inspection, the cut surface is seen to be marked by numerous parallel vertical striations which traverse the corn from top to bottom. On more minute examination, in the majority of cases, three distinct layers, differing in colour and degree of opacity, can be seen. These are arranged horizontally in a wavy manner throughout the entire substance of the growth. Thin sections mounted in glycerin on a microscope slide, and examined by transmitted light, show the vertical striations and horizontal layers exceedingly well. The deepest of the horizontal layers is usually pearly white in colour,
and opalescent. The intermediate layer is yellowish in tint and semi-transparent. The most superficial is also yellowish in colour, but darker, semi-opaque, and of much firmer consistence than the other layers. These layers vary greatly in relative thickness in different specimens. The most superficial layer is always the thickest, except in cases of soft corns, where the surface epithelium is rapidly shed. The intermediate layer is usually the thinnest; it is sometimes indistinct, but more usually well defined. The deep layer, the thickness of which varies greatly, is thickest in actively growing corns of moderate age. The significance of these layers will be discussed more fully when the microscopic appearance and mode of growth come to be considered.

A small fluid-containing sac or bursa is sometimes found in the subcutaneous tissue beneath the corn, but is by no means a constant occurrence. It is an important structure when it exists, and I shall have occasion to refer to it again later.

When a corn is allowed to macerate for some days in a saturated solution of sodium salicylate, it separates into two parts, the line of cleavage being at the level of junction of the superficial and intermediate layers just described. This is an important fact to bear in mind, and, as I shall presently endeavour to show, has a distinct bearing on the question of treatment.

_Histology._—Examined microscopically, the normal epidermis is seen to consist of four distinct cellular strata. These, enumerated from within outwards, are—(1) the stratum mucosum; (2) the stratum granulosum; (3) the stratum lucidum; and (4) the stratum corneum. These layers have a distinct physiological significance, in that they represent the successive changes which take place in the formation of keratin, a process which, as every one knows, is the special function of the epidermic cells. Proliferation takes place only in the deeper cells of the stratum mucosum, and, by the constant addition of newly-formed cells deeply, the more superficial ones are forced towards the surface, gradually becoming keratinised as they are pressed upwards, until they are shed, as they were formed, layer by layer. Thus the cells of the epidermis pass through a wonderful metamorphosis, the various phases of which are indicated by the several layers of which that structure is composed. Viewed from this standpoint, the epidermis may be said to consist of—(1) an actively growing layer, the constituents of which exhibits all the phenomena of life; and (2) a grown layer, the cells of which, having fulfilled their destined rôle, are ready to be cast off, and are to all intents and purposes dead. In the living layer must be included the stratum mucosum, the stratum granulosum, and the stratum lucidum, in all of which changes, having for their object the conversion of protoplasm into keratin, are in progress; and in the dead layer the stratum corneum, in which the keratinising process is complete and the
cells are waiting their turn to be shed. I have gone into this matter at some length, because, as the sequel will show, it has a very direct bearing on the pathology and treatment of corns.

A thinly cut, well stained section of a corn is as beautiful an object as one can wish to see under the microscope, and presents points of interest which must be seen to be justly appreciated. What strikes one most on examining such a section under a low power is the enormous thickening of the stratum corneum, which often is many times thicker than the whole substance of the skin. Next one sees that there is a considerable and marked increase in the thickness of the stratum mucosum. In actively growing corns, where proliferation is going on apace, this change is especially well marked. The stratum lucidum is always increased in thickness, sometimes not abundantly but distinctly, at other times not so distinctly but more abundantly. The epithelial cells of the stratum corneum are seen to be arranged in vertical columns, which traverse the entire thickness of the layer, and correspond to the papillae of the true skin on which they are superimposed. These vertical columns are intersected at intervals by horizontal segments, which represent successive periods of growth. In actively growing corns the cells of the stratum mucosum which cap the papillae are large and numerous, and appear to shoot up finger-like processes into the stratum above. In addition to the changes which take place in the epithelium, certain changes in the true skin are also observed. The papillae, wherever active growth is going on, whether at the centre or periphery, are elongated; but beneath the central portion of old corns which have reached their zenith they tend to become flattened, and present a squat, stunted appearance. The true skin is atrophied and thin, and often bears distinct evidence of compression, but the blood vessels of the skin and subcutaneous tissue are always numerous and conspicuous in the vicinity of the growth.

One is now in a position to interpret most of the naked-eye appearances of the sections which have been previously described. The vertical striations clearly represent columns of epithelial cells passing gradually towards the surface. The pale horizontal line of variable thickness, traversing the corn in a sinuous manner longitudinally, represents the stratum lucidum, while the layer below and deeper than this line corresponds to the stratum mucosum, and the layer above and superficial to it to the stratum corneum. It is further seen that, when a corn is made to separate into its constituent parts by maceration in a suitable medium, the separation takes place at the junction of the stratum lucidum with the stratum corneum—that is to say, at the junction of the living and dead layers of the epidermis. If this separation be made to take place while the corn is in situ, it is manifest that the living growing part of the corn is left behind,
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ready to grow again on the slightest provocation. To this point I shall again have occasion to refer.

To sum up, in a corn all the layers of the epidermis are more or less thickened, the relative amount of thickening observed in the several layers being dependent on the age, activity, and situation of the growth, but being usually most marked in the stratum corneum and stratum mucosum. In the dermis the papillae are elongated where active growth is going on, squat and stunted where full growth has been attained. The deeper layers of the true skin and subcutaneous tissue beneath the corn are compressed and atrophied, but contain blood vessels in abundance, which are very evident in the papillae. In other words, an aberration of structure is observed in all the constituents of the skin, but the overgrowth of tissue, which constitutes the tumour, is confined to the layers of the epidermis, whether formative or formed, and is especially evident in the stratum corneum and stratum mucosum.

Physiology.—The mode of growth of a corn can only be determined by studying a series of microscopic sections which represent collectively the various phases of its individual development. Among the first changes observed is a proliferation of the cells of the stratum mucosum over a limited area—a change brought about, as there is every reason to believe, by nervous influence, and the result of a stimulus directly applied from without to the nerve terminals which govern the nutrition of the part affected. This proliferation of the epithelial cells which surround the papillae causes these latter to become compressed and elongated; and these changes, together with the great increase in thickness of the layer of epithelial cells capping the papillae, give to the stratum mucosum the semblance of finger-like processes shooting up into the layer above. This appearance is characteristic of an actively growing corn. The cells of the stratum corneum being directly derived from the cells of the stratum mucosum, any increased production of cells in the latter naturally causes increase in the number of cell elements throughout the entire thickness of the epidermis; and as successive layers of cells are added from below more quickly than they are shed on the surface, the superficial cells become heaped up into a mound-like eminence which projects above the normal level of the skin—a budding corn is produced. As the summit of the mound is the oldest, most highly keratinised, and consequently most brittle part of the embryo corn, and, owing to the fact that from its exposed position it is more liable to attrition, this part of the corn very soon becomes detached, breaking off short just below the level of the surrounding tissue, and leaving a shallow, cup-like depression with a roughened surface. The result of this change is that the chief pressure is shifted from the centre of the corn to the margin of the cup-like depression. This, in turn,
has the effect of stimulating into activity and causing proliferation of the cells covering a group of papillae which surrounds the original group. Thus a sheet of hypertrophied epithelium grows up around and tends to envelop the central portion of the corn on all sides, and the superficial layers, in process of time, become broken off in the same way as those of the central portion before them. In this way the maximum pressure is again shifted to a ring of tissue still further removed from the central core; and the process is repeated, again and again, until the corn has reached its acme of growth, and become quiescent. So a corn grows by the constant addition of concentric layers to a central core, and tends to spread centrifugally. This concentric method of growth is rendered apparent to the naked eye by the vertical striations previously described. But the corn grows vertically as well as circumferentially; and, as its growth towards the surface is soon checked by the dense, unyielding structure of the epidermis, it tends to spread in a downward direction—that is, in the direction of least resistance. Hence the stratum mucosum, the thickness of which is being continually augmented, becomes depressed, pushing before it the true skin and invading the subcutaneous tissue.

In the so-called "soft" variety of corn the conditions of growth are identical, although the actual changes which result are somewhat modified owing to the external surroundings. This variety of corn is found in positions where it is continually subjected to the combined effects of heat and moisture, the result of which is that the surface layers are removed almost as quickly as they are formed. Consequently these growths always appear stunted on the surface, and do not tend to invade the underlying tissue to any great extent.

There is practically no limit to the spread of a corn deeply except the underlying bone, but, in order to obviate the ill effects which must necessarily arise from the meeting of two such compact structures as corn and bone, nature comes to the rescue, and by the formation of a little fluid containing sac or bursa in the subcutaneous tissue, interposes a buffer between the deep surface of the corn and the bone beneath. The presence of the bursa soon causes a change of shape in the deep surface of the corn from convex to concave, so that any risk of the corn coming in contact with the underlying bone is doubly obviated. It is not to be supposed, however, that the presence of a bursa is a constant phenomenon in the development of a corn. On the contrary, although it is very constantly found in connection with soft corns of any age, it is very commonly absent in the case of hard corns, unless they are old. Its development would seem to be dependent on anatomical peculiarity, that is to say, the relative thickness of the layer of subcutaneous tissue which exists between the corn and bone. Where the subcutaneous tissue is thin, as is usually the case in positions where soft corns are common, a bursa makes its
appearance early; but where the subcutaneous tissue is comparatively thick a bursa forms late or not at all. In some instances, however, it would appear that the formation of the corn is secondary to the formation of the bursa. Thus in the case of the bursa which is so frequently observed over the inner aspect of the metatarso-phalangeal joint of the great toe—constituting what is commonly known as a bunion—it is not infrequent for a corn to make its appearance as a secondary product. But, at times, the bursa, originally intended to be a source of safety, becomes converted into a source of danger; for inflammation and suppuration of this structure is by no means unknown, and, when it occurs, the danger of the inflammatory process spreading to surrounding structures—be it skin, subcutaneous tissue, joint, or bone—is a factor which has frequently to be taken into consideration.

The formation of the bursa and the part which it plays in the life history of the corn are points which are too frequently overlooked, and it is well to remember that the presence of this structure, whether it be defensive or aggressive, is a matter of considerable importance, tending as it very often does to modify the march of events in one way or the other.

Treatment.—The advice usually given with regard to the treatment of corns may be summed up in the three words—"Remove the cause." Theoretically, no doubt, this advice is sound; but, practically, it leaves much to be desired. It should always be borne in mind that among the chief peculiarities connected with the growth of a corn are the persistence with which it grows and its tendency to recur after so-called removal. Once the morbid process which ultimately results in the formation of a corn is set going, it is very readily perpetuated and not easily checked. Even after prolonged rest in bed, which frees them entirely from all risk of being exposed to undue pressure and friction, corns often fail to disappear, and when the patient begins to get about again become just as troublesome as ever. Under these circumstances, it has always seemed to me that the sounder advice would be—"Remove the corn and prevent recurrence." This brings me to the point which I wish especially to emphasise, namely, that if appropriate measures be adopted, any corn may be speedily and permanently cured without any risk of recurrence at all.

The various methods of treatment naturally resolve themselves into three groups—preventive, palliative, and curative.

Preventive treatment.—This naturally consists in adopting such measures as will secure freedom from pressure and friction for the parts which are most liable to corns. To this end a well-fitting pair of foot gear is essential. These should be neither too tight nor too loose, but should sit comfortably on the feet. They should be made of well-seasoned leather, soft and elastic, and be cut to a proper model. The length, width, and height should be sufficient
to give full play to the toes, and not to cramp them unduly, either laterally, longitudinally, or vertically. As a rule, boots and shoes should be made to measure, or, what is better, to a last modelled from an actual cast of the foot. If there is a tendency to flat foot or any other slight deformity, this should be taken into consideration in constructing the foot covering, and appropriate means adopted, as far as possible, for its rectification.

**Palliative treatment.**—Under this heading are included all measures which stop short of the removal of the entire morbid growth, by which I mean the removal of the living and dead layers of the corn together with the bursa, if it exists. These methods of treatment are the ones most commonly practised; and include the application of certain chemical substances to the surface of the corn and sundry instrumental procedures.

Many chemical substances have been employed from time to time in the treatment of corns. Among the older remedies silver nitrate is probably the best; among the more modern, salicylic acid. These remedies act by causing desiccation and shrinkage of the horny layer of the growth, which is thus made to shell out from the bed in which it lies. To secure this, repeated applications of the remedy are necessary, and the process is therefore more or less tedious. Perhaps the best method for securing the partial removal of corns by the application of chemical substances is that recommended by Unna. It is briefly as follows:—A ring of glycerin jelly is painted round the circumference of the corn so as to form a raised rampart. A piece of salicylic plaster mull is then cut to the size and shape of the central depression, and applied to the surface of the corn. This is then covered with a layer of glycerin jelly, and, before it sets, a pad of cotton-wool is applied to the surface. This process is repeated as often as is necessary, until the horny layer of the corn separates and is cast off.

If the point of a sharp thin-bladed knife be introduced at the groove which runs round the margin of the corn, and be made to penetrate towards its central axis, by the exercise of a little manual dexterity the horny part of the corn can be easily made to separate from the parts beneath. This method of removal is one which is much in favour with chiropodists. When separation of the horny layer is brought about by this method, the deep surface of the part removed usually presents an irregular, jagged appearance. This is often triumphantly shown to the patient as a proof that the corn has been extracted “by the roots.” The true explanation, of course, is that the vertical columns of cells, previously described, have been irregularly fractured at the level of cleavage. As a matter of fact, a corn has no roots in the ordinarily accepted sense of the word; but if by root is meant the part from which it grows, well, that is left behind. A corn which has been partially extracted by this method has been no more extracted by
its roots than a shrub has been rooted up by breaking the main stem short off just below the surface of the ground.

Before leaving the question of palliative treatment, it is well to point out that all these methods only secure the separation of the dead horny layer of the corn from the bed of living tissue in which it lies. Under these circumstances, the removal of the growth is only partial; the essential part of the corn—the part from which it springs—being left behind. This explains the tendency to recurrence exhibited by most corns when treated by the methods in ordinary use. I do not wish for one moment to imply that these measures fail to give temporary relief; but the point on which I wish to lay especial stress is that, for reasons which are sufficiently obvious, they can only yield uncertain results as a means of cure, and are therefore unsatisfactory.

Curative treatment.—As I have previously endeavoured to show, all palliative measures have the common defect that they leave the stratum mucosum—the living, growing layer of the corn—untouched. This, of course, can be destroyed by the application of caustics to the depression which is left after the horny layer has been removed; but it is a method which has its objections, being always more or less painful and uncertain. For the deeper layers of the stratum mucosum and papillae are very sensitive, and there is no means of gauging the thickness of the strata to be destroyed; nor whether the destruction is complete. Furthermore, the bursa, if existent, is left behind, and may subsequently inflame and give trouble; even if it does not do so at the time as the result of irritation set up by the application of the caustic.

Any method of treatment, then, to be curative must secure the removal of the entire corn together with the underlying bursa. The removal of this latter structure is important, for it is mainly in connection with this structure that complications, which alone make a corn a matter of serious import, are liable to arise. In accordance with these precepts, I have for some time past practised the full and complete excision of corns—a method of treatment which, as the result of accumulated experience based on upwards of sixty cases, I can confidently recommend as efficient.

Such an operation is naturally painful, unless some means be taken to render the parts insensitive. Fortunately there is no class of case in which a local anaesthetic gives more uniformly satisfactory results.

At the outset, let me state that it is just as imperative to adopt antiseptic precautions when operating on corns, as when operating under any other circumstances. He who neglects to make his procedure as aseptic as possible not only errs, but, in the present state of our knowledge, is guilty of culpable negligence. There is good reason for believing that the neglect of these rudimentary precautions is responsible for many of the accidents which occur
in connection with the amateur surgery of corns, and that inflammation with its attendant consequences is not infrequently the result of the use of septic instruments with septic fingers on a septic skin.

Having taken every precaution to render the operation aseptic, a spot is selected for the injection of the anaesthetic solution. At this point the skin is rendered insensitive by the application of ethyl chloride, and 5 minims—more or less—of a 4 per cent. solution of eucaine is injected into the subcutaneous tissue beneath the corn. Having waited a few minutes, the superficial parts at the site of the incision are rendered insensitive by ethyl chloride. Anaesthesia is now complete, the process itself being painless, and the operation may be at once commenced. Two hemi-elliptical incisions meeting at their extremities are made through the skin around the circumference of the growth, care being taken that they penetrate well into the subcutaneous tissue. Seizing the parts included in the incision with a pair of dissecting forceps, a wedge-shaped piece of tissue—including the corn, a layer of skin and subcutaneous tissue, and the bursa, if present—is dissected out. The oozing is pretty free, and it is sometimes necessary to torsion a small vessel; but the haemorrhage is never severe. The edges of the wound are brought together by one or two fine sutures; an antiseptic dressing is applied, and the wound left to heal—primary union in a few days being the rule. Indeed, the rapidity with which the wound heals is often phenomenal. The net result is the production of a layer of scar tissue at the former site of the corn. It might be thought, perhaps, that the formation of a scar on an exposed position, where it was liable to be subjected to pressure and friction, would lead to untoward results; but such in practice is not the case.

The difference between the parts removed by the writer's method and the methods in ordinary use is, that in the former the whole corn, including the bursa, is taken away; in the latter the horny layer of the epidermis alone is separated from the underlying parts of the corn—in the one case, removal is complete and recurrence practically obviated; in the other, the removal is only partial and recurrence more than likely.

Of course, I am quite well aware that in the case of corns dependent on deformity the appropriate treatment of the corns is the treatment of deformity which has called them into existence, the corns being merely by-products or accidents of the main malady. Into this it is obviously impossible to enter here. Nevertheless, the method of treatment which I have advocated can often be advantageously combined with the special treatment indicated for the malformation, and the cure thereby materially facilitated.

To sum up, the chief advantages to be derived from the complete excision of corns are that, as a method of treatment, it is
safe, speedy, and painless; while the results, as far as a cure is concerned, are permanent and effected at a minimum of time and trouble.

Conclusion.—I have endeavoured to show that even such everyday objects as common corns may be made a study of considerable interest, which may bear fruit in due season. The corollary to this is, that if practitioners of medicine would take a more intelligent interest in the study of these little tumours, which are as troublesome as they are common, an ever-increasing stream of sufferers would find their way to the consulting room of the surgeon, rather than, as is at present the case, to the sanctum of the chiropodist; and, furthermore, that the treatment of a disease, which legitimately belongs to the domain of surgery, would be gradually lifted from the depths of charlatanism into which it has long since subsided. The moral is obvious—both the profession and the public would be the gainers.

ON MUCOUS DISEASE OF THE INTESTINES.

By Francis Hawkins, M.D., M.R.C.P., Physician to the Royal Berkshire Hospital, Reading.

By mucous disease of the intestines I mean that condition of the intestinal canal which results in the passage of mucus in definite cylindrical, tubular, or pellicular forms, associated usually with highly fetid evacuations with or without hæmorrhage. The term mucous is used because microscopical examinations show that the cylinders, etc., consist merely of mucus, there being no membranous structure; and intestines, because there is no sign that this mucus in its varying forms comes solely from any one part of the intestinal canal, for while there is undoubtedly evidence that some of the tubes and cylinders come from the colon, yet there is no proof that others do not originate elsewhere, and my own observations confirm the opinion of Powell that mucous tubes may come from any part of the intestinal canal. My experience has led me to the conclusion that the results of this disease may assume three forms, which may be regarded as indicating either three distinct types, or three stages of the disease, in the following sequence:—

I. THE CYLINDRICAL TYPE OR STAGE.—In this form the mucus is expelled in the form of cylinders, or long thin bands, brownish red or pinkish white in colour when first passed, but becoming pale after being washed in water. They frequently resemble the Ascaris lumbricoides, and some might be mistaken for segments (proglottides) of Taenia solium. In the first case that came under my observation some few years ago, the patient told me she was passing a large number of worms. I insisted on the evacuations being kept, and on first inspection I was almost inclined to agree