in 1898 reported a case in which such degeneration took place.

PATHOLOGY.

The pathology of leukoplakia has been studied by Leloir, Sangster, Butlin and Nedopil, and the process is very similarly described by all. The superficial layers of the epidermis are thickened sometimes to a very marked degree. This is called hyperkeratosis. Under this strata is a granulation layer, very marked, consisting of four or five rows of cells filled with eleidin, and under this the not-much altered Malpighian layer, while the submucous tissue presents a great infiltration of small cells around the vessels.

In the second stage, if on the tongue, deep fissures form, going down into the Malpighian layer, which degenerates, showing granular colloid cells and numerous wandering cells—all evidence of degeneration. In such cases the granular layer filled with eleidin disappears. Sangster found not only vacuolation of the Malpighian layer, but wide lacunæ taking the place of the papillæ in the Malpighian layer.

The thickening of the submucous layer is evidence of a more or less chronic process, while its infiltration by round cells suggests acute conditions or exacerbation of chronic ones.

Butlin divides his pathology into smokers' patch, of which he gives a picture of the microscopical condition, and leucoma, which he considers a chronic inflammation. In the cases microscopically examined by me, the epidermis is thickened, the Malpighian layer has not been much changed, but is in places vacuolated, and the submucous tissue is thickened and often infiltrated. The first photograph shows a leukoplakia in process of degeneration into an epithelioma; the second shows a leukoplakia having an ulcerated portion, but not showing signs of epitheliomatous degeneration, while the third illustrates the vacuolation spoken of by Sangster.

In a case of smokers' patch examined, the epithelial layer was found to be thicker than in the cases shown. Clinically, also, the patch was thicker than in the cases of leucoma without smokers' history. The wide lacunæ of which Sangster speaks were not noted in any of the specimens.

TREATMENT.

As regards treatment, the evidence is most conflicting. Cases treated by papayotin, by excision, by cautery, alkaline washes and "let alone"—all are credited with successful results. On the other hand, many leukoplakias, in spite of all treatment, die of carcinoma.

Butlin, in his last edition, recommends soothing alkaline lotions and ointments, with avoidance of the cautery and all irritants, and decrease or abstinence from smoking. If the patch, in spite of all these measures, remains stationary, and above all, if induration or warts or any appearance of cancer suggests itself, thorough excision of the patch is advised. He cites two cases by Ramsdoff in which no recurrence had occurred ten years after operation.

During the last five years we have had at the Massachusetts General Hospital twelve cases, ten of which have been followed up by Dr. D. Crosby

Greene, for me. Of these, eight were in males and two in females; the average age was 50.4 years.

All the eight males were smokers. In four cases the lesion was on the tongue, on the cheeks in four, and on the lip in one, while in one case the location is not stated. Three cases only admitted syphilis, and none had any other skin disease. The duration of the disease as given by the patient varied from twenty-three years to five months.

Four cases out of the ten developed carcinoma, and one could not be traced. The patients developing carcinoma had had leukoplakia, one for twenty-three years, two for five years, and in one the duration of the lesion could not be ascertained. All the fatal cases denied syphilis and admitted being smokers.

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A CASE OF SUTURE OF DIVIDED URETER. RECOVERY WITHOUT LEAKAGE.

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THE number of cases in which the ureter has been sutured where it has been divided either accidentally or intentionally is as yet so small that no excuse is required for reporting an additional one.

The history was as follows: Mrs. T. J. B., forty-one years old, an American, entered May 1, 1901, on my service at the Baptist Hospital. Had always been well until the previous summer, when she was overworked and felt more or less unwell for two or three months. Menstruation had always been regular until two years before, when it became irregular, and finally, after a year, stopped altogether.

Present illness: In January, 1901, a flow which she regarded as menstrual began, at first profuse and then irregular. At the same time she had considerable pain in the right iliac fossa, radiating down the right leg. Pain at times very severe, and nearly constant. Of late, has required a quarter of a grain of morphia at night to control pain. Bowels have been constipated, but has had at no time any real obstruction, and has passed no blood. Urine has

FIG. 1.—Leukoplakia in process of degeneration into carcinoma.

FIG. 2.—Leukoplakia with ulceration.

FIG. 3.—Vacuolation.

been normal; no frequency. Thinks she has lost twenty to thirty pounds since last summer.

Physical examination: Patient fairly developed; poorly nourished; pale, rather flabby. Heart and lungs show nothing abnormal. Examination of abdomen showed increased muscular resistance over the lower half of right rectus. Liver in normal position. No visible intestinal peristalsis.

Examination by vagina showed the cervix very irregular in outline; deeply lacerated, and bleeding easily to the touch. The tenderness was so great that pelvic examination was unsatisfactory. A diagnosis of cancer of the cervix seemed beyond question. Operation was advised and accepted.

Operation: May 3. Ether. Examination under ether showed no involvement of the vaginal mucous membrane. Uterus was freely movable, and there was apparently but little extension into the broad ligaments. Median incision was made from umbilicus to just above the pubes. Abdomen contained no free fluid, and there were some adhesions of the sigmoid flexure to the left tube. The supra-vaginal portion of the cervix showed a hard, nodular growth more marked in front and on the right side, with some involvement of the base of the right broad ligament. The ovarian arteries on either side were tied with silk and the upper part of the broad ligament divided. Bladder was freed from the front of the uterus with some difficulty, but did not seem to be involved. The left uterine artery was tied with ease. On the right side the growth was found to extend out around the right uterine artery, which was tied with some difficulty about an inch from the cervix on account of the extension of the growth in this direction. Vaginal wall was freed for two inches below the attachment of the cervix, and divided at first on the left side, then in front, behind, and finally on the right side clear of the growth. Tumor was thus removed intact. After the bleeding was controlled, the left ureter was found uninjured, but the right ureter had been divided about three quarters of an inch from the bladder, and about one-half inch had been removed in the growth. Although the patient was in rather poor condition, it seemed wise to attempt a ureteral anastomosis at this time. This was done by the end-in-end method. The lower portion of the ureter was dilated somewhat with a pair of hemostatic forceps. A traction stitch of fine silk was then passed into the lumen of the lower portion from without inward, carried out through the open end up into the lumen of the upper portion from without inward, and then back into the lower portion and out at the same hole through which it was originally introduced. The upper portion was then pinched together, and traction on this suture readily invaginated the upper portion into the lower. The overlapping of the ureter thus obtained was about three eighths of an inch. The ends were held in position by three sutures of fine silk placed at the junction of the overlapping ends, but not entering the lumen of the ureter. The traction suture was then removed. The abdomen was drained both at the lower angle of the incision and by the vagina with large gauze wicks.

Though in considerable shock at the end of the operation, patient picked up rapidly, and no leakage occurred from the sutured ureter. There was some disturbance of the function of micturition, and

a certain amount of incontinence of urine which persisted for several weeks. The gauze packing was removed slowly, but without difficulty, and the wound closed in four weeks.

Convalescence was complicated by a thrombosis of the left femoral vein, which came on suddenly one night in the third week after operation. Temperature and pulse rose rapidly and patient had severe pain in the upper part of the left thigh. Whole extremity became cyanotic and very much swollen, so that pulsation in the arteries of the foot could hardly be felt. This rather alarming condition continued for four days, when improvement in the circulation began and went on rapidly. The recovery from this complication was surprisingly complete, and when the patient left the hospital on June 26, 1901, she had no inconvenience from the leg and there was but little tendency to oedema.

Subsequent History: For a few months after operation she had some dragging pain in right side, possibly due to the rather short ureter, but the symptoms disappeared, and during next six months patient gained twenty pounds in weight.

Aug. 5, 1902, patient presented herself for examination in answer to a letter inquiring after her condition. She looked well, and said she has been able to do all of her work. Weight has been well maintained. No symptoms referable to the genito-urinary tract. She complained, however, of pain and tenderness on the left side of the symphysis, and at this point there is to be felt a tumor about the size of an egg, apparently attached to the upper border of the symphysis pubes. It felt quite superficial, and gave rise to considerable rigidity of the left rectus. Examination by vagina and rectum failed to show anything abnormal. There was no evidence of recurrence within the pelvis except as above noted. Operation advised, but refused on account of comparatively slight inconvenience.

Sept. 10, 1902, patient sent word that she wished to come to the hospital for further operation as advised in August. Examination showed conditions essentially unchanged.

On the 17th of September she was etherized, and under ether it was found very difficult to demonstrate the presence of any tumor. A vertical incision was, therefore, made through the fibers of the left rectus, opening the peritoneal cavity. The pelvis was carefully explored and nothing abnormal found. There was no evidence of recurrence, and the ureter at the site of suture felt normal. I was about to close the wound when an excess of fibrous tissue at the lower angle of the incision attracted my attention, and I prolonged my incision downward and opened a cavity in the horizontal ramus of the left pubic bone filled with cancerous tissue. This was removed as far as possible with the curette, and the wound packed. Recovery from this operation was uneventful.

The malignant disease discovered at this time I took to be a bone metastasis rather than an implantation cancer at the lower angle of the previous wound.

In looking back over this case, we can see the entire course of recovery from the injury done to the ureter at the first operation, and in view of the complete examination made possible by the second

operation, I think it may properly be claimed that complete restoration of function has taken place. The other elements of the case are so much in line with the common observation in regard to operations for cancer of the uterus as to be of no special interest, except for the rather unusual site of the recurrence.

The attempt to unite divided ends of the ureter came as a natural result of the dissatisfaction with methods formerly so general of doing nephrectomy where this accident occurred, and it may now be somewhat dogmatically stated that nephrectomy is unjustifiable, except in cases where such large portions of the ureter have been removed as to make uretero-ureteral anastomosis impossible. Even then, the possibility of dislocating the kidney sufficiently to make a uretero-vesical anastomosis possible has been suggested. Of the methods of uretero-ureteral anastomosis, there are four which have been used in actual practice upon patients. A variety of other methods have been tried in animal experimentation, but the results of these experiments upon animals have in this condition been notably misleading, and led certain French observers to dogmatically assert that an end-to-end anastomosis of ureter was impossible, while as a matter of fact it has been done in nine cases with but one death, and in no case has the peristaltic action of the ureter resulted in the separation of the ends as was predicted from the results of experiments. We are, therefore, at liberty to regard experiments as often misleading, and there are now enough cases in which these methods have been employed in actual practice to warrant our drawing quite definite conclusions. The four methods are briefly as follows:—

The transverse end-to-end, the transverse end-in-end with or without splitting of one or other portion, the end-in-side and the oblique end-to-end.

The transverse end-to-end method has been done twelve times, with two deaths. In many of these cases some artificial aid has been used, either a small piece of catheter or a ureteral catheter passed in from the bladder so that it could be later withdrawn. In some of the cases, however, the anastomosis has been effected without artificial aids, and it is on the whole surprising how well these cases have done.

The end-in-end method has been done ten times, including my own case, with one death; three times by McMonagle without splitting the lower end, but in all these cases the ureter was dilated, and once by the author on an undilated ureter; six times by splitting the lower portion so as to admit more readily the insertion of the upper portion into the lower. The general principle of this method is the employment of one or more traction sutures, by which the upper portion is drawn down into the lower. McMonagle in his original communication advises the employment of two such traction sutures, but in my case one suture proved amply sufficient. It is quite possible to dilate the lower portion so as to admit the invagination of the upper without great difficulty, and it would seem that this method where possible would consume less time and sacrifice less ureter than in the splitting method. Where it is thought wise to split the lower fragment, such an incision need not

be more than one quarter or one third of an inch in length, and the application and use of traction sutures is then the same.

The end-in-side method has been advocated by Van Hook and Kelly. In this method the end of the lower portion is closed by a ligature, and a slit one centimeter long is then made in the lower fragment just below the ligature. Into this slit the lower end of the upper portion is drawn by means of a traction suture.

The fourth method is the oblique end-to-end method of Bouvé. The object in this method is to prevent stenosis from subsequent cicatricial contraction, but there seems to be comparatively little evidence to show that such stenosis actually occurs in practice. This oblique end-to-end method differs from the transverse end-to-end only in that the ends to be sutured are cut obliquely, thus giving a somewhat longer line of suture. This has been done twice without mortality.

In reviewing these four methods it will be seen that they are applicable to somewhat different cases.

The transverse end-to-end method, especially with the hammer recently introduced by Kelly, will necessitate the sacrifice of less ureter than any other method, and is, therefore, particularly applicable to cases where a considerable amount of ureter has been lost, and there is barely enough to permit the ends to be brought together. It is an operation of more technical difficulty and more likely to leak than the end-in-end or end-in-side methods, and may, therefore, wisely be reserved for those cases to which other methods seem inapplicable.

The oblique end-to-end has practically the same limitations, though it will necessitate the sacrifice of a small portion of the ureter in order to obtain the oblique ends necessary.

The end-in-side method is only applicable to cases in which plenty of slack is to be had, as it necessitates the sacrifice of one and one-half inches of the ureter, and might be entirely impossible in a considerable number of cases. It is probably as easy as any of the methods, and is a little less likely to leak.

The end-in-end method, with or without splitting, is a method applicable to cases where a moderate amount of ureter up to an inch can be utilized for the suture. It is quite as easy as the end-in-side method, and would seem to have a larger range of application, in that it requires the sacrifice of less tissue.

In looking back over the reported cases in which the ureter has been sutured, the surprising thing to be noted is the variety of methods and the very favorable results which have been obtained. The tissue of the ureter seems one very well adapted to the purposes of anastomosis, and even in some cases where faulty or hasty methods have been necessarily employed, the permanent closure of fistulae has very generally taken place, and the tendency in this direction seems to be very marked. We may, I think, conclude that attempts to suture the divided ureter are extremely likely to be successful, and that such an attempt should always be made before the ureter is implanted in the vagina, rectum or skin, or the formerly popular operation of nephrectomy is resorted to.