CLINICAL LECTURE

ON

THE CONSEQUENCES OF LONG CONTINUED CONSTIPATION.

By J. S. BRISTOWE, M.D., LL.D., F.R.S.,
Senior-Physician to St. Thomas's Hospital.

CASE I. *Fæcal Accumulation in Colon forming a Tumour.*—A little more than five years ago, while at the seaside, I was requested by the local medical man to see a patient with him. This was a married lady, about 30 years of age, who had for the most part had good health, and was the mother of several children. She had been suffering for about a week from abdominal pain, sickness, and disturbance of the bowels; and, now that she was recovering, a tumour had been detected within the abdomen. This discovery caused some alarm; and it was mainly in reference to this that my opinion was desired. She was a healthy looking, somewhat plump young woman when I saw her; and had then no particular complaint to make. But there was a hard rounded mass in the upper part of the left side of the abdomen, between the umbilicus and the ribs. This was not tender on pressure, was freely movable within narrow limits, and perhaps about 2½ inches in diameter. Although rather larger and rounder than a healthy kidney might have been expected to be, I was inclined at the time to think it was a movable kidney. The urine was healthy. A week later, I saw the lady again. She was then in her usual health; but on examining the abdomen, the tumour was still there. Strange to say, however, it had shifted its position; for it now lay in the centre of the abdomen immediately subjacent to the umbilicus; and, although still freely movable in a restricted space, it could not by any manœuvre be restored to the region which it had formerly occupied. This circumstance led me to modify my original opinion, and to think it probable that the tumour was a lump of solid fæcal matter, which had descended within the week from the descending colon into the sigmoid flexure. This opinion was confirmed by what I now, for the first time, learnt of her history. She had suffered, since her marriage, from persistent constipation; and after one of her confinements (I think the first), an enormous accumulation of solid fæcal matter had to be removed, partly by mechanical means, from the lower bowel. Ever since that time, her bowels had been exceedingly sluggish.

I did not see the patient again for three months. I had returned to town, and she to her home in the south-west of England. On this occasion, she had come to London to consult Sir James Paget, and I was asked to meet him. During the interval, she had, in the belief that the tumour was fæcal, been treated very actively with enemata, administered by the long tube, and powerful purgatives, including croton-oil. This treatment had pulled her down a good deal, but had not dispersed the presumed accumulation. At this interview, I learnt that the rectum was very roomy, and that the tumour could at times be felt descending into the pelvis. It was now entirely below the umbilicus, lying between this and the left Poupart's ligament. It could be moved a little from side to side, but could not be restored to the position in which I had last detected it. Moreover, it was larger and flatter, having much the shape of a penny bun, and it was now somewhat soft and doughy, and could be distinctly indented and moulded by the fingers. There was no doubt at this time that the tumour was fæcal, and that it had travelled slowly along the large intestine between my first and this last interview. I have not heard of the patient since.

I assumed that, in this case, owing to long continued and neglected constipation, the large intestine, and more especially its lower half, had become dilated and hypertrophied, sluggish, and a less efficient instrument for the propulsion of its contents than the healthy bowel; and that a solid lump of fæces, accidentally (as it were) left behind, had remained there and formed a nucleus, around which additional solid matter had gradually accumulated.

CASE II. *Fæcal Tumour in Ascending Colon: Dilatation and Hypertrophy of Sigmoid Flexure: Dysenteric Diarrhoea.*—Mrs. K., aged 46, came under my care on January 31st, 1885. She had been a fairly healthy, but not robust, woman, and had never had any serious illnesses; but for many years she had suffered from irregularity of the bowels, constipation of two or three weeks' duration, and loose-

[1274]

ness of bowels with discharge of mucus, often succeeding one another. Occasionally she had been sick, and at times had complained of abdominal pain. I had seen her at her own home early in July; at which time she had been suffering for two or three weeks from paroxysmal pain across the upper part of the belly, and sickness. The temperature was normal. I did not recognise any abdominal lump or tenderness, nor at that time did I know that she had been liable to bowel-disturbance; and I thought that probably she was suffering from the passage of small gall-stones. I saw her a week later, at which time she was complaining of diarrhoea; and my attention was called to two movable lumps in the belly; one hard, about the size of a pigeon's egg, and situated a little above the outer extremity of the left Poupart's ligament; the other larger and softer, just above the pubes, but mainly to the right of the mesial line. Her health was no worse than on the first occasion; and I formed no definite conclusion as to the nature of the abdominal tumours. Subsequently she improved in health, and in September went to Margate. During the last few weeks, there had been a recurrence of the symptoms from which she suffered in the summer.

She was a pale, spare woman, complaining of uneasiness in the belly, loss of appetite, and constant diarrhoea. The thoracic organs were all healthy. The abdomen was relatively large, prominent, and flaccid. There was no general tenderness of it, and it could therefore be examined without difficulty. On the right side, a little below the level of the navel, and about two inches from it, was an irregularly rounded very hard mass, altogether about as large as a hen's egg, which was freely movable within narrow limits. There was a sense of resistance in the umbilical region, but no definite tumour. And above the left Poupart's ligament there was a largish rounded mass, smooth, not very hard, slightly movable, and somewhat tender. There was no enlargement of the liver or spleen, no ascites. The so-called diarrhoea consisted in the frequent, and at times unrestrainable, discharge of dirty jelly-like mucus, of very offensive odour, mixed with small quantities of thin fæcal matter. There was never any discharge of blood; pulse 80; tongue clean; urine free from albumen.

The patient was kept in bed; and her abdominal uneasiness disappeared, and her general health improved. But her evacuations continued, for the most part, of the same character as on admission, and as they had been for months. They were thin, offensive, composed largely of mucus, and containing only a relatively small quantity of fæcal matter, which was for the most part fluid or semi-fluid. She did not suffer from tenesmus, but the discharge from the anus was frequent, and difficult to restrain.

Repeated examinations of the abdomen modified the views originally expressed with respect to the condition of parts within. The movable lump to the right of the umbilicus remained unchanged in position until she left the hospital; but it became more and more certain that it was merely a lump of fæces left behind in (probably) the ascending colon. At first this was very hard, perhaps an inch in diameter, and rounded, but somewhat nodulated in form. On February 8th, it was noted that either the lump had split into two unequal fragments, or a second smaller lump had developed in its immediate neighbourhood. But in the course of a few days the second lump had disappeared. As time went on, and partly perhaps as the result of frequent manipulation, the mass, which had previously been extremely hard, became more and more plastic, until at length it could be moulded between the fingers, like a lump of stiff dough. We never succeeded, however, in breaking it down. The vague sense of resistance above referred to as existing in the neighbourhood of the umbilicus, and the doughy tumour recognised in the left iliac region, turned out to be due to temporary conditions of the bowel, doubtless of the sigmoid flexure. For repeated examinations made it clear, that there was a large loop of bowel, the concavity of which faced the left lumbar region, while its convexity extended beyond the navel to the right, the upper limit reaching a couple of inches above the navel, the lower limit lying just above Poupart's ligament; that the bowel measured between an inch and a half and two inches in diameter, was thick and doughy and sausage-like to the feel, presented sluggish peristaltic movements which revealed themselves by slowly developed variations of elevation and depression of the abdominal walls; and that there was no tumour, in the proper sense of the term, in this situation. This loop of bowel gave the impression of being thick-walled and dilated, and of containing fæcal matter in some abundance; but it was resonant on percussion. It remained essentially unaltered to the last.

She was treated mainly with tonics and enemata; and for ten days (shortly before her discharge) had the continuous current applied daily to her abdomen. This caused a more continuous and profuse discharge of liquid, and almost total loss of control over her evacua-

tions; but it did not promote the escape of any larger proportion of solid faeces than she had been in the habit of passing, and moreover it made her feel ill and low-spirited. A few days before she left the hospital this treatment was discontinued, and she again improved in general health. I may add that we were compelled to discontinue the use of large enemata, in consequence of the pain and distress that followed their employment.

During her stay in St. Thomas's Hospital, she gained flesh, became stronger, and more healthy-looking, and lost her abdominal pain; but her evacuations underwent no material change. Her tongue was clean; her appetite fair; her pulse about 80 in the minute; and her temperature between 96° and 98°.

She was discharged on March 18th.

The opinion at which I arrived in regard to this case was that, from long-continued constipation, as in the former case, the larger bowel, and more especially its lower half, had become dilated, thick-walled and sluggish, that faeces were disposed to lag within it, and that one hard lump had become impacted. But I thought it also probable that, under the influence of overdistension and of the irritating effects of resting faeces, the mucous membrane of the larger bowel had undergone excoriation in tracts, and that the offensive mucus discharged from the anus was the product of the diseased surface; that, in fact, owing to the combination of ulceration of the mucous membrane with sluggishness and distension of the bowel, a condition clinically not unlike that of chronic dysentery had arisen.

The views above expressed with respect to the two cases just quoted will probably be accepted as giving an adequate explanation of the clinical phenomena which they severally presented. Nevertheless, I proceed to adduce two or three cases, the recollection of which had some influence in determining my views, and which not only help to confirm them, but are in other respects very instructive.

CASE III.¹ Constipation: Enormous Accumulation of Faeces in Large Intestine: Hypertrophy and Dilatation of Bowel: Ulceration of Mucous Membrane: Death: Necropsy.—Elizabeth M., a little girl 8 years of age, was admitted into St. Thomas's Hospital on May 15th, 1855. The history was that she had been ill for nine weeks, and that she had long been subject to constipation, the bowels often remaining unrelieved for three weeks together. On admission, she was pale, emaciated, and delicate-looking, and presented a large tense abdomen, the fulness being most marked in the upper half. There was no pain nor tenderness, and no distinct evidence of tumour. Tongue clean; pulse 80. She was supposed to be suffering from abdominal tuberculosis.

She lived for three weeks, and, during this time, her abdomen became more and more tense and hard, and also tender; she vomited from time to time; she never passed any actual faecal matter, but occasionally a little dark, greenish-coloured, offensive fluid; her urine was for the most part scanty and dark coloured, and she grew more anxious looking, thinner, and weaker. Her tongue was generally clean; her pulse not very rapid, but extremely feeble; her skin dry. Amongst other items of treatment, opening medicines were given, and enemata employed, but without any definite result. She died on June 5th.

I may here add that, although I had seen the patient once or twice during life, she was never under my care, and I had never troubled myself to form any opinion of my own about her case; that the results of the *post mortem* examination, presently to be detailed, led me to make very careful inquiries of the sister and nurse of the ward in which the patient had lain, and of her friends; that I then discovered that the child's bowels had not been relieved for fully seven weeks before she came into the hospital; that there had never been passage of actual faecal matter during her stay in the hospital; that her abdomen grew larger and larger during the whole of the period she was under observation, without there being at any time much pain or tenderness in it; that she was constantly complaining of feeling so full that she should burst; and that latterly she had vomited constantly.

Necropsy.—The body was extremely emaciated; the abdomen was much enlarged, and the form of the greatly distended intestines in contact with the walls distinctly mapped out. On opening the abdomen, the sigmoid flexure, and the descending and transverse colon, were found enormously distended, measuring between three and three and a half inches in diameter, elongated in a proportionate degree, and occupying between them the whole of the front of the abdomen. The caecum and ascending colon were also distended, but not to the same extent. The peritoneal surface of the large intestine was smooth and uncongested; but there was a degree of opacity in its walls, and a sort of doughiness on pressure, which were remarkable. The ap-

pendices epiploicae were small and red. The small intestine was universally distended, but much less in proportion than the large. The peritoneum was everywhere healthy. The stomach was small and contracted, its cavity empty, its mucous membrane pale. The small intestine was filled throughout with thick, fluid, olive-green-coloured faeces. Its mucous membrane was generally healthy; but, here and there, and especially at the lower part of the ileum, there was some congestion. The large intestine contained no trace of flatus, but was choke-full of thick, semi-solid, olive-green-coloured faeces. These were more solid in the rectum than elsewhere, and, immediately above the anus, formed an indurated conical lump. The dilatation of the bowel involved the upper part of the rectum, and ceased abruptly at two inches from the anus. But there was no stricture or any such condition in that situation, or, indeed, anywhere else. The walls of the large intestine, especially the muscular coat, were generally much thickened. The thickening of the muscular coat commenced in the ascending colon, and gradually increased to the lower end of the sigmoid flexure, where it measured one-eighth of an inch thick. The mucous membrane was tolerably healthy in the greater part of its extent, and consistent. It was, however, somewhat thickened, and, in many parts, presented patches and streaks of congestion, of various degrees of intensity. There were also half a dozen large tracts of ulceration, scattered at long and unequal distances from the caecum to the rectum. These were of irregular shape, and occupied each an area of from four to eight square inches. They presented numerous circular ulcers, from half an inch to a line in diameter, which towards the margins diminished in size and distinctness, and produced a rough reticulated condition of parts. The network of mucous membrane still remaining upon the tracts was generally much, but patchily, congested. The immediate edges of the ulcers were deeply congested, but not thickened. Their floors had an ashy colour, and were formed by the submucous and muscular tissues. There were also a few small ulcerated patches measuring from half a square inch to an inch in area. The mesenteric glands were healthy. The liver was somewhat congested, but healthy. The gall-bladder was large, and full of dark treacly bile. The spleen was small, healthy. The pancreas, kidneys, uterus, etc., were healthy. The thoracic organs were all healthy. There was no tubercle anywhere.

In this case, we have a striking example of the injurious effects of neglected and prolonged constipation. How far former repeated occurrences of constipation may have been instrumental in causing some of the dilatation and hypertrophy of the large intestine which were present at the time of death, it is impossible to say. But that the main part of the dilatation and hypertrophy was due to the ten weeks' absolute constipation that preceded death, there can be no reasonable doubt. It is easy to understand, and this case demonstrates the fact, that a lump of faeces unduly retained in the ampulla of the rectum, growing harder with time, and larger from repeated additions to it, may thus, before long, become extremely difficult of spontaneous dislodgment, and that the longer the process is continued, the more the addition of concentric laminae of faeces around the central core distends the ampulla, and the more the accumulation dilates the rest of the larger bowel, the more (notwithstanding the development of compensative muscular hypertrophy) the bowel becomes an inefficient instrument for the transmission of its contents; until at length what was at first only difficult, becomes impossible without mechanical assistance. This case shows how extreme the hypertrophy and dilatation may become under such conditions; but it shows, also, how, under the same conditions, the mucous membrane of the distended bowel tends—partly, probably, from the mechanical effects of over-distension, partly, probably, from the fretting of the surface by the retained faeces—to undergo excoriation. I may point out that the same kind of excoriation, similarly produced, is a common and grave sequence of dilatation of the colon due to stricture.

The next case I quote from the 23rd volume of the *Transactions of the Pathological Society*. It was under the care of my friend the late Dr. Peacock, and was put on record by him. But I recollect the case well; and it is one of those on which my personal experience of dilated and incompetent bowels is based, and it will bear repetition. In its pathology, it resembles the last case in almost every particular. Clinically, also, there is a striking resemblance between the two; but there are instructive differences, dependent on the fact that absolute obstruction of the bowel had never, as in the last case, been permitted. The long progress of the case, too, and the age the patient had attained, explain the much larger dimensions of the colon in this case than in the other.

CASE IV. Fatal Constipation from Excessive Dilatation of the Colon: Necropsy.—A man, aged 28, was admitted into St. Thomas's Hospital, under Dr. Peacock's care, on May 11th, 1871; and Mr. J. P.

¹ This case, and Case v, are described in briefer detail in my article on Intestinal Obstruction in Reynolds's *System of Medicine*.

Purvis, who sent him to the hospital, forwarded the following notes of his case.

"R. M. suffered from constipation from birth; his mother had great difficulty with his bowels, and was perpetually giving him purgative medicines. As he grew up, this constipation continued, and recourse was frequently had to enemata. About the year 1860, he had a severe attack of obstruction. Mr. Le Gros Clark was called in consultation, and removed from the rectum a very large accumulation of fecal matter. After this, aperients had no effect, and the bowels never acted without an enema, which he used about every other day. He suffered greatly from flatulence. His occupation was that of a teacher of music and singing at a ladies' school. While teaching, he had frequently been so distended as to necessitate his leaving the room, and going to the closet in order to evacuate the wind.

"Notwithstanding this, he enjoyed tolerably good health, and was able to do his daily work to within six weeks of his death. At that time, he was seized with symptoms of obstruction of the bowels, vomiting, etc., and his rectum was found to be blocked up with hardened feces. These were removed, and an enema administered, with some relief to his symptoms; but, at the end of a few days, the condition recurred, and necessitated the same treatment. The abdomen during this time was enormously distended, and extremely tympanitic all over; his appearance was that of a woman just previous to her confinement. Frictions in the course of the colon, galvanism, and nuxvomica and other aperients, were tried with a view to get the bowels to act, but all to no purpose; they merely enabled him to pass small quantities of flatus, and produced much uneasiness. Enemata administered daily were the only means which produced any relief, but they only procured very scanty evacuations."

When admitted into the hospital, the abdomen was enormously distended, and there was a greater amount of fullness on the left side than on the right. The distension was to a great extent tympanitic, though the resonance on percussion was not very clear; and on the left side, when he lay upon the back, there was marked dullness. The integuments about the lower part of the abdomen, the penis and scrotum, and lower extremities, were oedematous; the liver and heart were very much displaced upwards from the abdominal distension, and the heart's sounds were noisy, but without murmur. The pulse was very small and feeble, 100. The urine was passed in small quantity, and was highly coloured and loaded with lithates, and contained a very slight trace of albumen. He stated that he had not had evacuations oftener than every other day, and those procured were very small, though he passed much flatus. He had not, however, had recently any sickness.

He was ordered to have enemata administered, and nuxvomica and rhubarb were directed to be given, but he died unexpectedly on the third day after his admission.

Post Mortem Examination.—All the organs of the body were healthy, except the lower part of the alimentary canal, which presented the following conditions. The lower end of the ileum was somewhat distended with fecal matter. The large intestine, from the cæcum to the upper part of the rectum, was enormously distended; the diameter of this portion of the gut, which was pretty uniform throughout, measured from six to eight inches. It contained fully fifteen quarts of semisolid greenish-coloured fecal matter. On washing out the intestine, the mucous membrane was found extensively ulcerated, the ulcerations being for the most part aggregated into two groups—one, situated about the middle of the transverse colon, the other at the lower end of the sigmoid flexure. The distension ceased somewhat abruptly at the upper end of the rectum; and that portion of the bowel was free from obstruction, and was quite healthy, except that there were some hæmorrhoids near the anus. The peritoneum did not display any appearances either of present or of past inflammation.

The next case came under my observation a few months after that of the little girl. Its relation to hers impressed me while I was making the *post mortem* examination. Indeed, even before I had collected the scanty ascertainable facts of the medical history, I felt sure that the case had been one of chronic neglected constipation, issuing, as in the child's case, in large hypertrophy and dilatation of the bowel, and irritative excoriation of the mucous membrane; and I assumed that the patient had been suffering of late, not from accumulation of feces, but rather from the dysenteric symptoms likely to accompany abundant ulceration of the mucous membrane, and from which also the little girl had probably suffered in some degree, as indicated by the occasional escape of the greenish fluid, and that the perforation which caused his death was simply an accident likely to happen in all such cases when attended with consecutive ulceration.

CASE V. *Dilatation, Ulceration, and Perforation of the Large Intestine Arising from Long Continued and Neglected Constipation:*

Death and Necropsy.—C. H., a baker, aged 24, was admitted into hospital under one of my colleagues on February 26th, 1886, and died on March 26th from peritonitis, induced by perforation of the bowel. I never saw the patient during life, and no notes of any value were made concerning his clinical history. I learnt, however, that, during his stay in the hospital, and up to the time at which symptoms of peritonitis suddenly declared themselves, he had been suffering from dysenteric symptoms; and I further learnt, on pursuing my inquiries, that for some long time he had suffered from habitual constipation, but that diarrhœa had come on a fortnight before admission, and, consequently, just six weeks before death.

Post Mortem Examination.—The body was much emaciated. On opening the abdominal cavity, a few ounces of fluid escaped. There was a little clear lymph deposited over the portion of peritoneum above the great omentum. Below, the lymph was more abundant, and a little fecal matter was incorporated with it. A small quantity of thin pea-soup like fluid was found in the pelvis. There was a small perforation in the anterior part of the transverse colon, two or three inches from its junction with the descending colon. The colon was much dilated in its whole extent, but flaccid and empty, and the longitudinal bands of muscular tissue were remarkably thick and distinct, especially in the sigmoid flexure. On removing and laying open the intestine, it was found that the lower two or three inches of the rectum had their normal dimensions, and were in all respects healthy; but that, above this, the rectum presented a sudden large dilatation, and that this dilatation was continued to the cæcum. The greatest degree of dilatation was presented by the sigmoid flexure, and some parts of the transverse colon, where the circumference of the bowel was over seven inches. The peritoneal covering was unthickened. The muscular coat was generally hypertrophied, and, in the sigmoid flexure, was a line and a half thick. In the cæcum, the muscular coat was of the usual thickness, and in the rectum it was normal. The mucous membrane was extensively ulcerated. There were two or three patches, about the size of the palm of the hand, in the sigmoid flexure. From the middle of the descending colon to the corresponding point in the ascending colon, the ulceration formed a continuous tract, and, in the rest of the colon and in the cæcum, there were a few small patches. The diseased tracts everywhere presented the same characters. They were made up of innumerable small ulcers, blended in a greater or less degree with one another at their margins, so as to form an irregular network of ulceration, the interstices of which were occupied by irregular fragments and bands of mucous membrane. The floors of the ulcers were formed, in some places, by the submucous tissue, but mostly by the muscular coat more or less eroded. The fragments of mucous membrane presented, for the most part, abrupt margins, and were congested, thickened, and, in places, oedematous. The stomach and small intestine were healthy, as also were the other abdominal and the thoracic viscera.

I have little to add. The three cases which I have adduced in elucidation of my first two, show clearly how, in association with long continued obstinate constipation, the colon undergoes hypertrophy and dilatation, and becomes sluggish and inefficient. They show, in its extremest form, the condition of bowel which, from the history and observed clinical facts of the other cases, I assume to be present in them in a slighter degree. It may be gathered from them how fecal masses of unusual consistency and coherency might, in such cases, be easily left behind, while the softer parts were transmitted, and might remain *in situ* almost indefinitely. And one may see from them how readily dysenteric diarrhœa, due to ulceration, might, as in my second case, alternate with, or succeed, or even accompany, the more characteristic constipation. I do not myself think that fecal accumulations often form definite circumscribed tumours, detectable by palpation; but they certainly do occasionally, and I can call to mind one or two cases of abdominal cancer, with some dilatation of bowels, in which such definite movable lumps, doughy to the fingers, and disappearing in the course of time, were repeatedly recognised.

The cases I have narrated show the importance, in the first place, of not allowing constipation to be neglected and to become habitual; and, in the second, of emptying the rectum by mechanical means when there has been constipation of long standing, which does not readily yield to medicines. They show also the little efficacy, in such cases, of even drastic purgatives, in either dislodging impacted masses, or emptying the bowel.

In conclusion, I may briefly advert to a case, now in the hospital under my care, in which I am inclined to believe the conditions I have described are in process of manufacture.

CASE VI. *Habitual Constipation of Two Years' Duration.*—S. W., a housemaid, aged 20, was admitted on March 20th of the present year. Two years ago she was suffering from weakness, and at that time she

began to be troubled with constipation. The first attack lasted three weeks, and, since then, the bowels had been relieved on the average only once every two or three weeks. During this time she had been taking purgative medicine constantly, with no effect, and having frequent enemata. The relief of the bowels had been due to the enemata. For the last two or three months she had had pain in the lower part of the back, and running down both thighs, and the feet had been liable to swell.

On admission, she was well nourished, but pallid and delicate-looking. The abdomen was rather large, and resistant, but it was resonant; there was no tumour, no pain or tenderness, and its walls were flaccid. The bowels had not been relieved for three weeks. During the ensuing week, large enemata were administered on several occasions, and thus a considerable quantity of solid feces was evacuated. Since then, the bowels have been periodically relieved by enemata, so that there has been no reason to believe that there has been any continuance of undue fecal accumulation. They have never yet, however, acted spontaneously, or under the influence of purgatives. The patient suffered at first from occasional pains in the abdomen, and severe aching in the legs, but these symptoms have improved. She has been liable, also, to bad headaches. In other respects her health has been fairly good, and it has improved. The patient is still under treatment (April 18th).

ON THE ADVANCE OF THE PERIPHERY OF THE IRIS IN GLAUCOMA.

By W. A. BRAILEY, M.D.,

Assistant Ophthalmic Surgeon to Guy's Hospital, etc.

THE application of the peripheral part of the iris to the cornea in glaucoma is one of the most interesting phenomena of this remarkable disease. It has, at the same time, great importance in a practical sense, since its occurrence appears to me to signify the entry of the malady on a new and less curable stage, in which neither myotics any longer afford a chance of cure, nor is any operation so easily done or so likely to be effective. For it appears reasonable to assume that, when the iris has once reached this position, it remains there, pressed valve-like against the meshwork of the ligamentum pectinatum. Moreover, the applied part very rapidly contracts inflammatory adhesions, and soon passes, probably in consequence of this, into atrophy, together with the rest of the iris.

These circumstances prevent its removal by iridectomy from this, in this sense, most important region of the cornea. They also hamper the performance of this operation and of sclerotomy, by misleading the operator as to the real position of the point of the knife at its emergence into the anterior chamber.

In connection with this application of the iris, certain questions suggest themselves.

1. Is this condition essential to the establishment of increased tension?
2. Though perhaps not essential in the above respect, does it not always occur at a later period in those cases where the disease runs its course to blindness?
3. What are the symptoms indicative of its occurrence?
4. What is its cause?

I venture myself at once to supply answers to the first three and less important questions, in order that we may come as quickly as possible to the fourth, which forms the essential question before us. I say decidedly, both on clinical and on pathological grounds, that increased tension does not necessarily involve the application of the periphery of the iris to the cornea, and that eyes in which the disease has attained merely an early or very subacute stage do not exhibit this phenomenon. For, when we see a patient suffering from glaucoma, in whom the pupil is active, and becomes contracted to a pin's point under eserine, we must believe that the muscles of the iris have good tone, and, consequently, that this membrane is not inordinately stretched, as it would be if its periphery were applied to the cornea. And the clinical evidence seems conclusive in those cases in which heightened tension falls to normal under the use of this drug. So, also, in intermittent glaucoma.

Pathological evidence in the same direction is not easy to obtain, since, in the vast majority of eyes excised on account of glaucoma, the disease is in its final stage. But I have three such eyes in which the iris-periphery shows no evidence of application. One of them is of about two years' standing from the commencement of the disease, with

no great rise of tension, though perception of light has ceased. The margin of the anterior chamber is, however, narrower than normal. Both the others are cases of recent and acute glaucoma. They appeared to be in a condition curable by operation, and would not have been available for our instruction, had not the operator chanced in each case to wound the lens in his attempted sclerotomy.

The above observations will also furnish my answer to the second question. Though I admit that the periphery of the iris is applied in the vast majority of eyes excised on account of primary glaucoma, and though I have found it thus placed even where the pupil, though not excluded, has remained small and rigid from adhesions between it and the lens, I cannot, in the face of the specimens above referred to, suppose that it may not remain unapplied.

With regard to the third point, excepting such cases as those with posterior synechiae just referred to, I should say that dilatation, often excentric, and immobility of the pupil, in association with an advanced position of the iris, are the signs by which this application can be recognised clinically, and that a sudden wide dilatation of the pupil shows the exact time of such advance.

As to the causes of this condition, and the exact pathological states associated with it, I propose to speak more fully. From the anatomical conditions of the normal eye, I admit, as maintained by Weber, Priestley Smith, and others, that the ciliary folds can, by their advancement, cause this application of the iris; for the more prominent of these folds run on to the base of the iris, and the shorter ones up to it. From a consideration of the relative extreme diameters of the aqueous chamber and lens, it is clear that the latter itself, so long as it retains its normal attachments, cannot, by its advance, effect such application. A lateral pressure of the lens or of the ciliary folds, such as would be due to the swelling of either, without any advancement, is not the means of effecting it, since there is no evidence of the compression of the ciliary folds, either against each other or towards the ciliary body, in any one of the very numerous cases that I have examined microscopically. Moreover, the extreme base of the iris, which would be the part pressed outwards, if the diameter of the lens became materially increased, retains its normal position. Indeed, the anterior chamber may still exist at its extreme periphery, notwithstanding the application just in front of it of the corresponding part of the iris to the ligamentum pectinatum.

If, then, we conclude that the ciliary folds are, by their advance, the cause of this application of the periphery of the iris, the next question is as to the cause of the advanced position of the ciliary folds, or, at all events, of their anterior border.

Before undertaking this part, let me state some facts, or some things appearing to me to be facts. Perhaps I shall make certain recantations.

1. There is no atrophy of the ciliary body, inclusive of its muscular part, in the early stages of glaucoma. This I state on the strength of certain preparations which I have examined comparatively recently. The atrophy of the ciliary body and iris, which is so well marked and characteristic, comes on later, and is, in my opinion, only a consequence of this application of the iris. It is the ultimate stage of the inflammatory change set up by the adhesion.

2. The anterior chamber is rendered shallow in the earlier stages of glaucoma by a partial advance of the lens and iris. Later still, when the margin of the iris has become applied to the region of the ligamentum pectinatum, and when atrophy of the ciliary region has set in, the lens recedes to its normal position. Then, as we see by the numerous microscopic preparations in which fluid is clearly trying to push its way between iris and cornea, to the separation of the adhesion between them, the iris tends, though ineffectually, to regain its proper position.

3. In most cases of glaucoma, the vitreous body is at least not below the normal size. But cases are not wanting where it is shrunken and detached from the posterior part of the retina by fluid; and others are found where it is only represented by traces remaining in the cavity of the umbrella-shaped detached retina.

4. The canal of Schlemm is open, at least as widely as normal, up to and for some time after the establishment of the glaucomatous condition. And the ligamentum pectinatum presents its usual loose texture.

5. The lens does not usually exceed the normal size in glaucoma. In the comparatively rare cases where I have found a disproportionate size, this is simply in consequence of the initial stage in the development of the cataractous condition. Moreover, this enlargement causes it to approach the spherical shape, being developed principally in an antero-posterior direction.

6. There is no certain evidence, either pathological or clinical, that the ciliary folds are swollen in glaucoma; though, from the enlarge-