Colocystoplasty for the Bilharzial Bladder

BY

T. R. SIMPSON, M.B., CH.B., F.R.C.S. (Ed.)
Honorary Urological Surgeon, Salisbury Hospitals Group; Consultant Urologist, Harare Central Hospital; Consultant Urologist, Rhodesian Defence Forces.

The operation of colocystoplasty was developed from the earlier techniques of ileo cystoplasty. These were designed to replace, to a varying extent, the vault and walls of a fibrotic and contracted bladder by an isolated loop of bowel which remained attached to its mesenteric blood supply. (Wells, 1956; Pyrah, 1956; Yeates, 1956; Pyrah and Raper, 1958; Hanley, 1960; Riches, 1960.)

The procedures are now well established in the treatment of the contracted bladder of tuberculous cystitis and in chronic interstitial cystitis (Hunner’s ulcer). Many surgeons prefer colocystoplasty using an isolated loop of sigmoid colon, as this undoubtedly has a number of advantages over the use of ileum. There is much less post-operative morbidity, particularly in the low incidence of abdominal distension and ileus. There appears to be less risk of electrolyte disturbance and the quality of micturition is said to be better. Mucus secretion is no greater using colon and may even be less than with ileum. On the other hand, it is more difficult to sterilise the bowel content of the colon, but careful preparation with modern antibiotics removes this objection (Riches, 1960).

So far as I am aware, the first ileocystoplasty for the bilharzial contracted bladder was performed in Rhodesia by my colleague, R. M. Honey, in 1955. However, he too now prefers colocystoplasty in this condition for the reasons that have been mentioned.

Schistosomiasis haematobium (bilharziasis) is endemic in Rhodesia, and as a result some 75 per cent. of the African population suffer from the disease. It is therefore common to see in this country severe bilharzial changes in the urinary tract. These changes have been well described by Gelfand (1948, 1950), Honey and Gelfand (1960), Makar (1948) and others and will not be described here in detail, but only those features relative to the present study will be considered.

The main weight of the attack made by the parasite falls upon the bladder and lower ureters, and it is the effect upon the bladder which is of particular interest. Repeated infestation occurs in many people from early childhood onwards, and by the time they reach adolescence the worm burden is already heavy, often in spite of treatment, and such patients are well on the way to developing irreversible changes in the bladder wall. Very heavy deposition of ova in the submucosa takes place and leads to irregular thickening of the mucosa. Widespread “sandy patch” or “ground glass” appearance is seen on cystoscopic examination. The reaction of chronic inflammatory fibrosis takes place; there is round cell infiltration and much of the muscle layers in the wall of the bladder is frequently destroyed and replaced by fibrous tissue (Fig. 1).

Calcification in the bladder wall is often seen (Fig. 2). In fact, the condition is essentially a chronic interstitial cystitis.

At this stage it will not be significantly influenced by treatment with antimony compounds, and in fact many of these patients by the age of 25 to 30 have had numerous courses of antimony treatment without benefit. This is not to suggest that antimony has lost its place in

Fig. 1—Bladder wall. Reticulum stain showing bilharzial ova in submucosa (top right) and markedly increased fibrosis between muscle bundles.
the treatment of bilharziasis, but the condition we are now attempting to deal with is not the active presence of the parasite, but the irreversible changes in the bladder wall resulting from repeated infestation.

**CLINICAL FINDINGS**

There are two main effects which result from these changes. The bladder capacity is gradually diminished by fibrous contracture and thickening of its wall, and this may proceed to an extreme degree where the capacity is reduced to less than 100 c.c. (Fig. 4). The bladder then ceases to function as a reservoir and there is constant dribbling incontinence. This extreme condition, however, is rare and it is much more common to see capacities reduced to the 250 c.c. to 350 c.c. range.

The second effect, which is highly important, is that the bladder pathology of bilharzial interstitial cystitis frequently causes constant pain and disability long before there is significant reduction in bladder capacity. This pain is quite characteristic in its nature and distribution. It is described as a heavy ache in the suprapubic region passing down through the symphisis pubis and into the base of the penis. It is constantly present and not at all dependent on micturition, although it may be somewhat aggravated by bladder distension. Many patients have suffered this pain constantly for two or three years and, as has been mentioned, many have had several

![Fig. 2—Calcified bladder wall.](image1)

![Fig. 4—Case 1. Contracted bladder; capacity less than 100 c.c.s.](image2)
courses of treatment for bilharziasis during that time with absolutely no effect on their pain. It is exceptional to find secondary urinary infection in these patients, but even so many of them have been treated with sulphonamides and antibiotics in an attempt to relieve the pain with no success.

The clinical picture, of course, also shows frequency of micturition, burning dysuria and haematuria at various stages of the disease, but the symptom of constant suprapubic and pubic pain has been emphasised because it is in many cases the most persistent complaint and the most difficult to treat.

**Indications for Operation**

There are two main indications for the operation of colocytoplasty in dealing with the bilharzial bladder:

1. **Reduction in bladder capacity below about 300 c.c., associated with frequency, dysuria and pain.**

2. **Constant bladder pain, even where there is no significant reduction in bladder capacity.**

Some patients will show a combination of both indications, but I have found that as one becomes increasingly aware of the presenting symptom of constant suprapubic pain, the severe disability it causes and the failure of antibilharzial drugs to relieve it, one tends to do the operation more and more frequently for this symptom alone before reduction in bladder capacity has occurred. That this is fully justified is shown by the gratitude nearly all patients have expressed at the relief of pain which had made their lives miserable perhaps for years.

**Analysis of Cases**

A series of 20 cases is presented and the pre-operative findings are summarised in Table I.

The interpretation of the cystoscopic appearance has been divided into three grades. This is quite approximate and simply a means of description.

1. **"Moderate"** means the type of bilharzial bladder where sandy patch mucosa and occasional clusters of tubercles are scattered lightly in most areas. The ureteric orifices may be surrounded by somewhat thickened mucosa, but are not otherwise abnormal and are usually easily catheterised.

2. **"Severe"** means that all areas of the bladder mucosa show a marked change to either sandy patch or ground glass appearance, or a combination of both. The ureteric orifices are not only surrounded by thickened mucosa, but are distorted and sometimes displaced backwards and towards the middle line and are difficult to catheterise. Bladder capacity may or may not be reduced to 350 c.c. or less.

(3) “Gross” includes all the changes described above, but in greater degree, especially in the appearance of thickening of the bladder mucosa and in the marked distortion and displacement of ureteric orifices. There is also a significant reduction in bladder capacity, usually below 200 c.c.

It will be noted from Table I that in the moderate and severe grades of cystoscopic appearance there is no constant relationship with bladder capacity. The bladders described as severe on cystoscopic examination have capacities varying from 250 c.c. to 500 c.c., while one described as moderate has a capacity of only 300 c.c. Nor does the intravesical pressure at full capacity under anaesthesia bear a direct relationship to that capacity, although the pressures are all higher than normal.

It is interesting that vesico-ureteric reflux was observed in only one case pre-operatively. This patient had, as well as bilharziasis, a fibrous bladder neck stenosis and multiple bladder calculi with marked cystitis. These were dealt with before embarking on colocytoplasty.

Dilatation of the upper urinary tract was seen in 14 cases, of which eight showed dilatation of the lower ureters only, three showed dilatation of ureters and hydronephrosis and three showed hydronephrosis without dilatation of the ureters.

In three cases the pyelogram suggested chronic pyelonephritis, in that the kidney appeared small and the calyces small and slightly clubbed. None of these showed dilatation of the ureters.

The method of age grouping shown is used because many Africans do not know their exact age, so an assessment is made by the clerical admitting staff. Age group 4 lies between 16 and 45 years, so it will be seen that the majority of cases in this series are young or middle-aged adults—that is, men in the prime of life who can ill afford the disability which the symptoms of this condition cause.

The fact that only one female appears in this series is striking. It is doubtful if the incidence of bilharziasis in the African female is significantly less than in the male, and it may be that they do not complain about even quite marked urinary symptoms because these pale into insignificance beside the gynaecological and obstetric pathology which is their daily lot.
### Table 1

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**COLOCYSTOPLASTY IN URINARY BILHARZIASIS**

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COLOCYSTOPLASTY IN URINARY BILHARZIASIS

THE OPERATION

The procedure I have used is that described by Riches (1960). His technique has been closely followed and has given good results.

Pre-operative preparation of the bowel is carried out as for colectomy, and sterilisation of the bowel content is achieved by giving Kantrex by mouth in a total dose of 10 gm., over a period of two days. A Ryle's tube is passed before the operation and gastric aspiration continued post-operatively for as long as may be required. Routine blood transfusion is used during the operation.

A loop of sigmoid colon 20-25 cm. long is selected and isolated by division of the bowel at each end. The exact point of division is determined by the position of the main vessels in the mesocolon and the division is continued into the mesentery without damaging these vessels. Continuity of the bowel is then re-established by end to end anastomosis. I usually make the anastomosed bowel lie above the pedicle of the isolated loop, as it seems to lie most easily in this position.

The peritoneum is then stripped off the bladder vault and lateral walls, and downwards posteriorly to about the level of the intra mural ureters. The bladder is opened in the middle line of the vault and this incision is carried down in front to a point which will leave a sufficient cuff of bladder wall above the internal urethral meatus, usually 2-3 cm. Each ureteric orifice is then catheterised under direct vision and the catheters remain in position until the suture lines are completed. The incision in the bladder wall is then carried round each side from the lowest point in front and passes not less than 1 cm. above the intra mural ureters to meet posteriorly, so that most of the bladder is removed leaving only 1-2 cm. above the trigone posteriorly and laterally and slightly more than this above the bladder neck in front.

The mid point of the isolated loop of colon is then brought down to the mid point of the remaining bladder base posteriorly and united to it by a continuous sero-muscular suture round each side to meet anteriorly. This is done in sections of about one-third of the length at a time, as the later stages of this suturing would otherwise obscure the field of view for insertion of the next layer of sutures. After the first section is completed on each side the loop of colon is opened at its mid point about a quarter of an inch above the sero-muscular suture, thus leaving an edge of bowel wall for the all-coats layer of sutures. The incision in the colon loop is carried only as far round one side as the first section of sero-muscular suture and the all-coats suture then inserted.

The same thing is done from the middle point round the other side, and so the opening of the bowel and two-layer suturing to the bladder base proceeds in sections until the two suture lines on each side meet their fellows from the other side anteriorly. The opening of the bowel in sections in this way minimises bleeding.

At this stage there is usually about 3 cm. of bowel remaining unopened at each end, so the incision is now carried through to the open end of bowel, thus making it into a flat sheet instead of a tube, one edge of the sheet being attached all round to the edge of the bladder base.

The ureteric catheters are then removed and a self-retaining urethral catheter passed into the bladder. The two layers of sutures are then continued from the point they had reached in front and unite the edges of the opened-out sheet of bowel up the anterior wall and over the vault of the new bladder, thus closing it completely.

The ureteric catheters enable the ureters to be identified without the necessity of visual exposure and one can be certain, when the anastomosis is later being made, that a stitch has not been occluded and occluded the intra mural ureter. It is interesting to note that failure to pass a ureteric catheter in this way, by direct vision through the open bladder, is quite unusual in contrast to one's frequent failure by cystoscopic manipulation in these bladders.

I am sure this is more often due to the altered alignment of the intra mural ureter and mucosal folds and pits rather than to an actual stenosis of the orifice or ureter. The latter happens, of course, but is less common than one would suppose, as Gelfand (1950) pointed out. For this reason I have not carried out ureteric meatonomy or re-implantation of the ureter at the time of colocystoplasty, knowing that these procedures nearly always produce vesico-ureteric reflux. In fact, as will be shown, the colocystoplasty itself often causes a vesico-ureteric reflux, for reasons which will be discussed, and as it is thought this reflux may be temporary there seems no point in adding a further procedure almost guaranteed to make it permanent unless a definite stenosis of orifice or intra mural ureter can be demonstrated.

At the end of the operation it is important to close the gap in the sigmoid mesentery where the loop was isolated, and to stitch to the pos-
terior parietal peritoneum at least one side of the mesenteric pedicle of the colon loop forming the new bladder, in order to prevent the small bowel passing behind it and becoming obstructed.

RESULTS

No patient has died as a result of the operation. One patient, No. 4, died suddenly five weeks after the operation on the day after transurethral resection of a minor degree of fibrous bladder neck stenosis, which had maintained a persistent suprapubic urinary fistula since the colocystoplasty. This patient had been a sick old man from the beginning with a high blood urea, probably due to chronic pyelonephritis, and had required nephrostomy and much careful treatment before the colocystoplasty was performed. It was considered indicated because of the gross bilharzial changes in the urinary tract which could only have had a fatal effect on kidney function before long. In the event he took the operation surprisingly well and made good progress except for the urinary fistula. At the time of the transurethral resection his general condition appeared reasonably good.

The average post-operative stay in hospital was 35 days, and on being discharged from hospital all patients expressed themselves pleased with the operation and to a large extent relieved of their most pressing urinary symptoms even at that early stage.

Follow-up observations for a reasonable length of time have been made on 10 of the 20 patients and the results are summarised in Table II.

In this connection it should be noted that it is often difficult for African people to attend regularly for follow-up examination. Many of them live long distances away in bush country, and even the urban African often has no effective postal address through which he can be asked to attend. With those who do not return to hospital it is tempting to assume that their condition remains satisfactory and there may be some justification for this.

The last six patients in the series have only recently been discharged from hospital, and although it is as yet too early to assess them, the clinical condition on or soon after discharge is included in Table II.

It is clear, however, from all patients in the series that one of the immediate results of the operation is the relief of suprapubic and pubic pain. There is at first no dramatic improvement.
COLOCYSTOPLASTY IN URINARY BILHARZIASIS

The burst abdomen (Case No. 3) occurred one week after operation and was fortunately noticed while the bowel was still contained within the intact skin suture line. Immediate repair of the wound was carried out and the patient was little the worse for this mishap.

The suprapubic urinary fistula (Case No. 4) has already been described. It should be noted, however, that even a minor degree of bladder neck obstruction or urethral strictures may cause a persistent urinary fistula. Such an obstruction should therefore be dealt with before proceeding with colocystoplasty (Hanley, 1960).

DISCUSSION

There is no doubt that colocystoplasty offers relief of symptoms to many people suffering from chronic bilharziasis of the bladder. This depends on the recognition that the operation may be indicated in the presence of persistent painful symptoms long before significant reduction of bladder capacity occurs. The operation has had no mortality in the age group to which it has been applied in this series of 20 cases, and the incidence of post-operative complications is comparatively low. Studies of serum electrolyte balance have not been routinely performed in these cases as it is already established that this does not occur to any significant extent (Riches, 1960; Winter and Goodwin, 1958). Certainly no cases in this series exhibited any clinical manifestations of metabolic disturbance after the operation.

The occurrence of vesico-ureteric reflux is of interest. It was demonstrated in only one case pre-operatively (No. 7), although in the first two cases, where it might have been expected, the examination was unfortunately not made. One of these (No. 2) showed reflux in the right ureter one month after operation and there has been no opportunity to check this again.

Case No. 7 showed bilateral reflux before operation, and five months after operation there was no reflux on the right and diminished reflux on the left.

Four other cases showed reflux at varying times after operation where none had been demonstrated before. In one of these (No. 6), reflux which had been present on the right side one month after operation had disappeared three months later.

It seems probable that removal of the detrusor muscle contraction interferes with the valvar mechanism of the intra mural ureter. In normal micturition contraction of the bladder musculature compresses the intra mural ureter in its oblique course through the wall, thus aiding in

in bladder capacity, and increased frequency of micturition often continues for several weeks or months, depending on the successful control of urinary infection; but in time, as post-operative inflammatory reaction subsides, the new bladder gradually expands to an average normal capacity. This is clearly seen in Table II, where the capacities measured comparatively soon after operation are still in the region of 150 to 200 c.c., while the three cases measured at eight months, 11 months and 13 months show respectively capacities of 500 c.c., 400 c.c. and 400 c.c.

A similar pattern is seen with post-operative intravesical pressure. In the early stages the pressure often remains high, but as capacity expands and inflammatory changes subside the indications are that a fall in intravesical pressure takes place. Case No. 8 is an exception due to the fact that intravesical pressure was measured with the patient conscious. All the other readings both before and after operation were done under general anaesthesia.

COMPLICATIONS

Two patients developed acute small bowel obstruction, there was one burst abdomen and one suprapubic urinary fistula.

One of the cases of acute intestinal obstruction (Case No. 9) is described later, but it is worth noting the special character of this type of obstruction where the bowel became obstructed under the vascular pedicle of the new bladder. If it proved impossible to manipulate the bowel back under the pedicle there would indeed be an awkward dilemma. Division of the obstructing hand, as in the ordinary way of relieving an obstruction due to adhesions, would almost certainly result in sloughing of the whole vault and lateral walls of the new bladder unless sufficient anastomosis of blood supply across the suture line had taken place. It seems unlikely that this would happen in the first few months after operation, if ever. The only alternative would be to resect all the bowel which was obstructed in situ, whether it was viable or not, and this might prove an extremely difficult technical procedure in these circumstances. It is vital, therefore, that this gap below the pedicle must be closed at least on one side, as has been described.

The second case of intestinal obstruction (Case No. 17) occurred two weeks after the operation and was due to adhesions. It was relieved by laparotomy and division of adhesions in the normal way and the patient made an uninterrupted recovery.
preventing reflux. It is thought that in the beginning the new colonic bladder has no independent contractile power and is therefore incapable of compressing the intra mural ureter, so that reflux may occur. Also the trauma of division of bladder muscle close to the intra mural ureter must have at least a temporary paralysing effect on its function. That this effect is only temporary is suggested by Case No. 6 in which reflux was present one month after operation and had disappeared three months later, and by Case No. 7 in which reflux was diminished on one side and abolished on the other five months after operation.

However, further follow-up studies are required to substantiate the hope that post-operative reflux disappears as the new bladder becomes functionally more efficient. Whether in fact the colonic musculature develops a reflex contractile power to empty the bladder with any degree of co-ordination is not yet established, but it is thought that the close relationship of the nerve pathways in the reflex acts of micturition and defaecation may help to bring this about (Morales et al., 1958).

The possible long-term effect of colocystoplasty on the upper urinary tract in bilharziasis is worth considering. Honey states that reflux in combination with a high intravesical pressure gives rise to hydronephrotic atrophy and death from uraemia (Honey, 1964). Will the reduction of intravesical pressure produced by colocystoplasty prevent or delay this process in the bilharzial urinary tract? If it can be shown that reflux caused by the operation is only temporary it is hoped this will prove to be the case. However, Honey is also of the opinion that reflux in a normal bladder leads to no ill effects, so even if reflux continues after colocystoplasty the reduction of intravesical pressure may still protect the upper urinary tract.

It has been shown by Gelfand (1964) that many cases of bilharziasis of the urinary tract suffer from chronic pyelonephritis, often in the absence of dilatation and without ureteric reflux or secondary infection. The exact mechanism of this is not clear, but my own observations tend to confirm it and the suggestion is made that it may be due to a consistently high intravesical pressure.
COLOCYSTOPLASTY IN URINARY BILHARZIASIS

Therefore there would appear to be a considerable argument in favour of colocystoplasty being done at a comparatively early stage in the progress of bilharziasis of the bladder. This stage is likely to be reached when changes in the bladder wall are irreversible and are giving rise to constant pain unrelieved by other treatments.

There are a number of interesting speculations which arise from this study. In view of the high rate of re-infection with bilharziasis amongst the African people, will the colonic bladder in time show the same bilharzial lesions as the "normal" bladder, or will the different blood supply from the inferior mesenteric vessels fail to allow the deposition of ova of *S. haematobium* in the submucosa of the new bladder? Does colonic epithelium have an inherent resistance to the ova of *S. haematobium* and will these patients, if re-infected with *S. mansoni*, ultimately show a different bladder pathology due to this parasite?

Finally, accepting the close relationship between bilharziasis and carcinoma of the bladder, if colocystoplasty is done more frequently and at an early stage is there a hope that the present high incidence of carcinoma of the bladder in young adult Africans may be reduced?

These questions can only be answered by much further study and investigation.

**ILLUSTRATIVE CASES**

**Case No. 1**

African male, age group 4. Complained of frequency and dysuria for at least two years and had trouble with his bladder on many occasions before that. For several months he had been constantly dribbling urine and there was persistent suprapubic pain. The bladder was tender but not palpable and an old suprapubic scar was present, although he did not know what operation had been done. Rectal examination revealed no abnormality, and routine examination showed his general condition to be reasonably good.

At cystoscopic examination a urethral stricture was found and easily dilated. The bladder capacity was less than 100 c.c. and the appearance of the mucosa was typical of gross bilharziasis, being ground glass and thickened in all areas, completely obscuring both ureteric orifices.

An I.V.P. (Fig. 3) showed good function in both kidneys with slight hydronephrosis on the left and a normal right kidney. The left ureter was dilated in its whole length and the right lower ureter was dilated.

Fig. 4 shows the marked reduction in bladder capacity

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Fig. 6—Case 6. Micturating cystogram five weeks after operation. Reflux in right ureter.

Fig. 7—Case 6. Micturating cystogram five months after operation. No reflux.
COLOCYSTOPLASTY IN URINARY BILHARZIASIS

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and indicates a typical deformity of bilharziasis in which fibrous contracture displaces the alignment of the ureters upwards and backwards.

Colocystoplasty was performed and the patient made a straightforward recovery, being discharged from hospital four weeks later. He had complete control of micturition with frequency of about three-hourly during the day and three times at night. His pain was relieved and micturition was comfortable. He returned home to a remote country district and has not attended the hospital since.

Case No. 6

African male, age group 4. Complained of constant pubic pain passing down into the penis for two or three years. The pain was worse on micturition and there was some increased frequency with occasional haematuria. Bilharziasis had been diagnosed on cystoscopic examination elsewhere two years before and he had been given numerous courses of treatment with no effect on his symptoms. Clinical examination revealed no significant abnormality and an I.V.P. showed a normal upper urinary tract.

Cystoscopic examination showed a moderate bilharzial bladder with a capacity of 300 c.c. only and an intravesical pressure of 28 cm. of water at full capacity. The cystogram (Fig. 5) demonstrated a normal bladder outline and there was no evidence of vesico-ureteric reflux.

The patient was reluctant to undergo major surgery and was kept under observation for about five months. During this period his pain, frequency and dysuria remained the same in spite of a variety of treatments, and he finally agreed to the operation being done.

Colocystoplasty was carried out and recovery was uneventful. Histology showed a fibrotic bladder wall containing large numbers of bilharzial ova.

Five weeks after the operation he had no pain and only slight dysuria. Frequency was four per day and twice at night. The bladder capacity was 150 c.c. at 10 cm. pressure, and a micturating cystogram (Fig. 6) showed reflux in the right lower ureter. Four months later the bladder capacity was 200 c.c. at 9 cm. pressure; there was no residual urine and no vesico-ureteric reflux (Fig. 7). The patient felt well and had no pain, although there was still nocturnal frequency.

Case No. 7

African male, age group 5. When this patient was first seen he had four stones in the bladder and a severe cystitis. The stones were removed and a Y-V vesico-plasty on the bladder neck was performed.

Fig. 8—Case 7. Multiple bladder calculi and calcified bladder wall.

Fig. 9—Case 7. Pre-operative cystogram. Bilateral reflux.
COLOCYSTOPLASTY IN URINARY BILHARZIASIS

He attended again 14 months later complaining of constant suprapubic pain, frequency and dysuria, and was re-investigated.

Straight X-ray (Fig. 8) showed a recurrence of multiple bladder calculi and calcification in the bladder wall. On I.V.P. the left lower ureter was considerably dilated, but the renal pelvis and calyces on both sides appeared normal and function was reasonably good. Blood urea was 40 mg per cent., serum phosphorus 2.7 mg per cent., serum calcium 9.6 mg per cent., Hb. 92 per cent. and the white cell count normal. Urine culture produced a heavy growth of B. proteus.

Cystoscopic examination revealed a severe bilharzial bladder of 250 c.c. capacity with an intravesical pressure of 27 cm. of water. Multiple calculi were again seen and there was marked super added cystitis.

The cystogram (Fig. 9) showed bilateral reflux and dilatation of both ureters.

Colocystoplasty was performed, with removal of the bladder calculi. Histology of the bladder wall showed the submucosa moderately heavily infiltrated with ova of S. haematobium and marked fibrosis of the muscle layers. Recovery was uneventful and on discharge from hospital the patient was free from pain, but still had some increased frequency.

Five months after operation the bladder capacity was 400 c.c. at 9 cm. intravesical pressure. Cystogram (Fig. 10) showed no reflux on the right and diminished reflux on the left.

The patient was seen again 13 months after operation and stated that he was comfortable and passed urine with a good stream and normal frequency. However, he has had a B. coli urinary infection which has proved difficult to eradicate.

Case No. 8

African male, age group 4. For nine years he had lower abdominal pain and pubic pain passing down into the base of the penis. There was white discoloration of the urine at times and frequency was seven or eight by day and four times at night. He had haematuria at intervals, but not in the last three months. Much treatment had been given over a period of six months, including Nilodin and various antibiotics, with no effect on his symptoms.

Clinical examination revealed a tender bladder which was not palpable and no other abnormality. Blood urea was 56 mg per cent., Hb. 94 per cent. and the white cell count normal.

Cystoscopic examination showed a severe bilharzial bladder of 400 c.c. capacity at 18 cm. pressure.

Cystogram (Fig. 11) showed a normal bladder outline and no vesico-ureteric reflux. Both ureters were catheterised and retrograde pyelograms showed irregular
dilatation of both lower ureters and a normal renal pelvis and calyces on both sides.

Colocystoplasty was performed and after a straightforward recovery the patient was discharged five weeks later, relieved of pain and with frequency of three or four times by day and three times at night.

Histology showed a bladder wall whose muscle layers exhibited some fibrosis, and the submucosa was oedematous and heavily infiltrated with ova of *S. haematobium*.

Three months later the bladder capacity was 400 c.c. at 27 cm. pressure (conscious) and there was slight reflux in the right ureter (Fig. 12).

Ten months after operation frequency was three times by day and twice at night; he had no pain and micturition was comfortable. I.V.P. showed good function in both kidneys, slight clubbing of calyces and some dilatation of both ureters as before. Residual urine was small.

**Case No. 9**

African male, age group 4. For 12 years he had pubic pain and dysuria. Frequency was four or five times by day and three or four at night.

Clinical examination revealed no significant abnormality and the urine contained a few leucocytes and red cells.

Cystoscopic examination showed a severe bilharzial bladder, capacity 350 c.c. at 16 cm. pressure. The cystogram (Fig. 13) showed no reflux. Both ureteric orifices were distorted by bilharzial changes and would not admit catheters.

I.V.P. showed satisfactory function in both kidneys and no hydronephrosis. The left lower ureter appeared normal and the appearance on the right suggested a stenosis at the lower end of the ureter with some dilatation above this.

Colocystoplasty was performed and recovery was uneventful, but slower than average, with residual urine of about 50 c.c. during the first month.

The patient was discharged six weeks after operation with a bladder capacity of 200 c.c. at 22 cm. pressure and no reflux. He felt well with no pain, a good urinary stream and frequency about two-hourly during the day and rather less at night.

One month later—that is, three months after the operation—this patient was re-admitted with an acute small bowel obstruction. At laparotomy it was found that several feet of small intestine

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Fig. 12—Case 8. Post-operative cystogram. Slight reflux right ureter.

Fig. 13—Case 9. Pre-operative cystogram. No reflux.
had passed behind the pedicle of the colon loop forming the new bladder and become obstructed. The bowel was manipulated back under the pedicle and the gap closed by suturing the edge of the pedicle to the posterior parietal peritoneum. Resection of bowel was not necessary and recovery proceeded satisfactorily.

A cystogram (Fig. 14) then showed a bladder capacity of 250 c.c. at 5 cm. pressure, indicating some improvement since the previous one, particularly in the drop in intravesical pressure. The patient stated that his bladder was comfortable and was "working well."

Case No. 11

African male, age group 4. He had suprapubic pain, dysuria and moderately increased frequency for more than six months. There was occasional haematuria and a good urinary stream.

Clinical examination showed a tender bladder which was not distended, but the impression of thickening and induration in the area of the bladder vault was noted.

Blood urea was 20 mg. per cent., Hb. 111 per cent. and the white cell count normal. The urine showed a few red cells, ova of *S. haematobium* and no growth of organisms on culture.

Cystoscopic examination revealed a gross bilharzial bladder of 250 c.c. capacity at 25 cm. pressure. Both ureretic orifices were distorted and displaced by bilharzial changes and neither would admit a catheter. Cystogram (Fig. 15) showed no abnormality of bladder outline and there was no reflux. I.V.P. showed some clubbing of calyces on the left and an otherwise normal urinary tract in spite of the gross changes in the bladder seen at cystoscopy.

Colocystoplasty was performed, recovery was rapid and uneventful and the patient was discharged four weeks later.

Histology showed infiltration of the bladder mucosa with calcified bilharzial ova. The urothelium over the areas of heaviest deposits of ova was thinned and the submucosa was congested, thickened and fibroosed.

On leaving hospital this patient had a bladder capacity of 200 c.c. at 26 cm. pressure and there was bilateral reflux (Fig. 16). Eight months after operation the bladder capacity was 500 c.c. at 11 cm. pressure and there was no reflux (Fig. 17). There was no pain or dysuria and frequency was three times by day and twice at night.

**Summary**

The operation of colocystoplasty has been applied in the treatment of the chronic bilharzial bladder.
A series of 20 cases is presented and the results are assessed. There was no operative mortality and it is shown that the procedure brings relief of symptoms in nearly all cases. There is a low incidence of complications and generally a smooth post-operative course.

The effect of the procedure on the upper urinary tract in bilharziasis is discussed and it is suggested that the operation may prevent or delay the onset of serious renal complications if it is done at a comparatively early stage in the progress of the disease.

Certain questions are posed on the possible effects of substitution of colon for bladder wall in the event of further re-infection with bilharziasis.

REFERENCES


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Fig. 16—Case 11. One month post-operative cystogram. Bilateral reflux.

Fig. 17—Case 11. Eight months post-operative cystogram. No reflux.