Urinary Tract Diversion in Gynaecology*

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SUMMARY

A study of 68 consecutive diversions of the urinary stream performed in the gynaecological section of a hospital serving patients of low socio-economic status is presented. The results of various methods are analysed, especially when employed for the treatment of carcinoma of the cervix producing severe ureteric obstruction or a vesical fistula.

The construction of an ileal loop combined with whole-pelvis irradiation is preferable to exenteration, provided the patient has not received previous effective radiotherapy.

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Numerous methods of diverting the urinary stream have been described in the literature, but few of these have survived the test of time. We employed some of these methods in the early phase of this study but, like other workers, we now favour the ileal conduit.

The concept of a separate artificial bladder is not recent, for it was originally conceived during the early work on uretero-colic anastomosis. Its initial lack of popularity and success may be attributed to an over-riding desire to render the patient continent by using the anal sphincter. The use of an 'ileal' bladder was suggested by Wells[1] in 1953, but it had been proposed independently by Bricker[2] in 1950 as an adjunct to pelvic evisceration. Today, the ileal bladder is the most favoured method of urinary tract diversion in palliative or curative surgery for pelvic malignancy.

THE PRESENT STUDY

In our contribution we describe the evaluation of various methods for the special requirements of the community we serve, and the nature of its pathology; we emphasize our preference for diversion combined with whole-pelvis irradiation in the management of certain types of advanced cervical carcinoma; we illustrate the use of diversion in those rare cases of benign fistulae not amenable to other forms of surgery; and we offer the results of our experience especially to those who have to cope with similar problems in developing communities.

This is a study of 68 consecutive diversions of the urinary stream performed over a 13-year period (1957 - 1970) by a number of gynaecologists in the Gynaecological Unit of King Edward VIII Hospital.

The group consisted of 61 Bantu and 7 Asiatic (South African Indian) patients, whose ages varied from 18 to 68 years (mean 45 years). Almost all were of very low socio-economic status, many still living in kraals, and most were suffering from chronic renal impairment caused by advanced malignant obstruction and superimposed infection.

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Types of Operation (Table I)

For the first 5 years of the study uretero-colic anastomosis was favoured, but from 1963 onwards the ileal bladder was utilized in 29 of 43 cases. Cutaneous anastomosis was reserved for desperate cases with failing renal function, when more intricate methods of urinary diversion would have incurred the risk of death on the operating table.

TABLE I. TYPES OF OPERATION

Operation	No.
Ileal bladder	**33**
Uretero-colic anastomosis	**21**
Cutaneous ureterostomy	**9**
Others	**5**
Total	**68**

Indications

These may be divided into 4 groups:

Group I (50 cases): Part of *palliative therapy* for advanced pelvic cancer; combined with concomitant, or pre- or postoperative radio- or chemotherapy.

Group II (10 cases): Part of an attempt at *curative surgery* (exenteration); as a primary procedure; or following or combined with radiotherapy.

Group III (6 cases): After failure to cure *benign fistulae* by other means.

Group IV (2 cases): Palliative diversion for *bladder carcinoma* discovered at laparotomy.

RESULTS

Survival Times Related to Indications (Table II)

A major difficulty in assessing the efficacy of treatment in our special population was that posed by the follow-up examination. Death and distance were the limiting factors in this regard, the patient often residing 500 miles away, and it was not always possible to distinguish between these causes of failure to attend. A distinction is thus

made in the results between the outcome of cases where adequate follow-up was possible, and the over-all results where the final outcome was not necessarily established.

On the basis of our experience thus far, it would appear that:

1. Mean survival time for palliative diversions and radiotherapy was twice that for attempts to cure by exenteration.

2. The reason for this was the high operative mortality for the latter procedure (death within 1 month).

3. Only one of 10 cases in the exenteration group was alive at 1 year.

4. Almost two-thirds of those treated by urinary diversion and radiotherapy survived 1 month, at least 12% survived into the second year and at least 5 of the 50 cases in this group were alive at 18 months.

5. Six of the 8 cases treated for benign fistulae survived to live an active life; 1 has since delivered a healthy infant.

Survival Times Related to Method (Table III)

The operative mortality in our series (68 cases) was as follows: uretero-colic anastomosis 47·7% (21); ileal conduit 30·3% (33); and cutaneous ureterostomy 44·4% (9).

Jacobs and Stirling[3] suggested that those patients dying within 1 month of surgery represent mortality associated with the operative procedure, since operation should not be considered in those likely to die before that time.

From the results achieved (Table III), it is clear that:

1. Cases treated by cutaneous ureterostomy survived almost thrice as long as those treated by uretero-colic anastomosis, despite the fact that the former procedure was reserved for the sicker patient.

2. Operative mortality for uretero-colic anastomosis and cutaneous ureterostomy might nevertheless be considered prohibitive, at almost 50%. In Jacobs and Stirling's[3] series the figure was 40% for cases of bladder carcinoma. This was the main factor influencing the change to the use of the ileal bladder.

TABLE II. MEAN SURVIVAL TIME RELATED TO INDICATION

Outcome known (48 cases)

Group	No. of cases	Mean survival time
I	34	4 months and 21 days
II	7	2 months and 14 days
III	6	2 patients died first week, others alive and well
IV	1	1 died at 7 months

All cases (68 cases)

		Time of death				
Group	No. of cases	0 - 2 days	2 - 7 days	7 - 28 days	1 - 12 months	1 year +
I	50	8·1%	10·2%	20·4%	49·0%	12·2%
II	10	0%	40·0%	20·0%	30·0%	10·0%
III	6	14·3%	14·3%	all others alive and well		
IV	2	0%	0%	1 died at 7 months, other alive at 3 months +		

+ = longer than.

TABLE III. MEAN SURVIVAL TIME RELATED TO METHOD

Outcome known (38 cases)

Method	No. of cases	Mean survival time
Uretero-colic anastomosis	11	1 month and 9 days
Ileal conduit	20	5 months and 29 days
Cutaneous ureterostomy	7	3 months and 14 days

All cases (63 cases)

Method	No. of cases	0 - 7 days	7 - 28 days	1 - 12 months	1 year +
Uretero-colic anastomosis	21	23·9%	23·8%	47·6% +	4·8% +
Ileal conduit	33	12·1%	18·2%	48·5% +	21·2% +
Cutaneous ureterostomy	9	33·3%	11·1%	44·4% +	11·1% +

+ = longer than.

3. Only one of the 21 uretero-colic anastomoses and one of 11 skin ureterostomies survived into the second year, compared with 7 of 33 ileal conduits, of which 5 are alive and well 18 months after operation.

Effect of Operation on Urinary Tract (Table IV)

The pre-operative blood urea readings and results of intravenous pyelography were compared with the same parameters of renal function a month after operation in the survivors. Unfortunately, in our series it was not always possible to perform pyelograms at a later stage, as Brunschwig and Barber[4] were able to do.

The most marked improvement was in the cutaneous ureterostomy group, but the procedure was reserved for those patients with extremely poor renal function and their very survival was dependent upon an improvement.

Renal function was improved or no worse in over 80% of the uretero-colic anastomosis group and in 95% of the ileal bladder cases.

Operative Complications (Table V)

Our series is compared with Jacobs and Stirling's huge series of 1 673 cases of uretero-colic anastomoses collected from numerous centres in the United Kingdom[3] and with Riches's series of 374 cases of uretero-colic anastomoses and ileal conduits.[5]

The present series is small compared with those of other workers,[3,5] but it is nevertheless possible to draw certain conclusions from our results:

With the ileal conduit method complications, although more frequent, were less severe, thereby accounting for the lower operative mortality; and peritonitis posed a problem with both methods of diversion.

Our results confirm the findings of Riches[5] who noted that intestinal obstruction and wound disruption were more common after uretero-ileostomy than after uretero-colic anastomosis, but that the latter procedure was more frequently marred by the occurrence of fistulae and biochemical abnormalities, not to mention the higher risk of ureteric obstruction implied in the method. Biochemical abnormalities posed less of a problem than in the larger series because so many patients with severe renal impairment in the uretero-colic anastomosis group did not survive to pose this problem.

The most disturbing feature of our results was the exceptionally high incidence of pyelonephritis. The Coffey[6] and Leadbetter[7] techniques were favoured in the uretero-colic series and the Nesbit method[8] was not used.

The open mucosa-to-mucosa technique applied to the ileal conduit series was followed by a depressingly high incidence of postoperative renal infection; but on further analysis, the cause of the high morbidity was apparent in that severe 'antecedent' renal damage and infection was present in the great majority of cases in this series.

TABLE V. OPERATIVE COMPLICATIONS IN 54 CASES*

	Present series	Jacobs and Stirling's series[3]	Riches's series[5]
Uretero-colic anastomosis (21 cases)			
No complication	38%	59%	
Pyelonephritis	33%	2%	19%
Urinary fistula	19%	7%	16%
Peritonitis	14%	5%	
Biochemical abnormality	10%	40%	20%
Urinary obstruction	10%	2%	
Pneumonia	10%	2%	
Faecal fistula	5%	2%	
Burst abdomen	0%	2%	5%
Ileus	0%	7%	1%
Ileal conduit (33 cases)			
No complication	21%		
Pyelonephritis	42%		8%
Peritonitis	15%		
Ileus	12%		
Urinary fistula	9%		7%
Faecal fistula	9%		
Ureteric obstruction	9%		
Wound sepsis	6%		
Stomal prolapse	6%		
Burst abdomen	3%		13%
Biochemical abnormality	3%		4%
Others	9%		

* Results to nearest whole per cent.

Other Techniques (5 cases)

Uretero-rectal anastomosis was performed in 2 patients, both with advanced cervical carcinoma; suprapubic cystostomy was performed as a temporary diversion on two occasions, both emergency procedures for clot retention in advanced cervical carcinoma involving the bladder base.

TABLE IV. RESULT OF OPERATION IN 38 CASES

	Total	Improved		'I.S.Q.'		Worse	
		No.	%	No.	%	No.	%
Uretero-colic anastomosis	11	4	36.4	5	45·5	2	18·2
Ileal conduit	22	9	40·9	12	54·5	1	4·5
Cutaneous ureterostomy	5	4	80·0	1	20·0	0	0·0

An 18-year-old patient with a urethral stricture following obstetric trauma was treated by fashioning a new urethra from colon.

Surely the ability to live a full, and useful life after urinary tract diversion is a major yardstick by which the value of the procedures should be judged? It is therefore surprising that this aspect has received scant attention in other series.

CASE REPORTS

The following case reports illustrate the possibilities of the various procedures:

Case 1

A 45-year-old Bantu patient with stage IV carcinoma of the cervix, including a malignant vesico-vaginal fistula, underwent an ileal bladder construction on 7 February 1958, followed by radiotherapy. She was alive and well 11 months later but a positive biopsy specimen was taken from the persistent fistula. She died at home 2 months later, probably from remote secondary causes.

Case 2

A 48-year-old patient presented with stage IV carcinoma of the cervix involving the whole vagina. Bilateral skin ureterostomy was performed on 3 February 1965. Radiotherapy was not applied. The patient died from renal failure on readmission 16 months later.

Case 3

This patient was only 35 years old and had stage I carcinoma of the cervix. She received 2 radium insertions followed by a Wertheim's hysterectomy in 1963. Recurrence was diagnosed 2 years later and treated on 13 April 1965 by ileal bladder diversion, after further external irradiation had been refused by the radiotherapist.

She died nearly 4 years later from unknown causes; she had been seen after 3 years, when she had been well and fully active, but with gross persistence of carcinoma.

Case 4

A patient in her 50th year presented with stage III carcinoma of the cervix, treated with radiotherapy. A vesico-vaginal fistula developed 4 months later when an ileal bladder was fashioned. The patient remained alive and was fully mobile 3 years later. She was considered unsuitable for re-anastomosis because of severe fibrosis. There was no recurrence.

Case 5

A 48-year-old patient suffered from stage IV carcinoma of the cervix, including a vesico-vaginal fistula, and rectal involvement. An ileal bladder was constructed on 8 September 1967 and followed by radiotherapy. The stoma required refashioning later.

The patient was living a normal existence in a rural area 2 years later, but with persistent urinary tract infection. There was no evidence of recurrence.

Case 6

This patient, aged 68 years, suffered from a stage IV carcinoma of the cervix, including a vesico-vaginal fistula. An ileal bladder was fashioned on 22 September 1967 and followed by radiotherapy. She was living a comfortable existence 18 months later but there was clinical persistence of carcinoma. She did not return for follow-up visits.

DISCUSSION

In summarizing our results it should be borne in mind once again that ours was a special group of patients, of low socio-economic status, generally in a poor state of nutrition, among whom most had severe pre-operative renal damage from chronic infection.

Moreover, inadequate facilities for major surgery in respect of nursing care, patient-monitoring, and assessment of the biochemical status of patients, often nullified the remainder of the treatment of these patients.

When a carcinoma of the cervix produces a fistula or ureteric obstruction, urinary diversion preparatory to radiotherapy was far superior to exenteration. The latter should be abandoned in a population such as ours, unless a fully treated early case shows a local recurrence in bladder or rectum.

Palliative diversion is occasionally a worthwhile procedure in the malignant vesico-vaginal fistula, if pain from nerve involvement is absent, and not likely to supervene, and the blood urea is not markedly raised. If the blood urea is already markedly raised, the impending death from renal failure is probably the more acceptable form of demise.

Provided the immediate postoperative period is successfully overcome, urinary diversion for benign fistulae performed in those special cases where fibrosis, etc., preclude repair, is a curative procedure in that the patient can lead a normal existence, and even deliver children, despite the inconvenience of a collecting bag. However, our success rate in the cure of urinary fistulae is such that we have had recourse to this method in only 6 out of more than 1 000 cases.

Cutaneous ureterostomy was a life-saving procedure in over half the patients in whom it was performed, resulting in marked improvement in renal function. It even proved superior to uretero-colic anastomosis, performed under-

TABLE VI. REVISIONARY PROCEDURES (9 CASES)

Technique	Revisionary procedure	Outcome
Uretero-colic anastomosis	Right nephrostomy	Died 3 days
Bilateral cutaneous anastomosis	Ureteric dilatations	Alive 6 months
Ileal bladder	Bilateral ureterostomy	Died 26 days
Ileal bladder	Abdominal repair RVF	Died 4 years
Ileal bladder	Ileo-caecal anastomosis	Alive 3 months
Ileal bladder	Re-implant left ureter	Died 28 days
Ileal bladder	Re-fashioning stoma	Alive 2 years
Uretero-colic anastomosis	Excision abominal fistulae	Alive 13 months
Ileal bladder	Drain pelvic abscess	Died 12 days

less urgent conditions, although it should be remembered that the latter procedure was performed with inferior techniques during the earlier years.

Both uretero-colic anastomosis and the ileal conduit were shown to significantly improve or sustain renal function in a high proportion of postoperative survivors.

Though postoperative complications were high for all methods of diversion, they posed far less of a problem in the ileal bladder than in the other procedures.

Biochemical abnormalities in the uretero-colic anastomosis series were less frequent than in larger recorded series, but there was a high primary mortality due to severe pre-existing renal infection associated with malignant obstruction.

Compared with other methods the ileal bladder gave results far superior in terms of immediate outcome and survival time, over 15% of patients being alive at 18 months, even where carcinoma persisted.

The most disappointing feature of our series was the high incidence of postoperative renal infection. This was not due to poor operative technique, but could be fully accounted for by the practical impossibility of sterilizing the urinary tract pre-operatively in our special group of patients.

Our first diversion of the urinary tract, utilizing the isolated ileal loop, was performed in 1957, when the range of available antibiotics was limited, monitoring techniques were inadequate, and methods of applying radiotherapy far less sophisticated than those available to us today. Two of our 18 patients that had their urinary stream diverted by this method during the period 1966 - 1970 are alive and well with no evidence of recurrence of cervical carcinoma (previously stages III and IV) 2 years after diversion.

Whereas the *vis a tergo* for our approach was originally provided by the state of the community we serve, we now feel that our use of the ileal conduit, combined with post-operative whole-pelvis radiation, is superior to pelvic exenteration in the treatment of cervical carcinoma with a bladder fistula or increasing or pronounced bilateral ureteric compression.

The exenteration procedure with which Brunschwig and Daniel[9] have had outstanding success is one which, in our view, should be restricted to the fully-treated early case showing a local recurrence in bladder or rectum.

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