

Original Article

Morbidity following Ileal Conduit Urinary Diversion in a Welsh District Hospital over 10 years

R. Rajasundaram, K. Ananthakrishnan, R. Ayyathurai, W. Islam, C. Evans and V. Srinivasan

Department of Urology, Glan Clwyd Hospital, Conwy and Denbighshire National Health Service Trust, Denbighshire, Wales, UK.

ABSTRACT

Objective: To assess the post-operative morbidity after ileal conduit diversion at our institution.
Patients and Methods: The records of 84 patients with a mean age of 62.1 (range 22 -89) years who underwent ileal conduit diversion at our institution between 1992 and 2002 were reviewed and all post-operative complications occurring later than 3 months after the intervention were analyzed.

Results: Overall, 242 ileal conduit-related complications (71 major and 171 minor) developed in 72 of 84 patients (85.7%). The mean and median follow-up were 38.6 and 24 months, respectively (range 3 to 108 months). A total of 38 surgical procedures / interventions were needed in 33 patients (39.3%). 62/72 patients (86.1%) developed complications within the first 5 years. 32 stoma-related complications were recorded in 22/84 (26.2%) patients. Fifty-nine percent (n=42) of the major complications occurred in the 30 patients who had been subjected to diversion for non-malignant indications and had a longer mean follow-up (4.5 years) than the 54 patients who had been operated for malignancy (mean follow-up 2.5 years).

Conclusion: Patients with benign disease fared better in survival as expected, but the longer they survived, the higher was the incidence of complications and the re-intervention rate. In view of the high complication rate, especially in patients with a long life expectancy and benign conditions, objective guidelines regarding the choice of urinary diversion will help surgeons in decision making, patient selection and counseling.

Keywords : Ileal conduit diversion, complications, urinary diversion, morbidity, adult, cancer

Corresponding Author: Ramanan Rajasundaram, 35, Ingleton Drive, Lancaster, LA14QZ, United Kingdom, Email: ramananrajasundaram@yahoo.co.uk

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INTRODUCTION

The concept of urinary diversion is over 150 years old. According to J. Simon, the first recorded diversion in the form of ureterosigmoidostomy was done in 1852 by J. Smith¹. The earliest orthotopic reconstruction was attempted by Tizzoni² in 1888. The ileal conduit urinary diversion was described by Seiffert³ in 1935 and modified by Bricker⁴ in 1950. Continent diversions are being performed successfully, but they are technically demanding and have high

complication rates⁵. Due to their durability and simplicity, ileal conduits have become the most popular mode of diversion with patients and surgeons alike and are considered the gold standard form of urinary diversion. Yet, complications following this procedure are significant⁶⁻⁸ and have been described in detail. The aim of this study was to perform a comprehensive analysis of the long-term complications of ileal conduit urinary diversion.

Table 1: Long-term complications following ileal conduit diversion

Complications	No of Patients (n=84)	%	No. of Complications
Infection	57	67.9%	132
- UTI	-126 episodes		
- pyelonephritis	- 6 episodes		
Ureteric complications	6	7.1%	6
Raised creatinine*	7	8.3%	7
Bowel complications	8	9.5%	8
Stoma / Conduit complications	22	26.2%	32
Incisional hernia	7	8.3%	7
Chronic anemia	19	22.6%	19
Urolithiasis	7	8.3%	8
Chronic diarrhea	12	14.3%	12
Upper tract dilatation without demonstrable cause	7	8.3%	7
Low bicarbonate levels	4	4.8%	4

*true post-surgical deterioration of renal function

PATIENTS AND METHODS

Out of 92 patients subjected to ileal conduit diversion at the Glan Clwyd district general hospital in Wales, UK, between 1992 and 2002 and followed up for at least 3 months, 84 were included in this study. Eight patients were followed up out of region and were not included. The surgical technique was consistent, using ileal segments of 14-16 cm length. The type of uretero-ileal anastomosis varied between Wallace-1 (W1, side-to-side, single unit refluxing anastomosis), Wallace-2 (W2, reverse side-to-side single unit refluxing anastomosis) and Bricker (ureters anastomosed as separate non-refluxing units to ileum)^{4,9}. The records of clinic reviews, in-patient notes, investigations and correspondence were included in the data collection.

All complications related to ileal conduit diversion which occurred more than 3 months after the intervention were analyzed. The following were regarded as major complications: raised creatinine and low bicarbonate values, pyelonephritis,

urolithiasis, ureteric obstruction (partial or complete obstruction on IVU), ureteric or bowel loop malignancy, bowel obstruction requiring surgical intervention, stomal complications, incisional hernia and dilated upper tract. The following were regarded as minor complications: urinary tract infection (UTI), chronic anemia, chronic diarrhea, skin problems at the site of the stoma and cases of suspected urolithiasis or bowel pseudo-obstructions which were managed conservatively. A creatinine level >120 $\mu\text{mol/l}$ and a bicarbonate level <22 mmol/l were considered abnormal. UTI was defined as a urine culture positive for a single pathogen with a bacterial count of $\geq 10^5/\text{l}$ and proven sensitivity to oral antibiotics. The end point of treatment was symptomatic relief. Patients with symptoms of pyelonephritis were treated with parenteral antibiotics. Descriptive statistics was used to demonstrate the data. Chi square test was used to compare complication rates among patients with the benign and malignant indications for ileal diversion.

Table 2: Major complication rates in patients with benign versus malignant disease

Complications	No. of complications	No. of patients	% (Patients)	Benign N=30	Malignant N=54
Raised creatinine	7	7	8.3%	4	3
Low bicarbonate	4	4	4.8%	1	3
Pyelonephritis	6	6	7.1%	5	1
Urolithiasis needing intervention	1	1	1.2%	1	0
Ureteric or anastomotic obstruction / malignancy	6	6	7.1%	2	4
Bowel complications needing intervention	4	4	4.8%	1	3
Stomal complications	29	22	34.5%	22	7
Incisional hernia	7	7	8.3%	6	1
Dilated upper tract	7	7	8.3%	0	7
TOTAL	71	43*	51.2%	42	29
Mean follow-up (years)			3.2	4.5	2.5
≥5 years of follow-up			33.3%	36.6%	31.4%
Deaths (during study period)		30 / 84		7	23

*some patients developed more than one complication

RESULTS

The study group consisted of 84 patients with a mean age of 62.1 (range 22 -89) years. Among these, 36 were males (mean age 63 years, range 22 – 83) and 48 females (mean age 61.4 years, range 30 - 89).

The indications for urinary diversion were malignancy in 54 (64.3%), intractable incontinence in 19 (22.6%), interstitial cystitis in 8 (9.5%) and other benign conditions in 3 (3.6%) patients.

Forty-eight (57.1%) patients were subjected to radical cystectomy with ileal conduit diversion, 17 (20.2%) to simple cystectomy with diversion and 19 (22.6%) to diversion only. The type of uretero-ileal anastomosis varied between W1 (47/84 patients; 56%), W2 (24/84 patients; 28.6%), Bricker (7/84

patients; 8.3%) and non-specified (6/84; 7.1%). The mean and median follow-up were 38.6 and 24 months, respectively (range 3 to 108 months).

Thirty of the 84 patients (35.7%) died during the follow-up period. The initial indication for surgery in those patients had been malignancy in 23 and non-malignant disease in 7. The cause of death was malignancy-related in 16 patients, medically / surgically unrelated to the urinary diversion in 9 and unknown (deaths at home) in 5 patients.

Overall, 242 ileal conduit-related complications (71 major and 171 minor) developed in 72 of 84 patients (85.7%) (Tables 1, 2). Out of the 72 patients, 62 (86.1%) developed

Table 3: Stoma-related complications

Complications	Patients	Complications	Surgery
Parastomal hernia	12	17	11
Prolapse	3	3	2
Stenosis	3	3	2
Retraction	1	1	0
Ulcer/ erosion/granuloma	4	4	1
Leaking stoma / bag	2	3	3
Not coping	1	1	1
Total	22 (**)	32	20

** Some patients had more than one complication

complications within the first 5 years. In the group of patients that were followed up for 5 years and longer (n=28, median 7 years) upper tract changes and urolithiasis were seen in 3 (10.7%) and 2 (7.1%) patients, respectively. Fifty-nine percent (n=42) of the major complications occurred in the 30 patients who had been subjected to diversion for non-malignant indications and had a longer mean follow-up (4.5 years) than the 54 patients who had been operated for malignancy (mean follow-up 2.5 years). The observation of more complications among patients with benign indications (Chi square test p=0.0001) is most probably due to the longer follow-up in this group.

A total of 32 stoma-related complications were recorded in 22/84 (26.2%) patients. Seventeen para-stomal hernias developed in 12 (54.5%) of the 22 patients, and 9 of the 12 (75%) required surgical correction (11 hernias). Other stoma-related complications were stoma retraction, stenosis, prolapse and miscellaneous complications (ulcers, skin erosions, granulomas, leaking conduits, not able to cope, bag not fitting) encountered in 1 (1.2%), 3 (3.6%), 3 (3.6%) and 7 (8.3%) patients, respectively (Table 3). Fifteen (68.2%) of the 22 patients with stoma-related complications needed 20 surgical interventions; 4 (18%) of the 22 patients required more than one operation for complication management.

In total, 132 episodes of infection were recorded in 57/84 (67.9%) patients. Among these, 6 patients had pyelonephritis requiring hospitalisation and parenteral antibiotics; 3 of them were found to have anastomotic stricture with partial ureteric obstruction, one had associated urolithiasis and one had an abnormal creatinine value. A total of 126 episodes were simple urinary tract infection (UTI) with a significant bacterial count on urine culture and were managed with oral antibiotics on an outpatient basis. Thirty-one of these patients had more than one episode of UTI with a range of 2 to 8 episodes. In 50.9% (29/57) of the cases, the first episode of UTI occurred within the first 2 years of the post-operative period.

Urolithiasis was recorded in 7 patients, renal stones in 6 and stones in the kidney and ureter in one patient. One of these patients had pyelonephritis and the other 6 had UTI.

Among those with urolithiasis, upper tract dilatation was seen in 2 patients, one with a stone in the ureter and one without. None of these patients had abnormal creatinine levels. Six (7.1%) patients developed ureter-related complications. Four (4.8%) patients developed dilatation of the urinary tract secondary to obstruction (stenosis of uretero-ileal anastomosis and ureteral stricture in 2 patients each) and 2 patients developed malignancy of the ureter. Five of these

Table 4: Radiological / surgical interventions

Complication	No. of interventions	No. of Patients	% (patients)
Para-stomal hernia	11	9	10.7%
Bowel obstruction	5	4	4.8%
Incisional hernia	5	5	6.0%
Anastomotic narrowing	2	2	2.4%
Ureteric (calculus obstruction / malignancy)	5	4	4.8%
Urolithiasis without obstruction	1	1	1.2%
Prolapse of conduit	2	2	2.4%
Stenosis of stoma	2	2	2.4%
Problems with stoma care needing resiting of stoma	5	4	4.8%
Total	38	33	39.3%

patients needed 7 surgical procedures. In total, 13 patients had upper-tract dilatation (2 urolithiasis, 2 anastomotic strictures, 2 ureteral strictures and 7 without any demonstrable cause).

Raised creatinine levels were noted in 20 patients; 7 (8.3%) showed a true post-surgical deterioration of renal function (transient derangement in 3 and progressive renal failure without any identified underlying cause in 4), while 13 had underlying renal impairment prior to surgery.

Four (4.8%) patients had low bicarbonate levels, 2 of them had transient hyperchloremia and the other 2 high normal chloride levels.

Bowel complication (obstruction) was recorded in 8 (9.5%) patients of whom 4 needed surgical intervention for adhesions.

Chronic diarrhea was seen in 12 (14.3%) and chronic anemia in 19 (22.6%) patients.

Incisional hernia was recorded in 7 (8.3%) patients out of whom 5 needed surgical repair.

In total, 38 surgical procedures / interventions were needed in 33/84 (39.3%) patients in managing complications related to ileal

conduit diversion (Table 4). Stoma-related complications accounted for 20 of these interventions. Four of the 33 patients (12.1%) needed more than one intervention.

Out of the 84 patients, 47 had W1 type of anastomosis, 24 had W2 type, 7 had Bricker type and 6 were not specified / single ureters. The complications associated with the type of anastomosis are shown in Table 5.

DISCUSSION

According to the literature, stoma-related complications occur in 29% to 42% of patients after ileal conduit diversion¹⁰⁻¹². These rates are comparable to our results (26.2%). The commonest of these complications in our study was para-stomal hernia which is consistent with the findings of Singh et al.¹⁰

Complications related to uretero-ileal anastomosis were seen in 7.1% of our patients. This is also comparable to other studies which reported complications in 7% to 14% of patients^{7,12}.

However, the incidence of UTI in our patients (67.9%) was significantly higher

Table 5: Types of anastomosis and incidence of complications

Complications	Wallace 1	Wallace 2	Bricker
	n=47	n=27	n=7
Ureteric obstruction	2	1	1
Anastomotic stenosis	2	-	-
Upper tract dilatation without cause	4	1	2
Urolithiasis	4	2	
Total (%) complications	12 (25.5%)	4 (14.8%)	3 (42.9%)

than in other reports, while the incidence of urinary tract calculi in our study (8.3%) was considerably lower compared to other reports in the literature^{7,13-15}. There were no definite identified reasons for this unusually high UTI rate. During data collection UTI was defined as urine culture positive for a single pathogenic organism in significant counts ($\geq 105/\text{ml}$) with proven sensitivity to antibiotics and successfully treated by oral antibiotics. The clinicians involved (urologists, general practitioners, physicians and nurse practitioners) may have had a low threshold in testing the urine for infection and this may have led to higher detection rates. There may also have been contamination due to an inappropriate method of sample collection.

Following continent diversion, mild hyperchloremic acidosis is expected in 15% of patients with 10% requiring treatment¹⁶. In this study the incidence of acidosis was 4.8%; it was transient and did not require treatment.

Bilateral upper tract dilatation without any demonstrable cause has been reported in 10-18% of patients in the literature^{10,15,17}, while in our study only 7 (8.3%) patients had upper tract dilatation with no identifiable cause. This low figure may be attributed to the relatively short follow-up period.

The incidence of chronic anemia, chronic diarrhea, and bowel-related complications (obstruction, pseudo-obstruction or colic)

and meticulous accounting of episodes of UTI in our study may have increased the total number of complications. Whether these complications are directly related to the ileal conduit diversion is debatable. Chronic anemia and chronic diarrhea, although not proven to be directly related to the ileal diversion, were included in the data as they were not present pre-operatively, and the patients in question were investigated to rule out other bowel pathology. Short bowel syndrome could be one possible explanation, especially in those who presented with a history of tenesmus and intestinal urgency, but the length of resected bowel was consistently documented as 14 – 16 cm. These complications have to be recognized and treated as part of the routine follow-up.

The re-intervention rate in our study was 39% including surgery and radiological / endoscopic procedures. Thirty-eight surgical / radiological procedures were performed in 33 patients. Twenty of the 38 procedures were stoma / conduit-related (11 para-stomal hernias)^{5,18} and 5 were incisional hernias. The re-intervention rates for hernias might reflect the patients' attitude and expectations of post-diversion quality of life and available resources.

The overall late complication rate in our study group was comparable to other studies analyzing all complications related to ileal conduits. A 54-80% complication rate was reported in one of these studies, with 13-

35% patients needing surgical management¹¹ which is similar to our data (86% complications, 39% needing surgical interventions / procedures). In our study 59% of the major complications were encountered in the group of patients with benign disease (n=30) compared to 41% in those with malignant disease (n=54). This was probably due to the longer follow-up and lower mortality among patients with benign disease (Table 2).

In conclusion, the morbidity associated with ileal conduit diversion in our patient cohort was high, although most complications were minor and easily treated. Patients with benign disease fared better in survival as expected, but the longer they survived, the higher was the incidence of complications and the re-intervention rate. Patients who undergo this procedure must fully understand its expected long-term outcome. One cannot over-emphasize the need for careful patient selection, counselling and committed long-term follow-up.

Ileal conduit diversion has proved to be the simplest and most straightforward solution for patients needing urinary diversion. Yet, in view of the high complication rates, the longer life expectancy of those undergoing this procedure and the claims of effective alternatives^{13,19,20}, the establishment of a set of objective guidelines regarding the choice of urinary diversion will aid the surgeon in decision making. Only a prospective study analyzing the complications of ileal conduit urinary diversion covering a period of at least a decade will show the true morbidity of this procedure. With increasing life expectancy and better management of malignancies, it is imperative to continue the search for the ideal type of urinary diversion.

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Editorial Comment

This is an honest report on the complications of ileal conduit urinary diversion. It provides important information related to the high rate (up to 86%) of conduit-related complications. It is noted that conduit morbidity is as high as in any other type of diversion. Since these complications show a linear increase with time, meticulous follow up is mandatory. It is worthy to observe that patients with benign disease fair better.

Prof. Dr. med. H.C. R. Hautmann
Medical Director - Department of Urology
University Clinic Ulm - Germany