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ORIGINAL RESEARCH

Early outcome and quality of life post-Mainz Pouch II urinary diversion among bladder cancer patients treated at Kilimanjaro Christian Medical Centre: a 10-year experience

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Purpose: Mainz Pouch II is the most common continent type of urinary diversion performed after radical cystectomy for muscle-invasive bladder cancer (MIBC) at our facility. This study assesses the early outcomes and quality of life (QoL) post-Mainz Pouch II urinary diversion at Kilimanjaro Christian Medical Centre (KCMC).

Materials and methods: This retrospective cohort study examined all patients who underwent radical cystectomy and Mainz Pouch II urinary diversion at the KCMC urology department from January 2012 to December 2022. Variables assessed included sociodemographic characteristics, clinicopathological disease stage, histological type, early outcome, and QoL. Data were collected from the urology theatre registry book, the Data-Intensive Systems and Applications (DISA) for laboratory results, and the Electronic Health Management System (EHMS) for follow-up information. Clinical pathological characteristics were captured using a data extraction sheet. The World Health Organization (WHO) health-related quality of life (HRQOL) questionnaire was used for QoL assessment. The Statistical Package for the Social Sciences (SPSS) version 25 was used for data analysis.

Results: In this study, 41 subjects underwent Mainz Pouch II, with 78% male. Most patients (97.6%) had T2 clinical stage, while 75.6% had T2 pathological stage, and transitional cell carcinoma (TCC) accounted for 80.5%. Early outcomes included hyperchloremic metabolic acidosis (65.9%), pyelonephritis (4.9%), paralytic ileus (19.5%), wound complications (14.6%), deep vein thrombosis (DVT) (2.4%), acute kidney injury (AKI) (9.8%), and incontinence (12.2%). All subjects had good physical QoL, and 10.7% had poor mental QoL.

Conclusion: Mainz Pouch II is safe with minimal adverse early outcomes and overall good QoL. Further studies on long-term outcomes and determinants of survival are recommended.

Keywords: bladder cancer, Mainz Pouch II, urinary diversion, short-term outcome, quality of life

Introduction

Urinary diversion employs the separation of the ureters from the bladder, creating an alternative route for the evacuation of urine when the native bladder cannot perform this function.[1] It is usually indicated in patients with bladder malignancies requiring radical cystectomy, including congenital anomalies, intractable urinary incontinence, and intractable bladder haemorrhage.[1] The reconstructive urinary diversion options are broadly grouped into continent or incontinent types; however, generally, they include colon or ileal conduits, ureterosigmoidostomy, continent cutaneous diversions, and orthotopic neobladders.[2]

An ileal conduit is the most common type of diversion performed globally in patients with muscle-invasive bladder cancer (MIBC).[3] The classical continent ureterosigmoidostomy urinary diversion technique, popular in the 1950s, became discouraged due to its poor outcomes caused by the high-pressure intestinal pouch.[4] Therefore, a modified ureterosigmoidostomy, Mainz Pouch II urinary diversion, was introduced and became popular in the 1970s since the technique involved detubularisation of the sigmoid colon, making it a low-pressure, high-capacity pouch with no need for external appliances.[5] Consequently, Mainz Pouch II has been the most common type of urinary diversion performed after radical cystectomy for MIBC at our facility, and also because of its high social acceptance and challenges faced in the availability of stoma bags.

Bladder cancer is among the most common urological malignancies and is the second most prevalent urological cancer after prostate cancer.[6] Globally, it accounted for 550 000 new urinary bladder cancers in 2018, with a male-to-female ratio of 3.4:1 and 7% and 2% of all new cancer cases in males and females, respectively, in the United States.[6,7] However, 3–4 out of 10 bladder cancer patients with non-MIBC may become MIBC. Moreover, one-third of new bladder cancer patients usually present with already MIBC disease, requiring radical cystoprostatectomy in males and anterior pelvic exenteration in females, followed by urinary diversion.[8,9]

With Mainz Pouch II urinary diversion, postoperative morbidity and mortality have significantly reduced. However, the early outcomes such as pyelonephritis, peritonitis, pouch leakage, hyperchloremic metabolic acidosis, paralytic ileus, and deep vein thrombosis (DVT) still pose an unknown burden, and most of these patients' quality of life (QoL)is inadequately followed up and assessed.[5] Therefore, this study aimed to assess the early outcomes and QoL post-Mainz Pouch II urinary diversion.

Methodology

This retrospective cohort study was conducted at Kilimanjaro Christian Medical Centre (KCMC), one of the four zonal referral hospitals in Tanzania, located in the foothills of Mount Kilimanjaro. The hospital serves more than 15 million people in northern Tanzania, and the urology department has a 50-bed capacity, with six outpatient clinic rooms and two main theatre rooms.[5]

The study included all subjects who underwent radical cystectomy and Mainz Pouch II urinary diversion due to MIBC in the urology department at KCMC from January 2012 to December 2022. Subjects with missing data were excluded from the study. Data was collected using a pretested, structured extraction sheet. A consultant urologist from the KCMC urology department evaluated the data extraction tool. The tool was piloted using five subjects who underwent Mainz Pouch II urinary diversion due to MIBC, and the errors identified were rectified.

The data extraction tool contained five sections. Section one contained the sociodemographic information of the subjects, including age, sex, and area of residence. Section two contained the stages of the tumour, both clinical and pathological stages. Section three contained the tumour histological type observed. Section four contained the early outcomes that occurred within six months, including hyperchloremic metabolic acidosis, pyelonephritis, paralytic ileus, wound dehiscence, wound sepsis, DVT, hydronephrosis with acute kidney injury (AKI), and day- and nighttime incontinence. Section five assessed QoL using the World Health Organization (WHO)-validated health-related quality of life (HRQOL) questionnaire, comprising 12 questions (Short-Form 12-Item version 2, SF-12v2), which assess physical components (energy levels, pain, sleep quality, mobility, daily activities, medical dependence, and work capacity), and mental components, including emotions (anxiety, depression), self-esteem, body image, cognitive function, and spiritual well-being. All have an average score of less or more than 50, signifying either poor or good QoL.[10]

All eligible subjects were identified from the urology theatre registry book. Data-Intensive Systems and Applications (DISA), Electronic Health Management System (EHMS), and hard-copy hospital files were traced using the subjects' registration numbers. Postoperative follow-up information was extracted from individual files. QoL was assessed through direct phone call interviews with the subjects.

The principal investigator did data entry and analysis. Double entry was done during data analysis to ensure quality, and data cleaning was done to ensure quality and consistency. The collected data were entered into the computer and analysed using Statistical Package for the Social Sciences (SPSS) version 25. Univariate analysis was used to present the data in terms of frequency and percentage.

Table I: Subjects' sociodemographic and clinicopathological characteristics

Variables	Frequency	%
Age		
< 60	14	34.1
60–70	21	51.2
> 70	6	14.6
Mean (SD)	61.0 (11.7)	
Gender		
Male	32	78.0
Female	9	22.0
Residency		
Kilimanjaro	19	46.3
Arusha	5	12.2
Singida	3	7.3
Other	14	34.2
Clinical tumour stage		
cT2	40	97.6
cT4	1	2.4
Pathological tumour stage		
pT2	31	75.6
pT3	8	19.5
pT4	2	4.9
Histology		
TCC	33	80.5
SCC	8	19.5

SCC – squamous cell carcinoma, SD – standard deviation, TCC – transitional cell carcinoma

Table II: Early outcomes

Variable	Frequency	%
Hyperchloremic metabolic acidosis		
No	14	34.1
Yes	27	65.9
Pyelonephritis		
No	39	95.1
Yes	2	4.9
Prolonged ileus		
No	33	80.5
Yes	8	19.5
Wound dehiscence		
No	35	85.4
Yes	6	14.6
Wound sepsis		
No	35	85.4
Yes	6	14.6
DVT		
No	40	97.6
Yes	1	2.4
Hydroureteronephrosis with AKI		
No	37	90.2
Yes	4	9.8
Daytime incontinence		
No	40	97.6
Yes	1	2.4
Nighttime incontinence		
No	36	87.8
Yes	5	12.2

AKI – acute kidney injury, DVT – deep vein thrombosis

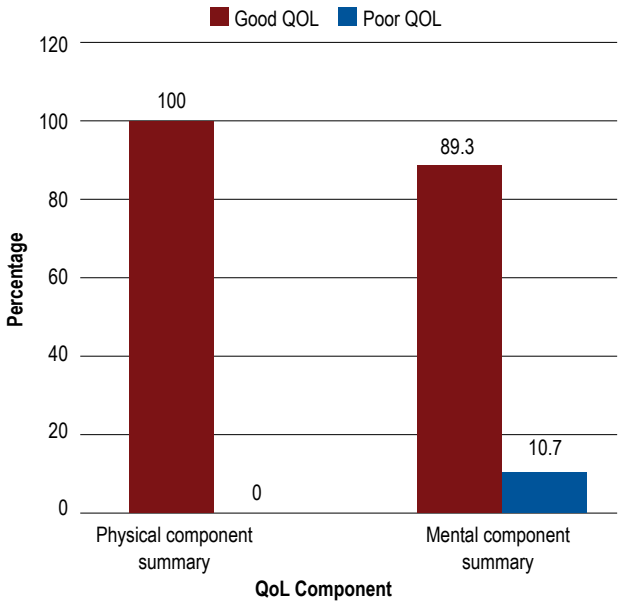

Figure 1: Participants' QoL (*n* = 28)
QOL – quality of life

Ethical clearance was granted by the College Research Ethics Review Committee of Kilimanjaro Christian Medical University College (number 48/2022). Permission to conduct this study at KCMC was obtained from the administrative authority. Informed verbal consent was obtained from the participants, who were contacted and interviewed via phone.

Results

Over 10 years, 41 subjects underwent modified Mainz Pouch II urinary diversion using an anti-reflux technique after radical cystectomy for MIBC. Among them, 32 (78%) were male, and the subjects had a mean age of 61 years. Most of the study subjects were residing in the Kilimanjaro region, accounting for 46.3% (Table I). Most of them had clinical tumour stage 2 (cT2) (40, 97.6%) and pathological tumour stage 2 (pT2) (31, 75.6%). The most common histological type was transitional cell carcinoma (TCC), with 33 subjects (80.5%).

Early outcomes were noted within six months post-Mainz Pouch II urinary diversion (Table II). Most subjects developed hyperchloremic metabolic acidosis (27, 65.9%). Eight patients (19.5%) had paralytic ileus, with six (14.6%) developing wound sepsis and wound dehiscence. Only one (2.4%) developed DVT. Most subjects attained continence.

Among the 41 subjects with MIBC who underwent Mainz Pouch II urinary diversion, 28 (68.3%) were assessed for their QoL. All participants showed good QoL in the physical component, and 89.3% had a good mental component and acceptance (Figure 1).

Discussion

The Mainz Pouch II, a modified continent type of urinary diversion popular in the 1970s, is simple, has better outcomes, and is more acceptable to society postoperatively than other forms of urinary diversion, especially the incontinent types, which may be unacceptable in Third World countries.[11] Due to its simplicity, this type of urinary diversion has become the most common type at KCMC since it was introduced in 1992. Also, it does not require external appliances, is a low-pressure pouch, and has fewer complications while being socially acceptable. Mainz Pouch II has been employed to manage other bladder pathologies. These include non-malignant and anatomical and functional pathologies such as bladder exstrophy in paediatrics and recurrent failed vesicovaginal fistulas in females, showing significant reduction in morbidity with good QoL reports.

This study's age distribution ranged from 30 to 90 years, with a mean age of 61 and an 11.7 standard deviation, showing that many affected age groups (60–70 years) account for more than half of all subjects. These results also tally with the study in Germany with a mean age of 62 years, another in Greece that showed a mean age of 70.5, and in Africa, a mean age of 58.6 at presentation.[8] This can be explained by the various bladder cancer risk factors' exposure time before they become symptomatic. Both clinical (cT2) and pathological (pT2) staging were most seen at the time of presentation, accounting for 97.6% and 75.6%, respectively. This implies that the disease was still localised at the time of presentation.

Males are more affected by bladder cancer than females. This study had a male-to-female ratio of 3.5:1, where males accounted for 78% and females for 22%. Other European studies correlate with these findings, where males account for 80.7% and females for 19.3%, while 86.2% (male) and 13.8% (female) were seen in other parts of Europe.[12] Men's high exposure to industrial chemicals, tobacco use, agricultural pesticide use, and Schistosoma infection may explain their predominance.

Initially, in African settings, squamous cell carcinoma (SCC) was the most common histological type of bladder cancer, while TCC was primarily seen in developed countries. The explanation was the exposure to and burden of *Schistosoma haematobium* infections in sub-Saharan Africa, a significant risk factor for SCC development. However, TCC was the most diagnosed histological type, accounting for 80.5%, while SCC accounted for 19.5%, with a ratio of 4.1:1 in this study. These results correlate with another study in West Africa, where 82% of participants had TCC while 18% had SCC.[8]

Early outcomes and complications were assessed in this study. These are generally defined as occurring within six months post radical cystectomy and Mainz Pouch II urinary diversion. The most notable common outcomes were hyperchloremic metabolic acidosis, prolonged ileus, and wound sepsis and dehiscence. In this study, hyperchloremic metabolic acidosis accounted for about 65.9% due to the reabsorption of urinary chloride by the sigmoid colon mucosa and the excretion of bicarbonates in exchange. Therefore, subjects were primarily treated with oral intake of sodium bicarbonate ($NaHCO_3$). These results also align with those from a study on metabolic complications after urinary diversion, showing how it is usually underestimated.[13] Our results also correlate closely with findings from a study in Greece, where 52% of subjects developed metabolic acidosis, requiring oral alkalising medications.

Prolonged ileus, whereby subjects present with persistent absence of bowel movement causing failure to tolerate oral intake, may

range from three to five days. In this study, eight participants (19.5%) experienced prolonged ileus; however, they did not require further intervention and their bowel habits resolved spontaneously. These findings are similar to the 25% of prolonged ileus cases in a southeastern European study.[14]

Six subjects (14.6%) developed both wound sepsis and dehiscence of varying degrees. The wound sepsis was managed with daily dressings and appropriate antibiotics according to the culture sensitivity. Subjects who developed wound dehiscence required secondary closure. These results closely correlate with the studies in Egypt and Tanzania, where wound sepsis accounted for 9.5% and 8.4%, respectively, while wound dehiscence accounted for 10.5%.[5,11,15]

The outcome of hydronephrosis with or without AKI post-Mainz Pouch II urinary diversion was managed conservatively. It may be explained by the possibility of stenosis at the ureterosigmoid reimplantation site after removing the ureteric stents 5–7 days postoperatively. In this study, hydronephrosis accounted for 9.8%, similar to 8.3% from other studies. Conversely, the outcome of pyelonephritis, which can be explained by urine and faecal material reflux to the kidneys, has accounted for about 5% of cases in this study, correlating with 6.8% from European studies.[12] Pyelonephritis was managed with broad-spectrum antibiotics for symptomatic patients.

Mainz pouch II as a continent type of urinary diversion, employs the use of the anal sphincter for the continent mechanism. Hence, patients will occasionally present with some degree of incontinence postoperatively, especially during the night. In this study, only one participant (2.4%) had daytime incontinence, which was transient and managed conservatively alongside light Kegel exercises. Five patients (12.2%) had nighttime incontinence; also transient and managed in the same manner. These findings align with other study results where most cases had attained continence during both day and night.[4]

As noted in various studies, DVT was the least frequent early outcome, occurring in one subject (2.4%). It can be related to protocols of administering anticoagulants after pelvic surgeries and employing early patient ambulation and mobility.

Effects on the HRQOL have been linked to both continent and incontinent urinary diversion types. The domains affected are usually physical function, body pain, emotional function, social function, and overall mental health. In this study, two main domains were assessed, and a total of 28 participants were able to respond to the tool. It was observed that in the physical aspect that involves general physical performance, all the participants' responses were scored as good, implying they were physically fit and able to perform duties without limitation.

The same applies to the mental domain that assessed the psychological and social aspects, demonstrating that 89.3% had a good QoL, similar to the 92% from other studies.[16] In the mental QoL aspect, 10.7% scored poorly, correlating to the 8% in other studies.[16] This poor mental aspect could be due to cancer-related distress and body function changes involving changes in bowel habits and self-social isolation. Overall, Mainz Pouch II is well accepted and favoured regarding its good QoL in this study, similar to other comparative studies assessing different forms of urinary diversion, demonstrating good outcomes from 75% to 84.6%.[4,17]

Therefore, the Mainz Pouch II urinary diversion technique among bladder cancer patients has demonstrated that the procedure is safe and reproducible, with minimal adverse complications. Moreover, it showed a good QoL in both physical and mental domains. Consequently, it can continue to be advocated as a type of urinary diversion at our hospital.

Conclusion

Mainz Pouch II urinary diversion is a safe and acceptable procedure in bladder cancer patients at our hospital, correlating with findings from other studies worldwide. However, further studies are recommended to assess the long-term outcomes and determinants of survival post-Mainz Pouch II urinary diversion at our hospital.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

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