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Successful pregnancy and delivery in a patient with a Mainz-II pouch urinary diversion: Case report and literature review

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ABSTRACT

This case report describes the successful management of a 16-year-old primigravida of Black African descent who had undergone Mainz-II ureterosigmoidostomy during infancy. Mainz-II ureterosigmoidostomy as a urinary diversion presents unique management challenges, particularly in pregnant patients. The patient presented to the antenatal clinic after a spontaneously achieved pregnancy; she had normal findings on obstetric and renal ultrasound scans throughout her pregnancy. At 38 weeks of gestation, an elective caesarean section was performed; the absence of the urinary bladder and the intact condition of the Mainz-II pouch were confirmed. A healthy biological male infant weighing 2.3 kg was delivered. Postoperatively, the patient experienced a mild superficial surgical site infection but otherwise had an uneventful recovery. This case underscores the importance of comprehensive prenatal care and meticulous surgical planning in managing pregnancies in patients with complex urinary diversions, and demonstrates that favorable maternal and neonatal outcomes can be achieved with appropriate medical oversight.

1. Introduction

Urinary diversion is a surgical procedure which in the paediatric population is variably indicated for conditions like bladder exstrophy, posterior urethral valves with severe bladder dysfunction, neurogenic bladder (e.g., due to spina bifida), bladder dysfunction after trauma or surgery, childhood malignancies of the bladder or urethra (very rare) and congenital anomalies of the bladder or urethra (conditions like cloacal malformations) [1] [2]. Among the various techniques, the Mainz-II pouch, a modification of ureterosigmoidostomy, has emerged as a significant advancement in urinary diversion [1] [3]. Historically, ureterosigmoidostomy was associated with complications associated with severe reflux, leading to recurrent urinary tract infections, and a greater risk of impaired renal function [4]. The Mainz-II pouch addresses these challenges by providing a detubularised, thus depressurised pouch associated with a more physiological urinary diversion, [3] [5].

This case report presents a successful spontaneous [1] [6] pregnancy in a 16-year-old female with a Mainz-II pouch urinary diversion. Her case offers a unique opportunity to explore the feasibility and outcomes of pregnancy in such patients, especially regarding the preservation of fertility and successful delivery through an elective caesarean [1] section at 38 weeks of gestation.

2. Case Presentation

A 16-year-old female of black African descent (G1P0 but now P1) as an infant, underwent ureterosigmoidostomy and Mainz-II pouch urinary diversion. She first presented to the antenatal clinic at 13 weeks of gestation. During her antenatal care, she was closely followed, with multiple obstetric ultrasound scans and a renal ultrasound scan. All laboratory results were within normal limits: haemoglobin 12.8 g/dl; blood urea (BUE) 5 mmol/L (2.5 to 6.4 mmol/L); serum creatinine (Cr) 60 μmol/L (45 to 84 μmol/L); sodium (Na+) 140 mmol/L (135 to 145 mmol/L); potassium (K+) 4.0 mmol/L (3.5 to 5.0 mmol/L); chloride (Cl-) 102 mmol/L (98 to 106 mmol/L); bicarbonate (HCO3-) 25 mmol/L (22 to 28 mmol/L). She had no signs of hydronephrosis or abnormal renal cortical dimensions. The obstetric ultrasound scans at booking, 22 weeks

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and 37 weeks showed normal foetal parameters. These findings indicated stable renal health and normal foetal development.

An elective caesarean section was planned and performed at 38 weeks of gestation [1]. During the procedure, it was confirmed that the urinary bladder was absent, consistent with the Mainz-II pouch urinary diversion. The caesarean section, conducted by a team of obstetricians, a urogynecologist and a urologist, was approached with a midline abdominal incision, and a careful excision of the old surgical scar from the previous ureteroneocystostomy surgery (Fig. 1). The uterine incision was a low-segment incision. Foetal presentation was cephalic. The baby was delivered manually and the cord divided between two haemostat clamps. The placenta was delivered by controlled cord traction, and found to be normal, with all lobes and membranes intact. Uterine toileting and haemostasis were ensured. Uterine repair was in two layers with absorbable sutures. The abdominal closure was in three layers with absorbable (vicryl sutures). The liquor was clear and of normal volume. Estimated blood loss was 350 mL (a value within what is expected in the literature) [7].

The Mainz-II pouch was noted to be in good condition, positioned posterior to the gravid uterus (Figs. 2 and 3). The outcome of the caesarean section was a live male infant weighing 2.3 kg, who had no anomalies, and APGAR scores of 8 to 10. Postoperatively, the mother developed a mild surgical site infection (superficial), which was managed effectively. She made a full recovery and was discharged home with her baby. She continued to receive follow-up care.

3. Discussion

Patients with complex urinary diversions like the Mainz-II pouch require vigilant monitoring for potential complications, particularly during pregnancy, and the index patient had this. Although it is unknown what necessitated the patient's ureterosigmoidostomy and Mainz-II pouch surgery, it could have been due to bladder exstrophy, a congenital defect where the bladder is exposed outside the body, requiring a urinary diversion when reconstruction is not feasible [1,2].

Fertility and pregnancy pose significant challenges in patients with a history of major urinary diversions after cystectomy. Adhesions from previous laparotomies can impair tubal function, contributing to infertility [1]. Deans et al. reported that upper renal tract obstruction leading to renal failure can occur in these patients, and pregnancies may be complicated by acute pelvic floor prolapse [6]. Additionally, there is an increased risk of preeclampsia and gestational hypertension during pregnancy in women with congenital bladder exstrophy [6]; the index patient had none of these.

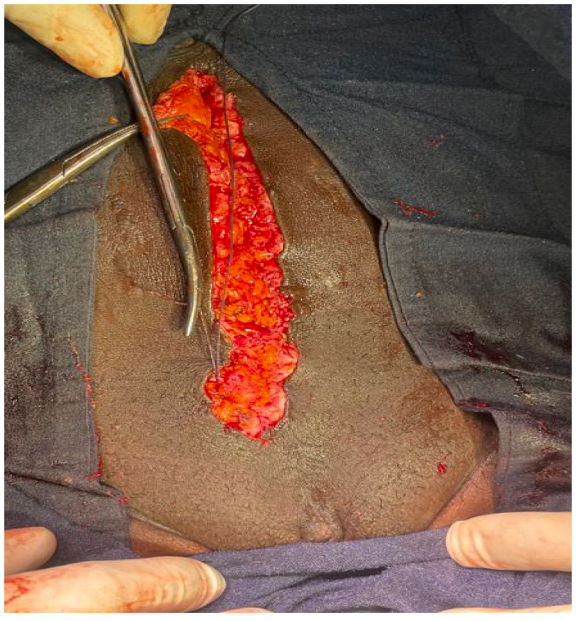

Fig. 1. The resulting surgical incision/wound after excising the old midline scar.

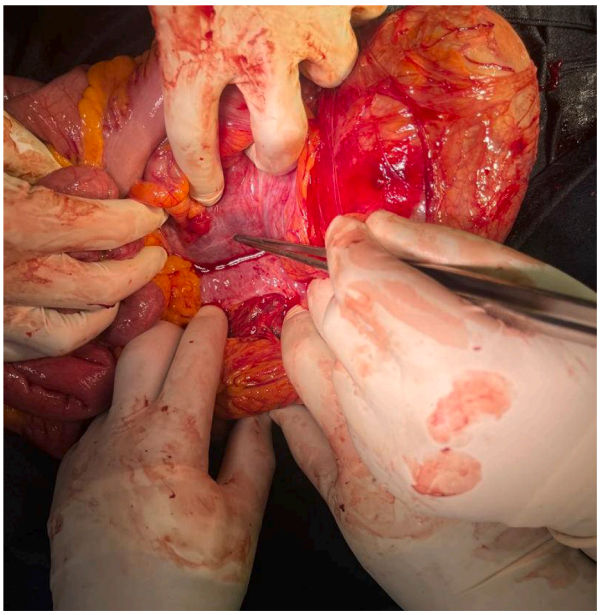

Fig. 2. Inspection of the Mainz pouch after delivery of the baby and repair of the uterus.

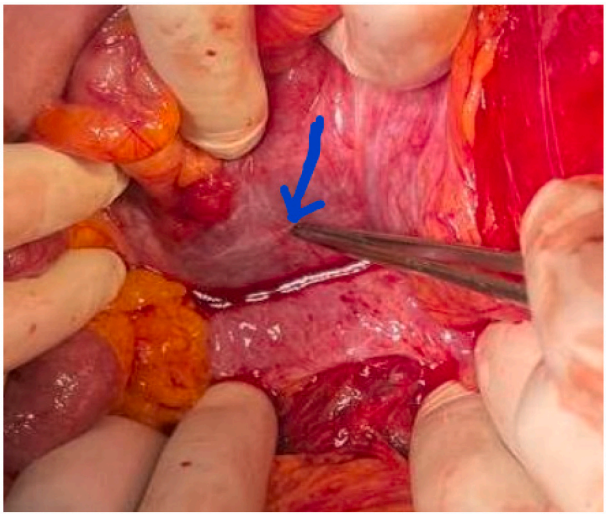

Fig. 3. Inspection of the Mainz pouch after delivery of the baby and repair of the uterus (arrow).

Complications such as bowel dysfunction and urinary tract infections are common in patients with urinary diversions and require careful monitoring during pregnancy [5,8]. Regular renal function tests and ultrasound scanning are essential to ensure stable renal health and prevent complications. In this case, the patient did not experience pyelonephritis, which is reported in 60 % of pregnancies with urinary diversions [9,10]. Her normal renal ultrasound and absence of hydronephrosis suggest stable long-term renal function and bladder health throughout pregnancy.

Antenatal care, delivery, and post-delivery care of pregnant patients after complex urinary diversion must be multidisciplinary to achieve the best outcome for both the mother and the baby [1,6,9]. In this case, the management and delivery were a collaborative effort between

obstetricians and urologists in particular.

A review of the literature indicates no consensus on a particular mode of delivery as the best for women with urinary diversion or augmentation cystoplasties. Ruan et al. (2022) noted that, of 101 pregnancies for which the mode of delivery was described, 72 were vaginal, with or without instrumental extraction, while the remaining 29 were by caesarean section (Table 1), 13 of which were conducted because of obstetric indications [10].

A review by Huck et al. (2019) discusses urological and obstetric outcomes during and after pregnancy following urinary diversion using bowel segments. The authors conducted a systematic literature search and identified 61 relevant articles published between 1961 and 2017 [9], encompassing data from 282 females who had 330 babies across 315 pregnancies. Out of these, 132 births were vaginal deliveries and 183 were via elective or emergency caesarean section. The most common urological complications reported during pregnancy were urinary tract infections, pyelonephritis, and upper urinary tract dilatation, with a total of 155 episodes of pyelonephritis (39.2 %) [9]. Importantly, no major or long-term complications were noted, and the authors concluded that pregnancies following urinary diversion are possible without significant issues, although they should be managed as high risk due to the potential for complications. Deliveries can be performed vaginally or by caesarean section, ideally in specialized centres with urological support [9]. This and additional studies are summarised in Table 2.

Given the uncertainty surrounding the index patient's urinary

Table 1
Characteristics of pregnant patients with major urinary diversions and augmentation cystoplasty from 17 important previous studies and the index case.

Ref.	Year	Patients (n)	Neobladder/Urinary diversion Type	Pregnancies (n)	Time of delivery	Urinary complications during pregnancy	Mode of delivery
Index case	2024	1	Mainz II pouch	1	38 + 0 GW	None (But rather had a surgical site infection post-CS)	CS
Ruan et al., 2022 [10]	2022	1	Sigmoidocystoplasty	1	40 + 2 GW	UTI, hydronephrosis	CS
Yamazaki et al [10]	1997	1	Ileocystoplasty	1	32 GW	UTI, hydronephrosis	CS
Yamamoto et al [10]	1997	1	N/A	1	N/A	UTI, hydronephrosis	CS
Shaikh et al [10]	2006	1	Ileocystoplasty	1	38 GW	UTI	CS
Sagili et al [10]	2013	1	N/A	1	40 GW	None	VD
Kapoor et al [10]	2014	1	N/A	1	Full term	UTI	CS (unsuccessful induction of labour)
Correia et al [10]	2015	1	Ileocystoplasty	1	38 GW	UTI, hydronephrosis	CS (orthopaedic limitations to vaginal delivery)
Kameda et al [10]	2017	1	Ileocystoplasty	1	38 GW	N/A	VD
Goodwin et al [10]	1962	1	Ileocystoplasty	1	Full term	UTI	VD
Kirkeby et al [10]	1992	1	Ileocystoplasty	1	Full term	None	VD
Muthulakshmi et al [10]	2010	1	Ileocystoplasty	1	37 + 4 GW	None	VD
Henry et al [10]	2002	1	Ileocystoplasty	1	Full term	UTI	VD
Natarajan et al [10]	2002	1	Ileocystoplasty	1	37 GW	UTI	CS
Smith et al [10]	1973	2	Ileocystoplasty, colocystoplasty	3	39, 35, 30 GW	UTI, incontinence, deterioration of renal insufficiency	2VD, 1CS (placenta previa)
Doyle et al [10]	1988	2	Ileocecocystoplasty	2	41, 37 GW	UTI, bladder calculi, incontinence	2 VD
Taniguchi et al [10]	2002	2	Sigmoidocystoplasty, ileocecocystoplasty	2	36, 36 GW	UTI, hydronephrosis	2VD
Hayashi et al [10]	2017	2	Sigmoidocystoplasty	2	N/A	N/A	N/A
Quenneville et al [10]	2003	3	Ileocystoplasty	3	All full term	UTI	3VD
Dap et al [10]	2017	3	N/A	6	1 premature labour	UTI, Artificial sphincter Infection, hydronephrosis, incontinence	6CS (3 breech)
Le Liepvre et al [10]	2017	3	N/A	5	1 miscarriage	UTI, 2 hydronephrosis	N/A
Hensle et al [10]	2004	4	N/A	4	1 premature labour	UTI, 1 incontinence	1VD, 3CS
Greenwell et al. 2003 [10]	13	5 ileocystoplasties 6 ileocecocystoplasties 2 sigmoidocystoplasties	13	35–40	6VDs, 7 CS	13 UTI, 3 hydronephrosis	Majority live births
Hill et al [10]	1990	15	6 ileocystoplasty, 4 ileocecocystoplasty, 5 sigmoidocystoplasty	15	4 premature labour	9 UTI, 5 incontinence, 1 bilateral ureteral obstruction+anemia+renal function deteriorated	10VD, 5CS
Fenn et al [10]	1995	18	N/A	19	1 premature labour	14 UTI, 1 AUS dysfunction	18VD, 1CS (transverse lie)
Creagh et al [10]	1995	27	N/A	34	All full term	All UTI, 6 postpartum incontinence	28VD, 6CS (4 obstetrical indications, 2 AUS)

Citation: Adapted, and Modified from Ruan J et al., "Pregnancy and delivery after augmentation cystoplasty," WJCC, Volume 10, Issue 13, May 6, 2022. [10].

Table 2
Management of Pregnancy after Major Urinary Reconstruction From eight other studies and the index case.

Author(s)	Year	Type of Reconstruction	Mode of Delivery	Outcomes	Live Births	Comments
Index case	2024	1	Mainz II pouch	1	38 + 0 GW	None (But rather had a surgical site infection post-CS)
Schumacher et al. [11]	1997	Mainz pouch urinary diversion	7 Caesarean sections	7 healthy children born; minor complications	7	Interdisciplinary approach essential; overall no contraindication to pregnancy.
Akerlund S et al. [14]	1991	Continent ileal reservoir	1 Caesarean section	Successful pregnancy with healthy delivery	1	Focused on patient management during pregnancy.
Kennedy et al. [15]	1993	Orthotopic continent urinary diversion	Unknown	Positive pregnancy outcome	Unknown	Highlights successful pregnancy after specific diversion techniques.
Hatch et al. [12]	1991	Continent ileocecal reservoir	1 Caesarean section	Successful term delivery	1	Noted successful delivery in complex cases.
Pedlow [16]	1961	Uretero-sigmoid anastomosis	Unknown	Documented early experience with pregnancy	Unknown	One of the first reports on pregnancy after urinary diversion.
Guzel et al. 2014 [1]	1	Indiana Pouch	1	38	Elective CS	None
Huck N et al. (Reviewed 61 studies between 1961 and 2017 [9]	201	232 pregnancies after Urinary diversion using bowel segments	132 vaginal, 183 caesareans	330 babies born; 39.2 % pyelonephritis	330	High-risk pregnancies due to urinary complications; both delivery modes feasible.

diversion and the indication for it, the elective caesarean section which was done for her was justified [1,9,10].

Caesarean sections in these women are often complicated by pelvic adhesions, leading to risks such as ureteric transection, fistula formation, and intestinal injury [6]. Deans et al. also noted that neonatal mortality and stillbirth and birth defect rates in gravid patients who were themselves born with bladder atrophies were nearly ten times higher than officially reported figures. They also highlighted that, in such cases, pregnancy is high risk for both mother and baby, contrary to other studies. However, none of these were observed in our case [6].

The patient did develop a superficial surgical site infection, which is relatively uncommon according to the reviewed literature [9,10], but it was manageable with appropriate antibiotic therapy. She made a full recovery and was discharged home with her baby, continuing to receive follow-up care. This case demonstrates that the presence of a Mainz-II pouch does not necessarily adversely affect pregnancy outcomes [1,9]. With appropriate antenatal care and surgical planning, patients with such complex urinary diversions can achieve positive outcomes. This case also highlights the importance of long-term follow-up and multidisciplinary collaboration in managing pregnancies in such patients. This case was reported in line with the SCARE guidelines [13].

4. Conclusion

This case report underscores the feasibility and success of managing pregnancy in a patient with a Mainz-II pouch urinary diversion, emphasizing the importance of fertility preservation and careful prenatal care. It also serves as an educational tool for promoting greater acceptance of urinary diversions as a treatment option, even in populations where such procedures are less common. With the possibility of fertility-preserving surgery, the potential for a successful pregnancy is a promising outcome for patients with complex urological conditions and reconstructions.

In summary, pregnancy in a woman with bladder exstrophy and lower urinary tract reconstruction may be safe for both mother and baby [1].

Contributors

Wisdom Klutse Azanu contributed to patient care, the conception of the case report, acquiring and interpreting the data, drafting the manuscript, undertaking the literature review, and revising the article critically for important intellectual content.

Afia Tabua Sakyi contributed to patient care, the conception of the case report, and acquiring and interpreting the data.

Aishah Fadila Adamu contributed the conception of the case report, acquiring and interpreting the data, drafting the manuscript, undertaking the literature review, and revising the article critically for important intellectual content.

Frank Obeng contributed to patient care, the conception of the case report, acquiring and interpreting the data, drafting the manuscript, undertaking the literature review, and revising the article critically for important intellectual content.

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Patient consent

The patient and her legal guardians provided full informed written consent for the inclusion of her medical history, images and laboratory reports and personal information in this case report. They consented to the publication of the case and the associated personal medical information, understanding that the patient's identity will remain confidential. The local age of consent in the country is eighteen years, and the index patient was sixteen.

Provenance and peer review

This article was not commissioned and was peer reviewed.

Conflict of interest statement

The authors declare that they have no conflict of interest regarding the publication of this case report.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.crwh.2024.e00656.

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