Sigma-rectum pouch (Mainz pouch II)

Jovan Hadži-Djokić, Bogomir Milojević, Tomislav Pejčić, Miodrag Acimović, Vladimir Stamenković, Zoran Đamij,
1 Serbian Academy of Sciences and Arts, Belgrade, Serbia;
2 Clinic of Urology, Clinical Center of Serbia, School of Medicine, University of Belgrade, Belgrade, Serbia
3 Department of Urology, Health Center Vranje, Serbia

The Mainz pouch II is a well tolerated form of continent urinary diversion in terms of morbidity, protection of the upper urinary tract and continence rate, even in patients aged >65 years. Mainz pouch II was described by Fisch and Hohenfellner in 1991. They viewed the simplicity and reproducibility of the operation as one of its major advantages. A good continence rates between 93%-100% after this procedure has been shown in previous studies. The longer follow up will show whether these high rates of continence can be maintained with increasing age. The Mainz Pouch II serves as a satisfying continent urinary diversion for both sexes in selected patients in terms of quality of life. Evaluation of overall quality of life in patients with Mainz pouch II urinary derivation has given encouraging results. Compliance and cooperation of the patients, together with preoperative tests for anal competence, are mandatory to avoid complications. The Mainz group reported that the overall complication rate was low and comparable with other techniques of continent urinary diversion. During the past years modifications of the original technique have been described. These represent an increasing interest in the procedure. Today, the techniques of low-pressure and reservoirs have completely replaced classical ureterosigmoidostomy. In this review article the main focus is aimed at history, complications, continence and quality of life of patients with Mainz pouch II.

Key words: Mainz pouch II, ureterosigmoidostomy, cystectomy, complications, continence rates, quality of life.

INTRODUCTION

Uretersigmoidostomy was the first form of supravesical continent urinary diversion and enjoyed broad popularity during the first half of the 20th century. A variation of ureterosigmoidostomy was described by Fisch and Hohenfellner in 1991 and updated in 1996.1,2 This operation, which they termed the sigma rectum or the Mainz II pouch, creates a low-pressure rectosigmoid reservoir of increased capacity. When this reservoir is full, the basal pressure is 24 cm water. The highest peak pressure recorded was 35 cm water. This low pressure improved continence and protected the upper urinary tract. They viewed the simplicity and reproducibility of the operation as one of its major advantages.1,2

The Mainz pouch II gives good results in terms of mortality, morbidity, and continence. It is a relatively simple and quick procedure, and is associated with a good quality of life. It is also suitable for the prospective laparoscopic cystectomy and diversion. The main disadvantage is malignant transformation of the ureterointestinal anastomosis. Metabolic acidosis is another limitation, but this can be successfully treated by oral alkalinizing therapy. Careful preoperative selection and patient compliance along with meticulous follow-up are of utmost importance to avoid complications and obtain good functional results. Providing excellent continence rate and good quality of life, it represents an optimal therapeutic option in selected cases in which orthotopic bladder substitute or other type of continent urinary diversion is not indicated or acceptable.

In this review article the main focus is aimed at history, complications, continence and quality of life of patients with Mainz pouch II.

REVIEW CRITERIA

We searched for original articles focusing on sigma-rectum pouch (Mainz pouch II) in MEDLINE and Pub Med covering all years in database until April 2014. The search terms used were "ureterosigmoidostomy", "cystectomy", "complications", "continence rates", and "quality of life" combined with "Mainz pouch II". All papers identified were English-language full text papers. We also searched the reference lists of identified articles for further papers.
TABLE 1

CONTINENCE IN PATIENTS WITH MAINZ POUCH II

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>No of pts</th>
<th>Day (%)</th>
<th>Night (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fisch et al(^1)</td>
<td>1993</td>
<td>47</td>
<td>100</td>
<td>97.8</td>
</tr>
<tr>
<td>Fisch et al(^2)</td>
<td>1669</td>
<td>73</td>
<td>95</td>
<td>98.6</td>
</tr>
<tr>
<td>El-Damanhoury et al(^3)</td>
<td>1996</td>
<td>51</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Atta(^4)</td>
<td>1996</td>
<td>15</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Gilja et al(^5)</td>
<td>1996</td>
<td>18</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>El-Mekresh et al(^6)</td>
<td>1997</td>
<td>57</td>
<td>100</td>
<td>93</td>
</tr>
<tr>
<td>Gerharz et al(^7)</td>
<td>1998</td>
<td>34</td>
<td>100</td>
<td>97</td>
</tr>
<tr>
<td>Woodhouse and Christofides(^8)</td>
<td>1998</td>
<td>15</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>Obek et al(^9)</td>
<td>2001</td>
<td>60</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>Nassar(^10)</td>
<td>2002</td>
<td>21</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>Hadzi-Djokic(^11)</td>
<td>2006</td>
<td>220</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>Ignjatovic et al(^12)</td>
<td>2007</td>
<td>67</td>
<td>100</td>
<td>95.5</td>
</tr>
</tbody>
</table>

THE HISTORY OF MAINZ POUCH II

The first urinary diversion using the anus continence was published over 150 years ago by Simon.\(^1\) Nineteenth century was the 2-century of urinary diversion; the initial description of many techniques dates back to the period between 1890 and 1920.

Primary enthusiasm was followed by disappointment when serious problems, such as electrolyte imbalance, pyelonephritis, renal function deterioration and renal calculi became evident. Also, secondary malignancies arising at the ureteral implantation site were observed. However, secondary malignancies were later also reported in the other forms of urinary diversion.\(^2\) Critics of ureterosigmoidostomy tend to quote publications dealing with complications in patients operated on before the 1950.\(^3\) Another major drawback of ureterosigmoidostomy was frequency and urgency especially at night.\(^4\) Urodynamic investigations showed that bowel contractions with rise in pressure in the bowel reservoir are responsible for the incontinence.\(^5\) By interrupting the circular contractions (antimesenteric opening of the bowel and "reconfiguration") a low-pressure reservoir can be created thus improving continence rates and protecting the upper urinary tract. Improvements in surgical techniques, new instruments/suture materials and the availability of antibiotics and alkalinizing drugs succeeded in tremendously reducing complications during and after surgery. The era of low pressure anal reservoirs began.

The first attempt to lower the pressure in the rectal reservoirs was made by Kock and associates when they reported a method of diversion to the rectum augmented by an ileal patch in addition to an intussuscepted nipple valve at the colorectal junction and antireflux implantation of the ureters in the ileal patch.\(^6\) This procedure had two main drawbacks namely complexity of the procedure in addition to the defunctioning colostomy necessary for it.\(^7\) Reports on similar techniques either augmenting the sigma with ileal or ileocecal segments followed.\(^8,9\)

A variation of ureterosigmoidostomy was described by Fisch and Hohenfellner in 1991 and updated in 1996.\(^10,11\) Detubularization of intestinal segments has been demonstrated to reduce the frequency and amplitude of contractions and allows the creation of a reservoir with the highest capacity for a given length of bowel. The resulting low-pressure system carries a significant lower risk of pyelonephritis and backwash of urine in an antiperistaltic direction.\(^10,11\) This operation, which they termed the sigma rectum or the Mainz II pouch, creates a low-pressure rectosigmoid reservoir of increased capacity.

The idea was not new, the first description dates back to Kocher in 1907.\(^12\) As standard technique for ureteral implantation the submucosal tunnel is used the same technique as for classical ureterosigmoidostomy. However, in dilated or ureters with thickened walls it is associated with an increased complication rate. For these the technique published by Abol-Enein and Ghoneim for
Early and long term complications of Mainz pouch II

In the past, ureterosigmoidostomy has been strongly criticized mainly due to its complications. In order to overcome these drawbacks, following Himman’s principles of detubularization, the Mainz Pouch II technique was introduced as a simple detubularized ureterosigmoidostomy procedure, by Fisch et al. It has been demonstrated that detubularization of bowel segments reduces the frequency and amplitude of contractions and thus reduces the risk of pyelonephritis and reflux of urine in antiperistaltic direction.

The results of the Mainz II pouch were reported by Fisch and colleagues in 1997. Between 1990 and 1993, 73 patients (59 adults and 14 children) underwent the Mainz II pouch procedure. Early complications were encountered in 5 of 73 patients (6.8%). These included single examples of a dislodged ureteral stent, pneumonia, pulmonary embolism, wound dehiscence, and ileus necessitating surgical intervention. There were eight (10.9%) late complications that required surgery: ureteral stenosis occurred in five patients (6.8%); one patient with nephrolithiasis was treated with extracorporeal shockwave lithotripsy; one patient with rupture of the anterior suture line required temporary colostomy; and one patient experienced perianal bleeding after chemotherapy that required endoscopic coagulation. Six patients presented with pyelonephritis (8.2%) and were treated with antibiotics. The Mainz group concluded that the overall complication rate was low and comparable with other techniques of continent urinary diversion.

Hadzi-Djokic et al. reported early complications in 14% of patients, and late complications in 8% of patients underwent the Mainz II pouch procedure. Early complications included prolonged ileus, pyelonephritis, unilateral ureterohydronephrosis, bilateral ureterohydronephrosis, and incipient renal failure. The late complications included: unilateral ureteric implantation site stenosis, bilateral ureteric implantation site stenosis, and ventral hernia. The most important complications were ureteric implantation site stenosis in 14 RUs (4%). Stenosis can occur at any time up to 2 years after ureteric implantation into the rectosigmoid using the Caney-Le Duc technique, which was used in this study. If submucosal tunnel is performed, stenosis predominantly occurs during the first two years after surgery. Some authors consider that those stenotic complications are not suitable for balloon dilatation or coldknife incision, in contrast to early stenotic complication.

The different ureteric implantation methods did not seem to be important. Ureteric implantation into the false segment of the sigmoid colon may cause ureteric kinking and upper urinary tract obstruction. When upper urinary tract dilatation secondary to uretero-colic stricture becomes evident early after surgery, balloon dilatation or cold-knife incision may be a suitable option. If scarring and Wbrosis have started, ureteric neo-implantation is inevitable.

Regarding secondary malignancies development, it has been most frequently associated with ureterosigmoidostomy. The risk has not been changed by numerous modification of ureterosigmoidostomy, including Mainz Pouch II procedure. Since it has been reported from large series that mean latent period for malignant transformation is 26 years, development of secondary malignancies is especially important in patients with long life expectancy. The incidence of colon carcinoma is important in patients with a long life-expectancy but may not be significant in elderly patients who require cystectomy for malignant disease. Annual sigmoidoscopy 5 years after a Mainz Pouch II procedure can help to screen for secondary malignancy.

Bastian et al. consider that pyelonephritis after Mainz Pouch II procedure is to be more frequent among younger patients, suggesting that there is good protection of the upper urinary tract in elderly patients. Generally, reported incidence of this complication from a large series suggests that low pressure reservoir, straight ureteral path by its fixation to the promontory in Mainz Pouch II procedure provides upper urinary tract protection as good as other urinary diversions.
CONTINENCE IN PATIENTS WITH MAINZ POUCH II

The Mainz Pouch II procedure provides a low pressure, high capacity reservoir, which prevents overdistension of the colon and consequent stimulation of motility and evacuation of the content. A good continence rate between 93%-100% after this procedure has been reported by several authors (Table 1). It has been demonstrated that classic ureterosigmoidostomy is associated with bowel frequency and urge incontinence, with nighttime incontinence in more than 50% and day-time incontinence 7%. However, the sphincter competency decreases with increasing age.

Fisch et al. reported daytime continence in 94.5% of patients and nighttime continence in 98.6% of patients underwent the Mainz II pouch procedure. Woodhouse and Christofides reported on their experience with the Mainz II pouch in 15 primary cystectomy patients and 4 patients with prior standard ureterosigmoidostomy who were continent. They reported excellent results: 14 of 15 (93.3%) of the primary patients achieved documented daytime and nighttime urinary control, while the remaining patient refused follow-up but reported continence. The four patients undergoing a salvage procedure fared less well. Only two patients became continent, while the remaining two were found to be in chronic retention. Their failed continence was believed to be secondary to inadequate pouch emptying. Similarly, excellent results have been achieved by Atta et al. They reported full daytime and nighttime urinary continence in 15 of 15 patients and no major postoperative complications. Hadzi-Djokic et al. in their study of 220 patients with Mainz pouch II reported only three patients with incontinence. Two of three incontinent patients had an exploration and conversion into an ileal conduit diversion, and the third had a conversion into a cutaneous diversion.

There is a lack of clear consensus related to preoperative rectodynamic evaluation. Fisch et al. suggests it as routine preoperative evaluation. Bastian et al. reported that these evaluation should be performed in high risk patients for incontinence.

QUALITY OF LIFE IN PATIENTS UNDERGOING MAINZ POUCH II URINARY DIVERSION

The impact of disease and treatment on the patient’s overall well-being and functioning is a topic of rising interest in clinical research. Researchers have found that the type of urinary diversion does not seem to be associated with differences in the quality of life. Others have shown that continent diversion is advantageous over incontinent diversion.

Today, cancer treatment no longer implies only the cure and control of the disease. The effect on psychological, functional, social and economic life of the patient plays a more important role during decision in respect to the type of urinary diversion. However, once a method of urinary diversion is selected, the patient has a strong tendency to want to believe that he has made the correct choice.

Bastian and colleagues have reported on the health related quality of life in 83 patients undergoing Mainz II urinary diversion. They found that quality of life was similar to that of age-matched controls except for diarrhea symptoms, with 100% daytime continence.

The Mainz Pouch II serves as a satisfying continent urinary diversion for both sexes in selected patients in terms of quality of life. In terms of continence modified ureterosigmoidostomy can lead to daytime continence rate of 100%. Evaluation of overall quality of life in patients with Mainz pouch II urinary derivation in the previous studies is shown in Table 2.

It is almost impossible to compare the studies of postoperative health related quality of life since there is no consensus on what should be measured and many different test instruments are used. To minimize the differences in health related quality of life after urinary diversion the patient should be part of the decision making and all options of diversion should be discussed.

SUMMARY

Mainz pouch II is dobro toleriran oblik kontinentne urinarne derivacije u pogledu morbiditeta, zaštite gornjih urinarnih puteva i stope kontinencije, čak i kod pacijenata starijih od 65 godina. Opisana je od strane Fisch-a i Hohenfellner-a 1991. godine. Jedna od glavnih prednosti ove operacije je upravo jednostavnost i reproducibilnost.

Pokazana je visoka stopa kontinencije od 93% do 100% kod pacijenata kojima je učinjen Mainz II pouch. Duže praćenje pacijenata će pokazati da li će se ovako visoke stope kontinencije održati sa starenjem pacijenata. Mainz pouch II je zadovoljavajuća kontinentna urinarna deriva- cija za oba pola u pogledu kvaliteta života. Procena ukupnog kvaliteta života kod pacijenata sa Mainz pouch II urinarnom derivacijom dala je ohrabrujuće rezultate.

Odabir i saradnja pacijenata, kao i preoperativno testiranje analognog sfinkteru su od najvećeg značaja za uspešnost operacije. Ukupna stopa komplikacija kod Maiz pouch II operacije je niska i slična sa drugim tehnikama kontinentne urinarno derivacije. Tokom proteklih godina su opisane brojne modifikacije originalne tehnike. Danas, tehnike stvaranja rezervara sa niskim pritiskom su u potpunosti zamenile klasinu ureterosigmoidostomiju.

U ovom revijalnom radu glavni fokus je usmeren na istorijat, komplikacije, kontinenciju, kao i na kvalitet života pacijenata sa Mainz pouch II.

Ključne reči: Mainz pouch II, ureterosigmoidostomija, cistektomija, komplikacije, kontinencija, kvalitet života
REFERENCES

3. Simon J. Ectopia vesicae (absence of the anterior walls of the bladder and pubis abdominal parietae); operation for directing the orifices of the ureters into the rectum; temporary success; subsequent death; autopsy. Lancet 1852; ii: 568.