Scientific Research Publishing

Open Journal of Urology, 2024, 14, 554-561
https://www.scirp.org/journal/oju
ISSN Online: 2160-5629
ISSN Print: 2160-5440

Boari Kuss Technique for Iatrogenic Ureter Injury on Single Kidney at C.H.U le Luxembourg about a Case and Review of the Literature

Alkadri Diarra*, Pape Kanoute, Aristo Tsayem, Amadou Kassogué, Badara Cissoko, Mamoutou dit Mody Keita, Dramane Cissé, Felix Sanogo, Richie Dioguey Calmer, Seydou Younoussa Coulibaly, Harouna Simido

Urology Department, CHU Mother Child Luxembourg, Bamako, Mali
Email: *dralkadri@yahoo.fr

How to cite this paper: Diarra, A., Kanoute, P., Tsayem, A., Kassogué, A., Cissoko, B., Keita, M.M., Cissé, D., Sanogo, F., Calmer, R.D., Coulibaly, S.Y. and Simido, H. (2024) Boari Kuss Technique for Iatrogenic Ureter Injury on Single Kidney at C.H.U le Luxembourg about a Case and Review of the Literature. *Open Journal of Urology*, **14**, 554-561.
https://doi.org/10.4236/oju.2024.1411058

Received: July 25, 2024
Accepted: November 18, 2024
Published: November 21, 2024

Abstract

Introduction: Ureteral lesions, most often iatrogenic, generally follow pelvic surgery. They are serious and can be life-threatening. Uretero-vesical reimplantation using the BOARI technique, modified by KUSS, was popularized in humans in 1954, and appears to be the most appropriate treatment for lesions of the lower ureter with significant loss of substance. **Observation:** We report in this work a case of iatrogenic ligation of the pelvic ureter on a single functional kidney (of fortuitous discovery) during gynecological surgery, having led to an Alteration of the General State (important Urinoma and collapse of the renal function) and treated by the surgical technique of BOARI KUSS at the urology department of the CHU Le Luxembourg. Follow-up and postoperative follow-up were excellent. **Conclusion:** Surgical repair of the ureter is very often indicated in cases of stenosis or iatrogenic lesions of the ureter. The BOARI KUSS technique is a good choice in cases of significant loss of substance due to injury to the lower ureter. Gynecological surgery is the main source of these lesions, and the prognosis of the treatment depends on how early the diagnosis is made, the anatomical condition of the ureter and the expertise of the surgical team.

Keywords

Reimplantation, BOARI KUSS Technique, Iatrogenic Lesion, Loss of Substance, Lower Ureter

1. Introduction

Pelvic surgery poses a real threat to the ureter. Indeed, the ureter is exposed to the

risk of iatrogenic injury throughout its course, the pelvic portion even more so. These iatrogenic lesions of the ureter are difficult to diagnose at an early stage, and are particularly common in gynecological and obstetric surgery [1]. This vulnerability of the pelvic ureter in women is a consequence of the intimate relationship it has with the female genital tract, and its seriousness is linked on the one hand to the sequelae it may cause, and on the other hand to possible repercussions on the upper urinary tract [2]. Consequently, the pathologies resulting from these lesions represent a functional or even vital risk for the underlying kidney, and to some extent an embarrassment for the surgeon who has to treat it.

Uretero-vesical reimplantation using the BOARI KUSS technique would appear to be the most appropriate for lesions of the lower ureter with significant loss of substance. Indeed, it was first performed on dogs by BOARI and CASATI in 1904; the technique was then applied and popularized in humans by RENE KUSS in 1954 [3].

In this work, we report a case of iatrogenic pelvic ureter ligation on a single functional kidney during gynecological surgery, treated using the BOARI KUSS technique at the Urology Department of CHU Le Luxembourg.

2. Observation

This is a 34-year-old patient with no medical history, 4th gesture, 4th pare with 3 living children, no abortions and 1 death (G4P4V3A0D1), who had received a hysterorrhaphy in 2021 for per-partum uterine rupture; following which her symptomatology began: Anuria, Abdominal distension, Altered general condition.

Initially admitted to the nephrology department of CHU Le Luxembourg for post-hysterorrhaphy anuria (on day 2 post-op), where acute renal failure due to cortical necrosis was suspected. The patient underwent 3 dialysis sessions, with no real improvement. The diagnosis was subsequently identified, and she was transferred to the Urology Department of the same university hospital (at 4 days post-op) on suspicion of anuria due to iatrogenic ligation/lesion of the lower ureters.

Clinical examination revealed a patient with altered general condition (asthenia + anorexia), moderately stained conjunctiva, clear consciousness; left lumbar tenderness with abdominal distension and positive float sign. No bladder globe was discernible (due to abdominal distension), while the 4-day diuresis was almost nil (<25 cc in the urine bag); the rest of the physical examination was in favor of an anasarca picture (OMI bilateral and bucketing + facial puffiness).

Complementary examinations, including CT scans (2 uroscans) and laboratory tests, did not provide a definitive positive diagnosis. Anemia was noted at 7.2 g/dl and hypercreatininemia at 3.3 mg/dl (292.05 µmol/l). The 2 successive uroscans were of little help in making a positive diagnosis, although they did provide additional information: presence of a retroperitoneal right kidney, atrophied and most probably non-functional (absence of renal secretion), with an enlarged left kidney (probable compensatory hypertrophy) and delayed left renal secretion (**Figure 1** and **Figure 2**).

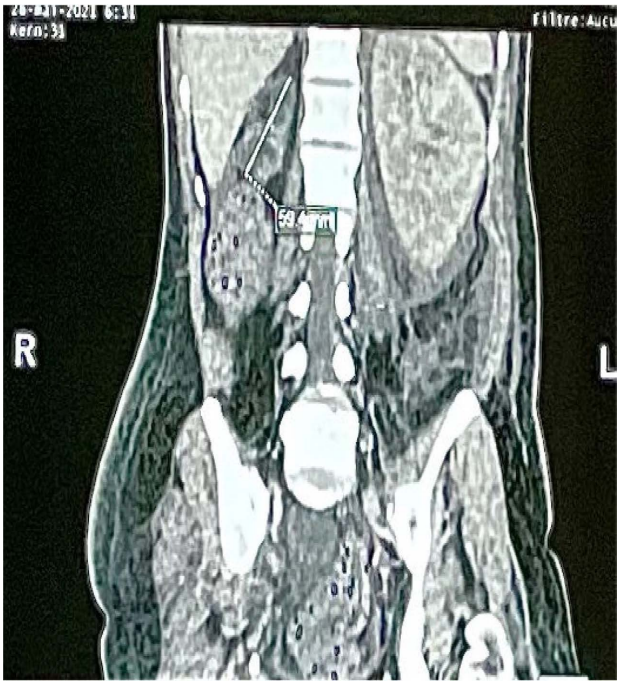

Figure 1. Coronal CT section**:** compensatory hypertrophy of the left kidney + atrophy of the contralateral kidney.

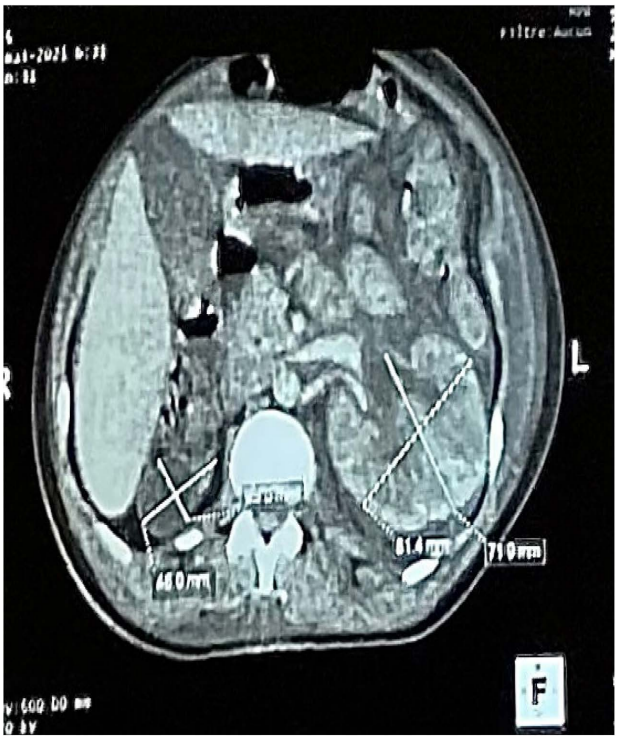

Figure 2. Axial section CT scan = Ditto.

NB: The diagnosis of a single functional kidney was an incidental finding.

Finally, it was decided by consensus to perform an emergency exploratory laparotomy on the patient (at 4 days post-hysterorrhaphy).

As a result, the following findings were made intraoperatively:

- A urinoma which, when aspirated, approximated 5 liters of sero-haematic fluid,
- Ligation and extensive damage (approx. 5 cm) to the left pelvic ureter, with its downstream portion dilated.

At this stage, the treatment option of choice was uretero-vesical reimplantation using the BOARI KUSS technique. The surgical procedure was more or less straightforward, as the patient had a bladder with good compliance and consistency, with no parietal thickening; the operative technique consisted in creating a ureteral neo portion by removing a bladder flap from the bladder dome, lengthening the pre-existing ureteral portion and defective by ligation/lesion, then reimplanting the uretero-bladder by creating a short intra-vesical sub-mucosal pathway, the uretero-bladder anastomosis being performed on a previously installed double-jj catheter (Figure 3).

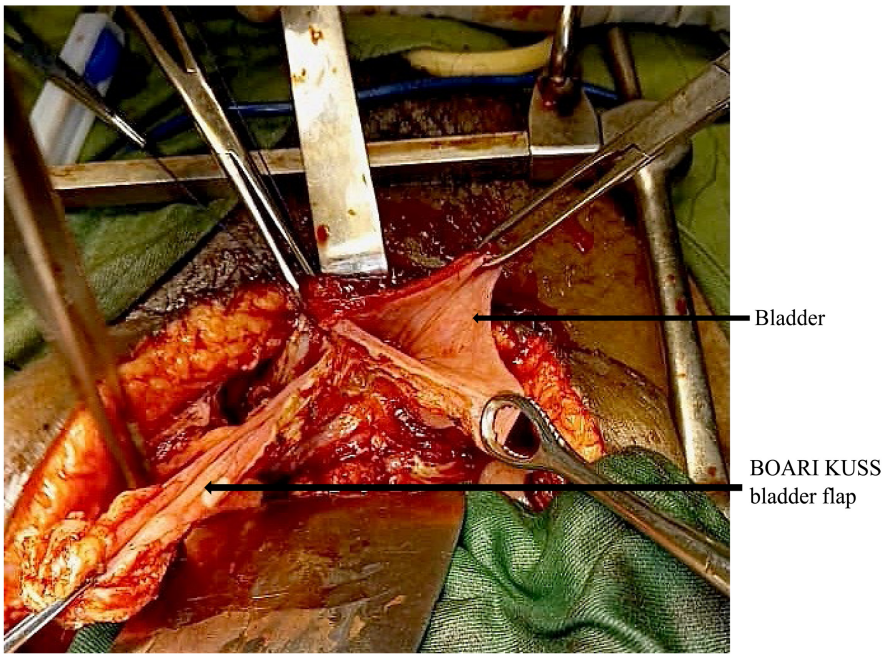

Figure 3. Intraoperative image.

The post-operative course was unremarkable.

At D-1 post-op, diuresis was 3.5 liters of urine, the Redon drain had returned 200 cc of sero-haematic fluid, and the unprepared radiograph of the urinary tree showed the left ureteral JJ catheter well in place (Figure 4).

At D-7 post-op, healing was satisfactory and the evolution was favorable, with a striking improvement in general condition and a good resumption of diuresis: 1.2 - 1.5 liters of urine/24 hours.

Creatinine levels were definitively normalized at D-10 post-op, as were blood counts, with hemoglobin back to 11.7 g/dl following transfusion of 2 bags of iso-group and iso-rhesus blood.

Figure 4. No-preparation urinary tract image at D-1 post-op.

The double-J probe was removed 6 weeks later. Radiological follow-up with Uro-Scanner was unremarkable.

We obtained informed consent from the patient for this publication.

3. Discussions

Despite advances in surgery, ureteral ligation remains a constant concern in gynecological and obstetric surgery. Indeed, in gynecological surgery, the incidence of iatrogenic lesions of the ureter is in the order of 0.013% to 1.8%. This surgical discipline alone accounts for 47% to 55% of all postoperative ureteral wounds (PUs) reported in the literature [4], followed by urological surgery, which accounts for 20% to 35% of ureteral wounds (**Figure 5**).

The pelvic ureter is the most affected, in 80% of cases [5] [6]. As a result, it occurs more frequently in open surgery.

Various types of ureteral injury have been identified: obstruction (by ischemia, ligation or crushing) or fistulization (in the vagina, uterus, peritoneum, through the scar or drainage device). The lesion mechanisms found were ligation (wires or clips), sectioning, crushing, resection and denudation by dissection altering the vascularization [5]. In our case, the lower ureter was injured by total ligation on wires during hysterectomy haemostasis. KIRAKOYA B *et al.* found that caesarean section and hysterectomy were the main causes of intraoperative injury to the lower ureter [7].

Prompt diagnosis enables appropriate management and promises good results. Diagnosis is made on the basis of either intravenous urography (IVU) with late film, or CT scan with late film, in the presence of clinical signs and a history of early pelvic surgery. Our diagnosis was confirmed intraoperatively despite the performance of two CT scans.

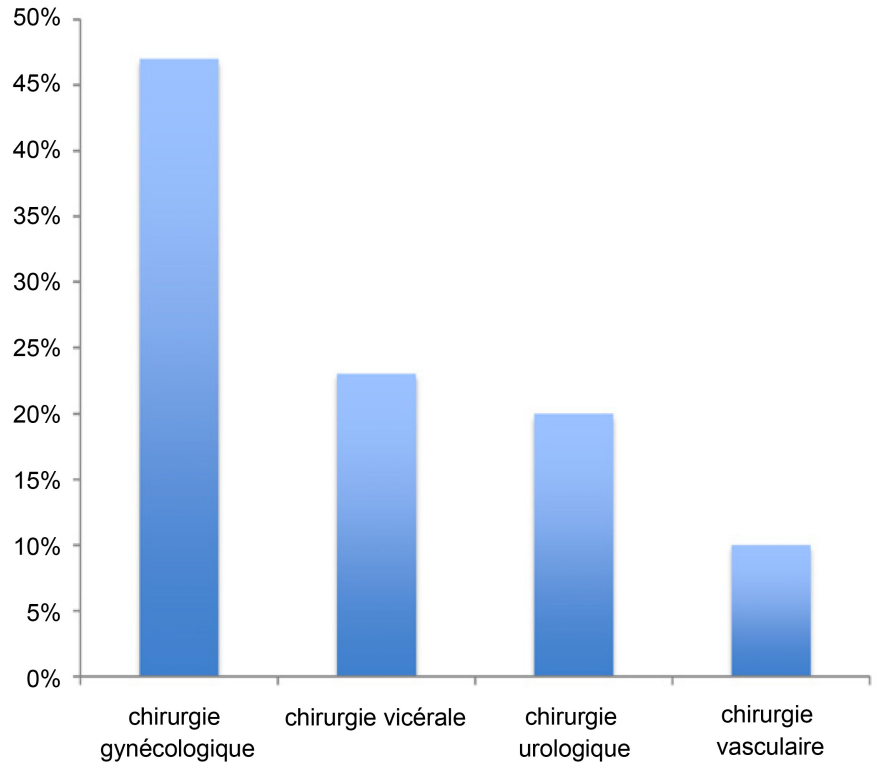

Figure 5. Distributions of ureteral lesions by surgical specialty. Karmouni *et al.* [6].

One of the most relevant aspects of our case is the incidental CT discovery of a single functional kidney. However, since renal scintigraphy is the reference examination for confirming this diagnosis, it could not be performed due to a lack of technical resources.

The primary aim of repairing ureteral lesions is to preserve renal function by restoring ureteral continuity. The choice of treatment therefore depends on several parameters:

- The topography of the ureteral wound and its extent,
- The time between the occurrence of the ureteral wound and the time of diagnosis (intraoperative, early or late),
- Mechanism of occurrence,
- Patient's comorbidities and
- The surgeon's technical resources and skills.

A number of animal model series have reported the possibility of full functional recovery when the delay in management was less than three weeks, and irreversible lesions appeared after seven weeks in the case of untreated ureteral lesions [8]. Our patient was managed surgically within one week.

For lesions of the lower ureter, uretero-vesical reimplantation is preferred when the ureteral wound is less than 2 cm and distal (<3 to 5 cm above the uretero-vesical junction). When the lesion is accompanied by a large loss of substance and direct TUR is not possible, two techniques are required to gain neoureteral length: the PSOIC bladder or the BOARI KUSS tubulated flap [4].

The BOARI tubulated flap was first performed in dogs in 1904, and popularized in humans in 1954 by R. KUSS. It involves incising a bladder flap with a length-to-width ratio equal to 3. The ureter is then re-implanted on the upper part of the flap, preferably using an anti-reflux route, and the bladder is closed longitudinally [9]. This technique can also be combined with the PSOIC bladder technique, by attaching the flap to the psoas (Olsson *et al*.), thus gaining up to 8 cm [10], with a success rate varying between 80% and 88% [11] [12]. Post-operative complications can include infection, stenosis of the anti-reflux system or devascularization, frequent vesico ureteral reflux and, rarely, pseudo diverticulum formation [13]. In our case, a bladder flap approximately 6 cm long was used on a fairly compliant bladder wall, followed by uretero-vesical reimplantation with an anti-reflux system. Postoperative follow-up was satisfactory and complication-free.

4. Conclusion

Surgical repair of the ureter is very often indicated in cases of stenosis or iatrogenic lesions of the ureter. A better understanding of the anatomy and relationships of the ureter could significantly reduce the risk of injury. The BOARI KUSS technique is a good option in cases of significant loss of substance due to injury to the lower ureter. Gynecological or obstetric surgery is the biggest source of these lesions. Their prognosis depends on how early the diagnosis is made, the anatomical condition of the ureter and the expertise of the surgical team.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Symmonds, R.E. (1976) Ureteral Injuries Associated with Gynecologic Surgery: Prevention and Management. *Clinical Obstetrics and Gynecology*, **19**, 623-644. https://doi.org/10.1097/00003081-197609000-00012

[2] Gueye, S.M., Sylla, M. and Ba, C. (1992) Traumatismes urétérovésicaux au cours de la chirurgie pelvienne chez la femme. *Revue française de gynécologie et d' obstétrique*, **87**, 411-413.

[3] René, K. (1954) Chirurgie Plastique et Réparatrice de la Voie Excrétrice du Rein. Masson.

[4] Karmouni, T., Patard, J.J., Bensalah, K., Manunta, A., Guille, F. and Lobel, B. (2001) Urologic Management of Ureteral Iatrogenic Lesions. *Progrès en Urologie*, **11**, 642-646.

[5] Brandes, S., Coburn, M., Armenakas, N. and McAninch, J. (2004) Diagnosis and Management of Ureteric Injury: An Evidence-Based Analysis. *BJU International*, **94**, 277-289. https://doi.org/10.1111/j.1464-410x.2004.04978.x

[6] Preston, J.M. (2000) Iatrogenic Ureteric Injury: Common Medicolegal Pitfalls. *BJU International*, **86**, 313-317. https://doi.org/10.1046/j.1464-410x.2000.00100.x

[7] Kirakoya, B., *et al*. (2013) Ureteral Injuries during Gynecologic and Obstetric Procedures. *Uro-Andrology Journal*, **25**, 86-89.

[8] Cormio, L., Battaglia, M., Traficante, A. and Selvaggi, F.P. (1993) Endourological

Treatment of Ureteric Injuries. *British Journal of Urology*, **72**, 165-168. https://doi.org/10.1111/j.1464-410x.1993.tb00680.x

[9] Ockerblad, N.F. (1947) Reimplantation of the Ureter into the Bladder by a Flap Method. *Journal of Urology*, **57**, 845-847. https://doi.org/10.1016/s0022-5347(17)69714-3

[10] Olsson, C.A. and Norlén, L.J. (1986) Combined Boari Bladder Flap-Psoas Bladder Hitch Procedure in Ureteral Replacement. *Scandinavian Journal of Urology and Nephrology*, **20**, 279-284. https://doi.org/10.3109/00365598609024512

[11] Rassweiler, J.J., Gözen, A.S., Erdogru, T., Sugiono, M. and Teber, D. (2007) Ureteral Reimplantation for Management of Ureteral Strictures: A Retrospective Comparison of Laparoscopic and Open Techniques. *European Urology*, **51**, 512-523. https://doi.org/10.1016/j.eururo.2006.08.004

[12] Wenske, S., Olsson, C.A. and Benson, M.C. (2013) Outcomes of Distal Ureteral Reconstruction through Reimplantation with Psoas Hitch, Boari Flap, or Ureteroneocystostomy for Benign or Malignant Ureteral Obstruction or Injury. *Urology*, **82**, 231-236. https://doi.org/10.1016/j.urology.2013.02.046

[13] Berzeg, S., Baumgart, E., Beyersdorff, D., Lenk, S. and Kopka, L. (2002) Late Complication of Boari Bladder Flap. *European Radiology*, **13**, 1604-1607. https://doi.org/10.1007/s00330-002-1599-4