Surgical Repair of Abdominal Aortic Aneurysm in Patients with Simultaneous Urological Disorders: a Single Center Experience

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ABSTRACT

Introduction: Although rare, co-existence of abdominal aortic aneurysms with urological manifestations, suggests a challenging surgical entity in terms of successful aneurysmal repair along with minimally or null urological complications. Case reports: There are neither available data regarding the incidence of their co-existence nor consensus regarding optimal surgical management. Given the infrequency of their simultaneous presentation, the report of unusual cases as well as proposal for successful surgical management, are always useful and educative. Conclusion: Precise imaging pre-operatively and meticulous surgical technique intra-operatively are of utmost importance and suggest our vast allies in successful outcomes. Herein, we present our small case series of 3 interesting cases.

Keywords: Abdominal aortic aneurysm, aneurysmal repair, urological manifestations.

1. INTRODUCTION

Abdominal aortic aneurysm (AAA) is a vascular abnormality affecting relatively older patients (1). The incidence of AAAs is between 2% and 8% in men over the age of 65 and occur four times more often in men than women, while their occurrence varies by ethnicity (1). Although AAAs are known from the ancient years and attempts for surgical repair were devastating, it was Matas in 1923 who performed the first successful aortic ligation on a human (2) and Albert Einstein with his operation by Nissen in 1949 who popularized AAA as a clinical and surgical entity. Apart from very odd cases where an AAA co-exists with urological manifestations (3), there are several reports of simultaneous existence and treatment of AAAs and benign and malignant urological disorders, albeit there are neither available data regarding the incidence of their co-existence nor consensus regarding optimal surgical management. The relative literature consists of retrospective small case series and case reports describing mainly single centers’ experience, thus not uniformly designed and grossly underpowered in a “guide-line” basis. Herein, we report our experience of three cases of AAA and sim-ultaneous urological disorders.

2. GENERAL CONSIDERATIONS

In this relatively small series of patients, our main goal was to offer a definite surgical repair of the life threatening situation caused by the AAA. However, given the fact that the co-existence of difficult benign urological disorders could easily incommode and complex aneurysm repair and further increase morbidity, it was of utmost im-portance to be well prepared pre-operatively with precise imaging and careful evalua-tion regarding cardiology and respiratory issues. This accurate pre-operative evalua-tion is routine-ly performed in our department, re-sulting in least intra- and post-oper-ative complications.

In general all patients undergoing AAA repair receive general endotra-cheal anaesthesia and undergo midline laparotomy from the xiphoid process to the pubic symphysis. Preoperative antibiotics are adminis-tered approximately 2 hours before incision.

Current surgical strategy is much more straightforward, at least in many of the cases that in the past would be classified as difficult to proceed or of a high surgical risk. Certainly, there will always be unexpected surgically difficult cases. However, con-temporary imaging studies carry so much information...
that the surgical path is often dictated in a clear way. Contrast enhanced computed tomography scanning, in particular with thin slices, is of a great value in aortic surgery; in our cases presented here it helped to mark an ideal surgical route in order to avoid further damage during the preparation of the surgical field for the repair of the aneurysmal aorta.

Case Report 1
A 62 year old male, presented with a 5.5 cm AAA and immense left renal cysts with average diameter of 17 cm. Preoperative CT scanning helped us in identifying the anatomic borders of the cysts (Figure 1). Preoperative consultation with the urologist clarified the relatively minimal risk of hemorrhage in case of the accidental cystic rupture, however the main concern in this case would be rather the soaking of the AAA bed or in worse case scenario of the synthetic graft. Furthermore, although very rare, the possibility of septic cystic content could not be excluded easily preoperatively. The possibility of opening the cyst after celiotomy, in order to evacuate it and then over-suture the cystic wall, was early abandoned given the aforementioned urological considerations. In the operation room, following meticulous technique, we first entered in the retroperitoneal space just before the aortic bifurcation, as the cysts were more expanded in high up the abdomen. Following the lower initial incision of the peritoneum, iliac arteries were exposed and a cephalic route was followed. Gentle retraction with covered retractors assisted in detaching the peritoneum and exposing the aorta till the left renal vein. Typical repair of the aorta with a polyester tube graft was executed without incidental or intended opening of the cysts.

Case Report 2
A 64 year old male, presented with a 5.5 cm AAA and underwent a radical cystectomy with double-barrel cutaneous ureterostomies due to muscle-invasive bladder cancer two years ago. The main issues, since it was a more complexed case, were the risk of infection due to the proximity of the double-barrel right ureterostomies and the trajec- tory of the left ureteral catheter which seemed in the preoperative imaging studies that was in close proximity to the aortic bifurcation (Figure 2). Thus, an increased infection risk was obvious as well as the risk of an accidental injury to the left ureter; both situations could be real disasters due to the use of a synthetic graft for the repair of the aorta. At first, a sterile adhesive surgical drape covered the area of the midline incision and then the ureterostomies area was fully exposed and following thorough scrubbing a new appliance sac was used, scrubbed and a sterile adhesive excluded the stoma area. Then the midline drape was removed and regular scrubbing followed, including scrubbing of the stoma covering the drape. Further regular application of surgical drapes took place. Following the midline laparotomy, mobilization of the duo-denum was performed detaching the ligament of Treitz and proximal exposure of the aorta was initiated towards the aortic bifurcation. The left ureteral catheter was pal-pated crossing the bifurcation and was apposed meticulously and iliac clamps were slipped under peritoneum, following proximal aortic cross-clamping. Finally, a polyester tube graft was placed.

Case Report 3
A 49 year old male presented with a 6 cm AAA and horseshoe kidney. In this case, the procedure was performed in the usual way of treating AAAs; the only difference in that case was that we avoided the separation of the horseshoe kidney, and also no attempt was carried in order to detach the isthmus of the horseshoe kidney.
from the aortic wall. We prepared the aorta above and below isthmus and following intravenous (iv) heparination, cross-clamping of the aorta and the iliac arteries was performed. The aorta above and below the isthmus was opened and the aortic wall in ad-herence with the isthmus was elevated. Following minimal bleeding con-trol inside the aortic wall, we slipped the tube graft like an endovascular graft inside the aortic wall. The proximal part of the graft was anastomosed just below the proximal aortic clamp and the distal part of the graft was anastomosed with the distal aorta just above the bifurcation (Figure 3). Both anastomoses and the residual exposed graft was covered by the remaining aortic wall. That way any vascular or parenchymal damage was avoided due to the intact isthmus and to the best of our knowledge, it is the first re-ported case in the literature with “endovascular-like” repair of AAA in case a horse-shoe kidney is present.

3. DISCUSSION

AAAs and urological neoplasms

In the literature it is estimated that approximately 75% of all cancer cases are diagnosed in patients more than 60 years old (4) which results in 14% of co-existence of AAA and any neoplasm (5). The detection of the aforementioned co-existence has been supported and amplified nowadays from the widespread use of several imaging techniques, such as ultrasound (US), computed tomography (CT) or magnetic resonance imaging (MRI) for the diagnosis and monitoring of AAAs, that led to the serendipitous detection of occult intraabdominal lesions, renal masses or neoplasms of the urinary bladder (6) as far as the urinary tract is concerned. Especially small solid renal masses are characteristic examples of incidentally discovered neoplasms by routine imaging use.

Since there are not randomized controlled studies yet in order to standardize optimal approach, the challenge for surgeons is still to establish the ideal treatment regarding optimal time of each surgical procedure and initial treatment priority or if they can be performed simultaneously, whereas optimal surgical strategy in case simultaneous treatment is chosen. There are small retrospective case series and case reports in the literature as an attempt to answer which is the ideal management, some of them with conflicting results (6-18). In most of the cases the final decision regarding staged or simultaneous as well as open or minimally invasive approach is based mainly on the clinical presentation of the diseases, with the most life-threatening lesion being the initially treated. What should be underlined in oncologic patients with AAAs, is the chemotherapy issue as sole or adjuvant treatment. There have been reports in the literature, although underpowered, suggesting that chemotherapy may favor the aneurysm evo-lution increasing the aneurysm diameter (18, 19), prioritizing the AAA repair over chemo-therapy administration. Along with that, there have been reports of increased risk of AAA rupture after open surgical procedures for tumor resection, in cases with aneurysm diameter more than 5 cm (20, 21) in the early postoperative period due to surgical trauma and consequent inflammation. Aforementioned processes cause increase of aneurysm diameter, mediat-ed by collagenases and metalloproteinases (18).

AAAs and urological benign lesions

Although there are several benign urological entities that might co-exist with an AAA, the most challenging - in terms of surgical management - urological manifes-tation in that field is the horseshoe kidney (HSK), which represents the commonest anatomic anomaly of the kidney and suggests a fusion of the lower poles of the kidneys in most of the cases either fibrotic or consisting of functional renal parenchyma (22). The incidence of a HSK is between 1:600 and 1:800 and it is twice as common in men than in women (23). Since men have a higher incidence of AAA (1) the combination of a HSK and an AAA is more frequent in men, rising 0.12% of patients (24).

The surgical challenge is the optimal repair of AAA with maximal preservation of renal function or minimal destruction of renal parenchyma. The later is the diffi-cult, given that HSKs are characterized by great variation in origin, number and size of renal vasculature, with approximately only a third of HSKs supplied by a single renal artery in each side (22, 23). In the recent literature, there have been several reports with surgical techniques of simultaneous management with preservation of the isthmus, either open - transperitoneal (25) or retroperitoneal (26) - or endovascular (27-29). Although the later method seems the best approach to avoid all technical difficulties in cases of AAA and HSK, it is obvious that is accompanied with significant disadvantages if most or large arteries arise from the aneurysm, since aberrant arteries cannot be preserved or anastomosed with the endovascular procedure.

Even more rare but at least equally significant and surgically challenging are the cases where an AAA co-exists with a transplant kidney. In both allograft and autograft cases, there is a single renal artery and no collateral vasculature. Apart from the AAA repair, the goal is to avoid irreversible ischemic renal injuries due to warm ischemia, but there is not a widely accepted surgical protocol in AAA repair, yet (30).

4. CONCLUSION

AAA and simultaneous urological disorders, although rare, are challenging surgical cases in terms of successful aneurysmal repair along with minimally or null urological complications. Precise imaging preoperatively and meticulous surgical technique intraoperatively are of utmost importance and suggest our vast allies in successful outcomes.

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REFERENCES

1. Kent KC. Clinical practice. Abdominal aortic aneurysms. N Engl J Med. 2014 Nov 27; 371(22): 2101-2108.
2. Livesay JJ, Messner GN, Vaughn WK. Milestones in the treat-
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1. Tsujii T, Iwai T, Kihara K, Tosaka A, Kawakami S, Masuda H, Jansen WB, Bogdanowicz JF, Welling L. Surgical treatment of concomitant cancer and abdominal aortic aneurysm. Cardiothoracic Surgery. 2011; 5164.16.

2. Jibilai A, Ahmed I, El-Sakka K, et al. Management of concomitant cancer and abdominal aortic aneurysm. Cardiothoracic Surgery. 2011; 5164.16.

3. Gordon S, Marsh P, Day A, Chappell B. Priapism as the presenting symptom of an aortocaval fistula. Emerg Med J. 2004; 21: 265.

4. Jibawi A, Ahmed I, El-Sakka K, et al. Management of concomitant cancer and abdominal aortic aneurysm. Cardiothoracic Surgery. 2011; 5164.16.

5. Onohara T, Orita H, Toyohara T, et al. Long-term results and prognostic factors after repair of abdominal aortic aneurysm with concomitant malignancy. J Cardi-ovasc Surg (Torino). 1996; 37: 1-6.

6. Konety BR, Shuman B, Webster M, Steed DL, Bahnsen RR. Simultaneous radi-cal nephrectomy and repair of abdominal aortic aneurysm. Urology. 1996 Jun; 47(6): 813-818.

7. Somani BK, Nicol G, Bhavan R, Swami S, Nabi G; Abacus Research Group. Synchronous resections of intra-abdominal pathologies during radical nephrectomy. A case-linked cohort study evaluation of outcomes. Eur J Surg Oncol. 2009 Aug; 35(8): 844-851.

8. Kira S, Sawada N, Kudou S, Zakoji H, Kaga S, Matsumoto M, Takeda M. Successful staged management of simultaneous abdominal aortic aneurysm and renal tumor: the novel minimally invasive treatment with endovascular aneurysm repair and retropitoneal laparoscopic radical nephrectomy in an elderly and high-risk case. Clin Pract. 2012 Apr 12; 2(2): e45.

9. Ginsberg DA, Modrall JG, Esgir D, Baek S, Yellin AE, Lieskovsky G, Skinner DG, Weaver FA. Concurrent abdominal aortic aneurysm and urologic neoplasm: an argument for simultaneous intervention. Ann Vasc Surg. 1995 Sep; 9(5): 428-433.

10. Tsuji Y, Watanabe Y, Ataka K, Sasada A, Okada M. Intraabdominal Nonvascular Operations Combined with Abdominal Aortic Aneurysm Repair. World J Surg. 1999; 23: 469-475.

11. Lee JT, Donayre CE, Walot I, Kopchok GE, White RA. Endovascular exclusion of abdominal aortic pathology in patients with concomitant malignancy. Ann Vasc Surg. 2002 Mar; 16(2): 150-156.

12. Illuminati G, Galio’ FG, D’Urso A, Lorusso R, Cecceani G, Vieri E. Simultaneous-ous repair of abdominal aortic aneurysm and resection of unexpected, associated abdominal malignancies. J Surg Oncol. 2004 Dec 15; 88(4): 234-239.

13. Barbalias GA, Liatsikos EN, Yarmenitis S, Maroulis I, Tsolakis I. Simultaneously occurring abdominal aortic aneurysm and invasive transitional cell carcinoma of the bladder and their synchronous management. Urol Int. 1998; 60(1): 66-68.

14. Jansen WB, Bogdanowicz JF, Welling L. Surgical treatment of renal cell carcinoma in a horseshoe-shaped kidney concomitant with an aortic aneurysm. Eur J Vasc Endovasc Surg. 2001 Sep; 22(3): 280-281.

15. Ginsberg DA, Esgir D, Grossfeld GD, Stein JP, Freeman JA, Yellin AE, Lieskovsky G, Weaver FA, Skinner DG. Technique of radical cystectomy and simul-taneous repair of an abdominal aortic aneurysm. Urology. 1996 Jan; 47(1): 120-122.

16. Tsuji T, Iwai T, Kihara K, Tosaka A, Kawakami S, Masuda H, Waku M, Oshima H. Management of invasive carcinoma of bladder and abdominal aortic aneurysm (AAA); technique of radical total cystectomy and simultaneous AAA repair. Nihon Hinyokika Gakkai Zasshi. 1998 Dec; 89(12): 979-984.

17. Habets J, Buth J, Cuypers PW, Nienhuijs SW, de Hingh IH. Infrarenal abdominal aortic aneurysm with concomitant urologic malignancy: treatment results in the era of endovascular aneurysm repair. Vascular. 2010 Jan-Feb; 18(1): 14-19.

18. Yazbek G, Nishinari K, Krumtan M, Wolosker N, Zottelle Bomfim GA, Pignataro BS, Fonseca IY, Cavalcante RN, Teivelis MP. Treatment of Abdominal Aortic Aneurysms in Cancer Patients. Ann Vasc Surg. 2016 Jan; 30: 159-165.

19. Palm SJ, Russwurm GP, Chang D, et al. Acute enlargement and subsequent rupture of an abdominal aortic aneurysm in a patient receiving chemotherapy for pancreatic carcinoma. J Vasc Surg. 2000; 32: 197-200.

20. Baxter NN, Noel AA, Cherry K, et al. Management of patients with colorectal cancer and concomitant abdominal aortic aneurysm. Dis Colon Rectum. 2002; 45: 165-170.

21. Lin PH, Barshes NR, Albo D, et al. Concomitant colorectal cancer and abdominal aortic aneurysm: evolution of treatment paradigm in the endovascular era. J Am Coll Surg. 2008; 206: 1065-1073.

22. Stroosma OB, Kootstra G, Schurink GW. Management of aortic aneurysm in the presence of a horseshoe kidney. Br J Surg. 2001 Apr; 88(4): 500-509.

23. Bauer SB, Perlmutter AD, Retik AB. Anomalies of the upper urinary tract. In: Walsh PC, Retik AB, Stamey TA, Vaughan ED Jr, eds. Campbell’s Urology (6th ed.). Philadelphia, Pennsylvania: WB Saunders, 1992: 1357-442.

24. Frego M, Bianchera G, Angriman I, et al. Abdominal aortic aneurysm with coex-istent horseshoe kidney. Surg Today 2007; 37: 626-630.

25. Canova G, Masini R, Santoro E, Bartolomeo S, Martini C, Becchi G. Surgical treatment of abdominal aortic aneurysm in association with horseshoe kidney. Three case reports and a review of technique. Tex Heart Inst J. 1998; 25(3): 206-210.

26. De Caridi G, Massara M, Greco M, Mastrojenni C, Serra R, Salomone I, Lo Spada M. Surgical Treatment of a Voluminous Infrarenal Abdominal Aortic Aneurysm with Horseshoe Kidney: Tips and Tricks. Ann Vasc Dis. 2015; 8(4): 324-327.

27. Chan YC, Qing XK, Ting AC, Cheng SW. Endovascular infrarenal aneurysm repair in patients with horseshoe kidneys: case series and literature review. Vascular. 2011 Jun; 19(3): 126-131.

28. Ruppert V, Umscheid T, Rieger J, Schmedt CG, Mussack T, Bomfim GA, Pignataro BS, Fonseca IY, Cavalcante RN, Teivelis MP. Treatment of Abdominal Aortic Aneurysms in Cancer Patients. Ann Vasc Surg. 2016 Jan; 30: 159-165.

29. Tan TW, Farber A. Percutaneous endovascular repair of abdominal aortic aneurysm with concomitant malignancy: treatment results in the era of endovascular aneurysm repair. Vascular. 2010 Jan-Feb; 18(1): 14-19.

30. Lee J, Dueck AD, Lossing AG, Stewart RJ. Abdominal aortic aneurysm repair with a functional autotransplanted kidney. Can Urol Assoc J. 2007 Sep; 1(3): 291-293.