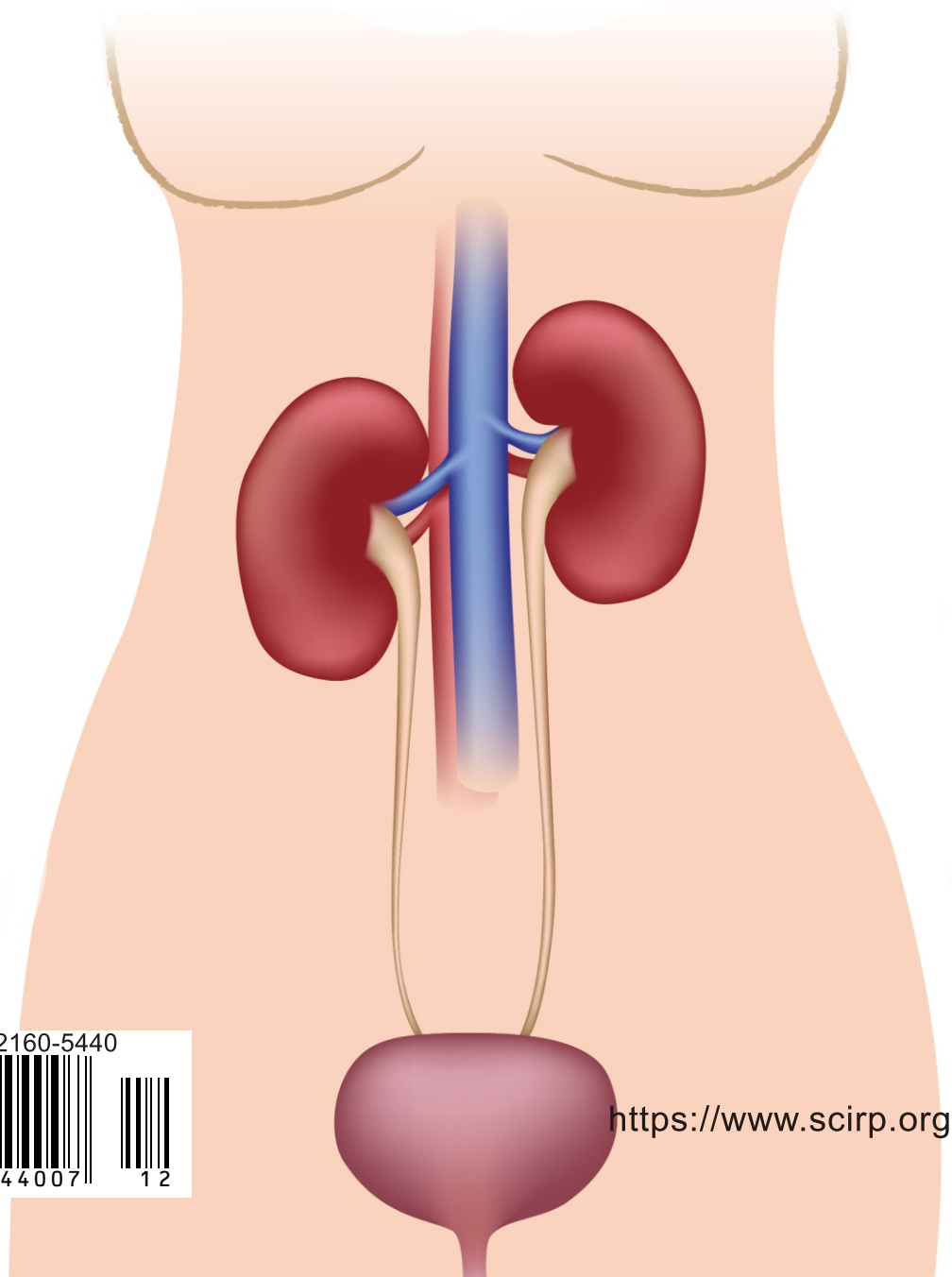
ISSN: 2160-5440 Volume 12, Number 12, December 2022

Scientific Research Publishing

Open Journal of Urology



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ISSN 2160-5440 (Print) ISSN 2160-5629 (Online)
https://www.scirp.org/journal/oju

Scientific Research Publishing

Open Journal of Urology, 2022, 12, 589-606
https://www.scirp.org/journal/oju
ISSN Online: 2160-5629
ISSN Print: 2160-5440

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Volume 12 Number 12 December 2022

Open Journal of Urology (OJU)
Journal Information

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Open Journal of Urology, 2022, 12, 589-595
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ISSN Print: 2160-5440

Right Radical Nephrectomy with Type-IV IVC Tumor Thrombectomy Using Venovenous Bypass Instead of Cardiopulmonary Bypass—A Case Report

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How to cite this paper: Sethia, R.K., Charag, A.H., Singh, S.S., Agarwal, N.N. and Ingole, P. (2022) Right Radical Nephrectomy with Type-IV IVC Tumor Thrombectomy Using Venovenous Bypass Instead of Cardiopulmonary Bypass—A Case Report. *Open Journal of Urology*, **12**, 589-595.
https://doi.org/10.4236/oju.2022.1212057

Received: August 15, 2022
Accepted: December 12, 2022
Published: December 15, 2022

Abstract

A renal mass with level Level IV IVC thrombus is usually managed with radical nephrectomy and IVC thrombectomy. This procedure requires the assistance of a cardiac surgeon and is usually done under complete cardiopulmonary bypass. However, the use of cardiopulmonary bypass is associated with reduced cardiac venous return and can consequently decrease cardiac output, adversely affecting haemo-dynamic stability and systemic arterial perfusion. This can lead to relative ischemia of the abdominal viscera, lower limbs and kidneys. We report a case where radical nephrectomy with IVC thrombectomy was done under venovenous bypass, thus avoiding the complications associated with the cardiopulmonary bypass.

Keywords

Nephrectomy, IVC Thrombus, Cardiopulmonary Bypass, Venovenous Bypass

1. Introduction

Radical Nephrectomy with removal of type III & IV IVC thrombus usually requires the use of cardiopulmonary bypass (CPB), deep hypothermia and circulatory arrest, which is associated with risk of renal and hepatic failure, neurologic dysfunction, postoperative sepsis and systemic coagulopathy. We operated

this case using veno-venous bypass (VVB) in place of cardiopulmonary bypass (CPB) so that most of the above complications could be avoided.

2. Case Report

A 56-year-old man presented to us with complaints of weakness. On evaluation he was found to have anemia and right renal mass with type IV IVC thrombus *i.e.*, tumor thrombus extending up to the right atrium. Other investigations did not reveal any metastasis to other organs. He was counseled for Right Radical Nephrectomy with IVC Thrombectomy. Anemia was corrected by preoperative blood transfusion.

Under general anesthesia, abdomen was opened by chevron incision. Resectability was confirmed by evaluating for evidence of metastatic disease. Right colon was reflected medially and duodenum was kocherized. Right kidney was mobilized outside the Gerota's fascia, with minimal traction to prevent embolism of tumor thrombus. Right renal artery, gonadal vein and right ureter were ligated and divided. Right triangular ligament and coronary ligament of liver were divided, permitting right lobe of liver to be rotated medially and cephalad, which exposed retrohepatic IVC up to the diaphragm. Infrarenal IVC and left renal vein was dissected, exposed and Rummel tourniquets were placed.

Median sternotomy incision was given by CTVS team and mediastinum opened exposing the heart. Access was gained to the left femoral vein using an 18 G 6.3 cm needle. A 60 cm J-tip 0.035-inch guidewire was passed through the needle into the femoral vein. The needle was removed and a 12 F dilator was passed over the guidewire. A 20 Fr heparin-bonded arterial bypass cannula was then inserted into the femoral vein and sutured into position. Using a similar technique an 18 Fr bypass cannula was inserted into the internal jugular vein. The cannulas were then connected by heparin-bonded tubing to a perfusion pump (Biomedicus, Minnetouba, Minnesota, USA). Transesophageal Echocardiography was used to see intra-atrial part of thrombus.

Venovenous Bypass (VVB) was instituted. Infrarenal IVC and left renal vein were clamped along with Pringle maneuver on the portal vein and hepatic artery. Flow through the bypass system was kept at around 10% of the cardiac output, as measured by a Swann Ganz pulmonary catheter.

Now anterior surface of renal vein was incised over the thrombus and venotomy extended posteriorly with scissor. Right kidney with thrombus attached was extracted out with gentle traction on it with patient in Trendelenburg position and using positive pressure respiration. Movement of tumor thrombus was monitored by TEE to ensure complete thrombus extraction. Now Infrahepatic IVC was also clamped. IVC was flushed with heparinized saline and evaluated for residual fragments. Two side biting satinsky clamps were applied at venotomy site and Rummel tourniquets were released. VVB was discontinued and IVC closed with 4-0 prolene (**Figure 1**).

On termination of the procedure the cannulae were disconnected from the

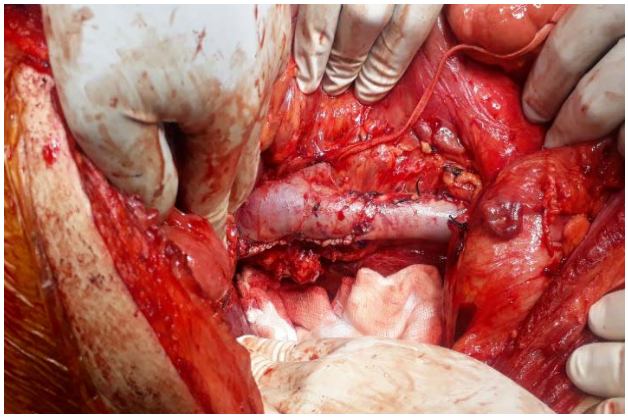

Figure 1. IVC repair after thrombectomy.

perfusion pump, but left in situ for 24 h and then removed.

3. Discussion

Renal Cell Carcinoma (RCC) can invade through the renal vein into the Inferior vena Cava (IVC), and can then extend intraluminally, with tumor-thrombus formation occurring in 5% - 15% of all cases (**Figure 2**). Tumor thrombus may extend up to the right cardiac chambers in 1% of cases [1].

Multiple classification systems exist for venous tumor thrombus level in case of renal cell carcinoma. According to the Mayo staging system, the following levels are described:

Level 0—thrombus extending to the renal vein.

Level I—thrombus extending into the IVC to no more than 2 cm above the renal vein.

Level II—thrombus extending into the IVC to more than 2 cm above the renal vein but not to the hepatic vein.

Level III—thrombus extending into the IVC to above the hepatic vein but not to the diaphragm.

Level IV—thrombus extending into the supradiaphragmatic IVC or right atrium.

Surgery to remove type III & IV IVC thrombus is technically challenging and can be associated with significant morbidity and mortality. It usually requires the use of cardiopulmonary bypass (CPB), deep hypothermia and circulatory arrest [2], which is associated with risk of renal and hepatic failure, neurologic dysfunction, postoperative sepsis and systemic coagulopathy [3]. In order to avoid these risks, veno-venous bypass (VVB) can be considered in place of cardiopulmonary bypass (CPB) in most of the Type III and a few selected cases of Type-IV IVC thrombus. It is associated with less side effects as compared to CPB.

In our case, we have described the technique of excision of a right side primary renal mass with tumor-thrombus extending via IVC into the right atrium (Type-IV) using veno-venous bypass instead of CPB (**Figure 3**).

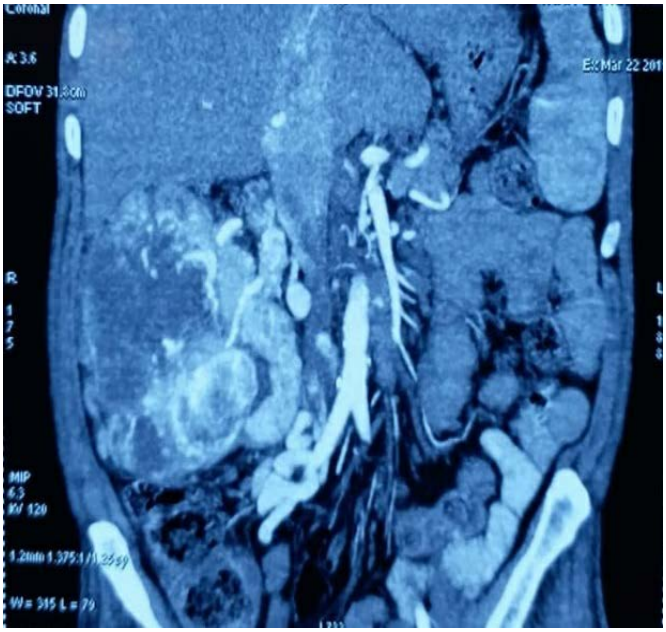

Figure 2. CT scan showing right renal mass with IVC thrombus.

Figure 3. Right radical nephrectomy specimen with tumor thrombus.

In 1913, Berg *et al.* first described nephrectomy and vena caval thrombectomy for RCC that extended into the IVC [4]. Thereafter, radical nephrectomy with vena caval thrombectomy has become a safe treatment for cases of venacaval tumor thrombosis, with operative mortality rates ranging from 2.7% to 13% and an expected 5-year survival ranging from 30% to 72%.

When the tumor-thrombus is localized to within the infrahepatic IVC (type I or II), tumor extraction is usually accomplished after proximal and distal control of the IVC.

When the tumor-thrombus extends into the suprahepatic IVC (type III & IV), en bloc tumor excision requires the use of either CPB with hypothermic circulatory arrest or veno-venous bypass (VVB).

Traditionally the use of CPB was utilized in almost all cases of level III and IV tumor thrombi.

Due to the known complications of renal and hepatic failure, neurologic dysfunction, postoperative sepsis and systemic coagulopathy associated with CPB, alternative technique of veno-venous bypass (VVB) has been attempted to reduce these complications [3].

Initially utilized for liver transplantation, VVB has the advantage that it does not require systemic anti-coagulation, as the cannulas are pre-coated with heparin. The use of VVB in IVC thrombectomy has been described extensively in the literature. One retrospective study conducted by Granberg *et al.* has compared VVB versus CPB bypass in the setting of RCC and IVC tumor thrombi [5]. This study demonstrated patients undergoing VVB (n = 13) had significantly shorter bypass, operative, and anesthesia times than did patients treated with CPB (n = 28). The study also demonstrated trends towards decreased intraoperative blood loss, reduced transfusion requirements, and a shorter length of hospitalization with VVB.

The advantages of VVB in orthotopic liver transplantation have been extensively documented [6].

Cross-clamping of the IVC, in the absence of VVB, reduces cardiac venous return and can consequently decrease cardiac output, adversely affecting haemo-dynamic stability and systemic arterial perfusion. This can lead to relative ischemia of the abdominal viscera [7], lower limbs and kidneys. Augmentation of the venous return by the administration of large volumes of intra-venous fluids can precipitate acute right ventricular failure on declamping the IVC. By maintaining cardiac venous return, VVB prevents the above complications. Systemic anticoagulation is not required for VVB and this avoids the possible coagulopathy that sometimes occurs during cardiopulmonary bypass [8]. The risks of profound hypothermia associated with cardiopulmonary bypass are not apparent with VVB [9].

Once the tumor thrombus extends into the right atrium, most of studies advocate the use of cardiopulmonary bypass with deep hypothermia and circulatory arrest for removal of the tumor thrombus [10].

In our case we attempted to determine if VVB can be utilized safely over CPB in patients undergoing type-IV IVC tumor thrombectomy with concomitant radical nephrectomy for renal tumor. In our case we kept everything ready for CPB and initially tried with VVB. Since tumor thrombus was not adherent to IVC wall anywhere throughout the length of IVC, after cross clamping the IVC along with pringle maneuver tumor thrombus was easily and quicky taken out by venotomy and then side biting Satinsky clamp was applied for further suturing. During this period of IVC cross clamping venous return was provided by VVB, without any complication and thus CPB was avoided.

4. Conclusion

Veno-venous bypass is a versatile technique during TYPE III & IV IVC thrombectomy and devoid of risks involved with CPB. It can be considered instead of

CPB in type IV IVC thrombectomy with radical nephrectomy in carefully selected cases.

Conflicts of Interest

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

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Abbreviations

IVC—Inferior Vena Cava.

VVB—Venovenous Bypass.

CPB—Cardiopulmonary Bypass.

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Open Journal of Urology, 2022, 12, 596-601
https://www.scirp.org/journal/oju
ISSN Online: 2160-5629
ISSN Print: 2160-5440

Place of Open Radical Nephrectomy, in the Era of Laparoscopy in Subsaharian Africa

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How to cite this paper: Tengue, K., Sewa, E.V., Sikpa, K.H., Botcho, G., Padja, E. and Kpatcha, M.T. (2022) Place of Open Radical Nephrectomy, in the Era of Laparoscopy in Subsaharian Africa. *Open Journal of Urology*, **12**, 596-601.
https://doi.org/10.4236/oju.2022.1212058

Received: October 27, 2022
Accepted: December 13, 2022
Published: December 16, 2022

Abstract

Introduction: Kidney cancer is discovered in Africa often at advanced or locally advanced stages. These patients could be treated by radical nephrectomy or cytoreductive nephrectomy. Open surgery still retains its place due to the technical difficulties which are linked to the stage of the tumors in this era where laparoscopy is becoming the gold standard. Through this study, we wanted to highlight the advanced stages of patients operated by open surgery in our institution rather than laparoscopy, however, with good results. **Patients and Method:** It was a retrospective study over a period of 5 years. Were included all patients in whom radical nephrectomy had been performed during this period. **Results**: Thirty-five (35) open radical nephrectomies for kidney cancer were performed. The average tumor size was 11.6 cm (±3.4 cm). The mean operating time was 169 min ± 63.4 min with extremes of 115 min (1 h 55 min) and 360 min (6 h). This duration was longer for large tumors ($p = 0.002$). Intraoperative incidents occurred in 4 patients (11.4%); it was a vena cava injury (02) and a spleen injury (02). Blood loss was estimated on average at 535 ml. The mean follow-up time was 19 ± 11 months. The overall survival rate was 90% at 3 months, 53% at 12 months and 35.4% at 24 months. **Conclusion**: The large size of kidney tumor found in Africa may constitute an obstacle to performing nephrectomies by laparoscopy. However, mastering the laparoscopic technique with appropriate equipment can help reduce operative morbidity.

Keywords

Open Radical Nephrectomy, Indications, Results, Africa

1. Introduction

Kidney cancer represents 2.2% of solid cancers in the world [1]. In 2020, the

global incidence was 431,288 with 179,368 deaths reported by GLOBOCAN. In Africa and the Middle East the standardized incidence of kidney cancer was 1.8 - 4.8/100,000 in men and 1.2 - 2.2/100,000 in women [2].

In the management of localized and locally advanced kidney cancer, radical nephrectomy is indicated and the procedure was first described by Robson in 1963 [3]. The principle of radical nephrectomy is to remove the kidney along with perirenal fat, Gerota's fascia with or without the adrenal gland with or without lymph node dissection. It can be performed laparoscopically, robot-assisted laparoscopic and open [4]. Regardless of the technique used, studies show that there is no difference in terms of specific survival and overall survival or in terms of oncological results [5]. Even though, laparoscopic and robot-assisted approaches are supposed to offer the advantages of reduced blood loss, rapid resumption of activity and fewer complications, the open route remains the reference technique for nephrectomies for large tumors and cyto-reductive nephrectomies [6].

By this study, our aim was to highlight the stages at which patients are operated by open surgery in our institution and the results of this surgery.

2. Patients and Method

This was a retrospective cross-sectional study over a period of 5 years from January 1st 2015 to December 31st 2019 at the Urology Department of the Sylvanus Olympio University Hospital in Lomé. Included were all patients in whom a radical nephrectomy had been performed during the study period. All the patients have been treated by open surgery. The parameters studied were: the tumor stage, the type of skin incision (median supra and subumbilical, subcostal, lumbotomy); additional surgical procedures performed (adrenalectomy, lymph node dissection); intraoperative incidents and postoperative complications; elements of post-operative follow-up such as: local and metastatic recurrences, renal function, patient survival. Overall survival was studied using the Kaplan-Meier estimation curve.

3. Results

During the study, thirty-five (35) radical nephrectomies for kidney cancer were performed which was 57.14% of all nephrectomies and 2.40% of all procedures performed. The average age was 46.5 ± 12.5 years with extremes of 21 years and 72 years old and women represented 70% of patients, a sex ratio of 3/1. The computed tomography was the imaging test for the diagnosis and the assessment of extension in all our patients. The average tumor size was 11.6 cm (±3.4 cm). Thirteen (13) patients (37%) were diagnosed at stage T2bN0M0 (**Figure 1**).

Regarding surgery, all patients had undergone general anesthesia and all had been operated by open surgery. The primary routes used were the midline transperitoneal route in 19 patients (54% of cases), the anterior subcostal transperitoneal route in 9 patients (26%) and lumbotomy in 7 patients (20%). The mean operating time was 169 min ± 63.4 min with extremes of 115 min (1 h 55

min) and 360 min (6 h). This duration was longer for large tumors (p = 0.002). In 20 patients (57.1%), separate ligation of the renal vessels was performed. Adrenalectomy was performed in 9 patients (25.7%). Lymph node dissection was performed in one (1) patient. Intraoperative incidents occurred in 4 patients, i.e. 11.4%; it was a vena cava injury repaired immediately with sutures, and a spleen injury that resulted in splenectomy. Blood loss was estimated on average at 535 ml with extremes of 200 and 1000 ml. Intraoperative blood transfusion was necessary in 15 patients, i.e. 42.8% of cases. The mean volume of red blood cell concentrates (RBCs) transfused was 1000 ml [±500 ml] with extremes of 500 ml and 3000 ml. The average length of hospital stay was 7 days with extremes of 4 and 19 days.

The most common histological type was clear cell carcinoma in 80% of cases and renal papillary carcinoma in 20%. Ten (10) patients or fifty percent (50%) of patients presented lesions classified stage pT2bN0. The ISUP 3 and 4 nucleolar grades were the most represented, respectively 51.4% and 40% of cases.

In the context of postoperative monitoring, the mean follow-up time was 19 ± 11 months. Regarding prognostic classification, 65% of patients were classified in the intermediate risk group according to the UISS classification, 20% in the low group and 15% in the high risk group. Local recurrence was observed in 6 patients (17%). Four (4) patients had presented a local recurrence between 12 and 24 months including one (1) at 13 months, two (2) at 17 months and one (1) other at 20 months. Local recurrence was present in less than 12 months in two (2) patients, one (1) at 5 months and the second at 8 months after the operation. Metastatic recurrences were found in 3 patients (8.5%). Two (2) cases of lung metastasis and one (1) case of liver metastasis. Three (3) patients (8.5%) died during follow-up and all 12 months after the surgery. Among the deceased patients, two (2) were stage pT2bN0 and one (1) stage pT3N. Among the deceased patients, two (2) were classified as grade 4 ISUP and one (1) grade 3 ISUP. The overall survival rate was 90% at 3 months, 53% at 12 months and 35.4% at 24 months as shown in Figure 2.

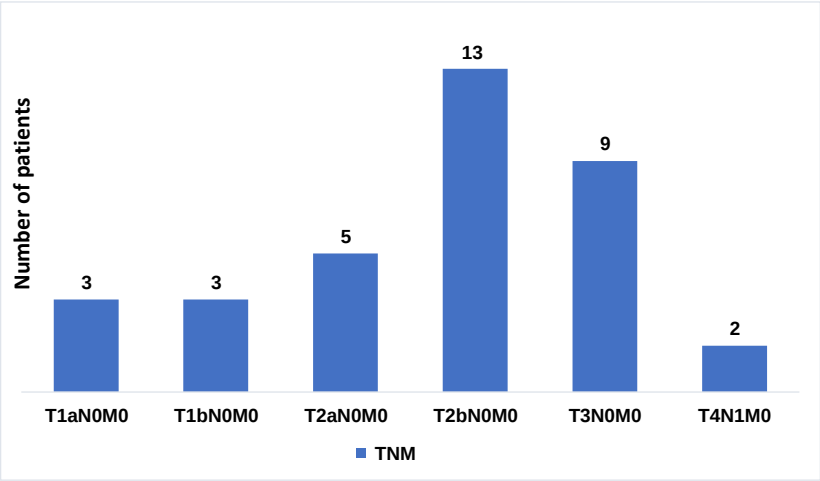

Figure 1. Distribution of patients according to TNM stage.

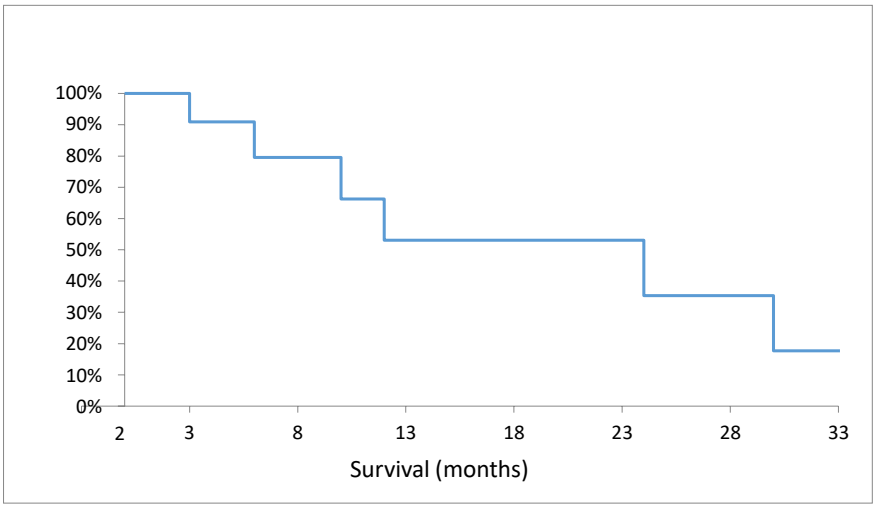

Figure 2. Kaplan Meyer curve showing the overall survival of the patients.

4. Discussion

In 5 years 35 radical nephrectomies for kidney cancer had been performed. This low incidence was found in the series of Ndoye M. [5] in Senegal and Badmus A [7] in Nigeria who had reported respectively 31 in 12 years and 18 cases in 10 years. However, Bellec L [8] in France had performed 274 radical nephrectomies in 4 years. These low incidences in our African countries are thought to be due to the non-practice of routine health check-ups, in the absence of clinical signs and the low level of education of our populations. In these countries tumors are more often found at an advanced stage, usually inoperable [9].

All of our patients had been operated by open surgery. This route was the only one described in the series by Ndoye M *et al.* [5] in Senegal, Avakoudjo DGJ *et al.* [10] in Benin and Badmus A *et al.* [7] in Nigeria. However, the laparoscopic route is currently the most widely used in developed countries. This is the case of James F.B *et al.* [11] in the USA, Hemal AK *et al.* [12] in India who asserted that the laparoscopic route is the gold standard for radical nephrectomies. Indeed, laparoscopic routes allow a reduction in intraoperative blood loss, rapid resumption of activities and fewer complications. Studies have shown that after surgery with laparoscopic radical nephrectomy, the operation time, intraoperative blood loss, hospital stay were better than open surgery [13].

With the continuous development of laparoscopic technology, the application range of laparoscopic radical nephrectomy is expanding. For large size renal tumor, technical problems have also been raised for the application of laparoscopic radical nephrectomy (LRN) An increase in tumor volume will reduce the space for surgery. The possibility of cancer rupture and the possibility of surgery to cause tumors to invade other organs are enhanced [14]. For these reasons, open radical nephrectomy is a technical challenge for larger tumor treatments. In theory, the treatment of larger tumors is a more sensible choice. There should be a clear range for the size of the tumor to which the LRN is applied. Dunn *et al.* reported that LRN can be selected for tumor size range <10 cm [15], Hemal *et al.*

reported a tumor size range of 7 to 10 cm [12]. Zhao even advocates the LRN in cytoreductive nephrectomy [16]. However, the extent of tumor size is not a factor in determining LRN use. Advances in laparoscopic techniques and increasing surgeon experience have helped to improve the adverse effects of LRN on larger kidney cancers.

The overall survival rate was 35.4% at 24 months, lower than that of HEMAL AK *et al.* and Polo G *et al.* [17] who had respectively 88.7% at 5 years and 82% at 60 months. The low survival rate observed in our patients could be explained by the large size of the tumors, the high ISUP nucleolar grade, which are factors of poor prognosis after radical nephrectomy [18].

5. Conclusion

Radical nephrectomy is a procedure that is not commonly performed in our institution because kidney tumors were most often found at an advanced stage. When realized, it was open radical nephrectomy for large size tumor or open cyto-reductive nephrectomy for metastatic renal carcinoma. Even though the oncological results are comparable to laparoscopic surgery, it should not be forgotten that the laparoscopic radical nephrectomy reduces morbidity. It will then be necessary to adapt to gold standard practices by acquiring the appropriate technical equipment.

Authors' Contribution

KT, EVS, and KHS were responsible for the conceptual design. Analysis, drafting, and critical revision of the article were performed by KT, EVS, GB. K T, EVS, EP and MTK were responsible for the final approval of the article.

Conflicts of Interest

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

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Scientific Research Publishing

Open Journal of Urology, 2022, 12, 602-606
https://www.scirp.org/journal/oju
ISSN Online: 2160-5629
ISSN Print: 2160-5440

Para Testicular Pseudotumeurs of Calcified Gait: A Case Report from the Nianankoro Fomba Segou Hospital (Mali)

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How to cite this paper: Sory, I.K., Samaké, B., Kassogué, A., Keita, M., Traoré, T., Bagayogo, T.B., Bah, A., Sanogo, A., Coulibaly, D., Coulibaly, A.N., Togo, M. and Fofana, A. (2022) Para Testicular Pseudotumeurs of Calcified Gait: A Case Report from the Nianankoro Fomba Segou Hospital (Mali). *Open Journal of Urology*, **12**, 602-606.
https://doi.org/10.4236/oju.2022.1212059

Received: April 7, 2022
Accepted: December 27, 2022
Published: December 30, 2022

Abstract

Fibrous tumors of para testicular location are extremely rare benign tumors. The diagnosis of benignity, which allows a conservative treatment, will be made intraoperatively in front of the macroscopic aspect with well enucleable nodules and confirmed by the extemporaneous anatomopathological examination. We report a case of multiple calcified paratestinal pseudotumors in a 25-year old patient with no particular history, whose benignity was proven by the histology of the operative parts. Our objective was to discuss, from this observation and a review of the literature, the diagnostic and therapeutic aspects of these tumors.

Keywords

Pseudotumor, Para Testicular, Benign

1. Introduction

Para testicular tumor-like formations are rare and the literature reports that fibrous tumors of para testicular location are extremely rare benign tumors. Until 1992, only about twenty cases had been described [1]. The diagnosis of benigni-

ty, which allows conservative treatment, will be made intraoperatively in view of the macroscopic appearance with nodules that can be enucleated and confirmed by an extemporaneous examination [2]. Ultrasound shows that the nodule is extratesticular and therefore generally benign [3]. Testicular micro lithiasis is well described by previous studies but is of intra testicular location and of echographic discovery either by chance or in the context of associated pathologies, it remains the subject of controversy as to its prevalence and its link with these pathologies, and in particular with testicular cancer [4] [5]. Pseudotumors and epididymal tumors are also generally benign but well related to the epididymis, as well as albuginea cysts, sessile or pedunculated hydatid cysts of Morgagni and other masses formed at the expense of the testicular adnexa are attached to the testis. Paratesticular tumors are rare and complex tumors with insidious and poor symptomatology. The benign forms represent 70%. However, some paratesticular formations can be malignant such as paratesticular rhabdomyosarcoma which is a rare and aggressive tumor whose treatment is multimodal and involves surgery, chemotherapy and radiotherapy. Our objective was to discuss, from this observation and a review of the literature, the diagnostic and therapeutic aspects of these tumors in order to contribute to the improvement of the identification of these benign pseudotumors of para testicular localization.

2. Observation

This was a 25 year old patient who consulted for multiple masses next to the testicle with an increase in volume of the left hemi-scrotum that had been evolving for four years. The clinical examination revealed a good general condition and allowed to palpate two hard para testicular nodules, well circumscribed without infiltration of the skin in front. An ultrasound scan showed that the nodules were located at the expense of the epididymis in the form of rounded hyperechoic masses. Tumor marker assays (alpha-fetoprotein, chorionic beta-gonadotropin and lactate dehydrogenase) were normal.

The surgery allowed easy removal by digital cleavage of two granulomatous nodular masses of calcified appearance with regular contours, well rounded, smooth surfaces, hard consistencies, stony, without attachment to the testis but slightly adjoining the epididymis and the testicular vagina **Figure 1**, **Figure 2**. The largest one measured 2.5 cm **Figure 3**. The operation was completed by a resection of the testicular vagina.

The postoperative course was simple, the patient was reviewed at 3 months and then after 12 months without any sign of recurrence.

3. Discussion

Calcified pseudotumors are rare. From July 2013 to July 2021, *i.e.* in 8 years, we have recorded only one case, a patient with a healthy homolateral testicle and a healthy contralateral testicle. Fibrous tumors of testicular localization reported in the literature are extremely rare benign tumors. Calcifications are reported,

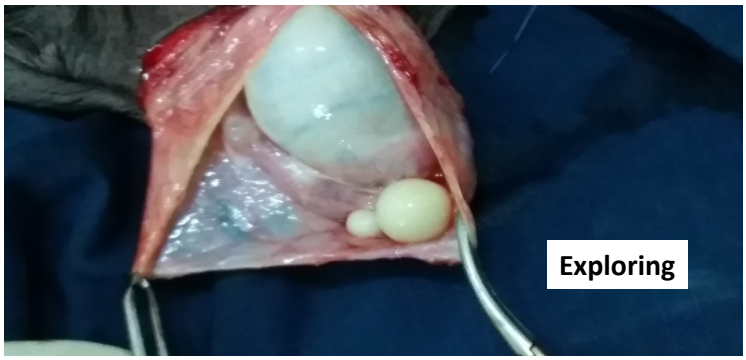

Figure 1. Opening of the testicular vagina and evidence of pseudotumors.

Figure 2. Removal of pseudotumors and verification of hemostasis of the pseudotumor bed.

Figure 3. View of the surgical parts.

often within the wall of the testicular vagina [6]. Testicular micro lithiasis has also been described by several authors, but it is intratesticular in location, small in size, and discovered incidentally on ultrasound or in the context of associated pathologies [4] [5]. We have recorded only one case of pseudotumors in 7 years. The extreme rarity of this pathology has been reported by other authors [7]. These para-testicular pseudotumors pose the problem of differential diagnosis with nodules of the epididymis, as these nodules may give rise to suspicion of urogenital tuberculosis, in particular epididymo-testicular tuberculosis, and may

justify a search for Koch's bacillus in the urine and a history of pulmonary tuberculosis or of another location in the patient [3]. In our case the patient had no particular history. However, he presented with a hydrocele tear which was leathered. Confusion may also occur with cord cysts, epididymal cysts, Morgagni's hydatid cysts, and paratesticular lipoma. In this case, ultrasound examination is the cornerstone of the diagnosis [8].

Calcified pseudotumors have a hard, stony consistency. The diagnosis of benignity, which allows conservative treatment, will be made intraoperatively in view of the macroscopic appearance with nodules that can be enucleated and confirmed by extemporaneous examination [2]. In our patient the benign nature of these pseudotumours was suspected in view of the healthy appearance of the tissues adjacent to these nodules and their easy extirpability, as they had very few attachments to the epididymis and the vaginal tunic. However, it is also important to bear in mind the existence of para-testicular malignant tumours such as para-testicular rhabdomyosarcoma, which must be ruled out with the help of ultrasound, CT scan and the measurement of tumour markers [9].

As in our patient, the notion of hydrocele associated with a pseudotume was reported by Abdelhak [10].

4. Conclusion

Para testicular pseudotumors are rare and benign (1, 2, 6, 7), easy to diagnose, essentially clinical, and treated surgically by simple enucleation. However, the differential diagnosis is made with epididymal nodules, spermatic cord cysts, Morgagni hydatid cysts and albuginea cysts.

Conflicts of Interest

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

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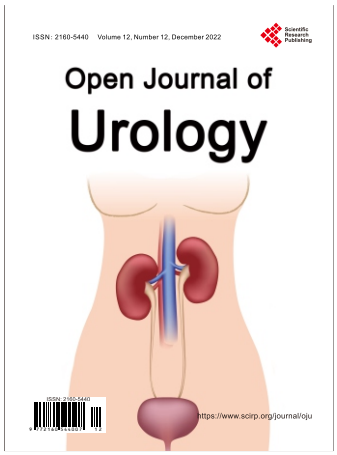

Open Journal of Urology (OJU)

ISSN 2160-5440 (Print) ISSN 2160-5629 (Online)

https://www.scirp.org/journal/oju

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