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Surgical Complications of Renal Transplantation

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1. Introduction

In the early era of kidney transplant, surgical complications were a major cause of graft loss. Between 1960 and 1980, the estimated incidence was around 20%. With the improvement of surgical techniques, the frequency of these complications has dropped significantly and this subject until then common in the medical literature came to be seldom discussed (Botto V, 1993; Hernandez D, 2006). Currently, it is estimated that in large transplant centers the incidence of surgical complications is less than 5%. In general, the results of renal transplantation have improved primarily as a consequence of advances in medical and immunosuppressive therapy and progress in surgical techniques. Posttransplant urologic complications are unusual, with the range of 2.5% to 27% in most series, and can cause significant morbidity and mortality (Zargar MA, 2005; Dalgic A, 2006). Results have improved over the past decade as a direct application of less invasive endourologic diagnostic and therapeutic techniques of the surgical complications (Strem SS, 1994).

However, the etiologies are the most common technical problems and association with immunological complications. Surgical complications after renal transplantation can be classified mainly as vascular (arterial and venous thrombosis, renal arterial stenosis, lymphocele, hemorrhage) and urologic (ureteral obstruction, vesicoureteral reflux, urinary fistula), although other types of complications are not uncommon, like graft's rupture and hematoma. These complications can occur early in the intra-operative, immediate postoperative period or later, and imply in increase morbidity, hospitalization and costs (Humar A, 2005).

Urologic complications are the most common surgical complication after renal transplantation, causing significant morbidity and mortality. Recently, the incidence of urologic complications after renal transplantation has decreased to 2.5% to 12.5% (Emiroglu R, 2001). Unfortunately, there is a still higher incidence of technical complications in pediatric recipients, reaching approximately 20% with an associated 58% and 74% graft survival rates for cadaveric and living-related transplantation (Salvatierra O Jr, 1997; US Renal Data System, 1996). Urologic complications represent an important cause of morbidity, delaying normal graft functioning, and in some cases leading graft loss and/or patient death (Beyga ZT, 1998; Colfry AJ Jr, 1974; Mundy AR, 1981; Hakim NS, 1994).

The most frequent urological complications after kidney transplantation involves the ureterovesical anastomosis (fistula, stenosis and reflux), with a frequency ranging from 5% to 10% in different séries.

2. Urologic complications

2.1 Urinary fistula

This is the leakage of urine from the collecting system. It can occur at the level of the bladder, ureter or renal calices. The leakage of urine can be collected around the graft, move to the retroperitoneum, scrotum or may manifest through the incision. His average prevalence in many studies is around 5.7%. In general, most urinary leaks are the results of ureteral problems, failure of ureterovesical anastomosis or ischemia and necrosis of the distal ureteral stump.

Like the majority of surgeons now employ an extravesical ureteroneocystostomy technique for implantation of the ureter, there are shorter ureter and decreased likelihood of ischemia, and a limited cystostomy that rarely leads to leakage from the bladder (Gibbins WS, 1992; Thrasher JB, 1990).

Clinical presentation:

In most cases, there is constant discharge of clear liquid (yellow citrus) through the drain, in the immediate postoperative period, and sometimes the flow through the drain can even surpass the diuresis the urinary catheter.

When later, after removal of the tubular drain, there may be bulging store kidney with extension into the perineum and scrotum or decreased urine output with maintenance of renal function. Unexplained graft dysfunction, pelvic fluid collection, fever, graft tenderness, an lower extremity edema can also occur (Streen SB, 1994).

Early urinary leaks can be divided into two types: the first usually occurs within the first 1 to 4 days and is almost always related to technical problems with the implantation. In this case, the ureter has usually pulled out of a tunnel caused by excessive tension at the anastomosis. This complication appears to be more common with the extravesical ureteroneocystostomies (Streen SB, 1994). Some authors have recommended use of a ureteral stent to lessen the likelihood of this complication (Gibbins WS, 1992). The second type of early ureteral leak, usually presents between 5 and 10 days, is associated with distal ureteral ischemia, which may be a consequence of injury during the donor nephrectomy, technical causes such as tunnel hematoma or distal stripping of the blood supply (Rosenthal JT, 1994).

Diagnosis:

For being the most common surgical complication of kidney transplantation, urinary fistula is easily diagnosed. In doubtful cases, where there is need to exclude the lymphocele as main differential diagnosis, biochemical analysis of the liquid is characterized by having elevated levels of creatinine, urea and potassium. In the lymphocele, creatinine should be similar of blood. Urinary leak are often suspected because of increased drainage from the wound. Radiographic tests of help include an abdominal ultrasound and nuclear renal scan. The ultrasound is nonspecific for evaluating patients with suspected urinary fistula after kidney transplantation. It will only reveal a fluid collection (anechoic image) around the graft. A renal scan demonstrating extravasation (figures 1.1, 1.2) is the most sensitive method to differentiate a urine leak from other fluid collections such lymphoceles or hematomas (Bretan PN Jr, 1989). A cystogram should be performed if a bladder leak is suspected.

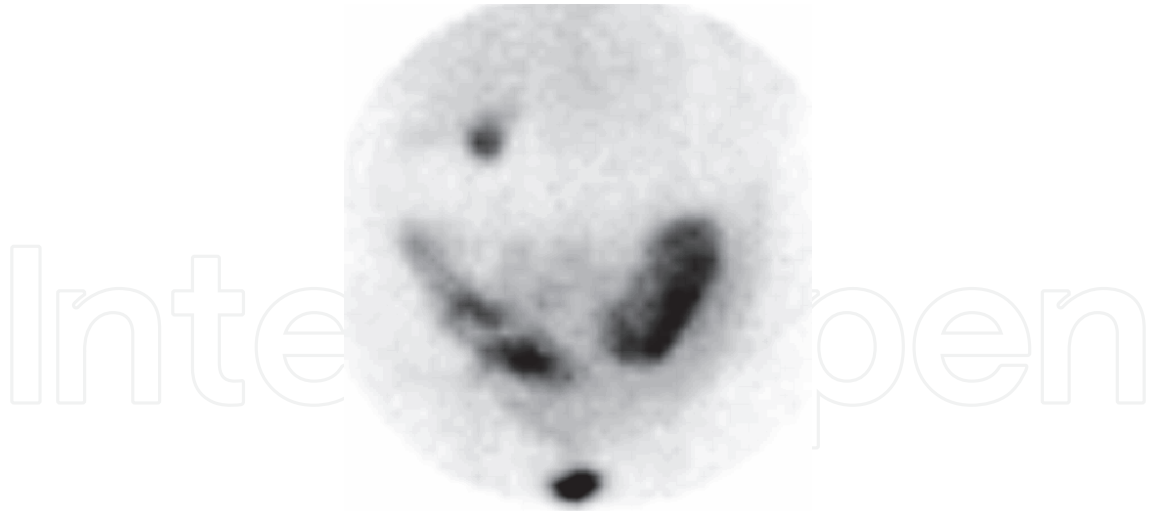


Fig. 1.1. Renal scan with contrast early extravasation (urinary fistula).

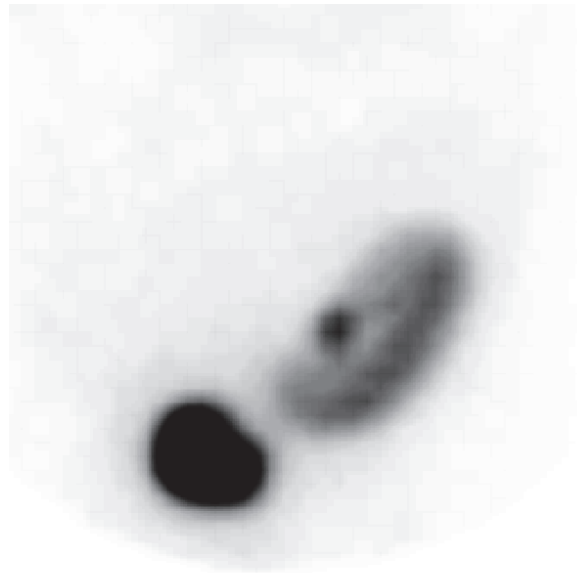


Fig. 1.2. Late renal scan without contrast extravasation (no fistula).

In the evaluation of transplant patients, nuclear medicine can contribute in the earliest complications that may arise in the period immediately following transplantation, as in the late complications and complications of surgical nature. A landmark study, conducted an initial assessment within the first 72 hours of surgery, is important so that we can better assess possible changes in the course of evolution. Studies with DTPA or MAG3 are the ones who will advise on the vascular phase and functional phase, and excretory phase, all parameters of the utmost importance in the evaluation of the graft (Kahan BD, 1989; Luk SH, 1999).

As surgical complications of kidney transplantation, the urinary fistulas are observed by scintigraphy an accumulation of the radiotracer outside the kidney (Luk SH, 1999). In cases of hematoma, other surgical complication, shows an area of low concentration of the tracer near the kidney, which may cause displacement of large structures such as vessels, ureter,

bladder and collecting system obstruction. The diuretic renogram may help elucidate this issue, because the transplanted kidney has the same performance as a native kidney scintigraphy.

Management of the urinary fistula:

Disruption of urinary tract in a renal transplant patient or graft dysfunction requires rapid diagnosis and treatment. Ureteral leakage needs careful and accurate diagnosis of the exact cause and site. It is important to know if the problem has a physical cause such a leak or an obstruction and is not associated with an acute rejection episode that required specific treatment (Streen SB, 1994; Rosenthal JT, 1994).

Surgical treatment has to be performed in all patients except those presenting with minimal extravasation at the ureteral reimplantation site and clinically stable. This group was initially treated by urinary drainage. In cases of unfavorable outcome after clinical treatment, surgery is indicated. Surgery is the initial approach for big extravasation or when leaks arising from the mid or upper ureter were suspected. We use the same incision of the transplant to access the fistulae. The type of surgical reconstruction is based on the intraoperative evaluation of the extent of the ureteral necrosis and local and systemic condition of the patient at the time of surgery. Primary reconstruction with the ureter of the recipient or a new ureteral reimplantation are performed preferentially when local and systemic condition allowed; if local or systemic infection are present and the patient is clinically unstable an ureteral ligature associated to a nephrostomy can be performed. Ureteral stenting alone is used exceptionally. All patients received prophylactic or therapeutic antibiotic according to the antibiogram of the collected fluid (Mazzucchi E, 2006).

The need for immediate open operative surgical intervention has been replaced, to a large extent, by early endourologic intervention (Banowsky LHW, 1991). The placement of a percutaneous nephrostomy can divert a leak or relieve obstruction and allow more definitive diagnosis. As described by Strem et al., endourologic management can select patients for whom the likelihood of successful nonoperative management is good. In a few cases, percutaneous access can offer long-term treatment with chronic stent management. Percutaneous techniques like nephrostomy associated to antegrade ureteral stenting works in 40% of a much selected group of patients presenting with small fistulae from the distal ureter (Campbell SC, 1993).

Early open surgery is our preferred approach. Our policy is to perform primary urinary tract reconstruction whenever local and systemic condition allows. Termino-lateral anastomosis of the graft ureter or pelvis with the ureter of the recipient can be used as technique for the correction of urinary leaks. Some groups use termino-terminal anastomosis with the ureter of the recipient (Salomon L, 1999) with good results but can result in ureterohydronephrosis of the native kidney after ureter ligation for reconstruction. Ureteroneocystostomy "de novo" is used for reimplantation defects or for small distal ureteral necrosis and can fail in many cases due to necrosis extension or incomplete ureteral and bladder wall resection during surgery. Ureteral reimplantation remains an important option for urinary fistulae management. Ureteral ligature and nephrostomy is performed when there is gross infection of the fossa or when the patient presents in sepsis. There is also described, in cases of infected urinary fistulas and to prevent distal ureteral ligature and nephrostomy, the introduction of a Foley's catheter through the bladder wall. The catheter's balloon is inflated at the transplanted renal pelvis to occlude the pyeloureteral junction and dry the region of the fistula (Suaid HJ, 2010).

Recurrences are due to insufficient ureter resection, leaving an ischemic stump extension of the process after the surgery or inadequate anastomosis. We recommend always leaving a double J stent in these cases in order to reduce recurrences but stents do not work if the necrosis extends. Recurrences were always managed surgically and an anastomosis with the ureter of the recipient was the first choice. Some patients can need a third procedure due to a new recurrence showing that the necrosis can extend after surgery and that extensive resection of the ureter is frequently necessary.

Mortality directly related to the fistula or to its correction was high in the early transplantation era (Dreikom K, 1992) and nowadays is reported to range from 0 to 8% (Salomon L, 1999). These better results are due to an earlier and more aggressive approach, reduction in the amount of corticosteroids in the immunosuppressive regimen and to better antibiotics and clinical support. The increase in the experience with these cases can still improve such results.

Routine ureteral stenting, to avoid urinary fistula, does not reduce significantly your incidence and its use is recommended only in special cases (contracted bladder, difficult anastomosis) (Campbell SC, 1993; Salomon L, 1999). In our center the modified Gregoir technique has been the procedure of choice in the last 35 years and the incidence of ureteral complications has been low.

2.2 Ureteral obstruction

Ureteral obstruction and ureteral leakage are the most common urinary complication after renal transplantation (Azhar, Hassanain et al. 2010). The incidence related in literature varies from 3 to 8% (Fontana, Bertocchi et al.; Smith, Windsperger et al.; Kaskarelis, Koukoulaki et al. 2008). Obstruction may occur during the early postoperative course due to blood clots, ureteral malrotation or kinking, tight submucosal tunnel, unsuspected donor calculus (Poullain, Devevey et al. 2010) or perigraft fluid collection (Kahan and Ponticelli 2000; Campbell, Wein et al. 2007). Late ureteral obstructions generally after the first month or even at years posttransplant are secondary to chronic ischemia which leads to chronic fibrosis and strictures. Other cause includes compressive lymphoceles or pelvic masses, ureteral lithiasis and rarely obstruction by ureteral carcinoma (Huurman, Baranski et al. 2008) or fungus ball (Vuruskan, Ersoy et al. 2005).

The clinical presentation includes pain over the surgical site, decreased urine volume leading to oligoanuria and rise in blood pressure secondary to impaired renal function. Diagnostic tests shows gradual rise in serum creatinine. The ultrasound demonstrates pyelocaliectasis (fig. 2.1) or ureteropyelocaliectasis (fig. 2.2) in most of cases. Nuclear scintigraphy is less sensitive because the obstructed kidney also displays impaired radionuclide uptake, a sign often present in allograft rejection. When the diagnosis is unclear the antegrade pyelogram must be performed, because is an accurate method to define anatomically the site, degree of obstruction (Kahan and Ponticelli 2000).

The treatment must be instituted as early as possible to avoid loss of renal graft function. Initially the nephrostomy by puncture must be done to ensure the patency of the kidney and restore renal function to normal. The definitive treatment of the obstruction is oriented according to the etiology. Stenosis ureteral at the site of bladder reimplantation is more common and can be addressed by several endourology techniques such as ureteral meatotomy or percutaneous ureteral dilation with balloon followed by angioplasty and implant of stent at the ureters. Such techniques are at acceptable levels of success especially

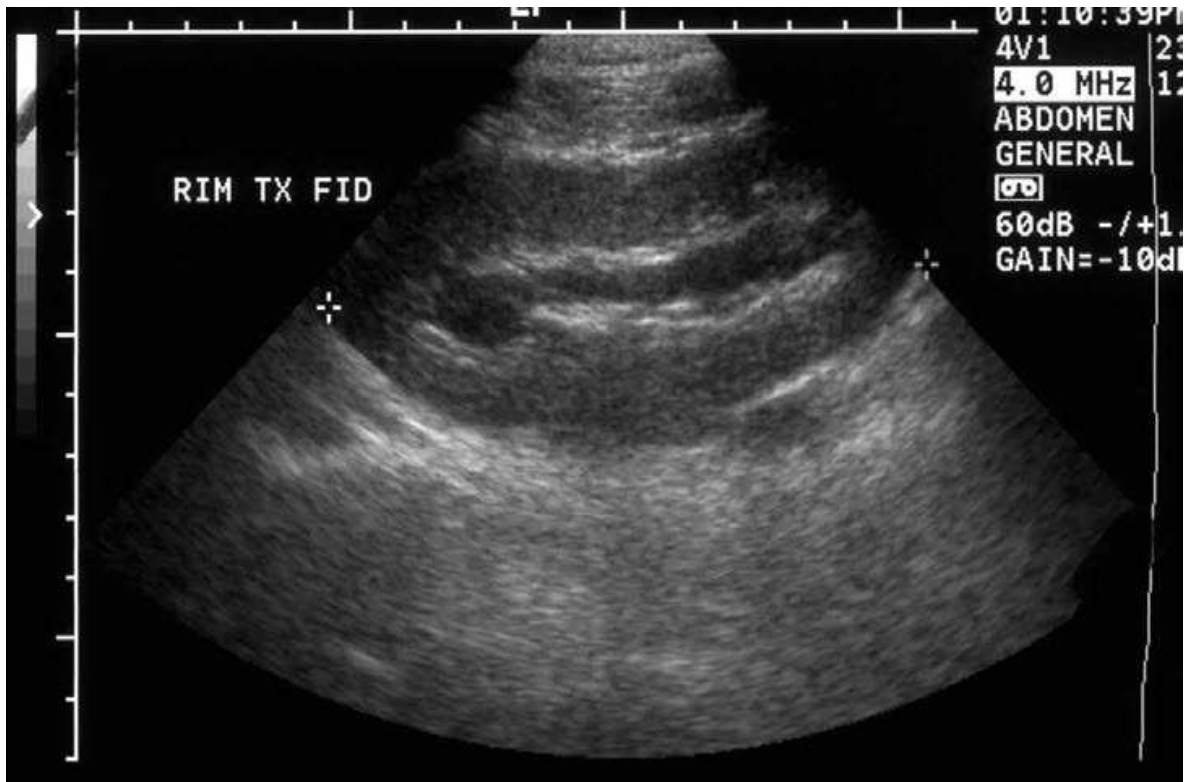


Fig. 2.1. Ultrasound with moderate hidronefrosis.



Fig. 2.2. Ultrasound of transplant kidney with ureteroectasis secondary to distal ureteral obstruction.

when treat small lesions (Burgos, Bueno et al. 2009). However, open surgery with reconstruction of the excretory pathway is still considered the gold standard. In distal ureteral obstructions or when there is redundant ureter, we can review the ureteroneocystostomy by extravesical Lich-Gregoir modified techniques (Campos Freire, de Goes et al. 1974) or intravesical (Politano-Leadbetter, 1958).

When there are multiple, long stenosis of the ureter or even poor vascularization, it is necessary to perform the anastomosis of the renal pelvis with the host ureter (ureteropyelostomy) or the ureter with the host ureter (ureteroureterostomy). However, the last technique has a higher rate of stenosis. When the native ureters cannot be used, the "Boari flap" should be done joining the short ureteral stump or the renal donor pelvis, allowing an adequate distance to the bladder. This allows tunneling the flap under the ureter, decreasing reflux and bacterial contamination during episodes of infection at the lower urinary tract. Extreme situations may require a pyelovesicostomy with anastomosis the donor urinary pelvis directly to the bladder. In this circumstance there is direct transmission of voiding pressure to the urinary collecting system as well as any urinary infection, leading to chronic pyelonephritis and deteriorating renal graft (Kahan and Ponticelli 2000).

3. Vascular complications

Although theoretically there is greater risk of surgical complications associated with living donors and recipients of kidneys with multiple arteries, in actuality it has not been considered more as a problem in laparoscopic (VLP) or open nephrectomy. This, indeed, is standard procedure in many transplant centers, (Wilson CH, 2005; Hsu TH, 2003) showing no significant adverse effects on the function and graft survival in VDL nephrectomies without or with hand assistance which may lead to higher vascular extension. (Saidi R, 2009; Hoda MR, 2010; Hoda MR, 2011) However, there is need for close attention to the anatomy of the donor due to the possibility of having two or more arteries and veins, or early arterial bifurcation (Benedetti E, 1995; Mazzucchi E, 2005; Harper JD, 2010). Furthermore, knowledge of microsurgical techniques for careful arterial graft reconstruction with multiple arteries and is essential for the reduction of vascular complications in these situations (Saidi R, 2009; Beckmann JH, 2008).

4. Arterial renal thrombosis

The most worrisome of vascular complications, it occurs in about 1% of all kidney transplants (Penny MJ, 1994; Bakir N, 1996) arterial thrombosis can reach values lower or higher in different series (Salehipour M, 2009).

Usually results from technical difficulties in removing the organ or implant. In nephrectomy and perfusion injury may occur in the endothelial layer, facilitating the process of thrombosis. The anastomoses of small vessels or of very different sizes or twisting or bending pressure are other predisposing factors for thrombosis, making demand for assessing the floor space of the kidney as well as proper positioning of the graft at surgery. With some frequency, there is a need to adjust the length of the renal artery to avoid kinking of the same. A technical care is obliquely sectioning the end of the renal artery (espatulating), which can reduce the risk of thrombosis and stenosis. Another factor to consider is the quality of the receiver because the arterial embolization of atheromatous

plaques predispose to thrombosis. Lesions in the endothelial artery caused by vascular clamp during anastomosis should also be considered (Gang S, 2009). Other situations of greater risk for vascular complications are patients receiving three or four kidney transplants, hyperacute rejection, and antiphospholipid antibodies (Gang S, 2009; Baños JLG 2005).

In children, either as donors or as recipients, renal transplantation deserves special attention, or some authors recommend the exclusion of donors under the age of 3 years and the best use of infusion solutions to reduce vascular complications and increase survival rates graft (Irtan S, 2010).

Clinical presentation and diagnosis:

The hallmark of renal artery thrombosis is the absence of blood perfusion of the parenchyma, which can still be identified intra-operatively. In the postoperative period the most common clinical presentation is the sudden interruption of urinary flow, without pain in the graft. Obstruction should be excluded from the catheter by blood clots. The renal perfusion should be evaluated by DMSA renal scintigraphy, by ultrasound Doppler, and even with arteriography, if needed (Nezami N, 2007).

The immediate surgical exploration may allow in a few cases, revascularization and recovery of the graft, especially if the diagnosis of arterial thrombosis is done before closing the incision. The loss of the graft is the most common consequence and nephrectomy should be performed (fig. 3.3).



Fig. 3.3. Nephrectomy: Arterial Renal Thrombosis.

5. Renal artery stenosis

The prevalence of renal artery stenosis is around 2% to 10% (mean 3.7%) (Benoit G, 1990). Clinical picture is suggested by onset severe hypertension post-renal transplant, dysfunction or presence of acute renal failure with prolonged NTA. With a peak onset at six months, renal artery stenosis can manifest itself as early as two days and as late as two years after transplantation. Stenoses located in the line of anastomosis, especially in termino-terminal anastomosis, the most frequent etiologic factor is technical failure. Other etiologic factors are largely the same that lead to arterial thrombosis, but acting with less intensity.

Clinical picture and diagnosis:

The suspicion must always occur when a transplant patient started with a progressive decline of renal function, heart murmur audible (or increasing its intensity) in the graft site and hypertension refractory to medical treatment. The diagnosis may be suggested by non-invasive techniques such as ultrasound associated with (color) Doppler (sensitivity 87 to 94%, specificity 86 to 100%). Doppler ultrasound is useful as screening and may show an increased blood flow velocity $> 6 \text{ kHz}$ ¹² (Nezami N, 2007).

The arteriography still remains the gold standard for diagnosis of arterial stenosis renal (Rengel M, 1998) The degree of stenosis is considered significant when more than 50% of the arterial lumen. Recently, gadolinium-enhanced MRI has allowed a noninvasive and efficacy comparable to that of renal arteriography convencional (Thornton MJ, 1999). The test with captopril, with plasma renin may be a method in the diagnosis of renal artery stenosis of kidney transplantado (Glicklich D, 1990).

The therapy depends on the location and degree of stenosis. Conservative treatment can be used in cases of mild stenosis in which blood pressure is controlled with medication and serum creatinine level remained stable.

Invasive procedures are indicated when blood pressure is not controllable by medication, there is progressive worsening of renal function or when noninvasive tests suggest the progression of stenosis. In this situation, diagnostic arteriography is indicated in combination with transluminal angioplasty and "stenting" (fig. 4.1, 4.2) (Leertouwer TC, 2000). This technique allows restoring renal perfusion in most cases and its effectiveness is confirmed immediately by a second angiography (Ghaffari S, 2009).

Intraluminal balloon dilatation with stenting is the preferred therapy for most patients, especially recommended in cases of localized stenosis and distant $> 1 \text{ cm}$ of the anastomosis. Surgery is reserved for lesions involving the anastomosis, or the surrounding area, and in cases of early artery stenosis renal (Benoit G, 1990). Other surgical procedures are indicated when the stenosis is severe and unsuitable for angioplasty or else, in this failure. Surgical techniques include reviewing local resection of the stricture and reanastomosis, may or may not be used autologous grafts (saphenous vein) or heterologous (Teflon) in the form of a patch graft or bypass, with success rates ranging between 63 to 92% (Bruno S, 2004), (fig. 4.3).

6. Renal vein thrombosis

The renal vein thrombosis is uncommon but serious complication, with incidence ranging between 0.9 and 4.5%, usually occurring in the first week after transplantation and with great potential for graft loss (Giustacchini P, 2002). Because the transplanted kidney does not have collateral circulation, venous stasis causes impairment of blood flow and consequent loss of function.



Fig. 4.1. Arteriography (post-transplant) showing a renal stenosis artery.

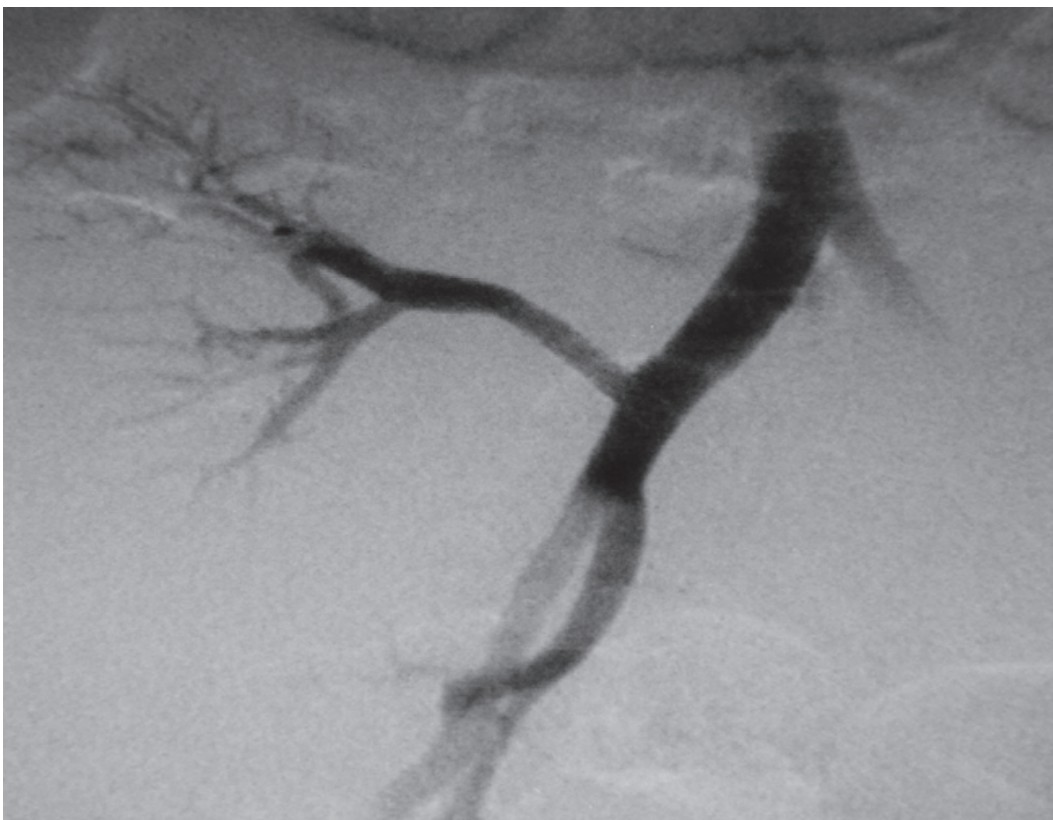


Fig. 4.2. Result after "stent" angioplasty.

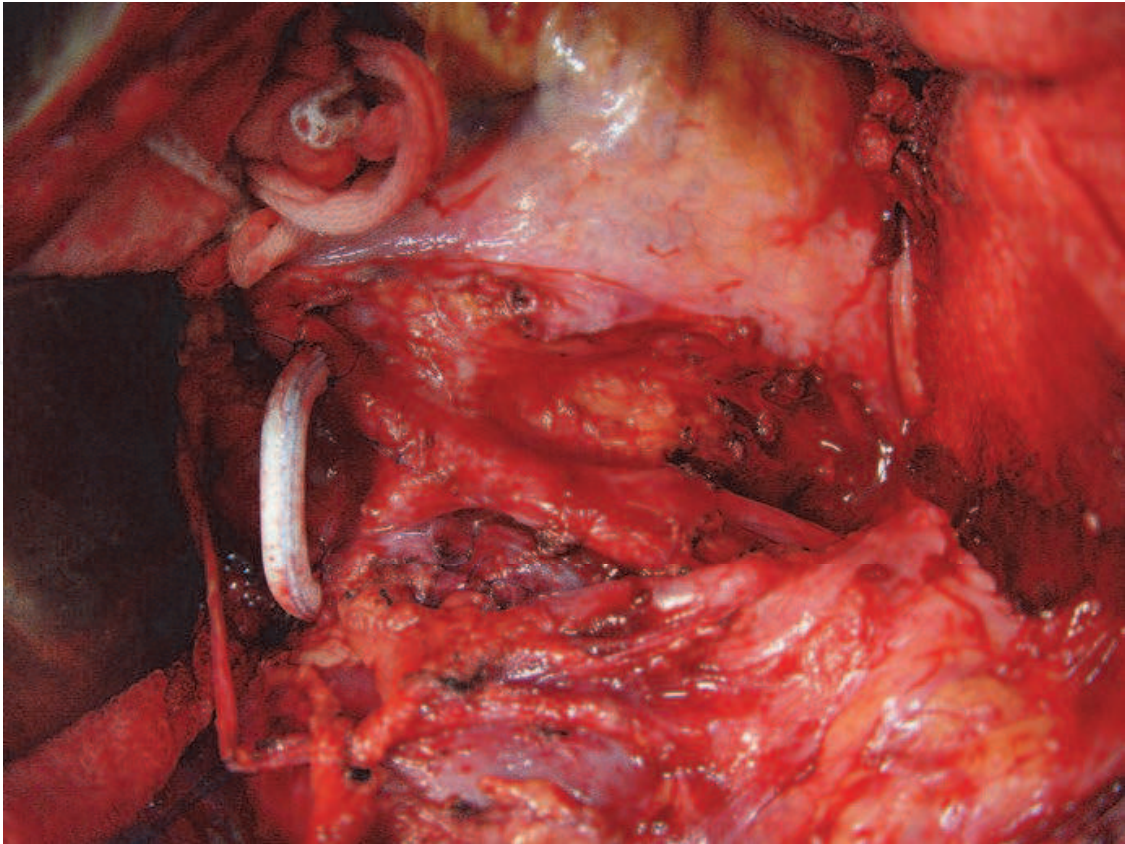


Fig. 4.3. Bypass iliac-renal arteries.

As causative agents related are: angulation of the renal vein or anastomotic stricture, dehydration, venous compression by lymphocele or hematoma, progression of ipsilateral iliofemoral thrombophlebitis should also be considered. Late cases of renal vein thrombosis have been associated with recurrence of membranous nephropathy, (Carrasco A, 2008).

Clinical presentation and diagnosis:

The symptoms is nonspecific as the sudden onset of hematuria, oliguria or anuria, accompanied by local pain and swelling of the graft. There may also increase the diameter of the ipsilateral lower limb deep venous thrombosis associated. The evaluation of renal Doppler ultrasound confirms the increase in renal volume and absence of venous flow. In the arterial can be seen reverse diastolic flow. Although it has been reported that early surgical exploration and thrombectomy allow the preservation of the graft in cases with renal vein thrombosis, but usually the kidney is no longer viable at the time of surgical exploration due to the spread intrarenal venous thrombus and prolonged hypertension. In most cases the nephrectomy is performed (Fathi T, 2007).

A complication associated with renal vein thrombosis is the rupture of the graft, which may cause hemorrhage and large hematoma perinephric (confirmed by ultrasonography), together with signs of hypovolemia and circulatory shock. Physical examination usually reveals bulging at the site. Nephrectomy is also standard procedure (figures 5.1, 5.2, 5.3).

However, in cases of rupture of the graft without thrombosis, should be attempted to suture the parenchyma and preservation of the graft (Gang S, 2009).



Fig. 5.1. Nephrectomy: Renal vein thrombosis.

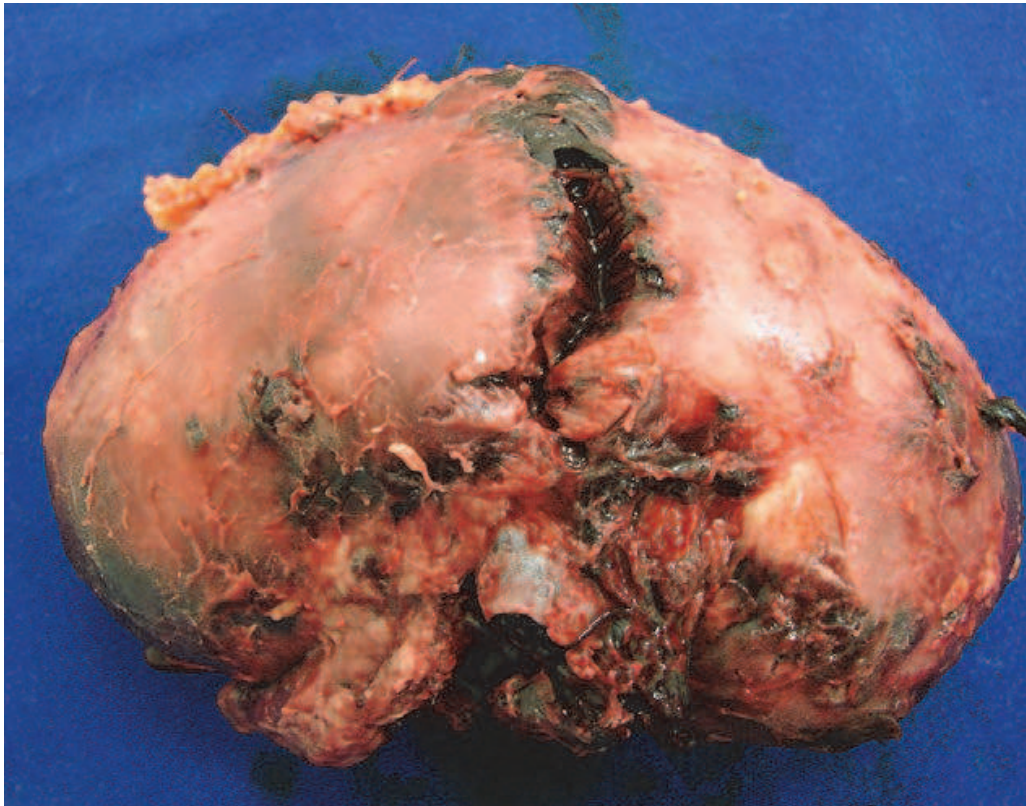


Fig. 5.2. Renal vein with thrombus inside and graft's rupture.

7. Lymphocele

Lymphocele is a lymph collection from the iliac lymphatic vessels of recipient or graft hilum that accumulates between the transplanted kidney and bladder. The average incidence of lymphocele in the literature ranges from 0.6 to 16% (Adani, Baccarani et al. 2007; Zargar-Shoshtari, Soleimani et al. 2008; Iwan-Zietek, Zietek et al. 2009). The etiology has been attributed to inadequate ligation of the delicate lymph vessels overlying the iliac vessels or present in the hilum. The method of renal uptake also appears to influence the appearance of lymphatic complications. The removal of the kidney by laparoscopy may prolong the lymphatic leak requiring drain for a longer period (Saidi, Wertheim et al. 2008). The small lymphoceles are more frequent but usually asymptomatic (Krol, Kolonko et al. 2007).

However, larger collections are manifested clinically in a few weeks to months after transplantation, bulging can occur in the surgical wound (Fig. 6.1) with or without cutaneous extravasation of lymph. In severe cases, there may be edema of lower limb ipsilateral to the graft, frequent urination due to bladder compression and ureteral obstruction leading to hydronephrosis and loss of renal graft function (Kahan and Ponticelli 2000)



Fig. 6.1. Abdominal bulging secondary to lymphocele.

The diagnosis is confirmed by ultrasound which may show hydronephrosis, altered vascular flow by Doppler and quantify the lymphocele or the presence of other collections such as hematoma (Fig. 6.2) or urinoma (Fig. 6.3)(Krol, Kolonko et al. 2007). In cases of doubt about the etiology, a computerized axial tomography (CT) (Fig. 6.4) can be performed following puncture of the collection guided by CT or ultrasound (US) with biochemical dosages of the liquid obtained.

The treatment can be divided into expectant, puncture and drainage or surgery. As previously mentioned, small volumes of lymphocele with less than 140ml and asymptomatic, tend to resolve spontaneously without any renal graft damage. Larger collections or lymphoceles with clinical manifestations can be punctured and drained, under strictly aseptic techniques and guided by US or CT. In this case you should aim for total disappearance of the collection. If there is clinically significant recurrence, a sclerotherapy with povidone-iodine 5% ethanol or antibiotics can be performed (Chandrasekaran, Meyyappan et al. 2003; Hamza, Fischer et al. 2006; Zomorodi and Buhluli 2007).



Fig. 6.2. Perinephric hematoma



Fig. 6.3. Urinoma.

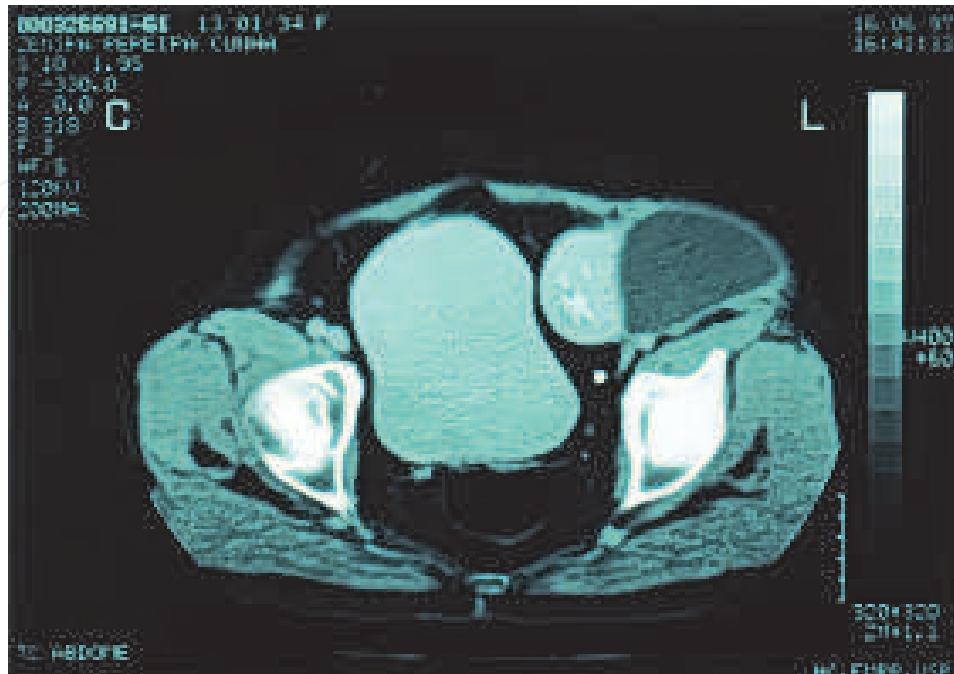


Fig. 6.4. Computerized axial tomography showing a lymphocele.

In lymphoceles larger than 500 ml, punctures, drainages and sclerotherapy are usually not effective. In cases refractory or complicated, the laparoscopic lymphocele fenestration (Marsupialization) is the procedure of choice in many centers. The laparoscopic technique reduces the risk of injury to the ureter or infection and demonstrates high rate of success. It is important to create a window sufficiently large to ensure patency of the ureter (Kahan and Ponticelli 2000).

When the location is not favorable to laparoscopy or in recurrent cases, the approach by open surgery should be performed, especially when the lymphocele is located posterior and lower to the transplanted kidney or behind the bladder (Fuller, Kang et al. 2003; Hamza, Fischer et al. 2006). In both techniques is recommended to perform the peritoneocystostomy with an oval window of at least 2.5 x 5.0 cm in width associated with interposition of short segment of omentum, allowing a good peritoneal absorption of lymphocele and avoiding internal hernias of the bowel segments (Kahan and Ponticelli 2000).

Recently was reported the treatment of recurrent and symptomatic lymphocele by inserting a Tenchoff catheter at the site of lymphocele tunneled to the abdomen, allowing the intraperitoneal drainage. This procedure offers as advantages the possibility of being performed in outpatient clinics, without general anesthesia, with good efficacy and safety, although the number of cases reported is still small (Adani, Sponza et al. 2007) (Adani, Baccarani et al. 2007).

In conclusion, the treatment of lymphoceles should begin by less invasive techniques. If there is recurrence or failure proceed to marsupialization by laparoscopy or open surgery.

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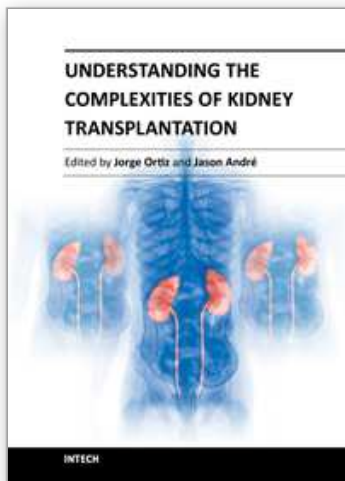
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Understanding the Complexities of Kidney Transplantation

Edited by Prof. Jorge Ortiz

ISBN 978-953-307-819-9

Hard cover, 564 pages

Publisher InTech

Published online 06, September, 2011

Published in print edition September, 2011

Kidney transplantation is a complex field that incorporates several different specialties to manage the transplant patient. This book was created because of the importance of kidney transplantation. This volume focuses on the complexities of the transplant patient. In particular, there is a focus on the comorbidities and special considerations for a transplant patient and how they affect kidney transplant outcomes. Contributors to this book are from all over the world and are experts in their individual fields. They were all individually approached to add a chapter to this book and with their efforts this book was formed. Understanding the Complexities of Kidney Transplantation gives the reader an excellent foundation to build upon to truly understand kidney transplantation.

How to reference

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Marcelo Ferreira Cassini, Murilo Ferreira de Andrade and Silvio Tucci Junior (2011). Surgical Complications of Renal Transplantation, Understanding the Complexities of Kidney Transplantation, Prof. Jorge Ortiz (Ed.), ISBN: 978-953-307-819-9, InTech, Available from: <http://www.intechopen.com/books/understanding-the-complexities-of-kidney-transplantation/surgical-complications-of-renal-transplantation>

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