Vascular complications after pediatric kidney transplantation

Tahar Gargah[1], Kamel Abidi[1], Hatem Rajhi[2], Taeb Ben Abdallah[3], Mohamed Chebil[4], Mohamed Rachid Lakhoua[1]

[1]Department of Pediatric Nephrology - [2]Department of Medical Imaging.
[3]Department of Nephrology - [4]Department of Urology.
Charles Nicolle hospital. Tunis. Tunisia. Tunis El Manar University

T. Gargah, K. Abidi, H. Rajhi, T. Ben Abdallah, M. Chebil, M. R. Lakhoua

Complications vasculaires après transplantation rénale chez l'enfant

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RÉSUMÉ

Prérequis : Les complications vasculaires, en particulier celles qui affectent la veine du greffon demeurent une cause majeure de la perte du greffon.
Buts : Evaluer rétrospectivement l'incidence et la prise en charge des complications vasculaires après la transplantation rénale chez l'enfant et étudier les facteurs de risque possibles et l'impact de ces complications sur la fonction du greffon.
Méthodes: Dans notre centre 82 greffes rénales ont été réalisées chez 79 patients. Les complications vasculaires sont suspectées en présence de symptômes évocateurs et confirmées par l'échographie Doppler et, si nécessaire par un angio-scanner.
Résultats: Sept complications vasculaires (8,5%) ont été recensées: thrombose de la veine rénale chez quatre patients, une sténose artérielle chez un patient et une thrombophlébite surale chez deux patients. La thrombose de la veine du greffon qui constitue la complication la plus fréquente est survenue dans les premières 24 heures après la transplantation rénale. Une transplantectomie a été réalisée chez tous ces patients. Dans les autres cas, l'évolution a été favorable, y compris chez le patient présentant une sténose de l'artère du greffon.
Conclusions: Les complications vasculaires au cours de la transplantation rénale sont redoutables et menacent la survie du patient et du greffon. L'amélioration de la technique chirurgicale et la surveillance rigoureuse radiologique devraient contribuer à réduire l'incidence et la gravité de ces complications.

Mots-clés

Enfant ; Transplantation rénale ; Thrombose veineuse ; Sténose artérielle

SUMMARY

Background: Vascular complications, especially those including the renal vein, remain a major cause of lost graft.
Aims: To evaluate retrospectively the incidence and management of vascular complications after pediatric renal transplantation and to assess possible risk factors and their effects on patient and graft.
Methods: A total of 82 consecutive renal transplants were performed in 79 patients at a single institution. The diagnosis of vascular complications was suspected in the presence of suggestive symptoms and confirmed by Doppler ultrasound and if necessary by a computed tomographic angiography. Urgent exploration was performed in all suspected cases.
Results: There were seven vascular complications (8,5%), including renal vein thrombosis in four patients, renal artery stenosis in one, and sural thrombophlebitis in two. The thrombosis of the graft vein which is the main complication occurred at mean 24 hours after renal transplantation. All these patients needed transplant nephrectomy after thrombosis event. In the remaining cases, the outcome was favorable even for the patient with transplant renal artery stenosis.
Conclusions: Vascular complications are common and serious events affecting patient and graft survivals. A perfect surgical technique and rigorous radiological monitoring may result in decreased incidence and severity of these complications.

Key-words

Child; Renal transplantation; Vein thrombosis; Artery stenosis

Vascular complications remain a major cause of morbidity and graft lost after pediatric renal transplantation. Graft vein thrombosis is the most common and usually occurs early in the postoperative period, with a variable clinical presentation consisting of unexplained drop in urine output, rise in serum creatinine and hematuria. The other vascular sites of thrombosis are less common. This retrospective review was undertaken to determine the frequency of vascular complications in pediatric kidney transplantation and identify the risk factors.

PATIENTS AND METHODS

Between January 1993 and December 2009, eighty-two kidney transplants were performed in 79 children at Charles Nicolle hospital (3 second grafts). Fifty-seven (69,5%) were from living related donors and twenty-five (31,5%) were from cadaveric donors. The incision used was the external pararectal with retroperitoneal access in all patients. The venous anastomosis was done to the common or external iliac vein and the arterial anastomosis was to common or external iliac artery. The uretero-vesical anastomosis was done with Lich-Gregoir technique. Postoperative treatment included antimicrobial prophylaxis and low-dose heparinization.

Immunosuppressive protocol consisted mainly of triple therapy with steroid, azathioprine/mycophenolate mofetil, and cyclosporine/tacrolimus. After transplantation the patients were monitored with daily biochemistry and Doppler ultrasound for the first week, and as needed thereafter.

The diagnosis of vascular complications was suspected in the presence of suggestive symptoms and confirmed by Doppler ultrasound and if necessary by a computed tomographic angiography. Urgent exploration was performed in all suspected cases.

RESULTS

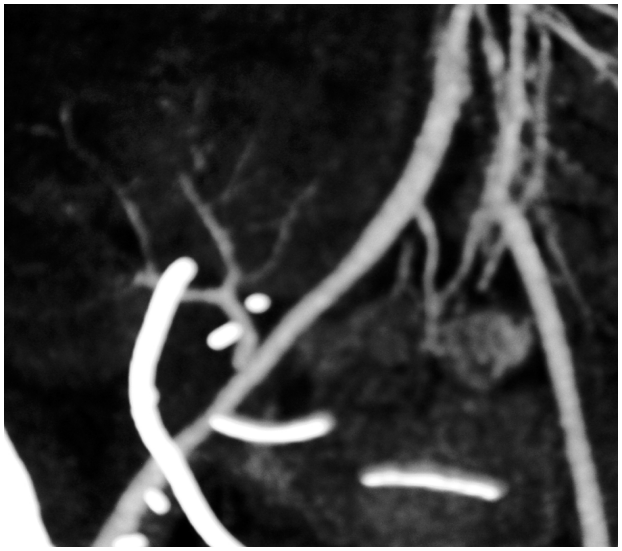
Seven episodes of vascular complications occurred in seven children, including renal allograft venous thrombosis (n=4), right sural thrombophlebitis (n=2) and transplant renal artery stenosis (n=1). There is no renal artery thrombosis. Demographic and clinical characteristics of these patients with vascular complications are summarized in table 1.

Table 1 : Demographic and clinical characteristics of patients with vascular complications

Patient	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Age (years) / weight (Kg) at transplantation	10/22	9/24	12/28	11/27	13/34	16/45	17/49
Sexe	Female	Male	Female	Male	Female	Male	Male
Primary Renal Disease	Renal hypoplasia	Nephronophtisis	Unknown	Vesico-ureteral reflux	Chronic glomerulonephritis	Focal and segmental glomerulosclerosis	Unknown
Thrombosis event before transplantation	Thrombosis of arteriovenous fistula	-	Thrombosis of arteriovenous fistula	-	-	Thrombosis of arteriovenous fistula	-
Donor	Living related (40 years)	Living related (35 years)	Living related (41years)	Living related (36 years)	Cadaveric (28years)	Living related (42years)	Cadaveric (27years)
Arterial anastomosis	Common iliac artery	Common iliac artery	Common iliac artery	Common iliac artery	Common iliac artery	Common iliac artery	Common iliac artery
Venous anastomosis	External iliac vein	External iliac vein	Common iliac vein	External iliac vein	External iliac vein	External iliac vein	External iliac vein
Thrombotic event	Graft vein thrombosis	Graft vein thrombosis	Graft vein thrombosis	Graft vein thrombosis	sural thrombophlebitis	sural thrombophlebitis	Graft artery stenosis
Outcome	Lost of graft	Lost of graft	Lost of graft	Lost of graft	Thrombosis resolved	Thrombosis resolved	Normal graft function

Renal allograft venous thrombosis was the most common complication. It occurred in 2 boys and 2 girls, with a mean age of 10.5 years (range 8-12 years) and a mean weight of 25 kg (range 22-28 kg). All grafts were from related living donors. The etiologies of end stage renal disease reported in our study were: one case of nephronophtisis, one case of renal hypoplasia and one case of vesico-ureteral reflux. The etiology was unknown in one case. Three patients had hypertension before renal transplantation. The thrombosis of the graft vein occurred at a mean 24 hours after renal transplantation. Doppler ultrasound had been contributory to the diagnosis in 3 out of 4. Computed tomographic angiography was used to confirm the diagnosis in one case (figure 1). All patients underwent exploratory surgery. Intraoperatively, both the renal artery and vein were patent, but the venous flow was noted to be sluggish. Transplant nephrectomy was performed in all patients. Pathological study of the nephrectomized graft revealed extensive capillary microthrombi throughout the kidney.

Figure 1 : Computed tomographic- angiography showed a poor enhancement of the transplant kidney artery (arrows) and non-visualisation of the graft vein.



Right sural thrombophlebitis occurred in two patients aged of 13 and 16 years respectively. This complication was suspected because moderate fever and pain with oedema of the right leg occurring in the second day after transplantation. Common femoral vein thrombosis was confirmed by Doppler sonogram. Anticoagulation with heparin was rapidly initiated and followed by administration of anti-vitamin K. After a 3-week course of anticoagulation the thrombosis lesions resolved. The patients were discharged from the hospital with normal graft function. There was no family history of thrombotic diseases. Their examination for lupus was negative and their antiphospolipid titers were negative. The coagulation studies were repeated on numerous occasions and always yielded normal or negative results.

Transplant renal artery stenosis was diagnosed in a 17-year-old boy who transplanted from deceased donor. Twelve months after transplantation, he was admitted in our department because of intractable hypertension. On admission, the patient's blood pressure was 180/100 mmHg. The pulse was symmetric between upper and lower extremities. His renal function was normal. A chest radiograph demonstrated cardiomegaly and prominent aorta. An electrocardiogram showed left ventricular hypertrophy. Echocardiography revealed hypertrophy of the interventricular septum and left ventricular free wall. Doppler ultrasound of renal graft showed a moderate stenosis in the proximal transplant renal artery with a significant decrease of resistance index. These data was confirmed by computed tomographic angiography (figure 2) which showed a decreased blood flow in proportion of 36%. This patient was treated by angiotensin-converting enzyme inhibitor with good response. The graft function remains normal.

Figure 2 : Computed tomographic- angiography demonstrates (arrow) a proximal stenosis of the transplant kidney artery.

DISCUSSION

In reviewing pediatric literature, we noted that vascular thrombosis and transplant renal artery stenosis have been well recognized since the advent of renal transplantation as an optimal therapy of end stage renal disease [1, 2, 3]. Detailed information regarding the incidence of vascular complication is variable depending on various factors such as the clinical status of the donor and recipient, prophylactic heparinization strategy and immunosuppressive therapy [4]. The incidence of vascular complications in our study was 8.5%. This value seems a little higher than in the literature in which the incidence does not exceed 6% [5]. The high incidence may be explained by the low weight of recipients and technical difficulties in young children.

The occurrence of sural thrombosis (unusual complication of renal transplantation, usually related to classic procedure surgery) in two patients has increased this incidence.

Graft vein thrombosis is a serious vascular complication [6]. It commonly manifests during the first few days after transplantation but can occur later [7]. It is more common after cadaveric than living donor transplantation. It is less common in male than female recipients, and more common in adult than children recipients [7]. Mechanical causes (compression of the renal vein by a hematoma or lymphocele), narrow venous anastomosis, or plication of the renal vein are the most common causes. Early severe vascular rejection and inherited coagulopathies are other possible Contributory factors [8].

Graft loss is the uniform outcome unless urgent diagnosis and therapy are undertaken [9]. Urgent surgical exploration was performed in our patients. However, the kidney graft has not retained its normal color after thrombectomy. Transplant nephrectomy was so performed in all patients.

Renal artery stenosis in the transplanted kidney may lead to hypertension and allograft dysfunction [10]. It occurs in 5%–15% of pediatric transplantation [11]. It should be suspected when there is onset of hypertension or significant increase of blood pressure over previous levels, often accompanied by proteinuria and/or an increase in plasmatic creatinine. Only hypertension was present in our patient. The prevalence of transplant renal artery stenosis has increased with the introduction of new non-invasive diagnostic methods. Wong [12] reported the prevalence of 2.4% before and 12.4% after the introduction of routine color Doppler ultrasound in the evaluation of hypertension.

Sural thrombophlebitis is an uncommon complication after renal transplantation. But, it may occur after any surgical intervention particularly in patients resting in bed for a long time. An exploration of haemostasis, as complete as possible, is imperative to search for a predisposing factor [8]. In our patients, the coagulation studies were repeated on numerous occasions and always yielded normal results.

In general, vascular complications in childhood renal transplantation are reported mainly in kidneys from cadaveric donors [13]. However, other studies found that vascular complications were equally distributed between living-related and cadaveric transplants [14]. Our sample is too small to gather any information concerning this controversy.

CONCLUSION

In summary, we can conclude that renal transplantation is the treatment of choice for end stage renal disease ESRD. However, it carries a significant risk for vascular complications. A perfect surgical technique and rigorous biological and radiological monitoring should help reduce the incidence of these complications.

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