AIM OF THE WORK

The purpose of this work was to study the surgical complications of renal transplantation in Alexandria University and to correlate them to patients outcomes.

PATIENTS

The present study was conducted in renal transplantation unit, Urology department, Main University Hospital, University of Alexandria, Egypt.

It was conducted as a retrospective study upon 104 couples during the period from June 1990 to December 2012. All of the recipients and their donors were followed up till June 2014 with a limitation of incomplete recording of peri-operative research data.

METHODS

Pre-operative evaluation:

I- Donor evaluation

1- Informed consent signed by all donors.

2- A general assessment with a clinical evaluation including personal and family history, physical and mental evaluation, relation to the recipient and measurement of blood pressure.

3- Immunological blood tests:
- Erythrocyte ABO and Rh typing
- HLA A, B and DR typing
- Cross-match test between the donor's lymphocytes and the recipient's serum

4- Biological tests:
- Complete blood count.
- Coagulation profile.
- Serum urea and creatinine, serum electrolytes, total protein, fasting blood sugar, uric acid.
- Liver enzymes, bilirubin.
- Cholesterol, triglycerides and LDL.

5- Tests for communicable diseases:
- HBsAg, anti-HBc
- Anti-HCV
- Anti-Human Immunodeficiency Virus (HIV) 1 and 2
- Anti-Epstein Barr Virus (EBV)
- Anti-cytomegalovirus (CMV)
- Syphilis serology

6- Renal evaluation
- Urine analysis and culture
- Renal ultrasonography
- Assessment of split renal function with Tc-99m DTPA renal scan.
- Detailed anatomic study of the kidneys using computed tomogram angiography (CTA).

7- Other investigations:
- Cardiovascular evaluation with stress test and echocardiography for donors over 50 years and/or smokers and/or mildly hypertensive donors for screening of coronary heart disease.
- Electrocardiogram
- Chest X-ray

8- Other specific investigations:
- For women, a pregnancy test and pelvic examination with Pap smear and mammogram
- For men above 50 years, the PSA assay.

9- pre-operative fluid management:
- Adequate intravenous hydration beginning the evening before the operation.
- The rate is gradually increased to approximately 1 liter fluid in the morning just before induction of anesthesia.

II- Pre-transplantation recipient assessment

1- Informed consent signed by all recipients.

2- A general assessment with a clinical evaluation including the collection of personal and family history, physical and mental evaluation, and measurement of blood pressure.

3-History of renal insufficiency:

- Cause of renal insufficiency
- Mode of dialysis or pre-emptive transplantation
- Previous transplantations
- Native nephrectomy

4-Immunological assessment:

- ABO and Rh blood grouping
- Tissue typing HLA A, B and DR
- HLA antibodies

5- Biological tests:

- Complete blood count.
- Coagulation profile.
- Serum urea and creatinine, serum electrolytes, total protein, fasting blood sugar, uric acid.
- Liver enzymes, bilirubin.
- Cholesterol, triglycerides and LDL.

6- Tests for communicable diseases:

- HBsAg, anti-HBc
- Anti-HCV
- Anti-Human Immunodeficiency Virus (HIV) 1 and 2
- Anti-Epstein Barr Virus (EBV)
- Anti-cytomegalovirus (CMV)
- Syphilis serology

7-Cardiovascular Assessment

- Electrocardiogram
- Chest radiograph
- Echocardiogram

8-Urological assessment

- History of previous urological surgery as augmentation cystoplasty
- Renal ultrasound
- Voiding cystourethrogram to search for vesico-ureteric reflux or reduced bladder capacity in patients with history of voiding dysfunctions or obstructive uropathies.

Intra-Operative evaluation

I-Standard Open Donor Nephrectomy

The present study followed the surgical technique of open donor nephrectomy described by J Barry and Streem Sb.[80, 81]

Anesthesia and fluid management:

1-Combined epidural analgesia + general anesthesia are given to the donor.
2- Once the initial incision is made, Mannitol (12.5 gm.) is infused.
3- I.V fluids are continued at approximately 10-15 ml. /kg. per hour.
4- Monitoring of urine output throughout the procedure to maintain adequate volume
5- An additional 12.5 gm. mannitol is administered after dissection of the main renal vessels and just before clamping of the renal artery.

Positioning:

Figure (9): Positioning of left open donor nephrectomy

Operative steps:[82]

The retro peritoneum is entered through a flank incision. Either a rib-resecting or a supracostal approach provides excellent exposure. Anteriorly, the incision is extended off the tip of the rib, and then carried downward and medially to the lateral border of the rectus fascia. The incision is deepened through the muscular layer, and exposure is maintained with a self-retaining retractor. The peri-renal fascia is opened, and the fat is separated from the kidney to expose the renal hilum and the adrenal gland. The peritoneum is retracted medially.

On the right side, the adrenal gland is separated from the kidney, and the right renal vein and the inferior vena cava (IVC) are exposed. The medial margin of the gonadal vein is used as a landmark to preserve ureteral blood supply, and the plane between the gonadal vein and the IVC is developed caudally until the gonadal vessels cross the ureter. The gonadal vessels are divided between ligatures lateral to the ureter

and at the lateral margin of the IVC. The ureter is then dissected distally with a large amount of periureteral tissue until it crosses the common iliac artery. The kidney is rotated medially and the renal artery is identified posterior to the IVC. The lymphatic and the nervous tissue overlying the renal artery is separated into bundles, ligated and divided. Adequate attention is given for any accessory or polar vessels. The dissection of the renal artery is accomplished outside the renal hilum, close to its aortic origin. A lumbar vein draining posteriorly into the renal vein might be identified at this time and is ligated and cut.

The kidney is now completely freed from the surrounding structures and attached only by the main renal vessels and the ureter. The ureter is transected to confirm the presence of diuresis. If there is no diuresis, the renal artery is examined for vasospasm which can be reversed with topical papaverine. Furosemide, 10 to 80 mg, or an additional 12.5 gm. mannitol can be administered, if necessary.

Once diuresis is confirmed, the renal artery is clamped and divided. A Satinsky clamp is applied to the side of the IVC to provide a cuff of the IVC. The renal vein is transected. Administration of heparin to the donor is unnecessary.

When the kidney is removed; it is flushed immediately with a cold isotonic electrolyte solution and kept in a basin of saline ice slush. The allograft is implanted immediately in an adjacent room where the recipient iliac fossa has been prepared simultaneously. If there is a delay until completion of the recipient bed, the kidney can be packaged in a sterile container, which is then packed in ice until the time of transplantation.

The renal artery is doubly ligated with 0 Vicryl. The outer Satinsky clamp is removed; the IVC cuff is over sewn with 5-0 vascular suture, and the remaining Satinsky clamp is removed.

The procedure for left donor nephrectomy is nearly the same as for the right donor nephrectomy with one exception. The adrenal vein is divided between ligatures at the cephalad border of the left renal vein.

A drain is inserted. Any incidental pleurotomy is repaired and a chest tube is added if necessary. The incision is closed in a standard fashion.

II-Standard of Renal Transplantation

Preparation of the graft:

1. Inspection of the graft
   - Verify the absence of renal pathology or lesion which was undetected during nephrectomy (tumor, sequelae of pyelonephritis)
   - Assess the characteristics of the graft (number of arteries, search for vascular lesions, length and vascularization of the ureter).
2. Preparation of the vascular pedicle
   - Check the renal vein tributaries and ligatures
   - renal artery is detected, cannulated and irrigated by heparin

Anesthesia, fluids and durgs

- Combined epidural analgesia and general anesthesia are given to the recipient.
- IV fluids: Normal saline, Ringer lactate and albumine. Systolic blood pressure must be maintained above 110 mm Hg at the moment of renal reperfusion (or CVP: 12-18 cm H_2O).
- Antibiotic prophylaxis
- Diuretic: Furosemide IV up to 10 mg/ Kg, at the moment of renal reperfusion.
- Induction Immunosuppression:
    a. Corticosteroids: Methylprednisolone (Solumedrol) IV 20 mg /Kg at induction.
    b. Monoclonal antibodies: Basiliximab (Simulect) IV 20 mg IV within 2 hours prior to transplant surgery

Operative steps:

After the induction of anesthesia and the placement of a triple lumen central venous catheter, the genitalia and skin are prepared and a Foley catheter is placed in the bladder or bladder substitute.

An oblique incision is made from the symphysis in the midline curving in a lateral superior direction to the iliac crest. It can be extended into the flank if more exposure is needed. Peeling the peritoneum medially and creating the fossa overlying Psoas major muscle to be a bed for the graft.

Vascular bed preparation

Dissection of iliac vessels to expose external iliac artery, external iliac vein and internal iliac artery with preservation of surrounding lymphatics

RENAL VEIN

The renal vein is anastomosed end-side to the external iliac vein. If there are multiple renal veins, the largest was used; the others can be ligated safely because of internal collateralization of the renal venous drainage. The venous anastomosis is usually done first to minimize ischemia to the leg.

RENAL ARTERY

The donor renal artery is either anastomosed to the external iliac artery in an end-to-side fashion or to the hypogastric artery in an end-to-end fashion. If an end-to-side anastomosis is chosen, a 2.7-mm aortic punch is useful in creating the recipient arteriotomy. A fine, nonabsorbent, monofilament suture, such as 6-0 polypropylene, is usually chosen. During the anastomosis time, the kidney was wrapped in a gauze pad with crushed ice saline to minimize warm ischemia.

Ureterovesical Anastomosis

Extravesical modified Lich-Gregoir technique. First, the bladder is distended with saline and the extravesical tissues are dissected from the detrusor muscle. A muscular tunnel is then created by separating the detrusor muscle from the bladder mucosa for a length of approximately 2 to 4 cm. The ureter is prepared by removing redundant ureteral length, preserving adequate distal blood supply, and spatulating posteriorly. A mucosal opening is created and interrupted or running biodegradable

suture, preferentially polydioxanone surgical suture, is used to approximate the ureteral and bladder mucosa. Double J ureteric stent (JJ) may be used to stent the ureterovesical anastomosis.

Finally, the detrusor muscle is closed exteriorly to create an antireflux mechanism. Absorbable suture is used to prevent stone formation. Foley catheter drainage of the bladder is required for five to seven days, unless there are bladder abnormalities that may necessitate longer drainage.

All of the following parameters were studied:

- Cold ischemia time (in minutes).
- Types of vascualr and ureterovesical anastmosis.
- Intra-operative urine production
- Graft colour, consistency and perfusion
- Ureteric stenting
- Surgical complications and mishaps.

Post-operative evaluation: (whenever possible)

I-Donors

- Serm creatinine (day 1, 7 30 after the procedure).
- Serum creatinine (3, 6,12 months)
- Serum creatinine (5, 10, 20, 25 years if possible)
- Postoperative donor complications were reported.
- 24-hours urine test for proteinurea (1, 3, 5, 10, 20years if possible)
- Measurment of eGFR at two points (pre doantion and one year after transplantation) using the abbreviated MDRD equation (MDRD = Modification of Diet in Renal Disease Study). [83]

II-Recipients

- Serm creatinine (day 1, 7, 30 after the procedure).
- Serum creatinine at 1, 3, 6 month/s
- Serum creatinine at (1, 5, 10, 15, 20, 25 years if possible)
- Doppler U/S in the same day of transpalntataion.

- Postoperative complications were carefully reported.
  Clavein-Dindo grading system[84] was used to categorize these complications
- Assessment of the graft survival.

RESULTS

Medical reports of one hundred and four consecutive live kidney transplant recipients and their donors admitted to Alexandria Main University Hospital, Urology department between June 1990 and December 2012 were recorded and analyzed and all of them were followed up till June 2014.

In the current study, the most common recipient age at transplantation was between 20-30 years (49%) with the median age (29 years) while the most common presenting age of their donors was below forty years with the median age (40 years). However the recipients male to female ratio was 2.2:1, the donor male to female ratio was 1:1.6 as shown in tables (I,II)

Table (I): The age and gender distribution among the recipients.

Age (years)	Number of recipients	%
<20	7	6.7
20-30	51	49.0
30-40	27	26.0
40-50	13	12.5
50-60	6	5.8
Total	104	100.0
Gender		
Female	32	30.8
Male	72	69.2
Total	104	100.0

Table (II): The age and gender distribution among the donors.

Age (years)	Number of donors	%
20-30	23	22.1
30-40	29	27.9
40-50	24	23.1
50-60	22	21.2
60+	6	5.8
Total	104	100.0
Gender		
Female	65	62.5
Male	39	37.5
Total	104	100.0

Table (III) shows that end-stage renal failure was due to non-surgical causes in 99 recipients (95.2%). In this cohort, pre-transplant nephrectomy needed only for six patients due to persistent hypertension, proteinuria and/or obstructed infected kidneys.

Three out of 104 recipients underwent pre-emtive transplantation that was reported after 2010.

Table (III): Etiology of ESRD in the recipients

Causes		Number of recipients	%
Non-surgical causes	**Hypertension**	35	33.7
	Glomerulonephritis	64	61.5
Surgical causes	**Obstructive uropathy**	5	4.8
Total		104	100.0

Table (IV) illustrates that the most commonly harvested kidneys had single artery and single vein. We use only eight kidneys with multiple vessels. Fifty eight recipients (55.8%) received the right kidney.

Table (IV): The graft characteristics

C.T findings		Number of recipients	%
	Single artery, single vein	96	92.3
Multiple vessels	Single artery, two veins	5	4.8
	Two arteries, single vein	1	1.0
	Two arteries, two veins	2	1.9
	Total	104	100.0
Side	Left	46	44.2
	Right	58	55.8
	Total	104	100.0

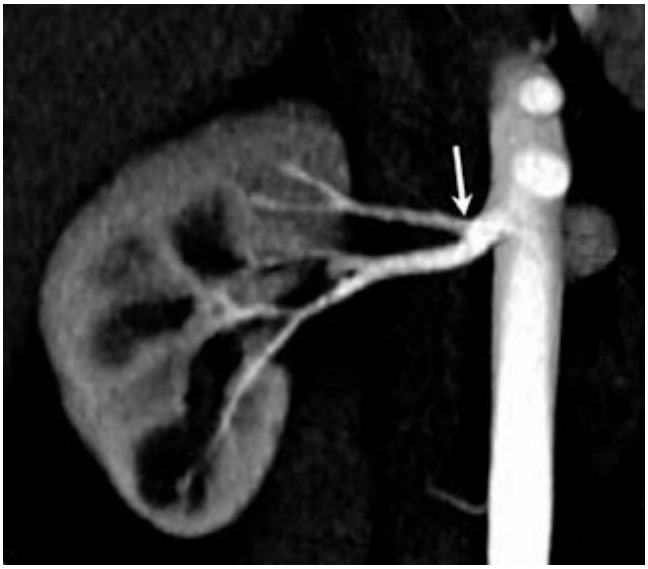


Figure (10): CT angiography in a 34 year old male donor scheduled for donor nephrectomy showing early branching (<2 cm) on the right side (arrow).

The standard immunosuppression protocols were used for the recipients including cyclosporine, steroids, and mycophenolate mofetil or azathioprine triple therapy. Induction therapy with monoclonal antibodies (daclizumab or basiliximab) was prescribed only for 32 patients (30.8%) who had 3 HLA mismatches as shown in table V

Table (V): HLA matching of the recipients

HLA	Number of recipients	Percent
3	32	30.8
4	36	34.6
5	25	24.0
6	11	10.6
Total	104	100.0

The donor renal vein was anastomosed in all recipients end- side to the external iliac vein using 5/0 double needle prolene. All recipients except three had end-end arterial anastomosis between the graft artery and the internal iliac artery using 6/0 prolene. End-side arterial anastomosis with the external iliac artery and common iliac artery in two and one recipient respectively were reported.

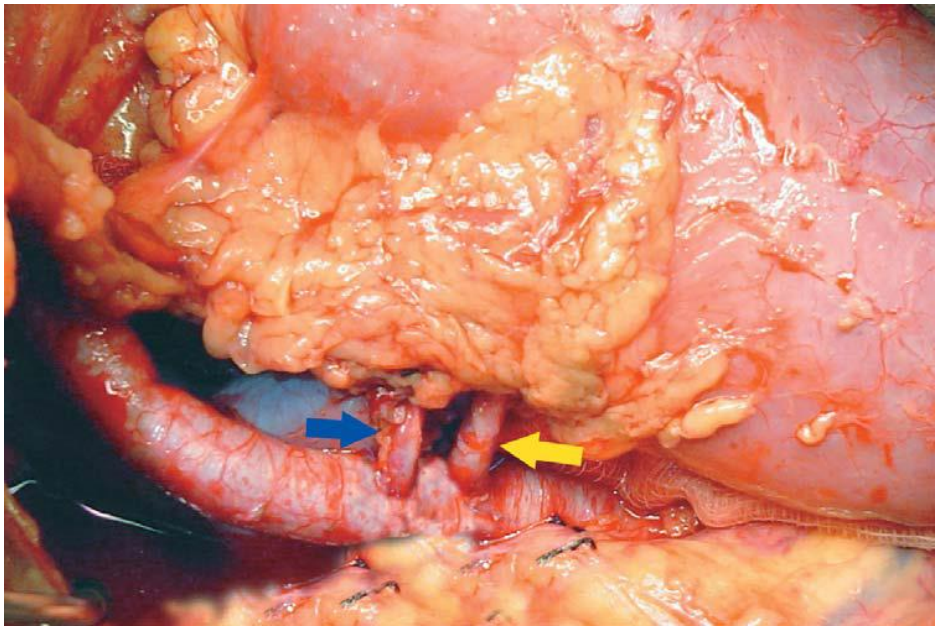


Figure (11): End-side arterial anastomosis of two renal arteries to the external iliac artery.

As shown in Table (VI), all of the uretero-vesical anastomoses were done using the modified Lich-Gregoir extra-vesical technique. Non stented anastomosis was adopted for the first sixty four recipients while routine ureteric double J stent was used in the last forty recipients.

Table (VI): Ureteric stenting of the ureterovesical anastomosis

Ureteric stenting	Number of recipients	%
Non-stented	64	61.5
stented	40	38.5
Total	104	100.0

Table (VII): Cold ischemia time

Cold ischemia time (minutes)	Number of the recipients	%
40-50	36	34.6
50-60	30	28.8
60-70	19	18.3
70-170	19	18.3
Total	104	100.0

The lowest cold ischemia time was 44 minutes while the longest time was 170 minutes.

One out of 104 patients needed intra-operative blood transfusion. Vascular bed preparation in the recipients usually started before donor nephrectomy procedure. Due to accidental injury of internal iliac vein/veins and massive bleeding, transplantation aborted and both donor and recipient were re-explored two days later.

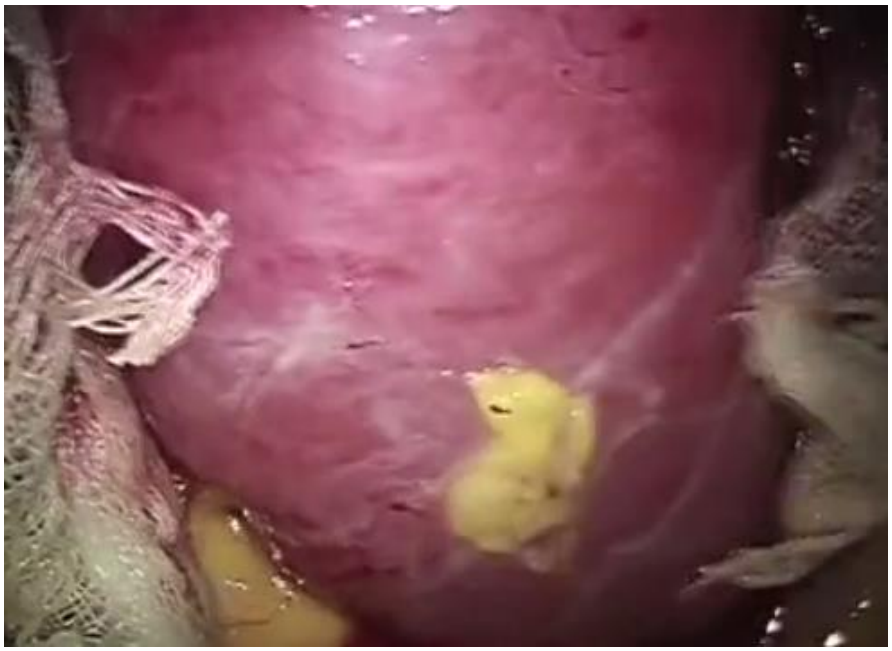


Figure (12): Firm pink well perfused graft after vascular declamping.

We did Doppler U/S study of the graft in the same day of the transplantation, low flow with high RI were detected in 18 recipients (17.3%).

Table (VIII): The recipients serum creatinine at the first and 7th post-operative days.

Serum creatinine (mg/dl) Day 1	**Number of the recipients**	**%**
<2	8	7.7
2-4	71	68.3
>4	25	24.0
Total	104	100.0
Serum creatinine (mg/dl) Day 7		
0.1-1.0	9	8.7
1.0-1.5	44	42.3
1.5-2.0	11	10.6
>2	38	36.5
Not done	2	1.9
Total	104	100.0

Twenty two recipients (21%) were scheduled for hemodialysis in the first post-operative week.

Redivac drain was removed after 5 days while the urethral catheter was removed after 7 to 10 days. The recipients were discharged after measurement of the trough level of immunosuppression drugs on the 7th post-operative day. The donors were discharged on the 1st post-operative day.

Table (IX): The incidence and grading of post-transplantation surgical complications using Clavein-Dindo system.

Surgical complication	Incidence	%	I	II	IIIa	IIIb	IVa	IVb	V
Renal artery thrombosis	7	6.7	-	-	-	-	6	-	1
Renal artery stenosis	4	3.8	-	-	1	1	-	-	2
Hemorrhage	8	7.7	-	3	-	5	-	-	-
Urinary fistulae	10	9.6	1	-	2	6	1	-	-
Obstructive uropathy	3	2.9	-	-	2	1	-	-	-
lymphocele	9	8.7	4	-	2	3	-	-	-

Overall there were forty one surgical complications in thirty seven recipients, an incidence of 35.5%. Nineteen vascular complications developed in 17 patients and 11 recipients had 13 urologic complications. Lymphocele was post-operatively diagnosed in nine recipients.

Renal artery thrombosis (RAT) occurred within the first 24 to 48 hours after surgery in seven patients (6.7%). All except one patient underwent re-exploration that resulted in graft nephrectomy. Renal artery stenosis (RAS) was diagnosed in four patients (3.8%), two of them died within the first post-operative week due to pulmonary embolism. One of the remaining two patients underwent angiographic balloon dilatation and stenting on 10th post-operative day under local anesthesia and the other one underwent surgical repair of stenotic segment on 4th post-operative day.

In this study, RAT was significantly developed in the recipients who had obstructive uropathy as a cause of ESRD (p=0.002).

Table (X): Renal artery thrombosis and risk factors

Risk factors	RAT				Total		p
	Yes "n=7"		No "n=97"				
	No.	%	No.	%	No.	%	
Recipient Age (years)							
< 29	2	3.4	56	96.6	58	55.8	0.135
> 29	5	10.9	41	89.1	46	44.2	
Recipient gender							
Female	3	9.4	29	90.6	32	30.8	0.236
Male	4	5.6	68	94.4	72	69.2	
Donor Age (years)							
< 40	5	9.6	47	90.4	52	50.0	0.2513
> 40	2	3.8	50	96.2	52	50.0	
Etiology of ESRD							
Medical	5	5.1	94	94.9	99	95.2	0.002*
Surgical	2	40.0	3	60.0	5	4.8	
Cold ischemia time (minutes)							
<44	1	10.0	9	90.0	10	9.6	0.611
>44	6	6.4	88	93.6	94	90.4	
Pre Transplant Dialysis							
Yes	7	6.9	94	93.1	101	97.1	0.107
No	0	0	3	100	3	2.9	

In this cohort, although all studied risk factors had no statistically significant impact on the development of RAS, all recipients developed such complication had cold ischemia time more than 44 minutes (p=0.254).

Table (XI): Renal artery stenosis and risk factors

Risk factors	RAS				Total		p
	Yes "n=4"		No "n=100"				
	No.	%	No.	%	No.	%	
Recipient Age (years)							
< 29	2	3.4	56	96.6	58	55.8	0.652
> 29	2	4.3	44	95.7	46	44.2	
Recipient gender							
Female	1	3.1	31	96.9	32	30.8	0.524
Male	3	4.2	69	95.8	72	69.2	
Donor age (years)							
< 40	1	1.9	51	98.1	52	50.0	0.512
> 40	3	5.8	49	94.2	52	50.0	
Etiology of ESRD							
Medical	4	4.0	95	96.0	99	95.2	0.104
Surgical	0	0.0	5	100.0	5	4.8	
Pre Transplant dialysis							
Yes	4	4.0	97	96.0	101	97.1	0.425
No	0	0.0	3	100.0	3	2.9	
Cold ischemia time (minutes)							
<44	0	0.0	10	100.0	10	9.6	0.254
>44	4	4.3	90	95.7	94	90.4	

Post kidney transplant hemorrhage and hematomae were encountered in eight patients (7.7%), two of them were associated with (RAT). Conservative measures with blood transfusion were the treatment plan for three patients, while exploration was done for the remaining five patients revealed only blood clots surrounding the graft without definitive source of active bleeding.

All recipients diagnosed as post-transplant hemorrhage were primarily diagnosed as CKD due to medical kidney diseases and underwent pre-transplant dialysis, however they were not statistically significant (p=0.52 and 0.221 respectively).

Table (XII): Post-transplant hemorrhage and risk factors

Risk factors	post-transplant hemorrhage				Total		p
	Yes "n=8"		No "n=96"				
	No.	%	No.	%	No.	%	
Recipient Age (years)							
< 29	6	10.3	52	89.7	58	55.8	0.25
> 29	2	4.3	44	95.7	46	44.2	
Recipient gender							
Female	2	6.3	30	93.8	32	30.8	0.521
Male	6	8.3	66	91.7	72	69.2	
Donor age (years)							
< 40	4	7.7	48	92.3	52	50.0	1.00
> 40	4	7.7	48	92.3	52	50.0	
Etiology of ESRD							
Medical	8	8.1	91	91.9	99	95.2	0.52
Surgical	0	0.0	5	100.0	5	4.8	
Cold ischemia time (minutes)							
<44	1	10.0	9	90.0	10	9.6	0.652
>44	7	7.4	87	92.6	94	90.4	
Pre Transplant dialysis							
Yes	8	7.9	93	92.1	101	97.1	0.221
No	0	0.0	3	100.0	3	2.9	

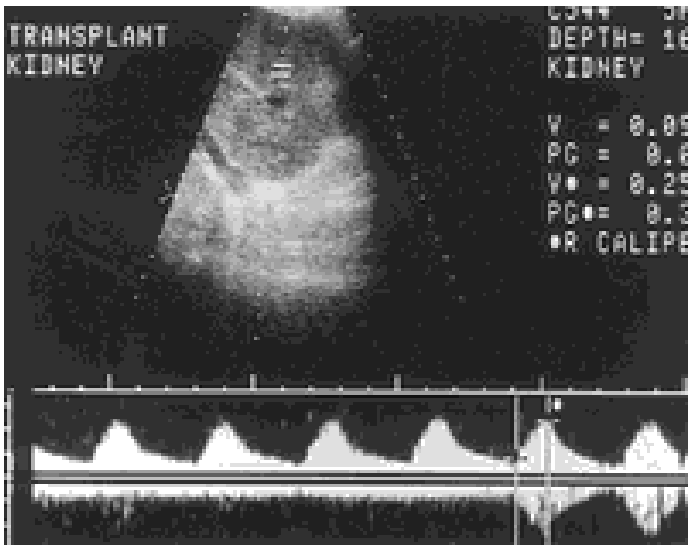


Figure (13): Doppler US image of RAS; shows a tardus parvus waveform distal to the stenosis.

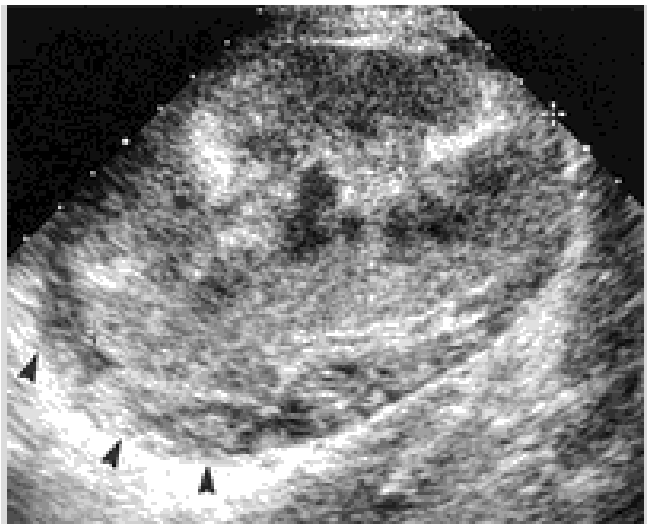


Figure (14): US image of post-transplant hematoma in a patient who presented with pain over the graft, an echogenic mass (arrowheads) surrounding the renal transplant.

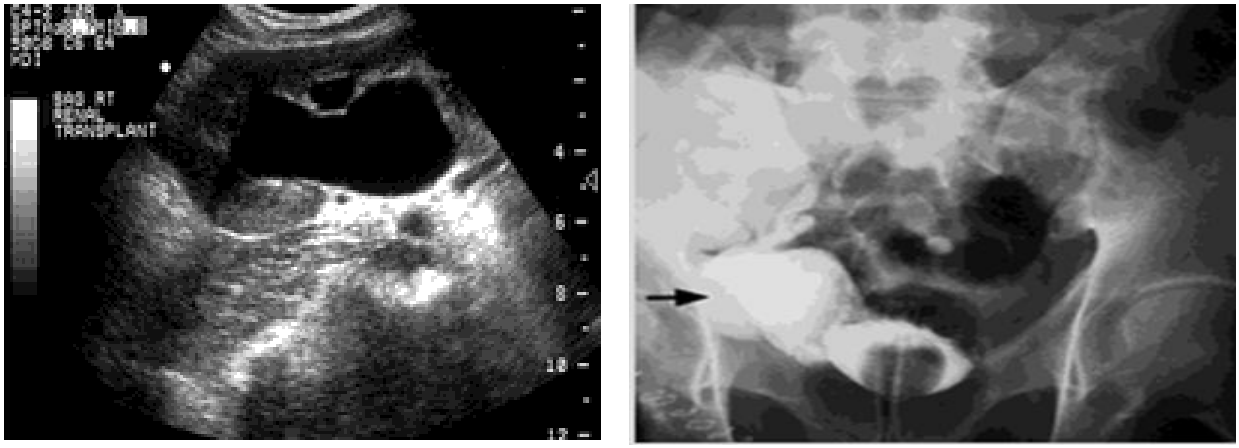
Urinary fistulae were reported in ten patients (9.6%). From 2000 to 2005, seven patients developed post-transplant urinary leakage within the first post-operative week. Re-exploration was adopted in six patients resulted in repair of ureterovesical anastomosis with insertion of JJ stent in five patients and graft nephrectomy in one of them due to associated massive perinephric collection and accidental vascular injury.

From 2007 to the end of this study, three recipients developed urinary fistulae after stented extra vesical ureteroneocystostomy. PCN insertion resulted in cessation of urine leakage with no need of further interventions.

Medical causes of ESRD in our recipients were significantly associated with the development of urinary fistulae (p=0.0333). Grafts from older donors (above 40 years) had significant risk of development of post-transplant urinary fistulae (p=0.042). Non-stented urterovesical anastomoses resulted in more urinary leakage than stented one (p=0.042).

Table (XIII): Urinary fistulae and risk factors

Risk factors	**Urinary fistulae**				**Total**		**p**
	Yes "n=10"		**No "n=94"**				
	No.	**%**	**No.**	**%**	**No.**	**%**	
Recipient Age (years)							
< 29	8	13.8	50	86.2	58	55.8	
> 29	2	4.3	44	95.7	46	44.2	0.071
Recipient gender							
Female	2	6.3	30	93.8	32	30.8	0.107
Male	8	11.1	64	88.9	72	69.2	
Donor age (years)							
< 40	2	3.8	50	96.2	52	50.0	
> 40	8	15.4	44	84.6	52	50.0	0.042*
Etiology of ESRD							
Medical	10	10.1	89	89.9	99	95.2	0.033*
Surgical	0	0.0	5	100.0	5	4.8	
Pre Transplant dialysis							
Yes	9	8.9	92	91.1	101	97.1	
No	1	33.3	2	66.7	3	2.9	0.107
Cold ischemia time (minutes)							
<44	1	10.0	9	90.0	10	9.6	0.632
>44	9	9.6	85	90.4	94	90.4	
Stenting	**Stent**		**Non stent**				P
	3	30.0	7	70.0	10	9.6	0.042*



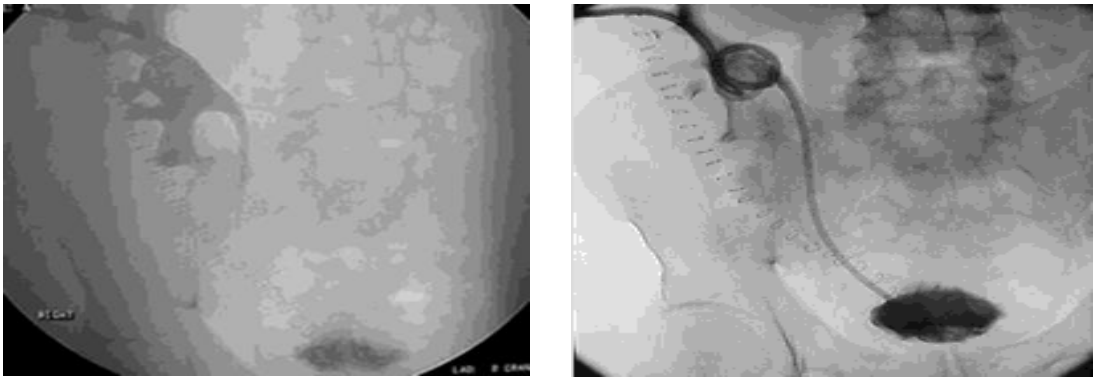
A **B**

Figure (15): Diagnostic modalities of urinary leakage: (A) U/S reveals a renal transplant that is obstructed because of a ruptured ureterovesical anastomosis and an urinoma. (B) Cystogram demonstrates extravasation (arrow).

Proximal and distal ureteric strictures were reported in one and two recipients respectively. The proximal stricture suspected to be due to compromised ureteric vascularity, it was managed by laser endoureterotomy and JJ exchange 3 months after transplant while for distal strictures that developed after JJ removal, PCN insertion and ante-grade JJ stent insertion later on was the treatment of choice.

Table (XIV): Post transplant obstructive uropathy and risk factors

Risk factors	Post transplant obstructive uropathy				Total		p
	Yes "n=3"		No "n=101"				
	No.	%	No.	%	No.	%	
Recipient Age (years)							
< 29	2	3.4	56	96.6	58	55.8	0.365
> 29	1	2.2	45	97.8	46	44.2	
Recipient gender							
Female	1	3.1	31	96.9	32	30.8	0.652
Male	2	2.8	70	97.2	72	69.2	
Donor age (years)							
< 40	2	3.8	50	96.2	52	50.0	0.422
> 40	1	1.9	51	98.1	52	50.0	
Etiology of ESRD							
Medical	3	3.0	96	97.0	99	95.2	0.254
Surgical	0	0.0	5	100.0	5	4.8	
Pre Transplant dialysis							
Yes	3	3.0	98	97.0	101	97.1	0.565
No	0	0.0	3	100.0	3	2.9	
Cold ischemia time (minutes)							
<44	0	0.0	10	100.0	10	9.6	0.421
>44	3	3.2	91	96.8	94	90.4	
Stenting	**Stent**		**Non stent**				
	2	66.7	1	10.0	3	2.8	0.013*



A **B**

Figure (16): Endourologic management of post-transplant ureteral stricture:

(A) Dilation of a proximal ureteral stricture.

(B**)** Demonstrates placement of a JJ stent across a proximal ureteral stricture after laser endoureterotomy

Post-transplant lymphocele was diagnosed in nine recipients (8.7%), most of them associated with long cold ischemia time (88.8%).

Both medical causes of ESRD and long cold ischemia time were significantly associated with the development of post-transplant lymphocele (p=0.0401 and 0.033 respectively).

Observation and serial imaging Follow-up were adopted for asymptomatic lymphoceles in four patients. U/S guided aspiration and sclerotherapy was served for two patients. Open and laparoscopic marsupialization were done for two and one recipient respectively after stabilization of the renal functions six month after transplantation.

Table (XV): Post-transplant lymphocele and risk factors

Risk factors	Lymphocele				Total		p
	Yes "n=9"		No "n=95"				
	No.	%	No.	%	No.	%	
Recipient Age (years)							
< 29	7	12.1	51	87.9	58	55.7	0.162
> 29	2	4.3	44	95.7	46	44.3	
Recipient gender							
Female	3	9.4	29	90.6	32	30.8	0.425
Male	6	8.3	66	91.7	72	69.2	
Donor age (years)							
< 40	2	3.8	50	96.2	52	50	0.081
> 40	7	13.5	45	86.5	52	50	
Etiology of ESRD							
Medical	9	9.1	90	90.9	99	95.2	0.0401*
Surgical	0	0.0	5	100.0	5	4.8	
Pre Transpalnt dialysis							
Yes	9	8.9	92	91.1	101	97.1	0.365
No	0	0.0	3	100.0	3	2.9	
Cold ischemia time (minutes)							
<44	1	10.0	9	90.0	10	9.6	0.033*
>44	8	8.5	86	91.5	94	90.4	

In this current study, six out of eleven recipients developed post-transplant urologic complications had serum creatinine more than 2 mg/dl, an observation which was statistically significant.

Table (XVI): Impact of surgical complications on the recipient serum creatinine at one month post-transplant.

Surgical complication	Number of recipients	Serum creatinine at 1 month (mg/dl)										p
		0.1-1		1-1.5		1.5-2		>2		Not done		
		No.	%	No.	%	No.	%	No.	%	No.	%	
Renal artery thrombosis	7	0	0.0	0	0.0	0	0.0	0	0.0	7	100.0	-
Renal artery stenosis	4	0	0.0	0	0.0	2	50.0	0	0.0	2	50.0	-
Post-transplant hemorrhage	8	0	0.0	2	25.0	1	12.5	2	25.0	3	37.5	0.365
Urinary fistulae	10	1	10.0	1	10.0	3	30.0	4	40.0	1	10.0	0.021*
Obstructive uropathy	3	0	0.0	0	0.0	1	33.3	2	66.7	0	0.0	0.043*
Lymphocele	9	1	11.1	5	55.6	1	11.1	2	22.2	0	0.0	0.236

It was found that all surgical complications mentioned had no statistically significant impact on the graft survival.

Table (XVII): Impact of surgical complications on graft survival

Surgical complications	Graft survival				p
	1 year		5 years		
	No.	%	No.	%	
Renal artery thrombosis	0	0.0	0	0.0	-
Renal artery stenosis	2/4	50.0	1/3	33.3	0.42
Urinary fistulae	8/10	80.0	8/10	80.0	1.0
Post-transplant hemorrhage	6/8	75.0	6/8	75.0	1.0
Obstructive uropathy	2/3	66.7	1/2	50.0	0.782
Lymphocele	9/9	100.0	8/8	100.0	1.0

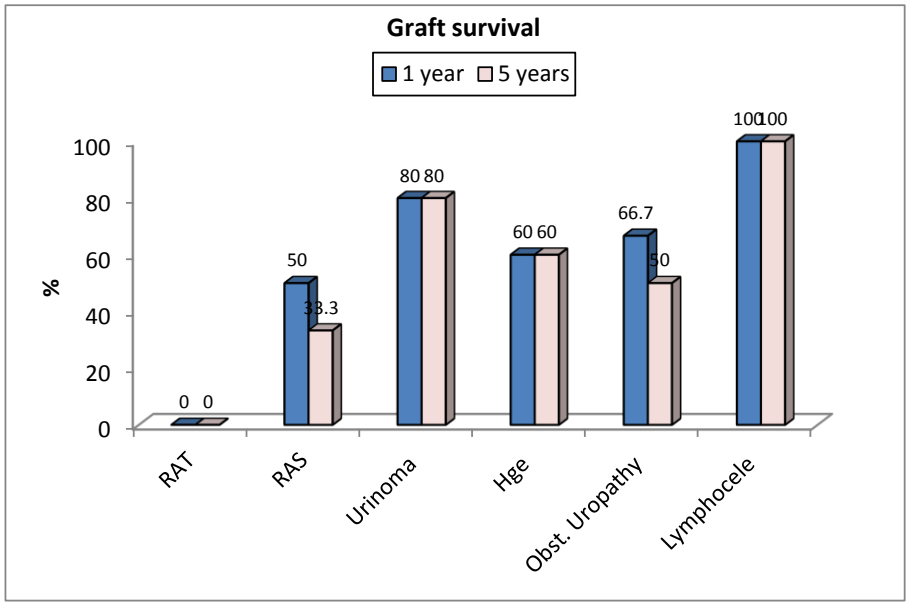


Figure (17): Impact of surgical complications on 1 and 5 years graft survival.