ETIOLOGY AND DETERMINENTS OF RENAL ALLOGRAFT DYSFUNCTION

Dissertation Submitted for

D.M. DEGREE EXAMINATION
BRANCH NO. III, NEPHROLOGY
DEPARTMENTAL OF NEPHROLOGY
GOVT. STANLEY MEDICAL COLLEGE
CHENNAI – 600 001.

THE TAMIL NADU
DR.M.G.R. MEDICAL UNIVERSITY
CHENNAI – TAMILNADU

AUGUST 2011

CERTIFICATE

This is to certify that this Dissertation titled **"Etiology and determinants of allograft dysfunction"** is a bonafide work done by **Dr. S. THIRUMAVALAVAN** Post Graduate Student (2008-2011) in the Department of Nephroloy, Govt. Stanley Medical College, Chennai under the direct guidance and supervision and in partial fulfillment of the regulations laid down by the Tamilnadu Dr. M.G.R. Medical University, Chennai for DM Branch III, Nephrology Degree examination.

Dr. J. RAVISHANKAR M.S.
Dean,
Govt. Stanley Medical College,
Chennai – 600 001.

Prof. Dr. R. VIJAYAKUMAR MD DM
Professor & Head of the Department
Department of Nephrology
Govt. Stanley Medical College,
Chennai – 600 001.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to my beloved Professor and Head of Nephrology Department, Dr.R. Vijayakumar, M.D.D.M., for his motivation, advice, guidance and constructive criticism which enabled the completion of this work.

I am extremely grateful to my Assistant Professors Dr. R. Manorajan, M.D.D.M., Dr. A. Ezhilarazi, M.D.D.M., Dr. M. Harish, M.D.D.M., for their valuable guidance and Co-operation.

My sincere thanks to the staff and technicians of the Nephrology Department and Renal Transplantation Unit for their co-operation.

I thank Mr. A. Boopathi statistician of the Central Epidemiological Unit for the statistical guidance rendered.

I am immensely thankful to the patients who participated in this study.

DECLARATION

I **Dr. S. THIRUMAVALAVAN,** solemnly declare that this dissertation entitled**, " Etiology And Determinents of Renal Allograft Dysfunction**" is a bonafide work done by me at the department of nephrology, Stanley Medical College and Government Stanley Hospital during the period 2008 – 2011 under the guidance and supervision of the Professor Dr. R. Vijayakumar M.D. D.M., Head of the department of Nephrology of Stanley Medical College and Government Stanley Hospital, Chennai.

This dissertation is submitted to The Tamil Nadu Dr.M.G.R Medical University, towards partial fulfillment of requirement for the award of D.M. Degree (Branch-III) in Nephrology.

Place : Chennai

Date: .06.2011

Dr. S. THIRUMAVALAVAN

CONTENTS

INTRODUCTION

Treatment option for Chronic Kidney Disease-Stage5 (CKD-stage5) patients fall into three categories viz., Haemodialysis, Peritoneal dialysis and Renal Transplantation. Many studies proved that the kidney transplantation is distinctly superior and it is associated with reduced mortality and morbidity compared to haemodialysis or peritoneal dialysis.

The renal donors are of three types viz. live related, live unrelated and cadaver. Due to shortage organs and long waiting period in cadaver transplant prevention of second or re transplant is more important. To improve the graft survival identifying etiology of graft dysfunction or loss is more important. Once we identified the etiology we have to evaluate for immunologic, nonimmunologic, modifiable, non modifiable risk factors to improve the graft and patient survival.

REVIEW OF LITERATURE

Prospective studies and analyses of registry data have shown that many variables affect renal allograft survival and lead to graft dysfunction. These variables can be immunogenic and nonimmunogenic. The factors can be considered as donor, recipient, or donor cum recipient factors. Many of them contribute to the development of graft dysfunction.

Early allograft dysfunction refers to loss in the first 12 months; late dysfunction or loss to any time thereafter. This distinction is empirical but makes clinical sense. In the first 12 months, allograft loss or dysfunction is relatively common, because of technical complications such as graft thrombosis and because of severe rejection. After 12 months, the incidence is lower but remains stable over time. The causes of late allograft loss are also different and patient death is equivalent to allograft loss

On the basis of 3 to 4 years of follow-up, compared to hemo or peritoneal dialysis, transplantation reduced the risk of death overall by 68%.[1] Transplantation was particularly life saving in diabetic patients.

The principal causes of allograft loss in the first post-transplant year are acute rejection, thrombosis, primary nonfunction, and patient death.

The current adjusted 1-year survival probability for recipients of deceased donor allograft (first or subsequent transplant) is 91%, this rate has slowly but steadily improved over the past 25 years. The current adjusted 1-year survival probability for recipients of living donor allograft (first or subsequent transplant)is 95%.[2] These outcomes have also improved over the past 25 years.

The longevity of patient and graft survival depends on donor, recipient and donor- recipient factors

Donor Source:

Deceased Versus Living Donor

The donor source is one of the most important predictors of short- and long-term allograft outcomes. In general, living donor are superior to deceased donor allograft [3] [4]). The better outcomes depends on several factors like healthy living donors, the absence of brain death, elective surgery, avoidance of ischemia-reperfusion injury, high nephron mass and shorter waiting time. Excellent results are now being demonstrated with living unrelated kidney transplantation in which HLA is not matching.[5] Allograft outcomes are superior with deceased donors with trauma as opposed to other causes of brain death.[2]

Donor Age

Kidneys from donors older than 50, and particularly 65, years of age have poorer outcomes. This effect is especially pronounced in deceased donor allograft. Allograft from older donors has low nephron mass because of the aging process and due to pre existing diseases like hypertension and atherosclerosis. Donor age younger than 5 years is also associated with poorer outcomes due to nephron under dosing. En bloc transplantation from donors aged 0 to 5 years significantly improves survival [6]

Donor Sex

There is evidence that allograft from female donors have slightly poorer survival. [2] [102] due to smaller renal mass and ethnicity differences

Donor Nephron Mass

Donor nephron mass is most important for longevity of graft survival. If there is a mismatch between donor nephron mass and recipient body mass index, it will lead to early chronic allograft nephropathy.

Cold Ischemia Time

Prolonged cold ischemia time particularly more than 24 hrs leads to delayed graft function and early CAN. Cold ischemia time is very important in deceased donor transplant.

Recipient Age

Allograft survival rates vary in extremes of ages particularly in age less than 17 or older more than 65 yrs [2]. The common cause for graft loss is acute rejection, vessel thrombosis. In older age group graft loss is mainly due to death and not due to rejection

Recipient Race

Black recipients generally have poorer deceased donor graft survival compare to other races.

Recipient Gender

Female recipients had slightly better allograft survival than male recipients of deceased donor kidneys or HLA-identical kidneys recipients of living donor kidneys.[8this is mainly due to high degree of sensitization to HLA ,non HLA antigen, pregnancy and because of more blood transfusions related to menstruation.

Recipient Sensitization

Patients who are highly sensitized (PRA greater than 50%) generally have poorer early and late graft survival compared with nonsensitized recipients. This is mainly related to an increased incidence of complications in the early post-transplant period such as DGF and acute rejection. The principal reasons for sensitization are previous transplants, pregnancy, and blood transfusion. Thus, allograft survival is poorer in recipients of second or third transplants compared with recipients of a first transplant.[2] Highly sensitized patients are usually given more intensive immunosuppression.

Recipient Immunosuppression

After invention of newer immunosuppressive agents like CSA ,Tacro, MMF, improve the short term graft survival by reducing incidence of acute rejection. On the contrary, long term CNI use contributes to chronic allograft dysfunction by induction of chronic renal ischemia, and by promotion of systemic hypertension. Registry data analysis suggests that MMF improves long-term graft survival both by preventing overt acute rejection and by other mechanisms.[13]

Recipient Compliance

Poor compliance with the immunosuppressive regimen greatly increases the risk of acute rejection and allograft loss. In one recent meta-analysis, a third of the allograft losses were linked to patient noncompliance.[10]

Proteinuria

Proteinuria, even when modest, is associated with poorer allograft survival

ALLOGRAFT DYSFUNCTION

Allograft dysfunction analyzed under three time periods: immediate, early, and late post-transplant.

Immediate Post-transplant Period (First Week)

Patients can be divided into three groups DGF, SGF, excellent graft function based on allograft function in the first post-transplant week.

DGF is usually defined as failure of the renal allograft to function immediately after transplant, and requires few dialysis session.

Excellent allograft function implies normal graft function with adequate urine output and rapidly falling plasma creatinine.

SGF defines a group of recipients with moderate early dysfunction. One definition is a plasma creatinine level of greater than 3 mg/dL and no dialysis within 1 week of transplant.

Delayed Graft Function

DGF is a clinical diagnosis. Criteria for dialyzing patients post-transplant differ between centers. Recent United States Renal Database System (USRDS) data still show an approximate 22% incidence of DGF in deceased donor allograft.[2] the causes of DGF, are the following among them Ischemic acute tubular necrosis (ATN) is by far the most common cause

Causes of DGF in Renal Transplantation

Prerenal

Severe hypovolemia/hypotension

Renal vessel thrombosis

Intrarenal

Ischemic ATN

Hyperacute rejection

Accelerated or acute rejection superimposed on ATN

Acute cyclosporine/tacrolimus nephrotoxicity (± ATN)

Postrenal

Urinary tract obstruction/leakage

The diagnosis of the underlying cause of DGF is based on clinical, radiologic, and sometimes histologic findings.

Definitive diagnosis of the underlying cause requires allograft biopsy. The decision to do biopsy depends mainly on the duration of DGF and the likelihood of the underlying cause being ATN as opposed to a more allograft-threatening cause such as rejection. Specific treatment of DGF depends on the underlying cause

Ischemic Acute Tubular Necrosis.

Ischemic ATN is the most common cause of DGF in deceased donor kidney recipients.

There is no clinical or radiologic features unique to transplant ATN. The natural history of uncomplicated ATN is spontaneous resolution. Usually, improvements in urine output begin from 5 to 10 days after transplant, but ATN may persist for weeks.

Management of the patient during this period is supportive, including dialysis if needed and avoidance of fluid overload. . When hemodialysis is required, minimal anticoagulation should be used to reduce the risk of postsurgical bleeding. Intradialytic hypotension must be avoided during dialysis

Experimental animal models have demonstrated that ischemic ATN is associated with increased expression/production within the renal parenchyma of class I and II major histocompatibility complex (MHC) molecules, co stimulatory molecules, pro inflammatory cytokines and adhesion molecules, thereby predisposing to acute rejection .[12]. Recent data from varies studies suggest that intra operative thymoglobulin shortens the duration of DGF, possibly by blockade of multiple receptors on human leukocytes.[16]

Hyper acute Rejection.

Hyper acute rejection is now a rare cause of immediate non functioning of graft. It is caused by preformed recipient antibodies reacting with antigens on the endothelium of the allograft, activating the complement and coagulation cascades. These antibodies are usually directed against antigens of the ABO blood group system or against HLA class I antigens. Anti-HLA class I antibodies are formed in response to previous transplantation, blood transfusion, or pregnancy. The only effective treatment is transplant nephrectomy. Screening for recipient-donor ABO and class I HLA incompatibility have ensured the rarity of hyper acute rejection

Acute Cyclosporine or Tacrolimus Nephrotoxicity Superimposed on Acute Tubular Necrosis.

Cyclosporine or tacrolimus, especially in high doses, causes an acute reversible decrease in GFR by renal vasoconstriction, particularly of the afferent glomerular arteriole. These drug toxicities further exacerbate ischemic ATN.

Vascular and Urologic Complications of Surgery.

Renal vessel thrombosis, urinary leaks, and obstruction are rarer but important causes of DGF. These complications may also cause allograft dysfunction in the early postoperative period

Outcome and Significance of Delayed Graft Function

In most cases, recovery of renal function is sufficient to become independent of dialysis. There is no recovery in less than 5% of cases, resulting in primary nonfunction of graft . The majority of studies suggest that DGF has a negative impact on long-term renal allograft survival.[15]

Early Post-transplant Period (First Six Months)

There is obviously some overlap in the causes of delayed and early allograft dysfunction. The following are the causes for early graft dysfunction

Causes of Allograft Dysfunction in the Early Postoperative Period

Prerenal

Hypovolemia/hypotension

Renal vessel thrombosis

Drugs: ACE inhibitors, NSAIDs

Transplant renal artery stenosis

Intrarenal

Acute rejection

Acute CNI nephrotoxicity

CNI induced thrombotic microangiopathy

Recurrence of primary disease

Acute pyelonephritis

Acute interstitial nephritis

Postrenal

Urinary tract obstruction/leakage

Prerenal Dysfunction in the Early Post-transplant Period :

Hypovolemia and Drugs

Hypovolemia may develop secondary to excessive diuresis from the transplanted kidney or from diarrhea. Diarrhea is a common adverse effect of the MMF plus tacrolimus combination. Angiotensin-converting enzyme inhibitors (ACE-Is) and nonsteroidal anti-inflammatory drugs (NSAIDs) should be avoided in the early post-transplant period because of the risk of functional pre renal failure

Renal Vessel Thrombosis

Transplant renal artery or renal vein thrombosis usually occurs in the first 72 hours but may be delayed for up to 10 weeks. Acute vascular thrombosis is the most common cause of allograft loss in the first week.

Duplex studies show absent arterial and venous blood flow. Renography or magnetic resonance (MR) angiography shows absent perfusion of the transplanted

kidney in case of artery thrombosis and thrombus in case of venous thrombosis. Removal of the infarcted kidney is indicated in both the cases.

Intrarenal Dysfunction in the Early Post-transplant Period:

Acute Rejection

Most cases of acute rejection occur in the first 6 months, but this complication may occur at any time.

Definitive diagnosis requires biopsy, but when there is a high likelihood of uncomplicated acute cellular rejection (ACR), empiric treatment is sometimes instituted. Acute rejection is presumed to involve cellular and humoral immune mechanisms, but evidence of cell-mediated responses has traditionally predominated on most biopsies.

Acute Cellular Rejection.

The Modified-Banff classification is a widely used schema for classifying rejection.

Modified-Banff Classification of Renal Allograft Pathology

1. Normal
2. Antibody-mediated rejection

Acute

Type I: C4d+, ATN

Type II: C4d+, capillaritis

Type III: C4d+, arteritis

Chronic active

Glomerular double contours and/or peritubular capillary basement membrane multilayering and/or interstitial fibrosis/tubular atrophy and/or fibrous intimal thickening in arteries, C4d+

3. Borderline changes ("suspicious" for acute rejection). Foci of mild tubulitis only.

4. T-cell mediated rejection

"Chronic allograft arteriopathy" (arterial intimal fibrosis with mononuclear cell infiltration in fibrosis, formation of neo-intima)

5. Interstitial fibrosis and tubular atrophy, no evidence of any specific etiology

6. Other: Changes not considered to be due to rejection

Focal infiltrates of mononuclear cells without endothelialitis or tubulitis may occur in the presence of stable allograft function and hence require no treatment. Conversely, histologic evidence of rejection can also be seen in the presence of stable allograft function, and there is evidence to support its treatment.[18] The presence of eosinophils in the infiltrate suggests severe rejection, but allergic interstitial nephritis should also be considered.

Uncomplicated ACR is generally treated with a short course of high-dose steroids. Typically, 500 to 1000 mg/day of methylprednisolone is given intravenously for 3 to 5 days. There is a 60% to 70% response rate to this regimen. After completion of pulse therapy, the maintenance oral steroid dose can be resumed immediately, although some centers prefer to taper back to the maintenance dose. An episode of acute rejection implies that prior immunosuppression has been inadequate. OKT3 and

the polyclonals are highly effective in treating first rejection episodes but because of cost and toxicity, these agents are usually reserved for steroid-resistant cases or when there is severe rejection on the initial biopsy.

Steroid-resistant ACR, defined somewhat arbitrarily as failure of improvement in urine output or plasma creatinine within 5 days of starting pulse treatment, is usually treated with depleting antibodies. One randomized, controlled trial has shown rabbit thymoglobulin to be more effective than ATG as primary therapy for acute rejection[19]; thymoglobulin has also largely replaced OKT3 in this setting.[20]

Acute Antibody-Mediated Rejection.

Acute AMR is increasingly recognized as a cause of allograft dysfunction and is now seen in 12% to 37% of biopsies done for acute rejection. This probably reflects better diagnostic tools (in particular, the C4d stain and improvements in tissue typing[23]), more awareness of acute AMR, better prevention of ACR, and more transplantation across HLA or ABO incompatibilities.[24] Diagnosis of acute AMR requires allograft dysfunction and at least two of the following: (1) neutrophil polymorphs or mononuclear cells or thrombi in capillaries, (2) diffusely positive staining of peritubular capillaries for C4d, (3) serologic evidence of antibody against donor HLA or ABO antigens.[25] Acute AMR typically occurs early after transplantation but can also occur late, especially in the setting of reduced immunosuppression or noncompliance. Acute AMR may occur alone or with ACR.

Until recently, the prognosis of acute AMR was considered poor. Now, good short- and medium-term outcomes have been reported with protocols that typically include the following: pulse steroids, tacrolimus, MMF, plasmapheresis, or high-dose IgG.[26] Rituximab is sometimes used as an adjunct in severe cases, although randomized controlled trials are lacking.

Acute Calcineurin Inhibitor Nephrotoxicity:

The CNIs, especially in high doses, cause an acute reversible decrease in GFR by renal vasoconstriction, particularly of the afferent glomerular arteriole. This is manifested clinically as dose and blood concentration-dependent acute reversible increases in plasma creatinine. Because acute CNI nephrotoxicity is mainly vasomotor / prerenal, histologic changes in this setting may be unimpressive. Histology may show tubule cell vacuolization; more prolonged toxicity is associated with hyaline thickening of arterioles[27]; these changes are not specific. Acute CNI nephrotoxicity responds to dosage reduction.

Acute Thrombotic Microangiopathy

Acute TMA after renal transplantation is a rare but serious complication.[28] Causes include CNIs, OKT3, acute AMR [29] viral infections such as cytomegalorvirus (CMV) and recurrence of primary disease . The presence of hepatitis C and anticardiolipin antibodies increases the risk.[30] Onset is usually in the early post-transplant period. The classic laboratory findings are increasing plasma creatinine and lactate dehydrogenase levels, thrombocytopenia, falling hemoglobin level, schistocytosis. and low haptoglobin level. In severe cases, the long-term prognosis for the allograft is often poor. Early diagnosis of TMA is essential to salvage renal function. There are no controlled trials of therapy for TMA after transplant.

Acute Allergic Interstitial Nephritis

Distinguishing acute allergic interstitial nephritis and ACR is very difficult. In fact, the pathogenesis is somewhat similar in both cases, involving mainly cell-mediated immunity. Fever and rash after ingestion of a new drug favor the former. Polyomavirus infection must also be considered in the differential diagnosis. Both

acute allergic interstitial nephritis and ACR usually respond to steroids. SMX-TMP is probably the drug most likely implicated in causing allergic interstitial nephritis in renal transplant patients.

Early Recurrence of Primary Disease

Several renal diseases may recur early and cause acute allograft dysfunction. Among them primary focal segmental glomerulosclerosis, antiglomerular basement membrane disease are most common.

Postrenal Dysfunction in the Early Post-transplant Period :

The incidence of serious early post-transplant urologic complications has decreased significantly over the last 20 years. However, post renal causes must always be considered in the differential diagnosis of acute allograft dysfunction. The following are post renal cause for dysfunction

1. Urine leak
2. Urinary tract obstruction

Late Post-transplant Period

Late Acute Allograft Dysfunction

The causes and evaluation of late (>6 months post-transplant) acute allograft dysfunction are broadly similar to those of early acute dysfunction. Acute prerenal failure may occur at any time, and the causes are similar to those seen with native kidneys, such as shock syndromes and ACE-I or NSAID hemodynamic effects. Urinary tract obstruction must also be considered in the differential diagnosis.

Late Acute Rejection

With standard immunosuppressive protocols, acute rejection is uncommon after the first 6 months. Late acute rejection can occur while tapering or withdrawing immunosuppression. Therefore, plasma creatinine must be carefully monitored when these drugs are stopped. Late acute rejection usually has a large cellular component, but there may be superimposed acute AMR, C4d staining should be routinely performed in all the cases

Late Acute Calcineurin Inhibitor Nephrotoxicity

Although lower doses of CNIs are generally prescribed after the first 6 to 12 months, acute CNI toxicity may occur at any time after transplant. Intake of medications that impair metabolism of the CNIs may induce acute deterioration in renal function, but this should be reversible with appropriate drug adjustment.

Transplant Renal Artery Stenosis

Transplant renal artery stenosis can arise at any time after transplantation. The reported incidence varies widely.[30] Luminal narrowing of more than 70% is probably required to render a stenosis functionally significant. The stenosis may occur in the donor or recipient artery or at the anastomotic site. Stenosis of the recipient iliac artery may also compromise renal arterial flow. The causes for stenosis are operative trauma to these vessels, atherosclerosis of the recipient vessels, and immunological factors. The “gold standard” for diagnosis is renal angiography, but this is invasive. Both MR angiography and duplex sonography are highly sensitive in diagnosing transplant renal artery stenosis and are adequate screening tests.[30] MR angiography has the advantage of better imaging the iliac arteries and identifying anatomy before angioplasty. Mild cases are often treated conservatively with antihypertensives,

aspirin. Percutaneous transluminal angioplasty (PTA) has been the treatment of choice for more severe cases.

Infections Causing Late Acute Allograft Dysfunction :

Human Polyomavirus Infection :

The polyomaviruses are DNA viruses, the best known of which are the BK virus, JC virus, and SV40 virus. Over the last 10 years, BK virus has been increasingly recognized as an important cause of renal allograft dysfunction and loss.

Replication of BK virus, with shedding of infected uroepithelial cells (decoy cells) into the urine occurs in more than one third of renal transplant recipients.[31] The clinical features associated with such replication include acute and chronic allograft dysfunction, and hemorrhagic cystitis. The allograft dysfunction is usually due to interstitial nephritis.Diagnosis of polyomavirus interstitial nephritis obviously requires allograft biopsy. The presence of intranuclear tubule cell inclusions by light microscopy should raise suspicion but diagnosis is confirmed by immunohistochemistry. It is difficult to distinguish viral infection alone from infection plus superimposed rejection.

The most important therapy for established BK virus nephritis is major reduction in immunosuppression to augment host mechanisms of viral clearance. Other therapies that have been reported in small series to be effective include leflunomide, low-dose cidofovir , IgG, and fluoroquinolones.[32]

Hepatitis C:

The management of progressive hepatitis C virus (HCV) disease in renal transplant recipients remains unsatisfactory. Reduction in immunosuppression is the

first step, and this obviously increases the risk of rejection. Treatment with interferon-alfa may induce temporary remission but the rate of relapse is high. Furthermore, the risk of provoking acute allograft dysfunction or loss with this drug via rejection or other mechanisms is high.[33]

Both membranoproliferative glomerulonephritis (MPGN) and membranous nephropathy are more commonly seen in HCV-positive compared with HCV-negative renal transplant recipients.

Drug and Radiocontrast Nephrotoxicity

A variety of drugs can cause acute dysfunction of the renal allograft. In many cases, the offending agent are aminoglycoside , amphotericin, NSAID, ACE or ARBs in the presence of transplant renal artey stenosis, statins and radiocontrast agents. However, a number of drug-related nephrotoxic effects are more common in the setting of transplantation Many of these effects are due to interaction with the CNIs. Diltiazem, verapamil, ketoconazole, and the macrolide antibiotics, particularly erythromycin, impair CNI metabolism and may lead to acute CNI nephrotoxicity unless there is concomitant dose reduction of the CNI. There are reports implicating the newer antidepressants and some of the antiretroviral drugs in this regard.[34] High-dose SMX-TMP may cause an acute increase in plasma creatinine by inhibiting tubule secretion of creatinine. Rarely, SMX-TMP can provoke allergic interstitial nephritis; this is treated by cessation of the drug and administering high-dose steroids.

Late Allograft Dysfunction and Late Allograft Loss (>3 to 6 Months) :

By far, the most important cause of allograft dysfunction after the first 6 to 12 months is chronic allograft nephropathy (CAN). The causes of late dysfunction areas follows. The main causes of allograft loss are patient death, CAN, late acute

rejection/non-compliance, and recurrent disease. The following are the causes of late allograft dysfunction

Prerenal

Transplant renal artery stenosis

Intrarenal

Chronic allograft nephropathy

CNI toxicity

Chronic rejection (cellular or antibody mediated or both)

Polyoma virus nephropathy

Recurrence of primary disease / new disease

Postrenal

Urinary tract obstruction

Chronic Allograft Nephropathy:

After censoring for death, CAN is the most frequent and important cause of long-term allograft loss. Halloran and colleagues [35] have defined CAN as a “state of impaired renal allograft after excluding other causes like acute rejection, overt drug toxicity, and recurrent or de novo diseases.

Histopathologic changes are seen in the tubulointerstitium, vessels, and glomeruli. These changes are not unique to CAN but include (1) atrophy and fibrosis of the tubulointerstitium, (2) fibrointimal thickening of arterial walls, (3) transplant glomerulopathy (thickening and double contouring of capillary walls and increased

mesangial matrix).[36] The degree of damage of the tubulointerstitium determines the stage of CAN .

The pathogenesis of CAN remains incompletely understood. Alloantigen-dependent and alloantigen-independent factors are considered to be important. Several of these factors probably interact in all patients with CAN. There is accumulating evidence that the humoral immune system contributes to the development of CAN and that chronic AMR is particularly associated with transplant glomerulopathy. [38] [36] [37].

Typical clinical features are hypertension, proteinuria, and falling GFR. Onset is rarely less than 6 months after transplant.. Proteinuria is usually subnephrotic range but may be severe enough to cause nephrotic syndrome. Severe proteinuria and inadequately controlled hypertension are associated with more rapid deterioration in renal function.

Renal ultrasound should be performed to rule out an obstructive cause. If there is suspicion of renal artery stenosis, further testing is indicated. Allograft biopsy helps characterize the predominant form of damage. [39] [40]

Treatment options are very limited. If there is histologic evidence of a component of acute rejection, pulse steroids are often used. If the clinical and histologic picture suggests a significant component of chronic CNI nephrotoxicity, the CNI dosage can be reduced. Alternative agents such as MMF or sirolimus can be substituted,[41] but patients should be watch closely for late acute rejection. Sirolimus should probably be avoided in those with proteinuria or GFR of less than 40 mL/min.[42]

Hypertension and hyperlipidemia should be rigorously controlled. There are no randomized controlled trials in CAN but ACE-I or angiotensin receptor blockers are often used.

Late Recurrence of Primary Disease :

The incidence of late recurrence is difficult to estimate: the original cause of ESRD is often unknown, transplant kidney biopsies are not always performed; and most relevant studies are small and retrospective with variable follow-up periods. In one large study of patients who underwent transplantation after developing ESRD from glomerulonephritis, recurrence was the third most frequent cause of graft loss at 10 years [44] . the following recurs in the graft

IgA Glomerulonephritis : recurrence more common

Lupus Nephritis

Membranoproliferative Glomerulonephritis

Membranous Nephropathy

Diabetic Nephropathy :

Measures to improve renal allograft survival

- Increased living kidney donation : both related and nonrelated.
- Preemptive transplantation in live kidney transplantation.
- Increased donation from younger, previously healthy deceased donors.
- Preferential matching of younger deceased donors with younger recipients.
- Zero mismatching of HLA antigens
- Improved organ preservation

- Reduced cold ischemia time
- Nephron dosing (e.g. matching of donor recipient sex, body mass index)
- Calcineurin inhibitor sparing immunosuppressive protocols.
- Angiotensin converting enzyme inhibitors, angiotensin receptor blockers.
- Aggressive control of hyperlipidemia, hypertension.

MATERIALS AND METHODS

Study place	**:**	Stanley Medical College Nephrology Department, Chennai
Study period	**:**	From October 2009 to march 2011
Study design	**:**	Prospective study
Study population	**:**	All the patients who have undergone transplant at Stanley Medical College and on regular follow-up in outpatient Department of nephrology were enrolled in this study

In our department we are regularly doing renal transplants since 1998. We do live related transplants between first degree relatives, spousal, cadaver transplants (approximately 40 per year). Since we cater to economically very poor patients we do hemodialysis, transplant surgery and immunosuppressive treatment free of cost.

All the recipient enrolled in the study are in different period of follow up, depending the date of transplant, follow-up period varying from 3 months to 3 yrs

Depending on the post transplant period they are followed once a week or once in two weeks.

Raised creatinine > 25% from the baseline or increase of 0.3 – 0.5 mg from the baseline creatinine was considered as criteria for graft dysfunction. All patients with graft dysfunction patients were subjected to graft biopsy after ruling out other causes for graft dysfunction.

For the present study I have followed up all post transplant recipients who have normal creatinine with graft dysfunction and analyzed etiology and factors contributing to graft dysfunction by comparing with normal graft function recipients

DONOR EVAUVATION

LIVE RELATED DONOR.

Only First degree relatives were selected as a donor. HLA ABC matching done to ascertain relationship

If HLA is not matching, in case of siblings, HLA from parents were taken to ascertain relationship,

In case of spousal donor relationship approval by authorization committee Obtained

Donor Selection Criteria:

1. Age criteria – donors more than 20 yrs and less than 60 yrs are selected
2. The donor should be either parents or offspring or sibling of the recipient
3. Spousal donors are considered for recipients who do not have medically fit donor / willing first degree relatives
4. Donors founds to have DM & SHT during screening are rejected

   Donors are thoroughly evaluated by history, clinical, biochemical and imaging modalities

All donors underwent the following investigation

GTT, HbA1c

Thyroid function test,

Liver function test

Complete blood count

Renal function test

Hepatitis viral serology (HbsAg, Anti HCV)

HIV ELISA

The donor should be having perfect health prior to being declared fit for transplantation.

Donor's renal status assessed by:

USG abdomen

Urine analysis

24 hrs urine protein

Radio nucleotide (DTPA) scanning for split GFR

Computerized tomography renal angiogram and IVU

Male Donors with more than 40 yrs of age are subjected uroflowometry studies CMV screening is not done routinely for donors.

Donors are explained in detail about the procedure of transplantation and possible risks

A written informed consent is obtained from the donor and relatives of donor and donors guardians.

CADAVER DONOR:

Brain dead donors mostly are road traffic accident victims

Donors are screened for diabetes, hypertension, underlying renal disease prior to harvesting

At present no extended donor criteria patients are included

All cadaver donors screened for HbsAg, Anti HCV and HIV serology

Donor's age ranged from 15 – 60 years

Donor kidneys were received from various hospitals in Tamil Nadu and also from our own hospital.

All cadaver grafts were perfuse with HTK solution (Custodial solution)

❖ Custodial (HTK) solution (in mmol/L)

- Sodium chloride 15.0
- Potassium chloride 9.0
- Potassium hydrogen 2-ketoglutarate 1.0
- Magnesium chloride 4.0
- Histidine Hcl 18.0
- Histidine 180.0
- Tryptophan 2.0

- Mannitol 30.0
- Calcium chloride 0.015

Kidneys are stored in ice box with three bag technique during transportation

RECIPIENTS

LIVE donor recipient

Recipient of less than 60 years of age are selected

The cause of NKD, is identifiable in less than 50% of cases

All recipients undergo viral screening for HBV, HCV and HIV

One recipient acquired HbsAg positivity during hemodialysis. He underwent HBV DNA by quantitative PCR, and liver function test and started on lamivudine .after 6 months of lamivudine therapy he was transplanted with normal liver function test with normal echo texture.

Two recipient acquired HCV positivity during HD. both of them were maintained on hemodialysis and none of them received interferon therapy (due to financial constraint). Both of them underwent transplant after six months of maintenance hemodialysis with normal liver function test

All patients undergo complete cardiac, gastroenterology, ENT, dental, dermatological, psychiatric, ophthalmological and urological evaluation

All recipients are vaccinated for HBV

Voiding cystourethrograms, uroflometry were done to assess the lower urinary tract abnormalities whenever required

Donor and recipient tissue cross match done by lymphocytotoxic method within 72 hours before Transplantation and only those with cross match 15 % or less were taken for transplant surgery. For live related transplant cross match was done during the preliminary stage itself.

Both cadaver and live related donor recipients undergo Doppler of aorta iliac vessels prior to Transplant to assess vessel status

All recipient are maintained only on hemodialysis prior to transplantation

All patients are given triple immunosuppression with cyclosporine / Tacrolimus, azathioprine / MMF, and prednisolone.

Spousal and cadaver transplant recipient started on Tacrolimus, MMF and prednisone

CSA / AZA regimen started on those who are all underwent transplant prior to 2008.

Now all live donor recipient started on Tacrolimus, azathioprine and prednisone based regimen

No induction therapy is given for cadaver and spousal transplant.

None of the recipients underwent de sensitization protocols

CADAVER DONOR RECIPIENT

Those who are not having prospective live related or spousal donor are included in the cadaver list

All registered recipients are on regular follow up

Human Leukocyte Antigen (HLA) and Panel Reactive Antibody (PRA) were not done for any of our cadaver recipients and cadaver donors.

Recipients undergo regular serology screening during follow up

DECEASED DONOR GRAFT ALLOCATION POLICY

A separate cadaver waiting list for each blood group of potential recipients is maintained according to their date of induction into hemodialysis. This seniority list is available online and it is supervised by transplant committee formed by the Government of Tamil Nadu.

- Selection of recipients is based on their seniority in cadaver waiting list
- Donor and recipient tissue cross match done by lymphocytotoxic method before transplant and cross match less than 15 % were alone taken for transplant surgery
- Transplant surgery was done alternatively by two teams of Urologists.

Recipients with co morbid conditions are temporarily excluded from the list and included again once they recover.

PROCEDURE

Pre operative treatment

All recipients were given Hemodialysis pre operatively. They were started on immunosuppression prior to surgery as below.

	Day before Surgery 4 p.m.	**0 POD (4 a.m.)**
T.Tacrolimus	0.066 mg/kg	0.066 mg/kg
T.MMF	500 mg	500 mg
T.Prednisone	0.5 mg/kg	0.5 mg/kg

Operative Technique

Grafts are placed in the right iliac fossa after creating renal bed except in second transplant. Anastomosis of the renal vessels to the iliac vessels was performed as follows.

Renal artery to internal iliac artery (except one patient) – end to end.

Renal vein to external iliac vein – end to side.

Ureter anastomosed to bladder obliquely by creating neocystostomy in the region of the trigone. DJ stents were kept if required.

During anastomosis of graft vessels, methyl prednisone 1 g was given as I.V. infusion.

Post operative treatment

Fluids (0.9% NS) were given according to their urine output.

Immunosuppression was given as follows:

T.Tacrolimus 0.06 mg/kg twice daily (Target tacrolimus level 10 – 12 ng/ml subsequently reduced to 5ng/ml by 6 months)

T.MMF 500 mg twice / thrice daily

T.Prednisone 0.5 mg od

Tacrolimus levels were assessed on 5th to 7th POD for all recipients. USG and Doppler of graft vessels are assessed on or before 7th POD. Recipients urinary Foley's Catheter is removed on 7th POD. Drainage tube was removed if drainage fluid is less than 50 ml. DJ stent if inserted is removed on 4th post operative week.

After 14 days, recipients are discharged and they are seen as outpatient at regular intervals as below:

Twice a week for the first month

Weekly once for next two months,

Fortnightly for first one year

And monthly for life long.

During each visit, patient's condition, renal function test and complete blood count were analyzed and other tests as and when required like (Cyclosporine, Tacrolimus levels)

Post operative drugs including immunosuppressant are given free of cost and all investigations are done at no cost.

METHODS

Prospective Study

All renal transplant recipients on regular follow up are included - September 2009 to march 2011

Those who died and those who are in irregular follow up during the period of study are excluded from the study

All the patient having graft dysfunction underwent renal biopsy

The following parameters of both donor and recipient of graft dysfunction were taken up and analyzed with normal graft function

Donor Parameters

1. Age
2. Sex
3. Blood Group
4. Left or right kidney
5. Number of donor renal arteries and donor renal veins

Recipient Parameters

1. Age
2. Sex
3. Group
4. Months of hemodialysis
5. HLA and CROSSMATCH
6. Warm ischemic time – in case of live donor
7. Cold ischemic time
8. Intra operative events
9. Day one urine output
10. Day one creatinine
11. Time to reach creatinine 1.2
12. Discharge creatinine
13. Type of immunosuppressant
14. New onset of diabetes after transplant (NODAT)
15. polycythemia

All the data are collected in the master sheet and statistically analyzed

EXCLUSION CRITERIA

1. Patients who are all died during the follow up period were excluded from the study.

2. Those who are all an irregular follow up during the study period were also excluded from the study.

RESULTS

Totally 155 recipients are on regular follow up in our department from the period October 2009 to march 2011.

Patients who died in that period and those who are on irregular follow up are excluded from the study

Total patients are divided into two study groups (normal and graft dysfunction based on graft functioning)

Graft dysfunction is defined as a raise in creatinine more than 25% from the baseline or 0.3 to 0.5 mg raise from the discharge creatinine

89 recipients had normal graft function and 66 developed grafts dysfunction during the follow up period for which no other cause was found.

All with graft dysfunction underwent biopsy if creatinine does not come down soon and if here is no clear cut cause.

The following parameters are compared between two groups

DEMOGRAPHIC DATA

Among the 155 recipients, live donor transplant is 114, spousal transplant is 6, cadaver transplant is 35

Among the 155 recipients 123 were male, 32 were female. Predominantly male population

Kidney Function

Group				Total	
Normal		Dysfunction			
N	%	N	%	N	%
89	100.0	66	100.0	155	100.0

DGF AND SGF Vs GRAFT FUNCTION

DELAYED GRAFT FUNCTION: required **hemodialysis** in post operative period

SLOW GRAFT FUNCTION : a group of recipients with is a plasma creatinine level of greater than 3 mg/dL and no dialysis within 1 week of transplant

		Group				Total	
		Normal		Dysfunction			
		N	%	N	%	N	%
Type	DGF	7	58.3	0	.0	7	46.7
	SGF	5	41.7	3	100.0	8	53.3
Total		12	100.0	3	100.0	15	100.0

RESULTS

155 RECIPIENTS ARE INCLUDED IN THE STUDY

89 HAD NORMAL FUNCTION GRAFT

66 DEVELOPED DYSFUNCTION

DELAYED GRAFT FUNCTION – 7 developed DGF. All were cadaver recipie

12 HAD SLOW GRAFT FUNCTION

24 hrs protein (mg)

24 hr protein group	N	%
< 500	7	10.9
501 – 1500	43	67.2
> 1500	16	21.9
Total	**66**	**100.0**

Biopsy Creatinine group

Biopsy creatinine group	N	%
< 1.50	3	4.5
1.51 - 2.00	42	63.6
> 2.00	21	31.8
Total	**66**	**100.0**

Month vs biopsy

Month Group	N	%
1 month	4	6.3
2 - 6 months	18	27.0
7 - 12 months	18	28.6
> 12 months	26	38.1
Total	**66**	**100.0**

Recipients with graft dysfunction underwent 24 hrs urinary protein quantification

Most of the recipient in the range of 500 to1500 mg

Most of those with graft dysfunction had creatinine of 1.5 to 2.0

Most of the recipient underwent biopsy one year after transplant

ETIOLOGY OF GRAFT DYSFUNCTION

Parameter	N	%
Anti body mediated rejection	2	1.3
Actute cellular rejection	13	8.4
Infection	2	1.3
Acute tubular necrosis	9	5.8
Thrombotic microangiopathy	6	3.9
Chronic allograft nephropathy	28	18.1
Drug Toxic	6	3.9
Transplant renal artery stenosis	1	0.6
Recurrence (IGA)	3	1.9

All 66 recipients who had dysfunction underwent renal biopsy

DONOR AGE

	Group	N	Mean	Std. Deviation	P - Value
donor age	Normal	89	39.57	11.801	0.005
	Dysfunction	66	44.29	8.747	

CADAVER AND LIVE DONOR SEPARATE

Kidney donor		Group	N	Mean	Std. Deviation	P - Value
Cadaver	donor age	Normal	28	32.14	14.018	0.426
		Dysfunction	7	36.71	10.259	
Live	donor age	Normal	61	42.98	8.846	
		Dysfunction	59	45.19	8.193	0.160

Results

Donor age significantly affects the graft dysfunction p value .005

DONOR SEX

		Group				Total		P Value
		Normal		Dysfunction				
		N	%	N	%	N	%	
Donor sex	Male	33	37.1	19	28.8	52	33.5	**0.043**
	Female	56	62.9	47	71.2	103	66.5	
Total		89	100.0	66	100.0	155	100.0	

DONOR RELATIONSHIP

		Group				Total	
		Normal		Dysfunction			
		N	%	N	%	N	%
Relation	Cadaver	28	31.5	7	10.6	35	22.6
	Father	4	4.5	7	10.6	11	7.1
	Mother	37	41.6	31	47.0	68	43.9
	Brother	7	7.9	6	9.1	13	8.4
	Sister	9	10.1	12	18.2	21	13.5
	Spouse	4	4.5	2	3.0	6	3.9
	Aunt what match	0	.0	1	1.5	1	.6
Total		**89**	**100.0**	**66**	**100.0**	**155**	**100.0**

RESULS

Most of live donors were females

Association of female donors with graft dysfunction is statistically significant. Likely because of smaller nephron mass

Donor Blood group

		Group				Total		
		Normal		Dysfunction		N	%	
		N	%	N	%			P - Value
Blood Group	A	17	19.1	16	24.2	33	21.3	
	B	29	32.6	29	43.9	58	37.4	
	AB	4	4.5	2	3.0	6	3.9	0.233
	O	39	43.8	19	28.8	58	37.4	
Total		**89**	**100.0**	**66**	**100.0**	**155**	**100.0**	

Results

Dysfunction group - B positive is more common blood group

Association of blood group is not statistically significant between two groups

KIDNEY SIDE vs GRAFT FUNCTION

		Group				Total	
		Normal		Dysfunction			
		N	%	N	%	N	%
Side	Left	75	53.6	65	46.4	140	100.0
	Right	14	93.3	1	6.7	15	100.0
Total		89	57.4	66	42.6	155	100.0

Result

Left side preferred more than right

No significant association of side of kidney with graft function

NUMBER OF BLOOD VESSEL VS GRAFT FUNCTION

		Group				Total		P - Value
		Normal		Dysfunction				
		N	%	N	%	N	%	
vessel Involved	Single	79	88.8	63	95.5	142	91.6	0.234
	Double	9	10.1	2	3.0	11	7.1	
	Triple	1	1.1	1	1.5	2	1.3	
Total		**89**	**100.0**	**66**	**100.0**	**155**	**100.0**	

Results

142 grafts had single renal vessel

Association between number of blood vessels with graft function - statistically not significant.

RECIPIENT AGE Vs GRAFT FUNCTION

	Group	N	Mean	Std. Deviation	P - Value
Age	Normal	89	30.42	8.689	0.944
	Dysfunction	66	30.52	8.571	

		Group				Total	
		Normal		Dysfunction			
		N	%	N	%	N	%
Age Group 1	<= 35 yrs	70	78.7	51	77.3	121	78.1
	>35 yrs	19	21.3	15	22.7	34	21.9
Total		89	100.0	66	100.0	155	100.0

RESULT

Recipient age difference between two groups - not significant P value 0.94

GENDER DIFFERENCE

		Group				Total		P - Value
		Normal		Dysfunction				
		N	%	N	%	N	% 79.4	
Gender	Male	64	71.9	59	89.4	123		0.008
	Female	25	28.1	7	10.6	32	20.6	
Total		89	100.0	66	100.0	155	100.0	

GENDER DIFFERENCE BETWEEN CADVER AND LIVE

			Group				Total		P - Value
			Normal		Dysfunction				
Relationship with donor			N	%	N	%			
Cadaver	Gender	Male	20	71.4	7	100.0		77.1	0.107
		Female	8	28.6	0	.0	8	22.9	
	Total		28	100.0	7	100.0	35	100.0	
Others	Gender	Male	40	70.2	50	87.7	90	78.9	0.022
		Female	17	29.8	7	12.3	24	21.1	
	Total		57	100.0	57	100.0	114	100.0	

RESULT

Among the Recipient most were males

Difference between two groups - significant P value 0.008

Further sub group analysis done between cadaver and live recipient

Among the live – male recipients had more dysfunction, significant P value 0.02

RECIPIENT BLOOD GROUP Vs GRAFT FUNCTION

		Group				Total		
		Normal		Dysfunction				
		N	%	N	%	N	%	P - Value
Blood Group	A	17	19.1	16	24.2	33	21.3	
	B	31	34.8	28	42.4	59	38.1	
	AB	5	5.6	4	6.1	9	5.8	0.400
	O	36	40.4	18	27.3	54	34.8	
Total		89	100.0	66	100.0	155	100.0	

RESULT

B group recipient had more graft dysfunction

Influence of blood group over dysfunction not significant P value 0.40

Difference between two groups - not significant P value 0.08

CAUSES OF NKD

		N	Col %
	Polycystic kidneys	2	1.3
	Diabetic nephropathy	2	1.2
	Focal segmental glomerulosclerosis	3	1.9
	Global sclerosis	2	1.2
	IGA	14	9.0
	Ischemic glomerulo nephritis	4	2.5
	Mesangio proliferative glomerulo nephritis	2	1.3
	Reflux nephropathy	4	2.5
	Systemic lupus erythemetaosis	2	1.3
Total		**35**	**100.0**

Results

Among them 35 had proven cause of native kidney disease

Duration of hemodialysis (months) vs GRAFT FUNCTION

	Group	N	Mean	Std. Deviation	P – Value
mhd(mon)	Normal	89	9.06	8.658	0.081
	Dysfunction	66	6.88	6.788	

HLA Vs DYSFUNCTION

		Group				Total		P – Value 0.012
		Normal		Dysfunction			%	
		N	%	N	%	N		
HLA TYPE	Not done	32	36.0	10	15.2	42	27.1	
	HLA 2	54	60.7	51	77.3	105	67.7	
	Full Match	3	3.4	5	7.6	8	5.2	
Total		89	100.0	66	100.0	155	100.0	

RESULTS

Number of months on hemodialysis is not statistically significant between the groups.

HLA - (P value 0.012) , statistically significant to predict dysfunction

CROSS MATCH (INTIAL) VS GRAFT FUNCTION

		Group				Total		P – Value 0.580
		Normal		Dysfunction				
		N	%	N	%	N	%	
CROSS MATCH intial	5	19	31.1	17	28.8	36	30.0	
	10	42	68.9	41	69.5	84	69.2	
Total		61	100.0	59	100.0	120	100.0	

CROSS MATCH FINAL VS GRAFT FUNCTION

		Group				Total		P – Value 0.09
		Normal		Dysfunction				
		N	%	N	%	N	%	
CROSS MATCH FINALl	5%	14	15.7	10	15.2	24	15.5	
	10%	61	68.5	55	83.3	116	74.8	
	15%	14	15.7	1	1.5	15	9.7	
Total		89	100.0	66	100.0	155	100.0	

RESULTS

Intial cross match done only in live donor transplant – not significant

Final cross match done in all cases – not significant to predict graft dysfunction P value 0.09

COLD ISCHEMIC TIME (MINUTES) VS GRAFT FUNCTION

Kidney donor		Group	N	Mean	Std. Deviation	P - Value
Cadaver	CIT	Normal	28	466.07	174.639	0.520
		Dysfunction	7	514.29	179.523	
Live	CIT	Normal	61	55.07	8.479	0.496
		Dysfunction	59	54.10	6.855	

RESULTS

In view of prolonged cold ischemic time in cadaver transplants , sub group analysis were done to know the statistical significance

Cadaver donor prolonged cold ischemic time mean 514minutes compare to live 54 minutes

The association of cold ischemia time with graft dysfunction is not statistically significant

CREATININE IN FIRST POST OPERATIVE DAY VS GRAFT FUNCTION

	Group	**N**	**Mean**	**Std. Deviation**	**P – Value**
cr 1st pod	Normal	89	2.792	1.4746	0.282
	Dysfunction	66	3.232	.8422	

SUBGROUP ANALYSIS BETWEEN CADAVER AND LIVE

Kidney donor		Group	N	Mean	Std. Deviation	P - Value
Cadaver	cr 1st pod	Normal	28	3.029	1.9903	0.090
		Dysfunction	7	4.287	.8139	
Live	cr 1st pod	Normal	61	2.362	.8997	0.227
		Dysfunction	59	2.556	.8459	

RESULT

Day one creatinine does not show statistical significant between groups

Subgroup analysis between groups also not significant

DAYS TAKEN TO REACH CREATININE 1.2

	Group	N	Mean	Std. Deviation	P – Value
cr1.2(day)	Normal	88	6.82	8.039	0.045
	Dysfunction	66	8.94	2.887	

Kidney donor		**Group**	**N**	**Mean**	**Std. Deviation**	**P – Value**
Cadaver	cr1.2(day)	Normal	28	6.61	12.066	0.452
		Dysfunction	7	8.00	6.000	
Live	cr1.2(day)	Normal	60	4.58	3.567	0.990
		Dysfunction	59	4.58	2.086	

RESULT

Days after transplant creatinine reaches 1.2 was taken up for study

Statistically significant association between groups P value 0.04

Sub group analysis showed between cadavers and lives not statistically significant

DISCHARGE CREATININE VS GRAFT DYSFUNCTION

	Group	N	Mean	Std. Deviation	P - Value
dis cr	Normal	89	1.113	0.1978	0.505
	Dysfunction	66	1.135	0.1957	

SUBGROUP ANALYSIS BETWEEN CADAVER VS LIVE

Kidney donor		**Group**	**N**	**Mean**	**Std. Deviation**	**P - Value**
Cadaver	dis cr	Normal	28	1.186	.2649	0.786
		Dysfunction	7	1.157	.1397	
Live	dis cr	Normal	61	1.080	.1492	0.112
		Dysfunction	59	1.132	.2021	

RESULT

Discharge creatinine - not statistically significant between the groups P value 0.50

DAY ONE URINE OUTPUT VS GRAFT DYSFUNCTION

	Group	N	Mean	Std. Deviation	P – Value
Urine output	Normal	89	9851.69	5975.618	0.155
	Dysfunction	66	8285	17836.890	

SUBGROUP ANALYSIS

Kidney donor		Group	N	Mean	Std. Deviation	P - Value
Cadaver	Urine out put	Normal	28	8043.21	5568.931	0.584
		Dysfunction	7	5485.71	8342.397	
Live	Urine out put	Normal	61	13630	5342.301	0.475
		Dysfunction	59	11500	18590.618	

RESULT

Urine output in first postoperative day – not significant between groups

Treatment drug details

	csa+aza	csa+mmf	tac+aza	tac+mmf	Total
csa+aza	62	11	5	2	80
csa+mmf	11	5	1	0	17
tac+aza	5	1	13	2	21
tac+mmf	2	0	2	42	46
Total	80	17	21	46	

CSA vs graft function drug

		Normal		Dysfunction		Total		P Value
		N	%	n	%	n	%	
CSA +	Yes	43	48.3	54	81.8	97	62.6	**<0.001**
	No	46	51.7	12	18.2	58	37.4	
Total		89	100.0	66	100.0	155	100.0	

RESULT

Most of the recipient on CSA based regimen.

Compare to Tacrolimus, cyclosporine group had more number of graft dysfunction. P value 0.001

NEW ONSET OF DIABETES AFTER TRANSPLANT(NODAT) vs GRAFT FUNCTION

	Group	**N**	**Mean**	**Std. Dev**	
NODAT	Normal	27	6.96	10.078	**P – Value 0.730**
	Dysfunction	24	8.08	12.954	

NODAT VS DRUGS

CSA or TAC		**Group**	**N**	**Mean**	**Std. Dev**	**P - Value**
CSA +	**NODAT**	Normal	9	14.22	15.123	0.555
		Dysfunction	12	10.00	16.481	
TAC +	**NODAT**	Normal	15	3.47	2.416	0.982
		Dysfunction	9	3.44	2.128	

RESULT

NODAT - influence of NODAT over graft dysfunction is not significant

POLYCYTHEMIA VS GRAFT FUNCTION

	Group	N	Mean	Std. Dev	P - Value
Polycythemia	Normal	14	8.29	5.030	0.597
	Dysfunction	12	7.08	6.403	

SUBGROUP ANALYSIS OF TACROLIMUS VS CYCLOSPORIN

CSA or TAC		Group	N	Mean	Std. Dev	P - Value
CSA +	Polycythemia	Normal	5	12.00	7.036	0.556
		Dysfunction	5	8.80	9.284	
TAC +	Polycythemia	Normal	9	6.22	1.716	0.005
		Dysfunction	4	4.00	.000	

RESULT

26 patients developed polycythemia

Association of polycythemia with graft dysfunction – not significant P value 0.597

Among sub group analysis Tacrolimus based group developed more number of polycythemia compare to cyclosporine group P value 0.005

CMV & HCV infections Vs Graft Function

		Normal		Dysfunction		Total		P value
		N	**%**	**N**	**%**	**N**	**%**	
Type	CMV	10	90	1	10	11	100	0.68
	HCV	6	40	9	60	15	100	0.92

CMV – CYTOMEGALO VIRUS

HCV - HEPATITIS C VIRUS

Results :

CMV infection – 11 recipients

No significant association with graft dysfunctions

HCV infection – 15 recipients

No significant association with graft dysfunctions

Analysis to identify the factors leading to kidney dysfunction

Factors	Unadjusted			Adjusted		
	OR	**95% CI**	**P-value**	**OR**	**95% CI**	**Pvalue**
Donor age	1.044	1.011 - 1.078	0.009	1.035	1.001 - 1.072	0.049
Donor sex						
Female	1.000			-	-	-
Male	0.686	0.346 - 1.361	0.281			
Recipient age Age	1.001	0.965 - 1.039	0.943	-	-	-
recipient sex						
Female	1.000					
Male	3.292	1.326 - 8.177	0.010	3.306	1.292 - 8.459	0.013
Cold Isch Time	0.997	0.996 - 0.999	0.014			
HLATYPE						
Nil Match	1.000			-	-	-
HLA 2	3.022	1.349 - 6.771	0.007			
Full match	5.333	1.079 - 26.358	0.040			
CR1.2 day	0.936	0.869 - 1.009	0.085	-	-	-
CSA +						
No	1.000					
Yes	2.817	1.441 - 5.511	0.002	2.437	1.198 - 4.959	0.039
TAC +						
No	1.000			-	-	-
Yes	0.378	0.192 - 0.743	0.005			

ALL RESULTS ENTERED IN X L SHEET

FOLLOWING TEST WERE CARRIED OUT TO ASSES THE SIGNIFICANCE

1. TO COMPARE MEAN VALUE STUENT T TEST WAS USED
2. TO COMPARE PROPORTION CHI SQUARE TEST WAS USED
3. TO IDENTIFY FACTORS INFLUENCING DYSFUNCTION, SIMPLE AND MULTIPLE LOGISTIC REGRESSION WAS USED

DISCUSSION

A total of 155 transplant recipients were regularly followed up in nephrology outpatient department from 2009 October to march2011. Out of these 155 recipients, 66 recipients had developed graft dysfunction. Among the 66 recipients, 57 were live related first degree recipients, 7 were cadaver graft recipients and 2 were spousal transplant recipients.

Delayed graft function (defined as those required hemodialysis in immediate postoperative period) was noted in 7 recipients. All of them were cadaver transplant recipients and they required two to three hemodialysis session during the post operative period. All of them recovered completely and none of them developed graft dysfunction during study period.

Slow graft function (SGF defines a group of recipients in whom plasma creatinine level of greater than 3 mg/dL and no dialysis required during the first week of transplant) was noted in 8 out of 155 recipients. Out of eight, three were cadaver recipients and five were live donor recipients. Among the 8 recipients three had persistent Graft dysfunction more than a month after transplant. Hence renal biopsy was carried out after ruling out the other causes. The Biopsy findings revealed acute tubular necrosis is the cause for dysfunction in all the three cases. The above said three recipients continued to have raised creatinine more than 1.5.

All the patients were started on triple drug immuno suppression (Tacrolimus /Cyclosporine, Azathioprine / Mycophenolate, and prednisone). No induction therapy was given for cadaver and spousal transplant recipient.

Out of 66 graft dysfunction (GDF) who underwent biopsy categorized as follows:

Antibody mediated rejection -2

Acute cellular rejection -13

Acute tubular necrosis - 9

Thrombotic microangiopathy -6

Chronic allograft nephropathy -28

Drug toxicity - 6

Non specific tubular changes-1

Nuetrophilic infiltration suggestive of infection-2.

Combined lesion-3

Acute cellular rejection with thrombotic microangipathy-2,

Chronic allograft dysfunction with mild cellular rejection-1.

Acute antibody mediated rejection was observed in 2 of the graft dysfunction recipients. Both of them were treated with plasmaphersis, and hemodialysis. No ATG were given as a rescue therapy due to financial constraint. There was no improvement in Graft function in these recipients. At present they are on maintenance Hemodialysis.

Those who have biopsy proven acute cellular rejection (13) were treated with methyl prednisone pulse therapy. Among the above 13 recipients, 2 were cadaver and remaining 11 were live donor recipients. HLA matching was carried out in live donor and recipients. It was found that one had full match, remaining 9 had haplomatch and

one had only one antigen match. HLA typing was not done for cadaver transplant recipients or donors. Out of 13 recipients, 7 were on cyclosporine regimen and 8 were on Tacrolimus regimen. There was an improvement in creatinine in eight out of thirteen recipients following methyl pulse therapy. Remaining 5 recipients maintained the same creatinine without further raise. Those who were on cyclosporine regimen were switched over to Tacrolimus.

Acute tubular necrosis (ATN) was observed in 9, out of 66 Dysfunction recipients. Among the 9, 6 had ATN within three months and remaining three (late group) had within six months after transplant. Out of six, three had ATN in the(early group) immediate post operative period (slow graft function) and in remaining three graft dysfunction(intermediate group) were identified during their follow up and subjected to biopsy after ruling out other causes. The cause for ATN in late group was diarrhoeal disease in 2 cases and pyrexia of unknown origin in another case ,improved after intravenous antibiotics. In all three(late group) recipients maintained high creatinine more than 2 for three weeks and subjected to biopsy. Among them eight recovered completely. One had underlying chronic changes and creatinine remains stable till date without further rise.

Thrombotic microangipathy (TMA) was observed in six recipients. Out of the six TMA, 4 were on CSA and 2 were on TAC based regimen. All of them developed de novo TMA in the graft. LDH and peripheral smear study were done for all the above six recipients but were not sensitive to predict TMA. Calcinuerin based immuno suppression were withdrawn in all cases. Sirolimus was started on two recipients.

Twenty eight (28) recipients had chronic allograft nephropathy (CAN). Out of this 28, 24 were males and 4 were females. Two were cadaver transplant recipient and remaining 26 were live donor recipients. Twenty three (23) out of 28 recipients

received organs from donors more than 40 yrs of age. Among them 25 were on cyclosporine based immunosuppression. Among the 28 CAN recipients, three had graft loss and are on maintenance of hemodialysis. On looking into the duration, 4 had CAN within a period of 4 months, 8 developed CAN within 6 months and 12 developed more than 1 year after transplant.

Biopsy proven calcinuerin toxicity was observed in 6 recipients. Among them 4 were on CSA based and 2 were on TAC based regimen. All of them had undergone frequent drug level (trough) monitoring and dosage was adjusted according to the level. All of them are maintaining stable creatinine.

One recipient developed transplant renal artery stenosis 3 months after transplant and underwent renal artery stenting. Even after stenting graft function did not improve and She underwent renal biopsy. Biopsy showed ischemic glomerulonephritis.

Out of 66 recipients, three recipients (3) had biopsy proven IgA nephropathy. Among them 2 had recurrent IgA and one had de novo IgA in the graft.

Univariate and multivariate analysis were done for all the parameters which were taken for analysis:

1. The association of graft function with donor age was analyzed. The mean age group of normal graft was 39 yrs compared to 44 yrs of dysfunction group. The association between donor age and graft dysfunction is significant P 0.005. The study done by **jhon swanson et all & Fernando G cosio et** all confirmed that increased donor age correlates with reduced allograft survival(52)

2. Most of the donors in this study were female, particularly live donor transplant. Donor gender was analyzed with graft dysfunction. In this study the association is statistically significant. The study done **by Neugarten J et all & Martin Zeier** et all confirms that longevity of graft survival is affected when female kidneys were transplanted to male recipients(53). The gender effect is more in case of young donors (16 to 45 yr) compared with older donors (45 yr). The proposed hypothesis is nephron under dosing

3. Donor blood group was analyzed with graft dysfunction. Dysfunction group received kidneys are mostly from 'B' group donors. The association of donor blood group with graft dysfunction is not significant.

4. Side of the kidney (right or left) and number of renal arteries were studied. In live donor transplantation left side is mostly preferred due to the technical reasons, provided left side has single renal artery. In this study out of 166 recipients, 140 received left side kidney. While looking into the number of renal arteries, eleven (11) had double renal artery and the remaining were single. Among the 11 double renal arteries 8 were cadaver donors. Side of the kidney and number of renal artery do not show statistical significance with graft dysfunction.

5. Recipient age was studied. In this study most of them were young recipients of age less than 35 yrs. Mean age group was 30 yrs in both arms. Recipient age does not show significant correlation with graft dysfunction.

6. Epidemiology study by **Dorry L. et** all showed that women had 11% less access to kidney transplantation than men(54). This study also confirms that access to kindly transplantation is better in males 80% than females 20% (132 male and 23 female recipients,).

7. The association between male recipients with graft dysfunction was significant in this study (P value 0.008).This may be due to the fact that most of them were received graft from female donors. A study by **Vereerstraeten P** et all showed that Inferior graft outcome when kidneys of female donors were transplanted into male recipients and also showed significantly higher incidence of rejections in male recipients who received organs from female donors(55). It is also observed in this study.

8. The association of Recipient blood group, duration of hemodialysis (months) and native kidney disease were taken for analysis. In this study it was observed that more 'B' group recipients developed graft dysfunction and mean duration of hemodialysis is eight months. The association of Recipient blood group, duration of hemodialysis (months) and native kidney disease with graft function is not significant.

9. HLA mismatch were analyzed. Out of 165 recipients, 104 had haplomatch , 8 had full match, one had nil match and not done in 42 recipients (35 cadaver and 6 spousal donors), . There is a statistically significant association between HLA mismatch with graft dysfunction (P value **0.012**). Studies done by **Halloran etall and Leepc , terasaki** et all showed that there is a significant association between HLA mismatches and graft dysfunction(56),(57). This finding is also validated in this study.

10. Influence of Tissue cross match over graft dysfunction was taken up for analysis. In this study, most of the cross match reports vary between 5 to 10 %. The association of cross match with graft dysfunction is not significant.

11. A study done by **Stefan gunthertullius et all** compared cold ischemia time and donor age with graft dysfunction and confirmed that prolonged ischemic time > 120 mts affects graft survival significantly in case of live donor transplants(58). Cold ischemic time varies between cadaver and live donor recipients due to transportation of organs from different places (mean - **514minutes in cadaver compare to 54 minutes in live donor grafts)..** In this study the association is not significant may be due to small sample size of cadaver donors and large pool of live donor recipient.

12. No statistically significant association between day one creatinine, discharge creatinine and urine output in first postoperative day with graft dysfunction

13. Post operative Days required to reach creatinine of 1.2 were taken up for study. A study by **Magaligiral-Classe** et all , showed that Delayed graft function of more than six days strongly by normal group compare to dysfunction group (8 days) to reach baseline creatinine of 1.2 and confirms the association of delayed function with graft dysfunction(59)

14. Post transplant Hemodialysis (HD) done in 14 transplant recipients. Among them, 6 were in the immediate post operative period (delayed graft function) and remaining 8 recipients underwent HD for varying period after transplant for graft dysfunction. Association between hemodialysis and graft dysfunction is not significant in this study. This is discordant with that study done by **Henkboom** et all**,** showed that significant association between Delayed graft function and poor long term graft survival(60). This may be due to small sample size of delayed graft function recipients. Out of 13, five (5) developed chronic allograft loss (CAN 3, AMR 2), presently they are on maintenance HD

15. 13 transplant recipients developed significant post operative events. There is no statistically significant association between the events and graft dysfunction. Among the subgroup analysis 9 pt in normal function group had intra and post operative events compare to 4 in dysfunction group.

16. All patients were started on triple drug immunosuppression (csa+aza/ csa+mmf, or Tac +aza / Tac + mmf and prednisone). All patient received steroids either 1mg/ kg in case of csa group, or 0.5 mg in case of tac group and gradually dose tapered and maintained 0.2 mg / kg dose thorough their life. No steroid free or withdrawal protocols were followed. High risk recipients (cadaver, spousal and graft dysfunction) were started on tacrolimus and mmf regimen. Among the 155 pts 80 were on csa +aza, 17 were csa+mmf, 21 were tac+asa, 46 were tac + mmf regimen. Statistical analysis done for csa and tac verses graft function**.** Among them who are in csa based regimen had number graft dysfunction p = .001 probably due to overdosing, under dosing, non availability of drug level to monitoring toxicity in the early periods and drug toxicity. This observation is confirmed in a study **by Marika A. Artzaetall** that conversion of csa to Tacrolimus slow down the progression of dysfunction(61)

17. New onset of diabetes mellitus after transplant (NODAT) was analyzed between normal and dysfunction group. Difference is not statistically significant between the groups. Among the subgroup analysis with age, recipients with age more than 30 developed more NODAT compare to less than 30 yrs P value .039. further subgroup analysis of incidence of NODAT between tacro based immunosuppression with cyclosporine regimen , more number of patient in tacro based group developed NODAT but statistically not significant .

18. Polycythemia was observed in 26 post transplant recipients. Influence of polycythemia over graft function is not statistically significant. **There is a significant (P= 0.03) increase in incidence of polycythemia in tacro based regimen.** This may be due to more number of normally functioning graft in tacro group.

Among the infection, cytomegalovirus & hepatitis c virus were taken up for analysis.11 recipients developed

19. CMV infection as confirmed by PP65Ag .Out of 11, 3 were positive after 3 months, 6 after 7 months, 2 after one year after transplant. All of them were treated. One recipient developed graft dysfunction. The association is not significant.

20. HCV infection was noted in 14 of our recipients. Among the 14, two were detected prior to transplant .In this study, the association between HCV infection and graft dysfunction is not significant

21. Multivariate analysis was done by using logistic Regression analysis to identify the factors leading to kidney dysfunction. Among the factors donor age, recipient sex and cyclosporine showed statistically significant association with graft dysfunction. This is concordant with a study done by **A.E. Courtney** et all(62).

CONCLUSION

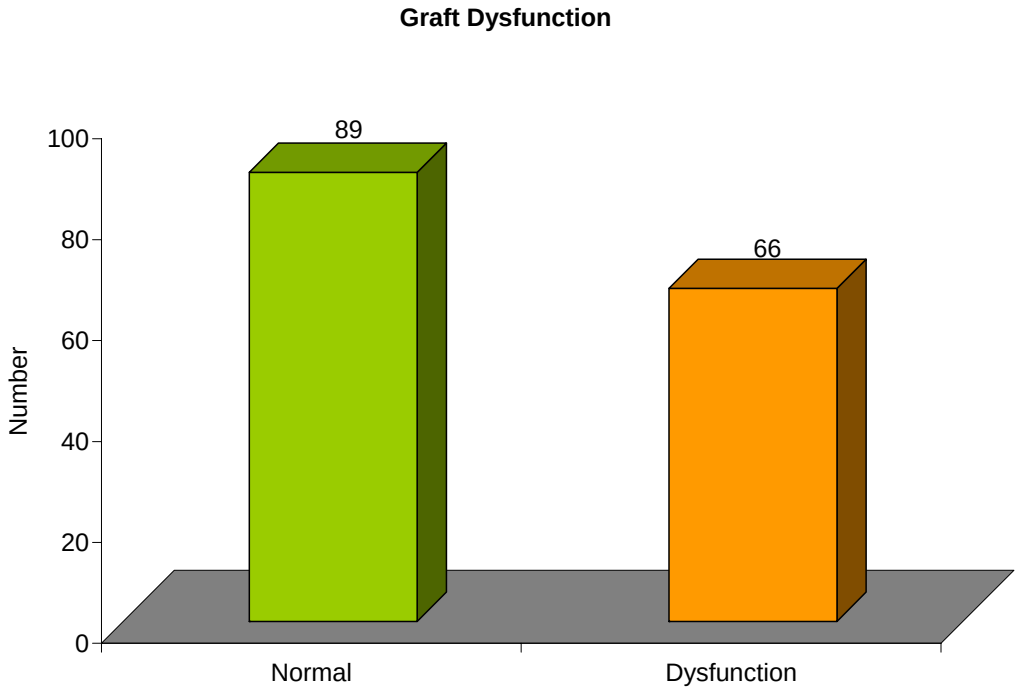
According to Univariate analysis following conclusion were made

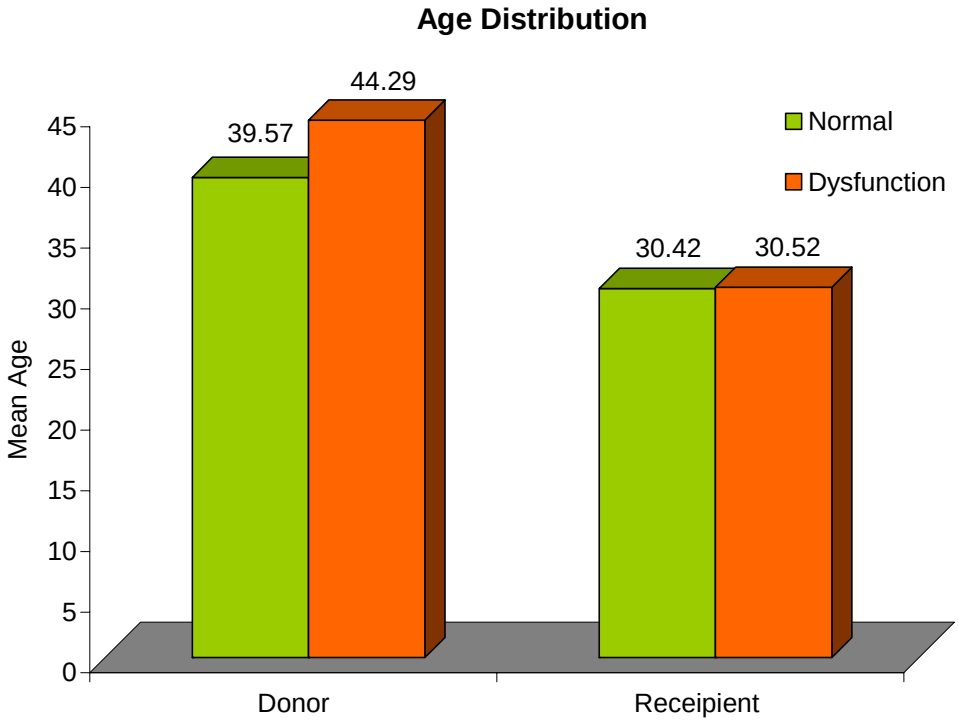
- Tacrolimus gives a better graft survival than cyclosporine for both live and cadaveric transplants.
- Donor age has significant impact on long term graft survival; younger the donor better the outcome
- With female donors the graft dysfunction is more, may be due to difference in antigencity and smaller renal mass
- The Male recipients do worse than female recipients; probably due to female recipients has higher degree of sensitization to HLA antigen.
- Blood group, cross match results, day one urine output, First post operative day creatinine, discharge creatinine are not having significant association with cause graft dysfunction
- Delayed graft function has significant impact on long term graft survival according to Univariate analysis
- Side of the kidney , number of blood vessels, post operative events are not statistically significant to cause graft dysfunction

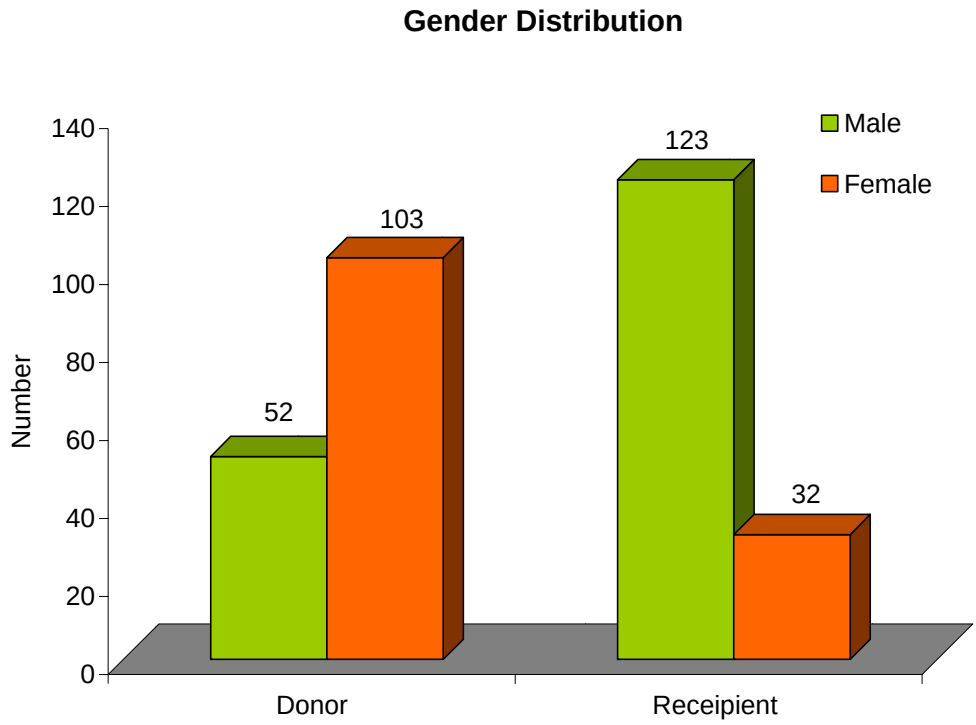
MULTIVARIATE ANALYSIS

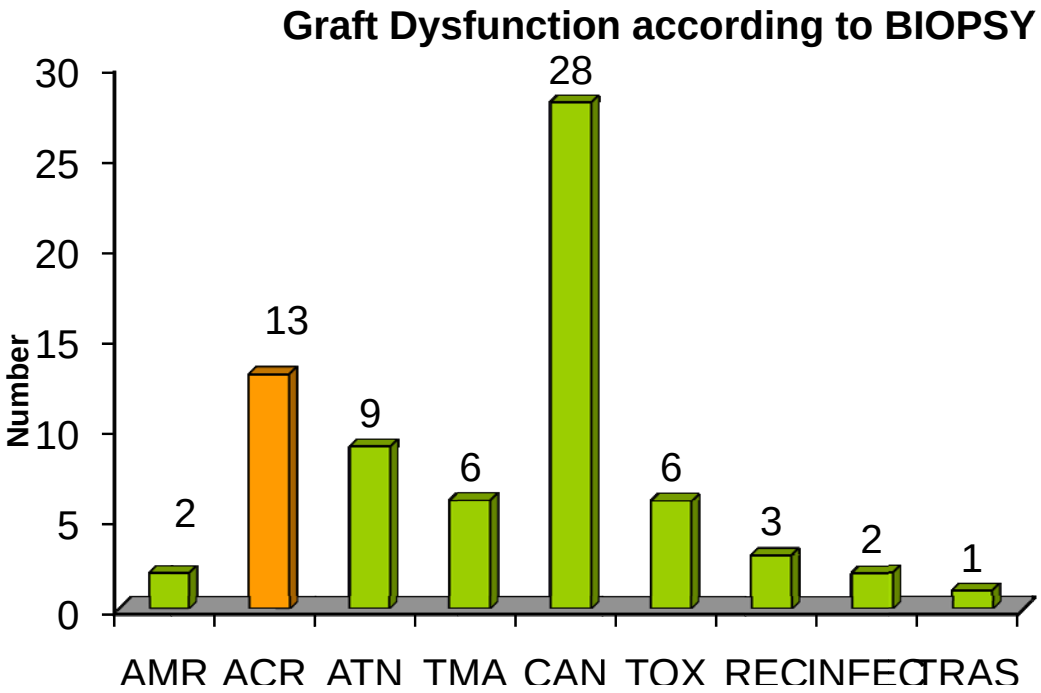
- Multivariate analysis was carried out for all the parameters to assess the significance. The following parameters has more significant association with graft dysfunction.

1. Donor age,
2. recipient sex – male recipient has more significant graft dysfunction
3. cyclosporine compare to tacrolimus has more significant association with graft dysfunction.

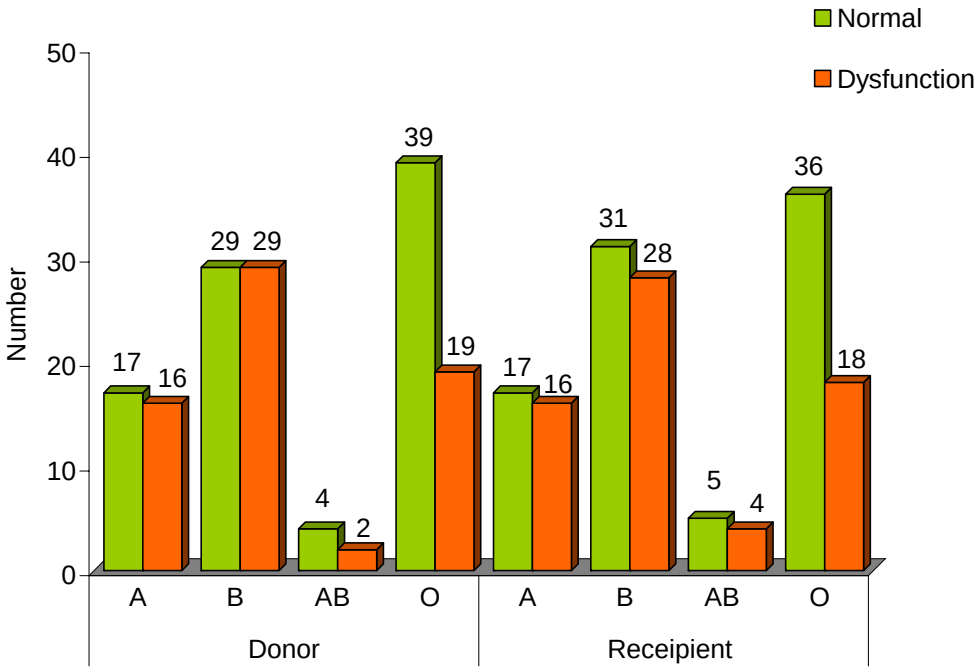

Graft Dysfunction
Number
100
80
60
40
20
0
89
66
Normal
Dysfunction


Age Distribution
Mean Age
45
40
35
30
25
20
15
10
5
0
39.57
44.29
30.42
30.52
Normal
Dysfunction
Donor
Receipient

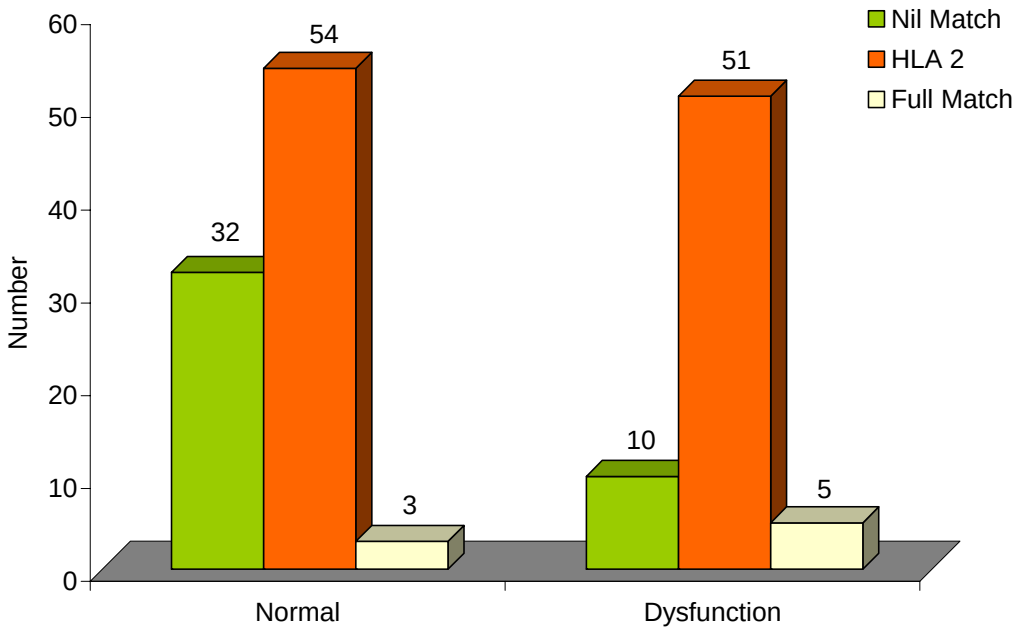

Gender Distribution
Male
Female
Number
140
120
100
80
60
40
20
0
52
103
123
32
Donor
Receipient

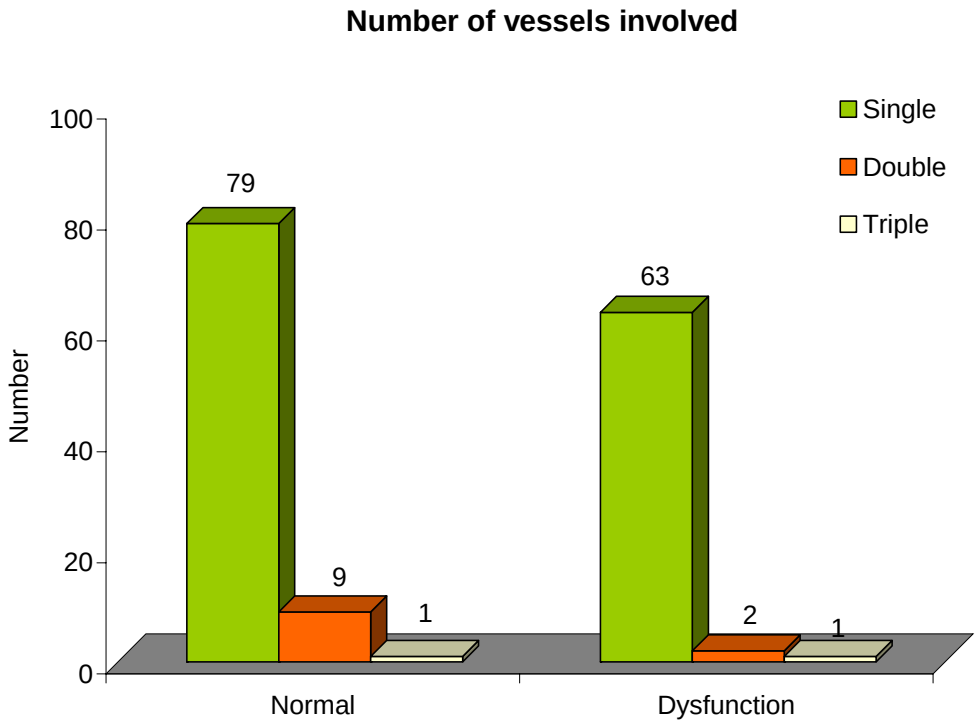

Graft Dysfunction according to BIOPSY
Number
30
25
20
15
10
5
0
2
13
9
6
28
6
3
2
1
AMR
ACR
ATN
TMA
CAN
TOX
RECINFEC
TRAS

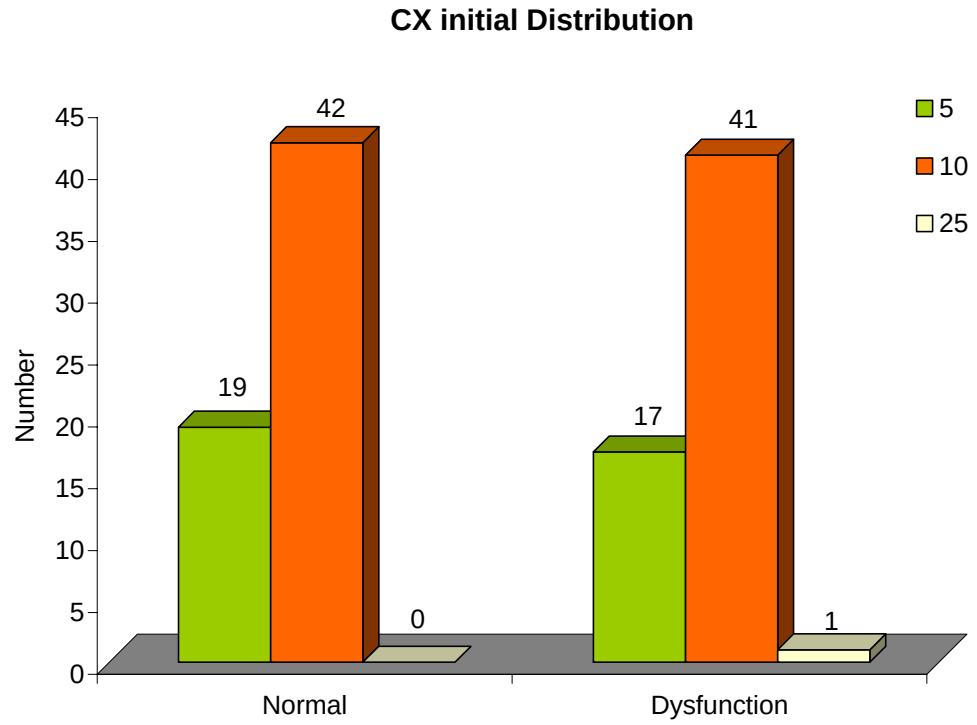
Blood group Distribution



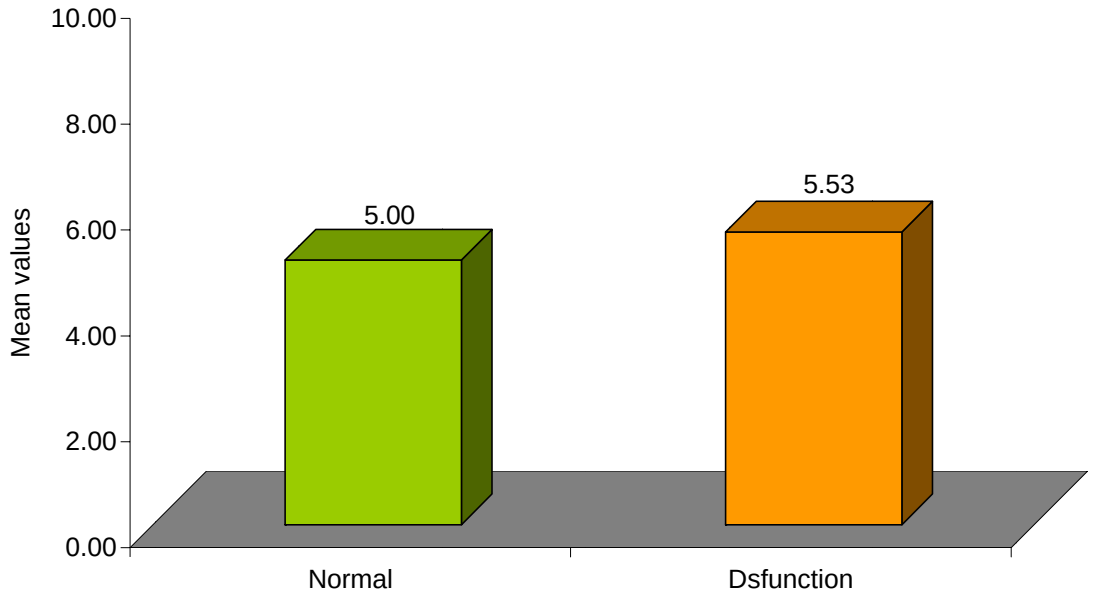
HLA type Distribution



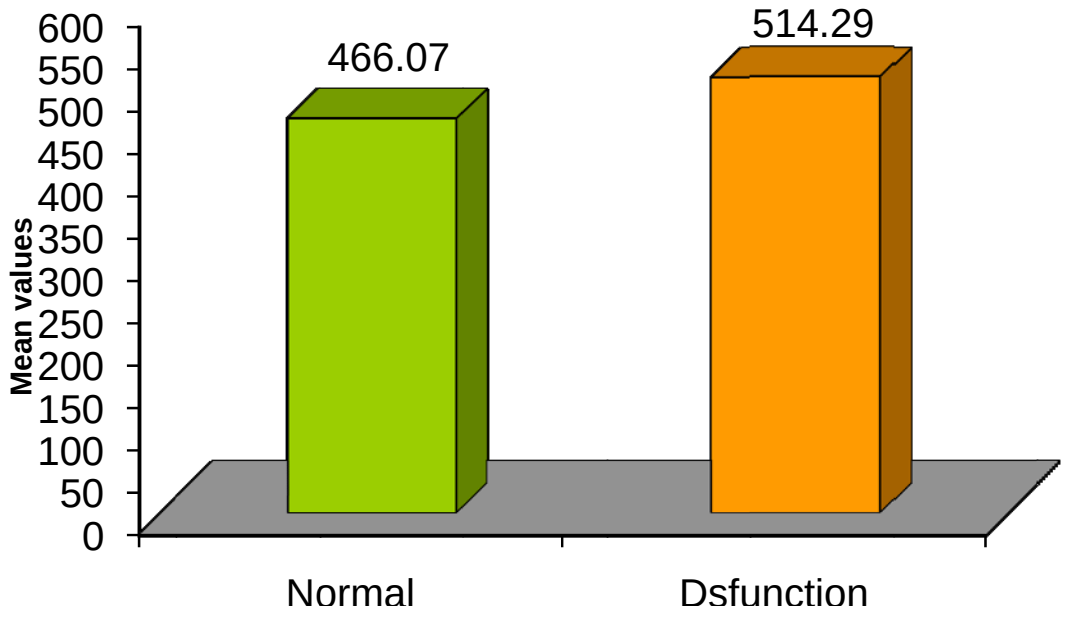

Number of vessels involved
Single
Double
Triple
Number
100
80
60
40
20
0
79
9
1
63
2
1
Normal
Dysfunction

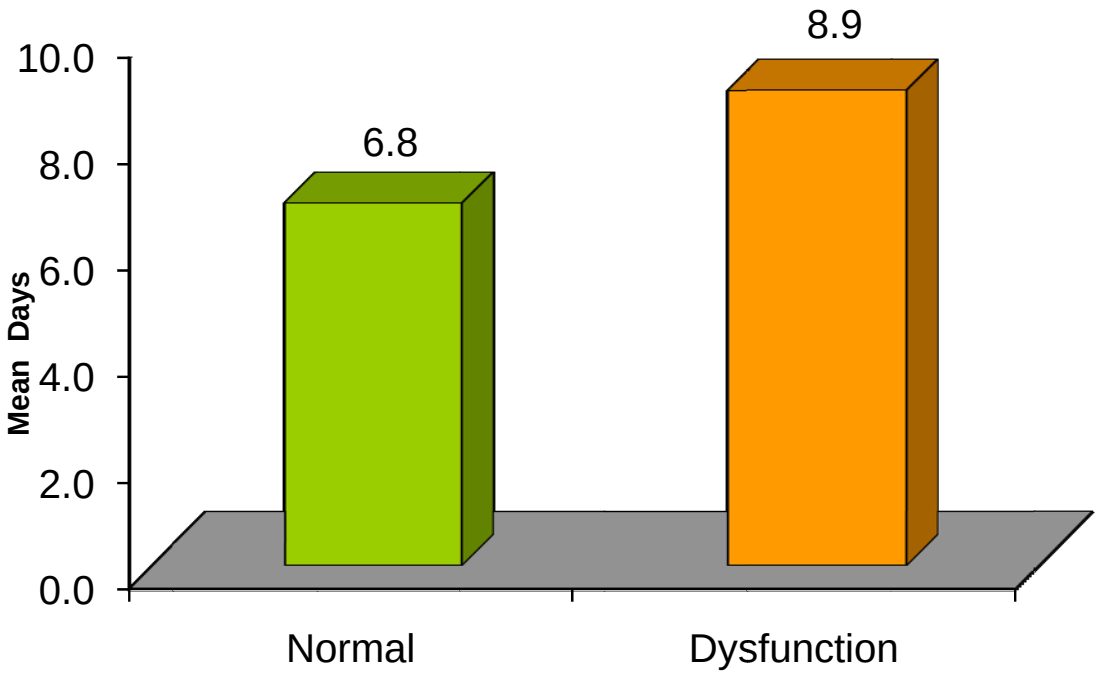

CX initial Distribution
5
10
25
Number
45
40
35
30
25
20
15
10
5
0
19
42
0
17
41
1
Normal
Dysfunction

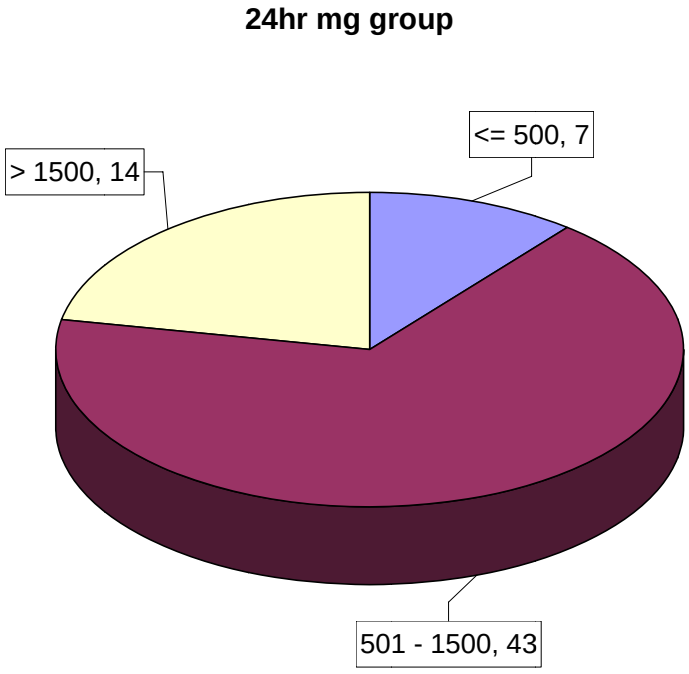
WIT distribution



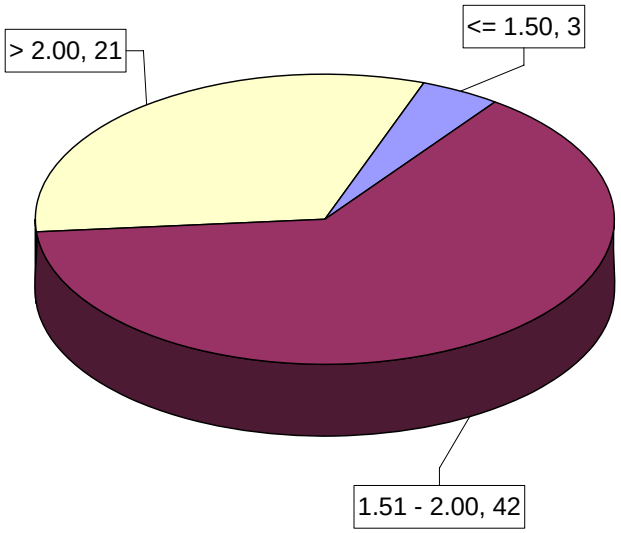
CADAVER CIT(MINUTES) distribution



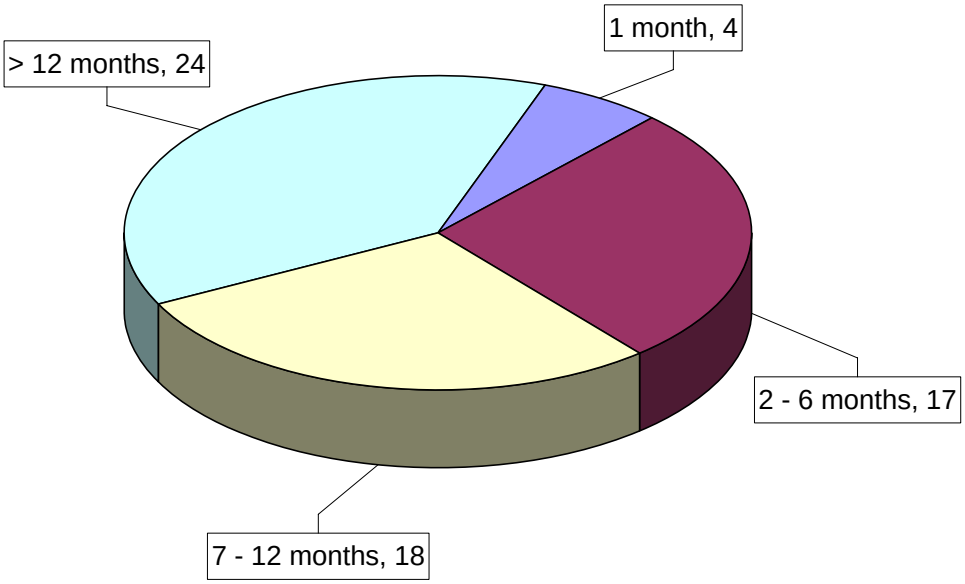

No . OF DAYS taken to REACH CR 1.2
Mean Days
10.0
8.0
6.0
4.0
2.0
0.0
6.8
8.9
Normal
Dysfunction

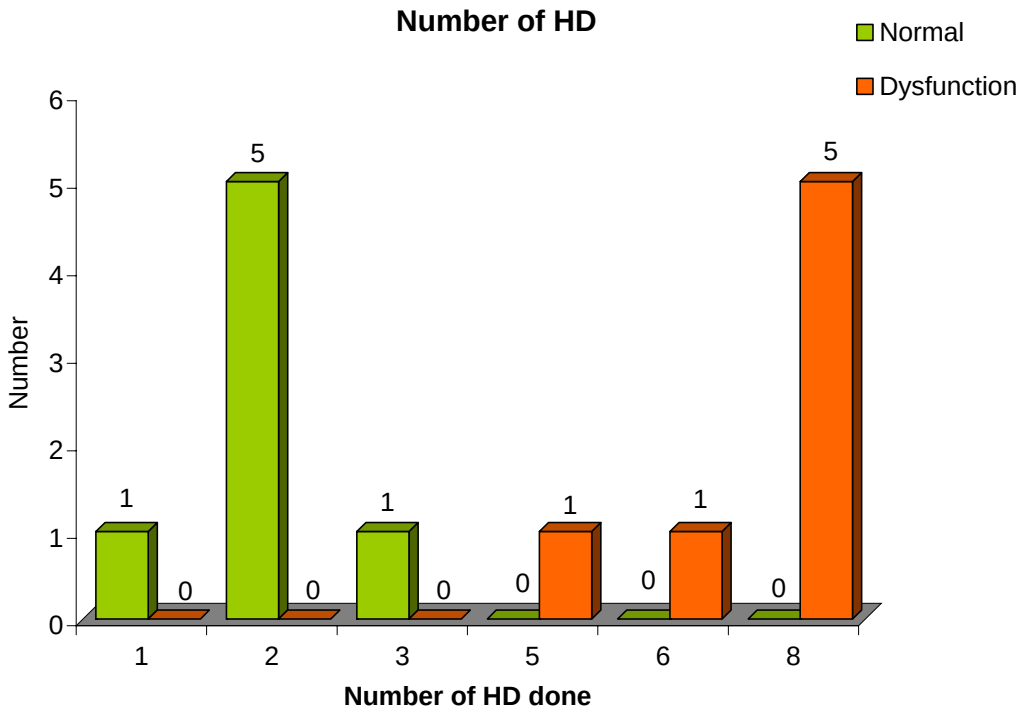

24hr mg group
<= 500, 7
> 1500, 14
501 - 1500, 43

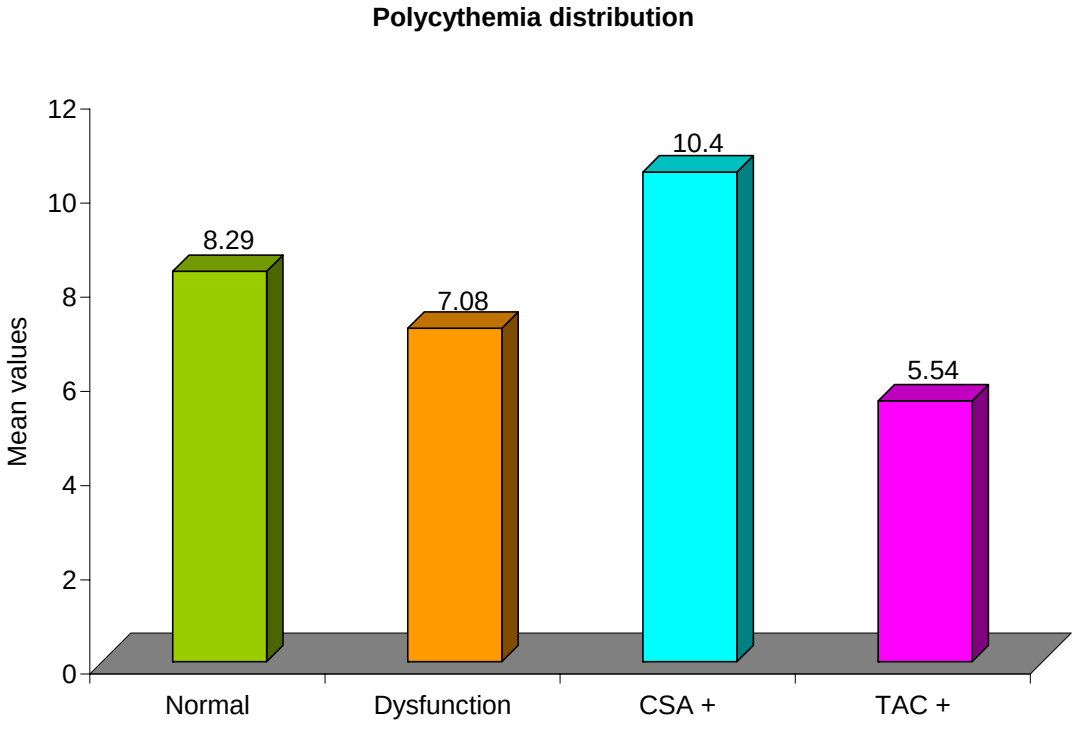
BXCR distribution



Month of biopsy




Number of HD
Normal
Dysfunction
Number
0
1
2
3
4
5
6
1
0
5
0
1
0
0
1
0
1
0
5
1
2
3
5
6
8
Number of HD done


Polycythemia distribution
Mean values
0
2
4
6
8
10
12
8.29
7.08
10.4
5.54
Normal
Dysfunction
CSA +
TAC +

BIBILOGRAPHY

1. Wolfe RA, Ashby VB, Milford EL, et al: Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. *N Engl J Med* 1999; 341:1725-1730.

2. USRDS. USRDS 2005 Annual Data Report: NIH and NIDDK, Bethesda, MD, 2005.

3. Morris PJ, Russell NK: Alemtuzumab (Campath-1H): a systematic review in organ transplantation. *Transplantation* 2006; 81:1137-1361.

4. Vincenti F, Larsen C, Durrbach A, et al: Costimulation blockade with belatacept in renal transplantation. *N Engl J Med* 2005; 353:770-781.

5. 100. Gjertson DW, Cecka JM: Living unrelated donor kidney transplantation. *Kidney Int* 2000; 58:491-499.

6. Gjertson DW, Cecka JM: LivZeier M, Dohler B, Opelz G, Ritz E: The effect of donor gender on graft survival. *J Am Soc Nephrol* 2002; 13:2570-2576.

7. Ojo AO: Expanded criteria donors: process and outcomes. *Semin Dial* 2005; 18:463-468.

8. Cooper JT, Chin LT, Krieger NR, et al: Donation after cardiac death: the university of wisconsin experience with renal transplantation. *Am J Transplant* 2004; 4:1490-1494.

9. Kayler LK, Rasmussen CS, Dykstra DM, et al: Gender imbalance and outcomes in living donor renal transplantation in the United States. *Am J Transplant* 2003; 3:452-458.

10. Butler JA, Roderick P, Mullee M, et al: Frequency and impact of nonadherence to immunosuppressants after renal transplantation: a systematic review. *Transplantation* 2004; 77:769-776.

11. Gore JL, Pham PT, Danovitch GM, et al: Obesity and outcome following renal transplantation. *Am J Transplant* 2006; 6:357-363.

12. Kasiske BL, Anjum S, Shah R, et al: Hypertension after kidney transplantation. *Am J Kidney Dis* 2004; 43:1071-1081.

13. Briganti EM, Russ GR, McNeil JJ, et al: Risk of renal allograft loss from recurrent glomerulonephritis. *N Engl J Med* 2002; 347:103-109.

14. Gjertson DW: Impact of delayed graft function and acute rejection on kidney graft survival. *Clin Transpl* 2000;467-480.

15. Perico N, Cattaneo D, Sayegh MH, Remuzzi G: Delayed graft function in kidney transplantation. *Lancet* 2004; 364:1814-1827.

16. Goggins WC, Pascual MA, Powelson JA, et al: A prospective, randomized, clinical trial of intraoperative versus postoperative Thymoglobulin in adult cadaveric renal transplant recipients. *Transplantation* 2003; 76:798-802.

17. Magee CC: Transplantation across previously incompatible immunological barriers. *Transpl Int* 2006; 19:87-97.

18. Rush D, Nickerson P, Gough J, et al: Beneficial effects of treatment of early subclinical rejection: a randomized study. *J Am Soc Nephrol* 1998; 9:2129-2134.

19. Gaber AO, First MR, Tesi RJ, et al: Results of the double-blind, randomized, multicenter, phase III clinical trial of Thymoglobulin versus Atgam in the treatment of acute graft rejection episodes after renal transplantation. *Transplantation* 1998; 66:29-37.

20. Shapiro R, Young JB, Milford EL, et al: Immunosuppression: evolution in practice and trends, 1993-2003. *Am J Transplant* 2005; 5(4 Pt 2):874-886.

21. Briggs D, Dudley C, Pattison J, et al: Effects of immediate switch from cyclosporine microemulsion to tacrolimus at first acute rejection in renal allograft recipients. *Transplantation* 2003; 75:2058-2063.

22. Woodle ES, Thistlethwaite JR, Gordon JH, et al: A multicenter trial of FK506 (tacrolimus) therapy in refractory acute renal allograft rejection. A report of the Tacrolimus Kidney Transplantation Rescue Study Group. *Transplantation* 1996; 62:594-599.

23. Collins AB, Schneeberger EE, Pascual MA, et al: Complement activation in acute humoral renal allograft rejection: diagnostic significance of C4d deposits in peritubular capillaries. *J Am Soc Nephrol* 1999; 10:2208-2214.

24. Magee CC: Transplantation across previously incompatible immunological barriers. *Transpl Int* 2006; 19:87-97.

25. Takemoto SK, Zeevi A, Feng S, et al: National conference to assess antibody-mediated rejection in solid organ transplantation. *Am J Transplant* 2004; 4:1033-1041.

26. Pascual M, Saidman S, Tolkoff-Rubin N, et al: Plasma exchange and tacrolimus-mycophenolate rescue for acute humoral rejection in kidney transplantation. *Transplantation* 1998; 66:1460-1464.

27. Racusen LC, Colvin RB, Solez K, et al: Antibody-mediated rejection criteria—an addition to the Banff 97 classification of renal allograft rejection. *Am J Transplant* 2003; 3:708-714. 57.

28. Ruggenenti P: Post-transplant hemolytic-uremic syndrome. *Kidney Int* 2002; 62:1093-1104.

29. Magee CC, Denton MD, Pascual M: Posttransplant hemolytic uremic syndrome. *Kidney Int* 2003; 63:1958-1959.

30. Baid S, Pascual M, Williams Jr WW, et al: Renal thrombotic microangiopathy associated with anticardiolipin antibodies in hepatitis C-positive renal allograft recipients. *J Am Soc Nephrol* 1999; 10:146-153.

31. Bruno S, Remuzzi G, Ruggenenti P: Transplant renal artery stenosis. *J Am Soc Nephrol* 2004; 15:134-141.

32. 66. Brennan DC, Agha I, Bohl DL, et al: Incidence of BK with tacrolimus versus cyclosporine and impact of preemptive immunosuppression reduction. *Am J Transplant* 2005; 5:582-594.

33. Baid S, Tolkoff-Rubin N, Saidman S, et al: Acute humoral rejection in hepatitis C-infected renal transplant recipients receiving antiviral therapy. *Am J Transplant* 2003; 3:74-78.

34. Gow PJ, Pillay D, Mutimer D: Solid organ transplantation in patients with HIV infection. *Transplantation* 2001; 72:177-181.

35. Halloran PF, Melk A, Barth C: Rethinking chronic allograft nephropathy: the concept of accelerated senescence. *J Am Soc Nephrol* 1999; 10:167-181

36. Nankivell BJ, Chapman JR: Chronic allograft nephropathy: current concepts and future directions. *Transplantation* 2006; 81:643-654. 78.

37. Lee PC, Terasaki PI, Takemoto SK, et al: All chronic rejection failures of kidney transplants were preceded by the development of HLA antibodies. *Transplantation* 2002; 74:1192-1194.

38. Takemoto SK, Zeevi A, Feng S, et al: National conference to assess antibody-mediated rejection in solid organ transplantation. *Am J Transplant* 2004; 4:1033-1041.

39. Regele H, Bohmig GA, Habicht A, et al: Capillary deposition of complement split product C4d in renal allografts is associated with basement membrane injury in peritubular and glomerular capillaries: a contribution of humoral immunity to chronic allograft rejection. *J Am Soc Nephrol* 2002; 13:2371-2380.

40. Halloran PF: Call for revolution: a new approach to describing allograft deterioration. *Am J Transplant* 2002; 2:195-200. Afzali B, Shah S, Chowdhury P, et al: Low-dose mycophenolate mofetil is an effective and safe treatment to permit phased reduction in calcineurin inhibitors in chronic allograft nephropathy. *Transplantation* 2005; 79:304-309.

41. Racusen LC, Solez K, Colvin R: Fibrosis and atrophy in the renal allograft: interim report and new directions. *Am J Transplant* 2002; 2:203-206.

42. Diekmann F, Campistol JM: Conversion from calcineurin inhibitors to sirolimus in chronic allograft nephropathy: benefits and risks. *Nephrol Dial Transplant* 2006; 21:562-568.

43. Pascual M, Theruvath T, Kawai T, et al: Strategies to improve long-term outcomes after renal transplantation. *N Engl J Med* 2002; 346:580-590. 83. Briganti EM, Russ GR, McNeil JJ, et al: Risk of renal allograft loss from recurrent glomerulonephritis. *N Engl J Med* 2002; 347:103-109.

44. Ponticelli C, Traversi L, Feliciani A, et al: Kidney transplantation in patients with IgA mesangial glomerulonephritis. *Kidney Int* 2001; 60:1948-1954.

45. Ward MM: Outcomes of renal transplantation among patients with end-stage renal disease caused by lupus nephritis. *Kidney Int* 2000; 57:2136-2143. Andresdottir MB, Assmann KJ, Hoitsma AJ, et al: Recurrence of type I membranoproliferative glomerulonephritis after renal transplantation: analysis of the incidence, risk factors, and impact on graft survival. *Transplantation* 1997; 63:1628-1633.

46. Andresdottir MB, Assmann KJ, Hoitsma AJ, et al: Renal transplantation in patients with dense deposit disease: morphological characteristics of recurrent disease and clinical outcome. *Nephrol Dial Transplant* 1999; 14:1723-1731.

47. Cosyns JP, Couchoud C, Pouteil-Noble C, et al: Recurrence of membranous nephropathy after renal transplantation: probability, outcome and risk factors. *Clin Nephrol* 1998; 50:144-153.

48. Kim H, Cheigh JS: Kidney transplantation in patients with type 1 diabetes mellitus: long- term prognosis for patients and grafts. *Korean J Intern Med* 2001; 16:98-104.

49. Krentz AJ, Wheeler DC: New-onset diabetes after transplantation: a threat to graft and patient survival. *Lancet* 2005; 365:640-642.

50. JOHAN W. DE FIJTER,* MARKO J. K. MALLAT,* ILIAS I. N. DOXIADIS Increased Immunogenicity and Cause of Graft Loss of Old Donor Kidneys - J Am Soc Nephrol 12: 1538–1546, 2001.

51. S. John Swansona,e, Iman O. Hypoliteb,Effect of Donor Factors on Early Graft Survival inAdult Cadaveric Renal Transplantation *American Journal of Transplantation 2002; 2: 68±75.*

52. MARTIN ZEIER -Effect of Donor Gender on Graft. The J Am Soc Nephrol 13: 2570–2576, 2002.

53. Neugarten J, Silbiger S R: The impact of gender on renal transplantation. *Transplantation* 15: 1145–1152, 1994.

54. by Dorry L. et all - *J Am Soc Nephrol* 20: 621–628, 2009).

55. Vereerstraeten P - Male recipients of kidneys from female donors are at increased risk of graft loss from both rejection and technical failure. *Clin Transplant* 13: 181–186, 1999.

56. Halloran etall – anti HLA class I antibodies mediated rejection- Transplantation49:1990.

57. Leepc , terasaki et all All chr . rejection were preceded by development of HLA antibodies Transplantation 74: 1192 – 1194 , 2002.

58. Stefan gunthertullius et all - comparing the cold ischemia time with donor age with graft dysfunction J Am Soc Neohrol 11:1317.

59. MAGALI GIRAL-CLASSE, MARYVONNE HOURMANT, DIEGO CANTAROVICH, Delayed graft function of more than six days strongly decreases long-term survival of transplanted kidneys - *Kidney International, Vol. 54 (1998), pp. 972–978.*

60. HENK BOOM, MARKO J.K. MALLAT, JOHAN W. DE FIJTER, AEILKO H. ZWINDERMAN,and LEENDERT C. PAUL Delayed graft function influences renal function, but not survival - *Kidney International, Vol. 58 (2000), pp. 859–866.*

61. Marika A. Artza,* Johannes M. M. Bootsb, GerryLigtenbergc, Joke I. Roodnatd, Maarten H. L.- Conversion from Cyclosporine to Tacrolimus Improves Renal Graft Function - *American Journal of Transplantation 2004; 4: 937–945.*

62. A.E. COURTNEY, P.T. McNAMEE and A.P. MAXWELLThe evolution of renal transplantation in clinical practice:for better, for worse?- Q J Med 2008; 101:967–978.

MASTER CHART

name	TYPE	Kidney Function	Kidney donar	age		sex	weight	group	nkd	bx	mhd(mon)	HLA TYPE	cx intial (%)	cx final (%)	wit Mts.	cit Mts.	donor age	Donar sex	relation	Blood group	side	vessel Involved	cr 1st pod	cr1.2(day)	dis cr	urine day	hd	intra op	csa+aza	csa=mmf	tac+aza	tac+mmf	PTDM	pol.cy	24 HR.mg	bx cr	bx/mon	ABR	ACR	INFECT	ATN	TMA	CAN	others	drug.tox	TRAS	HYDRONEPHROSIS	SEPSIS	recur
subramani		normal	cadaver	45		m	42	o	cgn		36	Not done	Not done	10		480	36	m	cadaver	o	left	single	1.6	5	1.2	12000					y	y	2	9															
JAYAKUMAR	SGF	normal	cadaver	30		M	42	B	CGN	iga	5	Not done	Not done	15		540	29	M	cadaver	B	RIGHT	single	4.8	21	1.1	6370		pancreat		y	y	y	1	7															
REVATHY		normal	cadaver	25		F	35	O	CGN		24	Not done	Not done	15		420	36	m	cadaver	o	RIGHT	single	1	2	0.8	17600		SEPSIS				y																
palani		normal	cadaver	37		m	42	o	cgn		38	Not done	Not done	10		120	15	f	cadaver	o	right	single	2.3	14	1.2	12000						y																
elavarasan		normal	cadaver	22		m	36	ab	CGN	OBSTR	24	Not done	Not done	15		600	12	M	cadaver	ab	left	single	2.4	3	1	7700						y	2																
devi		normal	cadaver	29		m	35	o	cin		6	Not done	Not done	15		300	36	m	cadaver	o	RIGHT	single	1.7	14	1.2	7300						y																	
meeramohideen		dys	cadaver	35		m	46	o	cgn	IgA	9	Not done	Not done	15		600	38	m	cadaver	o	left	single	2.2	4	1.4	26100						y	2		2500	1.5	4		y										
abdul rahim		normal	cadaver	30		m	43	ab	cgn		13	Not done	Not done	15		420	31	m	cadaver	ab	RIGHT	single	2.2	3	1	5500						y	2	4												y			
nasirali	DGF	normal	cadaver	25		m	75	o	cgn		36	Not done	Not done	15		840	21	m	cadaver	o	RIGHT	single	10.2	60	2.2	1450	2					y	1															
amuthulvalli		normal	cadaver	20		f	42	b	cgn		8	Not done	Not done	15		600	50	m	cadaver	o	RIGHT	single	5.5	6	1.3	3650		lymphocele				y	7															
narasingan	DGF	normal	cadaver	23		m	46	b	cgn		18	Not done	Not done	15		240	42	m	cadaver	b	left	DOUBLE	5.6	19	1.2	625	1	pancreatitis				y																
sajeevan		normal	cadaver	32		m	42	a	cgn		12	Not done	Not done	15		300	33	m	cadaver	a	rright	single	1.9	5	1.1	3200						y																
dasaprakash		dys	cadaver	36		m	52	b	cgn		8	Not done	Not done	10		600	45	m	cadaver	b	rright	double	3.8	7	1.2	5450						y			1500	2	6								y				
abdulmunaf		dys	cadaver	38		m	48	a	cgn		24	Not done	Not done	10		120	40	m	cadaver	a	left	single	2.1	7	1.1	5200			y						1500	2	60					y							
devaraj		normal	cadaver	45		m	52	o	cgn		14	Not done	Not done	10		660	24	m	cadaver	o	left	single	3	4	1	4300						y																
riyazali		normal	cadaver	25		m	42	o	cgn	iga	8	Not done	Not done	15		330	29	m	cadaver	o	right	double	4.8	9	1	4650						y	5	5															
ponkodi		normal	cadaver	45		f	42	b	cgn		6	Not done	Not done	10		480	45	m	cadaver	b	left	single	2.5	4	1.1	9500						y																
suja		normal	cadaver	29		f	42	o	cgn		12	Not done	Not done	10		420	23	m	cadaver	o	right	double	2.4	5	1.1	2400						y																
periyaswamy		normal	cadaver	29		m	38	a	cgn		12	Not done	Not done	15		420	29	m	cadaver	a	left	single	5.3	1	1.2	4280						y																
nirmala		normal	cadaver	34		f	41	o	cgn		24	Not done	Not done	10		480	19	m	cadaver	o	let	single	6.2	12	1	2000		SEPIS				y																
kondyaraj		dys	cadaver	32		m	40	o	cgn		36	Not done	Not done	10		600	49	m	cadaver	o	left	three	3	3	1	1500	8					y	6		3500	2	6					y						
balaraman		normal	cadaver	32		m	40	b	cgn		10	Not done	Not done	10		480	26	m	cadaver	b	left	single	3	6	1	3400						y	4	4	2000	2	3	y										
balakrishnan	DGF	normal	cadaver	31		m	45	b	cgn		24	Not done	Not done	10		720	48	m	cadaver	b	left	double	5	18	1.4	390	3					y	6	6														
lillytherasa	SGF	normal	cadaver	29		f	50	b	cgn		24	Not done	Not done	15		720	56	f	cadaver	b	left	three	3	25	1.5	4000						y		8														
sasikumar		normal	cadaver	29		m	35	a	cgn		1	Not done	Not done	10		180	15	f	cadaver	a	left	double	2	4	1	21000						y																
baskar		normal	cadaver	38		m	40	ab	cgn		8	Not done	Not done	5		600	20	f	cadaver	ab	left	single	2	8	1.2	5750	5					y	4		2500	2	6	y										
dasan	SGF	dys	cadaver	48		m	51	o	CIN	adpkd	24	Not done	Not done	10		600	39	m	cadaver	o	left	single	4	21	1.2	5000		sepsis				y	1		2000	2	1			y							y
renuka		normal	cadaver	34		f	41	b	cgn	iga	36	Not done	Not done	5		420	19	f	cadaver	o	left	single	2	3	1	2125						y																
gopikrishnan	DGF	normal	cadaver	40		m	45	b	cgn	fsgs	6	Not done	Not done	5		600	57	m	cadaver	b	left	single	3	9	1	3000	2					y	4															
prema	DGF	dgf	cadaver	35		f	60	a	cgn		23	Not done	Not done	5		720	18	f	cadaver	a	left	double	5	15	1.2	500	2	SEPSIS				y																
kumar		normal	cadaver	32		m	35	a	cgn	iga	10	Not done	Not done	10		480	22	m	cadaver	a	right	double	4	12	1.2	6150						y		6														
kamaraj	DGF	dgf	cadaver	43		m	45	o	cgn		8	Not done	Not done	10		300	50	m	cadaver	o	left	single	6	20	1.4	300	2					y	6															
arumugam		normal	cadaver	35		m	40	a	cgn		26	Not done	Not done	10		480	25	m	cadaver	a	left	single	3	3	1	7550						y																
ramadoss	DGF	dgf	cadaver	57		m	38	b	cgn	adpkd	8	Not done	Not done	10		480	60	f	cadaver	b	right	single	5	26	1.6	1620	2					y	2															
balagi		normal	cadaver	32		m	42	o	cgn		34	Not done	Not done	10		300	20	m	cadaver	o	right	single	3	3	1.2	18050						y																
ARJUNAN		dys	live	32		m	41	b	cgn		5	Full Match	10	10	5	45	35	f	sister	b	left	single	1.7	6	1.2	6500		SEPSIS				y	7		3000	2	9	yes										
palani		dys	live	29		m	57	b	CGN		7	HLA 2	5	10	5	45	46	f	mother	b	left	single	1.1	4	1.1	16300					YES			4	1500	2	8	YES			YES							
gopal		dys	live	35		m	45	b	cgn		4	HLA 2	5	10	5	85	45	f	mother	b	left	DOUBLE	2	6	1.4	23650			yes				3		3500	2	7										iga
sumitha		dys	live	18		f	25	ab	cgn	IgA	8	HLA 2	10	10	7	55	48	f	mother	AB	left	single	2.8	5	1.2	8500						y			2000	1.6	72						ischemic.GN		3month		
sasikumar		dys	live	35		m	35	b	cgn		6	Not done	10	10	5	55	28	f	SPOUSE	B	left	single	1.7	10	1.3	14150	8					Y			3000	2	6	Y									
saraswathy		dys	live	35		f	36	b	cgn		6	HLA 2	10	10	5	55	50	f	mother	b	left	single	1.2	2	1	17850			y				7	1	1200	1.7	6					y					
shankar		dys	live	45		m	45	a	cgn		3	HLA 2	10	10	6	55	63	m	brother	a	left	single	3.2	5	1.2	7500				pred+aza					1000	2	5					y					
venkatesan		dys	live	29		m	39	a	cgn		3	HLA 2	10	10	6	53	55	m	brother	a	left	single	2.6	5	1.5	8150						y			1000	1.8	4				y						
ramamoorthy		dys	live	56		m	42	o	cgn		5	HLA 2	10	10	5	53	57	f	sister	o	left	single	3.8	5	1.5	6800						y		60	1500	2	4					y					
simsone		dys	live	26		m	40	b	cin		4	HLA 2	5	10	6	48	59	f	mother	b	left	single	2.3	6	1.2	8000						y		3	2000	2	48					y					
tamilarasan		dys	live	20		m	40	b	cgn		5	HLA 2	5	10	5	45	45	m	father	B	left	single	1.6	2	1.2	15300						Y			2000	1.8	46					Y					
KAVIRAJAN		dys	live	24		M	52	B	CIN		6	HLA 2	10	10	7	59	45	F	mother	B	left	single	3.5	2	1.2	14150						Y		5	2000	2.1	42			Y							
baskar		dys	live	33		m	36	a	cgn		5	HLA 2	10	10	8	52	40	f	mother	a	left	single	3.2	4	1.2	11500						y			1200	3.3	12			y ,chr chan							
raman		dys	live	24		m	43	a	cgn		6	HLA 2	10	10	5	58	43	f	mother	a	left	single	2.3	4	1.1	12050						y			500	1.8	3	y	1			y					
ramachandran		dys	live	37		m	36	b	cin		6	HLA 2	10	10	5	55	55	m	father	b	left	single	2	4	1	19200				y	y				1000	2	29						Y					
sadasivam		dys	live	33		m	42	a	cgn		5	HLA 2	5	10	7	58	52	m	father	a	left	single	3.2	7	1.2	9630						y		11	750	3	26					y					
sathiskumar		dys	live	21		m	52	b	cgn		4	HLA 2	5	10	6	60	48	f	mother	b	left	single	2.9	4	1	13600						y		14	1250	2.4	24	y				y					
SARANYA		dys	live	17		f	25	a	cgn		2	HLA 2	10	10	5	55	32	f	mother	a	left	single	1	1	1	148000		PANCREATI	y		y04.08		32		1000	2	20					y					
sakthivel		dys	live	24		m	45	b	cgn		5	HLA 2	10	10	5	55	45	f	mother	b	left	single	1.5	3	1	9950						y		5	500	3	19	y									
murugasen		dys	live	26		m	42	o	cgn	SLE	5	HLA 2	10	10	5	55	48	f	mother	o	left	single	1.5	5	1	19350						y			1250	3.5	17			1		y		int.lym.inf01.07				
shamregis		dys	live	21		m	42	b	cgn		4	HLA 2	10	10	8	52	49	f	mother	b	left	single	1	1	1	19650						y			1500	2	14					y					
vijyakumar		dys	live	25		m	40	o	cin		5	HLA 2	10	10	10	60	34	f	mother	o	left	single	2.6	3	1.1	11350						y		1	1250	2.6	12					y					
mohan		dys	live	24		m	35	o	CGN		4	HLA 2	10	10	7	50	50	f	mother	o	left	single	1.6	3	1	9250						y			1200	3	12					y					
saleem		dys	live	48		m	42	b	cgn		5	HLA 2	10	10	5	55	35	f	sister	b	left	single	3.5	5	1	8500						y		3	1000	2.5	11						y				
raffic		dys	live	24		m	45	ab	cgn		6	HLA 2	10	10	5	55	48	f	mother	a	left	single	2.3	3	1	5800									1250	1.7	10			y								
ravichandran		dys	live	30		m	42	o	cin		5	HLA 2	10	10	5	50	35	f	sister	o	left	single	2.5	5	1	5500				y	y				750	2	10					y					
subramani		dys	live	40		m	45	a	cgn		5	HLA 2	10	10	7	55	38	f	sister	a	left	single	3	4	1	12750						y		2	1200	2	10	y									
kadiracen		dys	live	39		m	44	a	cgn		4	HLA2	5	10	3	48	44	f	sister	a	left	single	2	4	1.2	4500				y	y			24	500	2.5	10						y				
vijyapandian		dys	live	29		m	58	b	cgn	glo.sclero	3	HLA 2	5	10	5	40	49	f	mother	b	left	single	5.8	6	1.2	13850				y																	
chandrasekar		dys	live	23		m	42	b	cgn		5	HLA2	5	5	3	47	50	m	father	b	left	single	2.6	5	1.1	17950				y	y / 02.11			3	1500	2.3	185						y				
marimuthu		dys	live	32		m	42	o	cgn		4	HLA 2	5	5	5	58	58	m	father	o	left	single	3.5	5	1.2	8500								8	1250	2.8	77						y				
logeswaran		dys	live	24		m	40	b	cgn		5	Full Match	10	10	5	55	58	m	father	b	left	single	2.1	3	1.1	8500				y	y / 03.08			8	1500	1.7	51						y			reflue hun		
SHANKAR		dys	live	48		m	50	o	cgn		9	HLA2	10	10	5	60	32	m	brother	o	left	single	2.6	5	1.1	7500									1250	2.3	25						y				
gokulvardarajan		dys	live	21		m	40	o	cgn	fsgs	5	HLA 2	5	10	5	65	50	f	mother	o	left	single	3.4	8	1.7	12900	6			y	y				1000	1.5	24						y				
RAMESH		DYS	live	19	M		30	O	cgn	IGA	6	HLA2	5	5	5	50	32	F	mother	O	left	single	2.3	2	1	20550				Y	Y				750	1.7	21						y				
raja		dys	live	24		m	42	o	cgn	iga	5	HLA 2	5	10	5	60	45	f	mother	o	eft	single	3.5	5	1	7250						y			750	3	19										iga
chengamuthu		dys	live	27		m	42	o	cin		4	HLA 2	5	10	5	55	48	f	mother	o	left	single	3	6	1.1	8560						y			1250	3	19						y				
deenadayalan		dys	live	35	M		45	a	cgn		6	HLA 2	10	10	5	50	35	f	sister	o	left	single	4.8	6	1	11250		sepsis		y					1200	2.5	14	y									
anandan		dys	live	30	m		50	b	cin		5	HLA 2	10	10	5	60	55	f	mother	b	left	single	2.5	5	1.2	8500				y					500	2	12							y				
ramesh		dys	live	30	m		50	a	CIN	OBSTRU	6	HLA 2	10	5	5	60	45	f	sister	a	left	single	3.1	5	1.1	8500				y					900	9	10						y				
karthikeyen		dys	live	34	m		45	ab	cin		5	HLA 2	10	5	3	60	50	f	mother	b	left	single	2.4	5	1	23200					y	y		4	1250	2.5	10	y									
julian		dys	live	39	m		50	b	cgn		8	Not done	10	10	5	45	34	f	SPOUSE	b	left	single	3.2	2	1	22950						y		2	600	1.5	5			y					y		
srinivasan		dys	live	23	m		42	o	cgn	iga	5	HLA 2	10	10	4	50	30	m	brother	o	left	single	2	3	0.7	5500				y					900	1.7	4										iga
buhari		dys	live	30	m		35	a	cgn		2	HLA 2	10	10	3	57	48	f	mother	a	left	single	2.6	4	1	7500			y						1200	2	4						y				
saraswathy		dys	live	32	m		40	a	cgn		6	HLA2	10	10	5	55	54	F	mother	a	left	single	3	4	1.2	8600	8								1200	1.7	6						y				
mayakrishnan		normal	live	35	M		52	O	CGN		5	HLA 2	10	10	3	50	45	f	mother	o	left	single	1.7	4	1	21200			yes		yes / 2.09																	
vivekanandan		normal	live	18	m		35	a	cin		7	HLA 2	5	10	5	50	40	f	mother	a	left	single	2	7	1.2	16600			yes																			
dhanalakshmi		normal	live	39		f	45	a	cgn	mpgn	5	HLA 2	10	10	5	60	35	f	sister	A	left	single	1.1	2	0.9	20900			yes																	
prasanth	SGF	sgf	live	35	m		55	b	CGN		4	HLA2	10	10	5	55	45	f	mother	b	left	single	3	21	1.1	16950			y		y /26/2.10																	
jayaprakassh	SGF	sgf	live	31	m		62	o	cgn		8	HLA 2	10	10	5	55	48	f	mother	o	RIGHT	single	3.4	NEVER	1.6	4580				y	y / 11.3.10			1															
KUMAR		normal	live	32	M		54	AB	cgn		5	Not done	10	10	7	50	28	f	spouse	a	left	single	2.6	3	1.2	5100						y																
mangeswaran	SGF	sgf	live	35	m		45	b	cgn		6	HLA 2	10	15	6	55	52	f	mother	B	left	single	1.5	19	1.2	18000		pnumnia ,sepsis			y			1															
dhanalakshmi		normal	live	45	f		39	o	cin		5	HLA 2	10	10	5	55	40	m	brother	o	left	single	1.1	2	0.8	23350								1															
bhuveneswari		normal	live	17	f		36	ab	cgn		4	HLA 2	10	10	5	55	45	f	mother	ab	left	single	3.6	5	0.8	4360				y																	
nainar mohamed		normal	live	36	m		42	b	cgn		6	HLA 2	10	10	5	50	45	f	mother	b	left	single	2.8	2	1	8660				y				8															
menaga	SGF	sgf	live	22	f		41	b	cgn	IgA	6	Full Match	10	10	5	55	51	f	mother	b	left	single	3.8	2	1.5	8900				y					300	1.7	1			y								
balagi		normal	live	17	m		43	a	CGN		6	HLA 2	10	10	8	45	45	f	mother	a	left	single	3	4	1.2	1.2				y					500	2	6			y								
ravi		dysfunct	live	30	m		42	b	cin		5	HLA 2	10	10	7	58	50	m	father	b	left	single	1.9	3	1	13250				y				12															
shabudeen		normal	live	23	m		40	o	cgn		6	HLA 2	5	10	5	55	48	f	mother	o	left	single	3.4	2	1	15950				y				24															
nagaraj		normal	live	32	m		45	o	cgn		6		10	10	6	60	30	f	SPOUSE	O	left	single	1.6	5	1	16100				Y																	
gandhi		normal	live	31	m		43	o	cgn		5	HLA 2	10	10	5	58	40	m	brother	o	left	single	1.8	4	1	9000				y				48															
tamilarasan		normal	live	18	m		36	b	cin		5	HLA 2	10	10	5	58	52	m	father	b	left	single	1.1	1	1	15300				y																	
MERCYANNAMERY	SGF	SGF	live	43	F		48	b	cin		4	Full Match	10	10	10	55	37	f	sister	b	left	single	1.8	14	2	5400				y				12	800	2	1			y								
rajeswari		normal	live	29	f		38	o	cgn		4	HLA 2	10	10	5	57	49	f	mother	o	left	single	1.9	5	1.2	13300					y																	
hemavathy		normal	live	16	f		32	b	cgn		4	HLA 2	5	10	5	45	45	f	mother	b	left	single	2.4	4	1.2	5500			y																			
THANGARAJ		normal	live	32	M		42	B	CGN	schmic	4	HLA2	10	10	15	50	39	F	sister	B	left	single	2.6	14	1.4	13100			Y	Y				10													
RAMAMOORTHY		normal	live	41	M		50	A	CGN		5	Not done	5	10	3	50	38	F	SPOUSE	O	left	single	2.3	4	1.3	9500				Y																	
t.mohan		normal	live	36	m		42	b	cgn		3	Full Match	5	10	10	50	55	f	mother	b	left	single	2.3	5	1.1	17300					y																	

name	TYPE	Kidney Function	Kidney donar	age		sex	weight	group	nkd	bx	mhd(mon)	HLA TYPE	cx intial (%)	cx final (%)	wit Mts.	cit Mts.	donor age	Donar sex	relation	Blood group	side	vessel Involved	cr 1st pod	cr1.2(day)	dis cr	urine day	hd	intra op	csa+aza	csa=mmf	tac+aza	tac+mmf	PTDM	pol.cy	24 HR.mg	bx cr	bx/mon	ABR	ACR	INFECT	ATN	TMA	CAN	others	drug.tox	TRAS	HYDRONEPHROSIS	SEPSIS	recur
ramesh		normal	live	32		m	45	o	cgn		4	HLA 2	5	5	3	55	55	m	father	o	left	single	1.6	6	1.2	10500					y																			
madanagopal		dysfunct	live	37		m	45	o	cgn		4	Full Match	5	5	3	45	40	m	brother	o	left	single	3.2	4	1.1	8500			y				3		350	2	1				y											
eevarathinam		normal	live	26		m	38	b	cin		2	HLA 2	5	5	4	54	45	f	mother	b	left	single	2.5	5	1.1	8200		pancreatitis					6																	
thirunavukarasu		normal	live	32		m	40	o	cin		6	HLA 2	10	10	5	58	45	f	mother	o	left	single	3	6	1.2	8000																								
kumaravel		dysfunct	live	27		m	45	o	cgn		2	HLA 2	5	5	5	46	48	f	mother	o	left	single	2.5	5	1.1	6500	8		y						2300	2	4					y									
elumalai		normal	live	16		m	42	b	cgn		5	HLA 2	10	15	5	60	42	m	father	b	left	single	1.1	3	0.8	9650			y	y																				
ramamoorthy		normal	live	31		m	43	a	cgn		5	HLA 2	10	10	6	54	42	f	sister	a	left	single	2.5	2	1.1	5350			y																				
MANIKANDAN		normal	live	21		m	35	a	cgn	iga	5	HLA 2	5	5	5	55	21	f	mother	a	left	double	3.7	3	1	8500			y																		
shanmugam		normal	live	26		m	35	b	cgn	dm neph	5	HLA 2	5	5	5	55	46	f	mother	b	left	single	2.5	5	1	8500			y																		
ksirajan		normal	live	26		m	35	b	cgn		6	HLA 2	5	10	3	45	55	f	mother	b	left	single	2.5	5	1.1	5600			y																		
navaneetham		normal	live	29		m	40	a	cgn		5	nil	10	10	5	55	48	f	AUNT	a	left	single	3	5	1.1	8200									850	2	48				Y								
sakthivel		normal	live	28		m	42	a	cgn		5	HLA 2	10	10	5	55	35	m	brother	a	left	single	2.8	6	1.3	7400			y							2								infection					
shankar		normal	live	30		m	32	b	cgn		42	HLA 2	25	10	3	45	48	f	mother	b	left	single	3.8	2	0.8	19200					y		1	4		1.9							y						
babu		normal	live	34		m	45	b	cgn	iga	6	Not done	10	10	7	90	24	f	spouse	b	left	double	4.4	3	1.5	17950						y	1														
maheswaran		normal	live	28		m	42	a	cgn	ht nephro	5	HLA 2	10	10	5	48	40	f	mother	a	left	single	3	4	1.1	7560			y																		
venkatesan		normal	live	25		m	52	b	cgn		5	HLA 2	10	10	5	60	48	f	mother	b	left	single	2.4	6	1.1	11650			y				3	7															
fathima		normal	live	25		f	35	o	CGN	SLE	7	HLA 2	10	10	3	50	49	f	mother	o	left	single	1.2	1	1	19850					y																
elumalai		normal	live	24		m	42	o	cgn		5	HLA 2	5	5	5	45	45	f	mother	o	left	single	2	3	1	10800			y																		
kathirvel		normal	live	30		M	52	o	cgn		4	HLA 2	5	5	5	55	53	f	mother	o	left	single	1.7	4	1.1	18050			y				8	7															
senthamilraja		normal	live	29		m	52	b	cgn		8	HLA 2	10	10	5	55	46	f	mother	o	left	single	2.3	5	1	8000			y				5																
malathy		dysfunct	live	20		f	42	b	cgn		5	HLA 2	10	10	6	54	35	f	sister	b	left	single	2.2	5	1	5400			y						1200	1.8							y						
usha		normal	live	14		f	20	o	cgn		2	HLA 2	10	10	5	50	30	f	mother	o	left	single	2	4	1	8500			y																		
mary		normal	live	23		f	35	a	cgn		4	HLA 2	10	10	5	50	46	f	mother	a	left	single	2.5	4	1.1	8600			y																		
sakthivel		dysfunct	LIVE	25		M	48	B	CGN		2	HLA 2	10	10	5	40	40	F	mother	B	left	single	2.5	6	1	15850			Y		Y		3		1500	2.3	8	Y											
stefen devakumar		dysfunct	live	48		m	42	o	cgn		5	HLA 2	10	10	5	55	56	f	sister	o	left	single	1.8	5	1.2	7500			y						1500	2.3	10					y							
mahesh		dysfunct	live	23		m	40	b	cgn		5	HLA 2	5	5	15	60	45	f	mother	b	left	single	4.6	7	1.1	8355			y	y					1000	1.8	10					Y							
lakshmi		normal	live	45		f	40	b	cgn	fsgs	4	HLA 2	5	10	5	50	60	f	mother	b	left	single	2.7	4	1	8050						y														
vinothkumar		normal	live	20		m	35	o	cgn	iga	5	HLA 2	5	10	5	50	50	f	mother	o	left	single	3.3	7	1.2	19150					y		4													
gomathy		normal	live	35		f	48	b	cgn		5	HLA 2	10	10	5	60	50	f	sister	b	left	single	2.5	6	1	7800			y						800	2	14					Y							
vijyalakshmi		normal	live	37		f	45	o	cgn		4	HLA 2	10	10	6	54	37	m	brother	o	left	single	2	3	1	9600			y	y																		
srinivasan		normal	live	25		m	50	a	cgn		5	HLA 2	10	10	5	80	21	m	brother	a	left	single	4.5	8	1.2	5850																						
devika		normal	live	42		f	35	o	cgn		5	HLA 2	5	10	5	55	35	m	brother	o	left	single	2.5	5	1	8200						y														
mugunthan		normal	live	19		M	36	O	cgn	reflux	8	HLA 2	5	5	3	58	46	F	mother	O	left	single	1.7	2	1.1	6550					y		4													
thagera		normal	live	27		f	48	b	cgn		5	HLA2	10	5	5	58	48	f	mother	b	left	single	2	3	1	5800			y																		
viswanathan		normal	live	38		m	42	b	cgn		3	HLA 2	10	5	4	56	50	f	mother	b	left	single	2	4	1	6400			y																		
thulasi		normal	live	19		f	42	b	cgn	mpgn	5	Full Match	10	10	5	45	28	f	sister	b	left	single	1.3	2	0.9	20650					y		8													
chakaravarthy		normal	live	53		m	50	o	cgn		5	Full Match	10	10	5	55	52	m	brother	o	left	single	2	5	0.8	8500																						
subramanian		normal	live	40		m	35	a	cgn		5	HLA2	5	5	5	55	55	f	mother	a	left	single	2.5	5	1	8500			y				4													
bhavanandi		normal	live	35		m	46	b	cgn		6	HLA 2	5	5	3	57	42	f	sister	b	left	single	2.5	6	1	7500																						
anitha		normal	live	20		F	54	a	cgn		5	HLA 2	10	10	5	55	52	f	mother	a	left	single	2	3	1	8500			y				4													
pongodi		normal	live	28		F	50	o	cgn		4	HLA 2	10	10	5	55	54	f	mother	o	left	single	2	2	1.2	7800			y																		
murali		normal	live	26		m	45	o	CIN	OBSTR	4	HLA 2	10	10	3	47	47	f	mother	o	left	single	3	5	1.2	6800				y			24													
umamaheswaran		normal	live	33		m	42	o	cgn	isch.gn	5	HLA 2	10	10	5	56	36	f	sister	o	left	single	2	2	1	8500			y				24													
asokan		normal	live	32		m	40	o	cin		6	HLA 2	10	10	5	55	43	f	sister	o	left	single	2	4	1	7500				y																	
balraj		normal	live	18		m	48	a	cin		5	HLA 2	10	10	3	55	36	f	mother	a	left	single	2	2	1	19500			y																	
sulaiman		normal	live	27		m	42	ab	cgn		5	HLA 2	10	10	3	50	32	m	brother	ab	left	single	2	1	1.1	20950						y														
menaga		normal	live	52		f	48	b	cgn	isch.gn	12	HLA 2	10	10	5	55	32	f	sister	b	left	single	4.2	7	1.1	12000			y																	y
devagi		normal	live	21		f	27	o	cgn		5	HLA 2	10	10	4	90	43	f	mother	o	left	single	1.5	3	1.2	17250					y																
venkatesan		normal	live	28		m	45	o	cgn	dm	6	HLA 2	10	10	5	55	31	f	sister	o	left	single	1.5	2	1.2	20350						y		7												
babu		normal	live	18		m	32	b	cgn	isch.gn	4	HLA 2	10	10	3	58	42	f	mother	b	left	single	2.1	3	1.1	6580		LYMPOCELE	y																			
sathiskumar		dys	live	21		m	35	b	cgn	iga	8	hla2	10	5	5	64	46	m	father	b	left	single	2	4	1	8560	8		y			y		6	2000	2.5	24	y										
suresh		dys	live	29		m	57	b	CGN		7	HLA 2	5	10	5	45	46	f	mother	b	left	single	1.1	4	1.1	16300					YES			4	1500	2	8		YES			YES							

mhd

mhd