

# Renal Transplant Complications, Role of Resistive Index on Colour Doppler Ultrasound

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We evaluated 50 patients who had renal transplants and were sent for Doppler Ultrasound for complications, after the transplant procedure. Ages of the patients ranged from 20 to 65 years, 39 were male and 11 were female. In inclusions only first month post op patients were included and only those patients were considered who had some sort of complications on ultrasound at some stage of the follow up. Following complications were noticed: Diminished corticomedullary demarcations, increased echogenicity with raised RI (20 pt). Perinephric collections other than haematoma (13 pt). Perinephric haematoma (06 pt). Obstructed transplanted kidney (05 pt). Diminished arterial vascularity of the kidney (04 pt) Renal vein thrombosis (02 pt). RI was found to be raised in increased echogenicity, obstructed hydronephrotic kidney, diminished arterial supply and was disturbed in RVT.

**Key words:** Colour Doppler, resistive Index, Renal Transplantation Complications, ultrasonography.

Renal transplantation is the most preferred treatment for the majority of patients with end stage renal disease. As compared to the dialysis, renal transplant gives improved long term survival rate, better quality of life and superior degree of rehabilitation<sup>1,2</sup>. Achieving immediate graft function is an important goal in renal transplantation. Following the procedure patients are evaluated with ultrasonography to assess the renal function. Doppler Ultrasound is an effective screening modality to assess the renal perfusion status and to detect complications in the post transplant period<sup>3,4</sup>. Colour Doppler ultrasonography is also valuable for monitoring normal liver transplantation and its postoperative complications like renal transplants<sup>5</sup>.

Among the more important complications in the recipient of the graft, are the vascular complications. Doppler sonography has become an integral part for the detection of post transplant vascular complications. Early diagnosis with ultrasound enables timely appropriate treatment and therefore survival of the transplant<sup>6</sup>.

Arterial stenosis, pseudoaneurysm, and venous thrombosis are treatable causes of allograft failure that can be detected easily with colour and spectral Doppler. Doppler has a limited but important role in the emergent evaluation of the native liver and kidneys, usually involving prior biopsy or instrumentation<sup>7</sup>.

Resistive Index may be a reliable parameter for early detection of renal transplant rejection. Resistive Index is a widely used parameter to quantify the vascular flow. It is the measure of resistance to arterial flow within the vascular bed and is calculated from the Doppler arterial waveform<sup>8,9</sup>. An RI of less than 0.7 is considered normal whereas RI greater than 0.9 is a strong indicator of graft dysfunction. Normal main renal artery flow velocity ranges from 20 to 50 cm/sec with a mean of 32 cm/sec<sup>5</sup>.

Purpose of this study was to determine the role of resistive index in the evaluation of renal transplant complications by Colour Doppler ultrasound.

## Materials and methods:

This study was conducted in the Department of Radiology, Mayo Hospital, Lahore from June 2004 till July 2005. 50 patients of renal transplants with complications on ultrasound were selected with age range from 20-65 years including 39 male and 11 females. Doppler was done on Logic 7 (GE) and 3.5 & 5 MHz frequency probes were used. RI was recorded in all cases (< 0.7 was taken as normal value).

## Results:

Colour Doppler Ultrasonographic study of 50 patients of post-renal transplant showed various complications. There was increased echogenicity in 20 patients. 13 patients showed perinephric collection other than hematoma while perinephric hematoma was seen in 6 patients. 5 patients showed obstructive renal lesions. Diminished vascularity was seen in 4 patients and renal vein thrombosis was detected in 2 patients (Table I).

RI was recorded in all cases (<0.7) was taken as normal value). Relationship of RI to the complication was noted with comparison to the normal value (Table II). 60% patients showed more increased RI with increased Echogenicity (>0.7), while 40% of this group RI (<0.7).

Table I: Only 100% raised RI (>0.7) was seen in patients with diminished flow.

| Complications                              | =n |
|--------------------------------------------|----|
| Increased echogenicity                     | 20 |
| Perinephric collection other than hematoma | 13 |
| Perinephric hematoma                       | 6  |
| Obstructed kidney                          | 5  |
| Diminished vascularity                     | 4  |
| Renal vein thrombosis                      | 2  |
| Total                                      | 50 |

Patients with perinephric collection other than Hematoma showed increased RI in 16%(>0.7) and in 84% RI within normal range (<0.7), while with hematoma >0.7 RI was seen in 15% < 0.7 RI in 85% cases. In case of



obstructed Kidney  $>0.7$  RI was seen in 55% patients while  $< 0.7$  RI was noted in 45% cases of obstructed kidney.

Table II: Relationship of RI to different complications in transplanted Kidney

| Complication                 | $>0.7$ | $<0.7$ |
|------------------------------|--------|--------|
| Increased echogenicity       | 60%    | 40%    |
| Hematoma                     | 16%    | 84%    |
| Hematoma other than Hematoma | 15%    | 85%    |
| Obstructed Kidney            | 55%    | 45%    |
| Diminished flow              | 100%   |        |

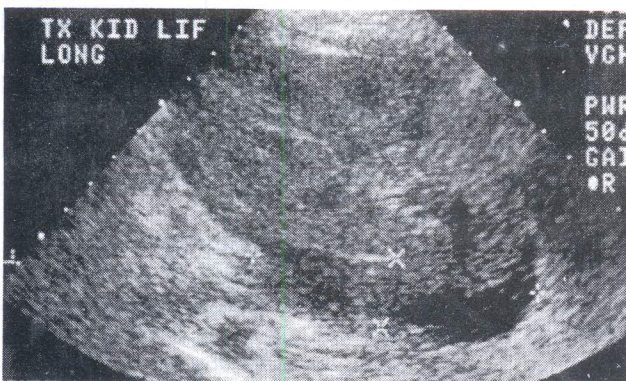


Fig I: Hematoma in transplanted kidney

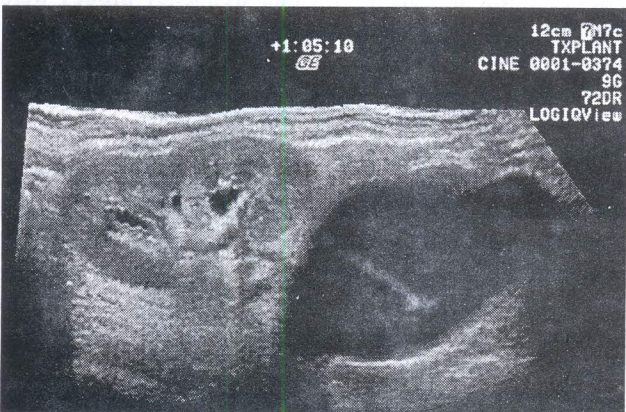


Fig II: Collection of urinoma in transplanted Kidney

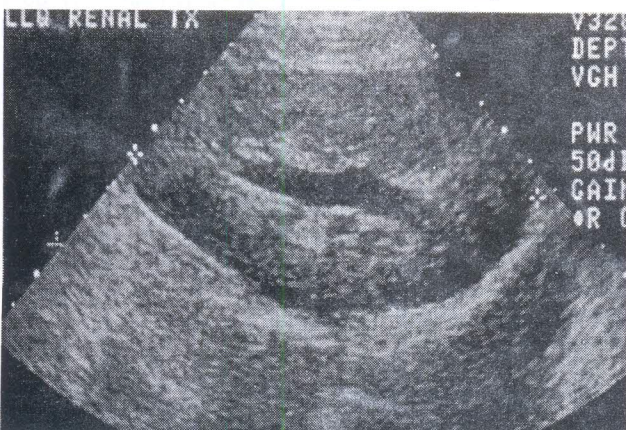


Fig III: Collection of urinoma and hydronephrosis in transplanted kidney

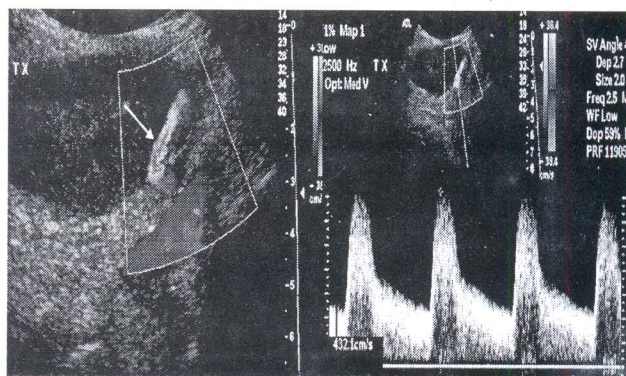
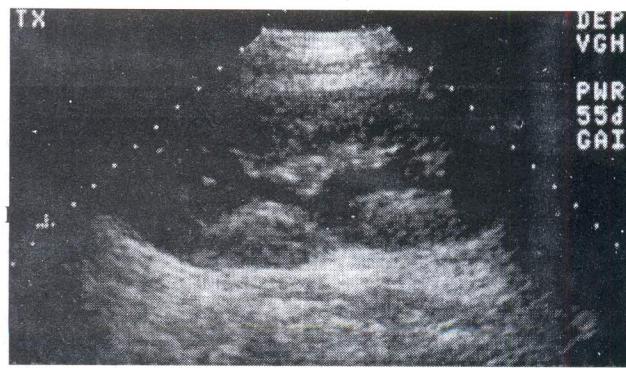


Fig IV: Vascular stenosis in transplanted kidney

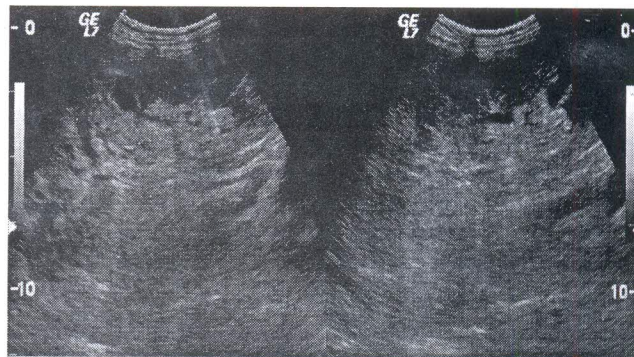


Fig VI: increased echogenicity in transplanted kidney.

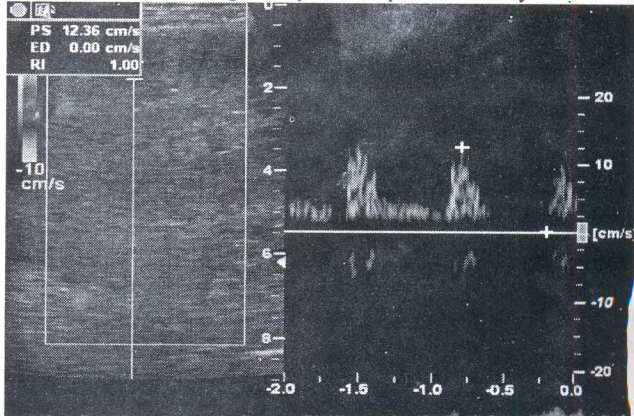


Fig VII: Raised resistive index in transplanted kidney.

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**Discussion:**

Following renal transplants, patients are evaluated with Ultrasonography, colour Doppler imaging and pulsed Doppler to assess renal function and the presence of possible complications<sup>1,9</sup>.

Doppler Resistive index (RI) [(peak systolic velocity-end diastolic velocity)/peak systolic velocity] is a useful parameter for quantifying the alterations in blood flow that may occur with renal disease. RI is a popular parameter for characterizing the arterial waveform at Doppler ultrasonography (US)<sup>10,11</sup> (Fig I-VII).

In our study most of the renal transplants complications were increased echogenicity (20 patients), Perinephric collection other than hematoma (13 patients) perinephric hematoma (6 patients), obstructive renal lesions (5 patients), Diminished vascularity (4 patients) and renal vein thrombosis (2 patients) (Table I). These lesions are also detected by other observers Brown et al (2000) (1), Sandhu et al (2004), (12) (Akbar et al 2005)<sup>11</sup>.

In our study RI was recorded in all cases ( $< 0.7$ ) was taken as normal value. Relationship of RI to the complication was noted with comparison to the normal value (Table II). RI was not helpful in hematoma and perinephric collection other than hematoma while it was more effective in diminished flow (table II). 60% patients showed more increased RI with increased Echogenicity ( $>0.7$ ), while 40% of this group showed RI ( $< 0.7$ ). Patients with perinephric collection other than Hematoma showed increased RI in 16% ( $>0.7$ ) and 84% RI within normal range ( $< 0.7$ ), while with hematoma  $>0.7$  RI was seen in 15%  $< 0.7$  RI in 85% cases. In case of obstructed Kidney  $>0.7$  RI was seen in 55% patients while  $< 0.7$  RI was noted in 45% cases of obstructed kidney. Only 100% raised RI ( $>0.7$ ) was seen in patients with diminished flow. Our results are consistent with the findings of Bude et al (1999) Huang et al (2003), Tublin et al (2003) Zwirewich (2005) (Table II and Fig I)

**Conclusion:**

Though RI has not much role in paranchymal and urologic complications but it does have a significant role in vascular

complications of renal transplants. So, RI is a partially helpful diagnostic parameter in evaluating renal graft dysfunction.

**References**

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