Invaluable Role of Nuclear Renogram in Immediate Post Renal Transplant Complication Assessment

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Abstract

Nuclear Renogram can play an invaluable role in assessment of post renal transplant complication. Early recognition of renal functions loss after renal transplant can allow early management of high probability of salvaging the renal function.

Introduction

Renal scintigraphy has provided clinically important functional evaluation of renal transplants since the beginning of the transplantation era.[1] Correlation between renal sonographic and nuclear medicine findings helps to differentiate between purely functional disease, such as acute tubular necrosis or rejection, and abnormal fluid collections, such as haematomas, abscesses, and lymphocoeles.[2] For almost three decades, noninvasive radionuclide procedures are used for the evaluation of renal disease, these procedures are easy to perform and carry a low radiation burden and sedation is not required.[3] Moreover, radionuclide imaging of the genitourinary tract has become an invaluable asset to clinicians in the evaluation of renal parenchyma and urologic abnormalities.[3]

Case Report

A 20 year young male, a known case of chronic kidney disease on haemodialysis was planned for allograft renal transplant. Pre-transplant HLA cross match with donor mother was 5%. Renal profile evaluation revealed blood urea nitrogen (BUN) of 29 mg/dl, serum creatinine of 7.1 mg/dl. Other haematological and biochemistry levels were within normal limits. Donor had dual arterial supply in both kidneys. Creatinine clearance test of donor was 78.5 ml/min. technetium (99mTc) diethylene triamine pentaacetic acid (DTPA) renogram of donor (mother) was within normal limits i.e. total GFR of 94.8 ml/min. Donor's left kidney was selected for donation. Patient underwent allograft renal transplant with dual arterial supply in right iliac fossa by end to side anastomosis. Intra and immediate post-operative urine output (u/o) was 1000 ml/hr, but the u/o dropped to 300 ml/hr within 8 hours postoperatively. Patient was urgently evaluated with 99mTc Mercapto acetyl triglycine (MAG3) renogram. Imaging was obtained on a General Electric integrated gamma camera and computer system. The camera detector was fitted with an all-purpose, parallel-hole collimator with an acquisition window set at 20%, centred on 140 keV. All images were obtained after intravenous injection of 370 MBq of 99mTcMAG3. Patients were studied at their baseline hydration status. Positioned supine on an imaging table. The camera detector was positioned anteriorly over the pelvis with the symphysis pubis projected at the bottom edge of field of view. The computer was set to acquire a two-phase dynamic study. The first phase was obtained at a rate of 1 sec/frame for a total of 60 frames. The second phase was acquired at a rate of 1 min/frame for 20 frames. The imaging matrix was 128 X 128 pixels. The images were inspected visually for perfusion, uptake, excretion patterns and other morphological changes. 99mTcMAG3 renogram revealed small transplant kidney in the right iliac fossa, the upper half of kidney was not visualised and only inferior half of transplant was visualised with preserved perfusion, preserved parenchymal function and non-obstructed drainage pattern. MAG3 clearance was 26.7 ml/min (Fig. 1).

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Subsequently an urgent USG KUB & doppler of transplant kidney was performed which revealed absent perfusion in upper half of transplant with finding suggestive of complete thrombosis of artery supplying the superior polar region corroborating with the renogram finding. Patient developed increase in abdominal girth, subsequent decrease in urine output. Patient was urgently re-explored, there was discolouration of upper half of transplant kidney with no pulsation in the artery supplying superior pole, re-anastomosis was performed. Good pulsations were noted post re-anastomosis and the upper half of kidney showed good colour after releasing the clamp. The post-operative urine output was 100 ml/hr. Approximately 24 hours post re-anastomosis, patient underwent USG KUB & doppler of transplant kidney which revealed prompt preserved perfusion in upper pole of transplant, the finding suggestive of significant improvement in the arterial supply of the superior polar region. The urine output on the third day post re-anastomosis improved to 800 - 1000 ml/hr. We conclude that early recognition of renal functional loss post renal transplant allows early management and high probability of salvaging the renal function.

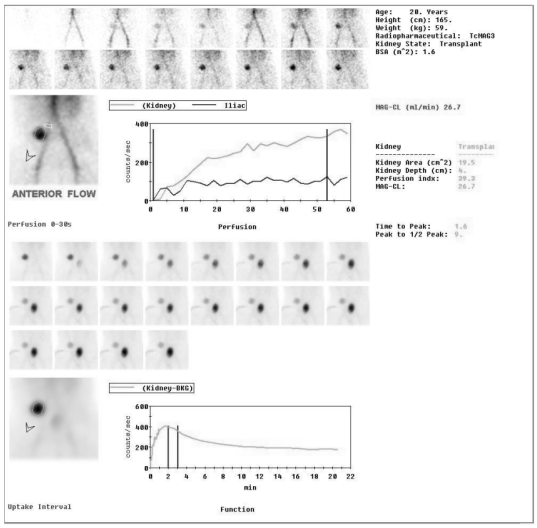

Fig. 1 : Eight hours post Transplant 99mTcMAG3 renogram revealed small transplant kidney in the right iliac fossa. The upper half of kidney was not visualised and only inferior half of transplant was visualised with preserved perfusion, preserved parenchymal function and non-obstructed drainage pattern.

Discussion

Nuclear medicine scanning and flow studies remain the primary means for evaluating vascular supply to the transplant after surgery.[2] The main advantage of nuclear medicine scans is that they demonstrate the pathophysiology involved.[2] Mark Tulchinsky assessed 99mTc-mercaptoacetyltriglycine (MAG3) for determination of renal transplant prognosis for recovery in patients with early postoperative dysfunction.[4] The postulate tested was that good tracer extraction may imply high likelihood of recovery, while poor extraction may confer a poor prognosis.[4]

MAG3 scan is an accurate prognosticator in patients with early postoperative renal transplant dysfunction. One of the most critical clinical questions in patients with dysfunctioning renal transplant during the early postoperative period is a likelihood of functional recovery. This is important because a patient who has no hope of transplant recovery could potentially benefit from early termination of immunosuppression and transplant removal. For example, early termination of immunosuppression should reduce the likelihood of infections.[5]

There is evidence in patients with native kidneys who develop acute renal failure, which suggests that MAG3 can predict recovery.[6] Importantly, it takes only a few minutes after initiation of renal scintigraphy to obtain this critical information, allowing a prompt decision regarding further patient management.[7]

The renogram curve also appeared useful in evaluating prognosis.[7]

An important limitation to this investigation is that patients with absent flow and no parenchymal uptake (TISS 5 and 6) were not referred for angiography, probably because of the belief that renal transplant loss is inevitable regardless of any intervention.[7] However, recent evidence indicates that transplant function in those patients can be saved by prompt restoration of blood flow.[8]

In the today's era where there is scarcity of donor organs, early recognition of deterioration of renal perfusion/ function, allows early management of complication, thereby aid in prompt measures for salvaging the renal graft function.

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Balancing the Risks and Benefits of Dual Platelet Inhibition

Cardiovascular and cerebrovascular events commonly arise from atherosclerotic plaque rupture that produces platelet activation, thrombus formation, and reduction of blood flow to the brain or heart. The inhibition of platelets with aspirin is effective in the secondary prevention of acute coronary events. The addition of clopidogrel (i.e., dual antiplatelet therapy, a platelet $P2Y_{12}$-receptor antagonist, produces even greater secondary prevention of coronary events in high-risk patients for up to 1 year. Second-generation $P2Y_{12}$ inhibitors (i.e., prasugrel and ticagrelor) produce further reductions in the risk of ischaemic events over the same time frame, albeit with ***more*** bleeding complications.

Dual antiplatelet therapy is recommended for 1 year after an acute coronary syndrome, but the effect of longer-term therapy is not clear. Concern exists regarding the balance between reducing the risk of cardiovascular events and the risk of bleeding complications, because bleeding complications are linked to adverse outcomes in patients with an acute coronary syndrome.

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