

# Acute and Chronic Allograft Dysfunction in Kidney Transplant Recipients



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## KEYWORDS

• Kidney transplant • Allograft rejection • Allograft failure • Diagnostic evaluation

## KEY POINTS

- Allograft dysfunction after a kidney transplant is often clinically asymptomatic and is usually detected as an increase in serum creatinine level, which corresponds with a decrease in the glomerular filtration rate.
- Kidney allograft dysfunction requires prompt evaluation with tests such as a transplant ultrasonography, radionuclide imaging, and allograft biopsy.
- Early causes of allograft dysfunction that manifest during the first 6 months after transplant include hyperacute rejection, thrombosis, urologic causes (urine leak, ureteral obstruction), and thrombotic microangiopathy.
- Some causes of allograft dysfunction, such as acute rejection, medication toxicity from calcineurin inhibitors, and BK virus nephropathy, can occur early or later after a kidney transplant.
- Other later causes, which usually occur 6 months or more after transplant, include transplant glomerulopathy, recurrent glomerulonephritis, and renal artery stenosis.

## INTRODUCTION

Among recipients of kidney transplants, a primary concern of patients and their physicians is the function of the kidney allograft. Transplant nephrologists and surgeons seek to minimize the unwanted, deleterious side effects of transplants (eg, malignancies,<sup>1</sup> infections,<sup>2</sup> and diabetes mellitus<sup>3</sup>) while simultaneously maximizing the function and survival of the allograft (and patient). A well-functioning kidney transplant is ultimately associated with better allograft and patient survival.<sup>4–7</sup> Therefore, allograft dysfunction, whether it occurs early or later in the posttransplant period, is a cause for

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immediate concern and action. This article reviews the symptoms, testing, differential diagnosis, treatment, and management of allograft dysfunction.

## SYMPTOMS

Allograft dysfunction following kidney transplant usually manifests as an increase in the serum creatinine concentration, which corresponds with a decrease in the estimated glomerular filtration rate (eGFR). Other, less common presentations of allograft dysfunction include (1) proteinuria, (2) a sudden reduction in urine output, (3) failure of an expected reduction in creatinine level; or (4) pain over the allograft site (rarely). Causes can be medical or surgical, and a methodical approach almost always leads to a diagnosis. Approaches to categorizing allograft dysfunction include a temporal approach (acute vs chronic, early vs late), immune versus nonimmune causes, or the traditional etiologic approach used in native kidneys (prerenal vs intrinsic vs post-renal). This article categorizes the causes of allograft dysfunction as early versus later (**Box 1**). These causes can also be categorized within the traditional etiologic framework (**Table 1**). This article emphasizes transplant-specific causes of allograft dysfunction, but the traditional causes of acute and chronic kidney disease in native kidneys also occur in kidney transplants.

## DIAGNOSTIC TESTING AND IMAGING STUDIES

### *Assessment of Allograft Function*

Function of a kidney allograft is usually measured by the serum creatinine concentration and associated eGFR.<sup>8</sup> The eGFR of a kidney allograft is typically calculated using creatinine-based estimating equations, such as the Modification of Diet in Renal Disease study equations or the Chronic Kidney Disease Epidemiology Collaboration

#### **Box 1**

#### **Some causes of kidney allograft dysfunction**

##### *Early (<6 months posttransplant)*

- Hyperacute rejection<sup>a</sup>
- Thrombosis (of transplant renal artery or renal vein)<sup>a</sup>
- Acute rejection
- Urinary leak
- Obstruction of transplant collecting system
- BK polyoma virus infection
- Calcineurin inhibitor toxicity

##### *Later (6 months or more posttransplant)*

- Acute rejection
- BK polyoma virus infection
- Transplant renal artery stenosis
- Calcineurin inhibitor toxicity
- Chronic antibody-mediated rejection and transplant glomerulopathy
- Recurrent glomerulonephritis

<sup>a</sup> Usually occurs in immediate (<1 week) posttransplant period.

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