

BK Virus

Clinical Background

BK virus is a polyoma virus in the same family of viruses as human papilloma and JC virus and has become recognized as an important causal infectious agent in complications after kidney transplant.

Epidemiology

- Prevalence
 - Primary BK infection generally occurs in childhood (without specific symptoms)
 - 90% are seropositive by 10 years
 - 1-5% of kidney transplant patients are affected
- Transmission
 - The virus is presumably transmitted via respiratory droplets
 - Other speculated modes include urine, semen, blood transfusion and organ transplantation

Organism

- Double-stranded DNA virus
- Human papillomavirus (genetically similar to JC virus)
- After primary infection, BK virus becomes latent in the kidneys and urinary tract
- Reactivated BK virus infection occurs with immunosuppression

Clinical Presentation

- Clinical disease is rare in immunocompetent adults
- BK virus infections are a cause of morbidity and mortality for patients with hematologic malignancies and transplants (most often bone and kidney)
- Illnesses caused by BK virus
 - Nephropathy and graft loss in renal transplant patients
 - BK virus allograft nephropathy (BKVAN) present in up to 8% of kidney transplant patients
 - Tubulointerstitial nephritis
 - Most common manifestation
 - Leads to irreversible graft failure in 40-50% of patients
 - New immunosuppressive regimens may increase the risk of BKVAN
 - Hemorrhagic cystitis and renal impairment in patients with hematologic malignancy and bone marrow transplant

Treatment

- Bone marrow/hematologic malignancies
 - Supportive in hemorrhagic cystitis; most patients recover
 - Refractory cystitis may be catastrophic
 - Poor response to antiviral therapy
- Renal transplant patients
 - If no active rejection present, judicious reduction of immune suppression is acceptable and usually decreases viral load

Diagnosis

- Indications for testing – renal transplant patient with deterioration in renal function; transplant patient presenting with hemorrhagic cystitis
- Histology

- Gold standard in BKVAN is renal biopsy
 - Demonstration of BK virus inclusions in tubular epithelium in renal tissue
- Immunohistochemistry – BK virus staining
- Laboratory testing
 - PCR assay
 - Quantitative and qualitative testing available
 - Substantially more sensitive than urine cytology measurements
 - Quantitative testing
 - Provides objective estimate of viral load
 - Can distinguish BK from JC viruria
 - Urine cytology
 - Infected cells show rounded nuclei
 - Negative decoy suggests no viral nephropathy
 - Positive decoy means reactivation of the virus but does not necessarily mean infection

Differential Diagnosis

- Other viral infections – cytomegalovirus (CMV)
- Acute or chronic rejection
- Malignancy

Monitoring

- PCR quantitative – expect reduction in viremia with treatment

Lab Tests

Indications for Laboratory Testing

Tests generally appear in the order most useful for common clinical situations. For test-specific information, refer to the test number in the ARUP Laboratory Test Directory on the ARUP Web site at www.aruplab.com.

| Test Name and Number | Recommended Use | Limitations | Follow Up |
|---|--|---|--|
| BK Virus, Quantitative PCR 0090067 Method: Polymerase Chain Reaction | Exclude diagnosis of BKVAN Monitor patient response to treatment | Negative result does not rule out the presence of PCR inhibitors in the patient specimen or BK virus DNA concentrations below the level of detection by the assay Inhibition may also lead to underestimation of viral quantitation | Renal allograft biopsy required to make a definitive diagnosis of BKVAN |

| | | | |
|---|--|--|--|
| BK Virus, Quantitative PCR, Blood 2002304 Method: Polymerase Chain Reaction | Detect BK virus infection and viral load quantitation | Negative result does not rule out the presence of PCR inhibitors in the patient specimen or BK virus DNA concentrations below the level of detection of the assay Inhibition may also lead to underestimation of viral quantitation | |
| BK Virus, Quantitative PCR, Urine 2002310 Method: Polymerase Chain Reaction | Detect BK virus infection and viral load quantitation | Negative result does not rule out the presence of PCR inhibitors in the patient specimen or BK virus DNA concentrations below the level of detection of the assay Inhibition may also lead to underestimation of viral quantitation | |
| Cytology, Urologic 8209704 Method: Routine Cytopathologic Evaluation | May be helpful if negative, but PCR and biopsy are more sensitive | Positive test does not necessarily diagnose BKVAN | Biopsy or PCR is advised for positive test |
| Immunohistochemistry Stain Offering arup005 Method: Immunohistochemistry | For fixed tissue samples, consultative services as well as immunohistochemical staining for the presence of BK virus are available | | |

General References

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JC Virus

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