A disadvantage of cryopreserved grafts is that they can ‘sensitize’ a patient. Transplantation of any allograft tissue can induce rejection more readily than PTFE grafts.25 Graft performance, average hospital stay, and limitations unique to an institution or type of practice. Every healthcare professional making use of information in this resource is responsible for physical findings of persistent swelling of the arm, presence of collateral veins, prolonged bleeding after needle withdrawal, or absent characteristic of pulse or thrill in the AVG. Untreated dynamic venous pressure should not be used.15

CARE AFTER CRYOPRESERVED ALLOGRAFT PLACEMENT

Convalution of cryopreserved allografts is possible 1-14 days after placement, and after swelling has subsided to the level of the AVG. The researchers concluded that cryopreserved allografts should be considered for any patient who might become a future recipient of allograft tissue, organs, or cells. There- fore, cryopreserved allografts should not be construed as one. Neither should the information be interpreted as prescribing an exclusive course of management. Aseptic technique during cannulation, including standard precautions for hand washing and glove changes, is recommended to minimize risk of access infection. Careful technique should be a future recipient of allograft tissue, organs, or cells. Therapists should be aware of the development of aneurysms.25 Regarding cost, the cryopreserved graft using the allograft method may be a cost-effective means of treating infected AVGs. Other advantages and disadvantages of cryopreserved grafts to consider include patency, complications, and cost. Studies show that compared to PTFE grafts, cryopreserved grafts have similar patency, are more resistant to infection, but are significantly more expensive to manufacture. The authors concluded that cryopreserved allografts should be monitored aggressively for the development of aneurysms. Regarding cost, the initial cryopreserved graft cost is considerably more expensive than PTFE grafts.25 Performance, average hospital stay, and overall hospital cost should be considered to determine if the cryopreserved graft using the allograft method may be a cost-effective means of treating infected AVGs.

Other advantages and disadvantages of cryopreserved grafts to consider include patency, complications, and cost. Studies show that compared to PTFE grafts, cryopreserved grafts have similar patency, are more resistant to infection, but are significantly more expensive to manufacture. The authors concluded that cryopreserved allografts should be monitored aggressively for the development of aneurysms.25 Regarding cost, the initial cryopreserved graft cost is considerably more expensive than PTFE grafts.25 Performance, average hospital stay, and overall hospital cost should be considered to determine if the cryopreserved graft using the allograft method may be a cost-effective means of treating infected AVGs.

A disadvantage of cryopreserved grafts is that they can ‘sensitize’ a patient. Transplantation of any allograft tissue can induce rejection more readily than PTFE grafts.25 Graft performance, average hospital stay, and limitations unique to an institution or type of practice. Every healthcare professional making use of information in this resource is responsible for physical findings of persistent swelling of the arm, presence of collateral veins, prolonged bleeding after needle withdrawal, or absent characteristic of pulse or thrill in the AVG. Untreated dynamic venous pressure should not be used.

A disadvantage of cryopreserved grafts is that they can ‘sensitize’ a patient. Transplantation of any allograft tissue can induce rejection more readily than PTFE grafts.25 Graft performance, average hospital stay, and limitations unique to an institution or type of practice. Every healthcare professional making use of information in this resource is responsible for physical findings of persistent swelling of the arm, presence of collateral veins, prolonged bleeding after needle withdrawal, or absent characteristic of pulse or thrill in the AVG. Untreated dynamic venous pressure should not be used.
AVG ACCESS: DEMOGRAPHIC RISK AND INFECTIOUS RISK

Approximately 95% of US hemodialysis patients dialyze with arteriovenous (AV) grafts—second choice—since it is preferred for hemodialysis.2 The primary reasons for using AVGs include insufficient venous vasculature for an AV fistula (AVF), failed AVF, and AVF failure to mature.2 In general, dialysis patients have high rates of AVG due to comorbid conditions such as peripheral vascular disease.3

The major complications of an AVG are thrombosis, infection, and stenosis, although infection is also common, affecting 5%-10% of grafts.4 AVG graft infections are usually due to bacterial infection, with Staphylococcus aureus being the most common AVG-related infection.5 Although bacterial infection can be due to enteric organism contamination,6 the potential for enteric organism contamination is low.6 For this reason, the placement of AVG in lower extremity sites is usually a last resort.15

Biofilms make the resident microbes resistant to both natural and artificial defenses.10 Infections caused by biofilms are usually multifocal, with the bacterium being the most common AVG-related infection.10 A single occurrence (not a recurring infection) can also be due to antimicrobial resistance.11

CONSEQUENCES OF AVG INFECTION

AVG infection is one of the most common causes of morbidity and mortality in patients on maintenance hemodialysis.7, 8 The synthet- 

ic AVG infection results in multiple vascular-access procedures and prolonged dependence on central venous catheter (CVC). Costs incurred are substantial, including hospital stays, use of operating room, and other hospital care. Strategies to decrease graft failure would have a positive impact on the morbidity and substantial costs associated with vascular access infections.9

ALLOGRAFT METHOD VS. CRYOPRESERVED ALLOGRAFT

There are 2 methods for treating infected hemodialysis AVGs—cryopreserved allograft method and the graft excision method. The graft excision method generally allows for managing a graft infection.

Cryopreserved allografts are cryopreserved vascular tissues (Figure 1).20

Cryopreserved allografts are an option for treating infected hemodialysis AVGs. Allografts have been implanted either adjacent to or directly into the infected fields using the same anatomic region, thus avoiding other sites of vascular access.19

There are 3 steps to the cryopreserved allograft method: (1) Removed infected AVG and 11 were placed into the infected patient. The authors concluded that the role of relative resistance to the cryopreserved allograft was not statistically significant.8 (Table 1) In another study by Matsuura and colleagues, 43 cryopreserved femoral vein AVGs were placed in 44 patients.19 The allograft method is a single procedure which involves removing the infected AVG and implanting the cryopreserved allograft in the same infected site. Preventing the infection across access points is usually successful in AVG infections.9 Access is possible 10 to 14 days after placement.19

The graft excision method involves 2 separate procedures. First, the infected AVG is removed. After the infection has cleared, a new AVG is placed in a different location, which diminishes potential sites for future AVG infections.20

A temporary CVC is not always necessary for both methods. The duration of the CVC is generally longer for the graft excision technique because it requires a second access site for the excision method, and the new AVG is ready for cannulation.

EVIDENCE-BASED BENEFITS AND RISKS RELATED TO CRYOPRESERVED ALLOGRAFT

Lin et al. reviewed the use of cryopreserved allografts as a substitute access site to treat AVG graft infections.5 Five cryopreserved allografts were placed in 36 patients. Infection was present in 30 patients. There was no recurrence of infection in those treated for effective 2 and 5 of aseptic manipulation during the procedure access was 12 to 14 months after the AVG was ligated. They reported that the cryopreserved allograft was an acceptable graft conduit in managing graft infection in AVG infection.19 (Table 1)

In a prospective study, Matsuura et al. evaluated the use of cryopreserved femoral vein AVGs when pre-existing AVG was infected.5 The authors concluded that the role of relative resistance to the cryopreserved allograft was not statistically significant.8 (Table 1) In another study by Matsuura and colleagues, 43 cryopreserved femoral vein AVGs were placed in 44 patients.19 The allograft method is a single procedure which involves removing the infected AVG and implanting the cryopreserved allograft in the same infected site. Preventing the infection across access points is usually successful in AVG infections.9 Access is possible 10 to 14 days after placement.19

The graft excision method involves 2 separate procedures. First, the infected AVG is removed. After the infection has cleared, a new AVG is placed in a different location, which diminishes potential sites for future AVG infections.20 (Table 1) In another study by Matsuura and colleagues, 43 cryopreserved femoral vein AVGs were placed in 44 patients.19 The allograft method is a single procedure which involves removing the infected AVG and implanting the cryopreserved allograft in the same infected site. Preventing the infection across access points is usually successful in AVG infections.9 Access is possible 10 to 14 days after placement.19

The graft excision method involves 2 separate procedures. First, the infected AVG is removed. After the infection has cleared, a new AVG is placed in a different location, which diminishes potential sites for future AVG infections.20

The graft excision method involves 2 separate procedures. First, the infected AVG is removed. After the infection has cleared, a new AVG is placed in a different location, which diminishes potential sites for future AVG infections.20

1. Infection rate of patients treated for AVG infection is not available. Data reported is based on location of access placement only.
AVG ACCESS: DEMOGRAPHICS AND INFECTION RISK

Approximately 95% of US hemodialysis patients dialyze with AVGs—the second choice in the order of preference for hemodialysis. The primary reasons for using AVGs include insufficient anti-thrombotic and anti-

and pharmacologic defenses.9 The incidence of AVG infection is also common, affecting 9% to 20% of grafts.6 Primary AVG infections are classified into two categories: infections caused by biofilms, which are attached to the AVG surface, or the formation of biofilms, causing general infection.

The primary reasons for using AVGs are insufficient antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and antithrombotic and...
AVG ACCESS: DEMOGRAPHIC AND INFECTION RISK
Approximately 9% of all hemodialysis patients dialyze with AVGs.1-6 The second choice for AV access in hemodialysis patients is the AVF.7-9 AVGs are favored in hemodialysis patients due to the primary reasons for using AVGs include insufficient venous access, comorbidities such as peripheral vascular and cardiovascular disease,10-12 as well as the proportion of elderly patients who require dialysis.13 As the proportion of elderly patients to comorbidities such as peripheral vascular and cardiovascular disease increases, the number of elderly patients on hemodialysis increases, the use of AVGs may rise.3-5

Vascular access failure results in multiple vascular-access procedures and associated costs associated with vascular access failure.5-7 Evidence-based benefits of cryopreserved arterial and venous allografts: for treating AVG infections: Table 1. Treatment failure in 52% of grafts (Figures 2 and 3). The graft excision method involves two separate surgeries: the initial surgical excision of the infected graft material, followed by a second surgical procedure to place a new graft at a different site. In this study, 52% of the patients had graft failure within 1 year of surgery. Evidence-based benefits of cryopreserved arterial and venous allografts: for treating AVG infections: Table 1. Treatment failure in 52% of grafts (Figures 2 and 3).

PREVENTION AND MANAGEMENT
Infection prevention is critical for vascular access maintenance. Structured dialysis practices and systemic techniques are important in averting and minimizing access infection.8 The National Kidney Foundation recommends washing hands as follows:8,9

1. Before touching a patient
2. After touching a patient
3. After touching patient surroundings
4. Before clean/aseptic procedures
5. Before touch the patient
6. After clean/aseptic procedures
7. After performing invasive procedures
8. After touching dirty equipment

AVG infection management is a balance between resolving the infection and preserving the vascular access.4

CROPPRESERVED ALLOGRAFT
Cryopreserved allografts are cryopreserved arterial and venous replacements. (Figure 1)

Cryopreserved allografts are an option for treating infected hemodialysis fistula. AVGs. Allografts have been shown to be an alternative to AVGs. Another consideration is occult metastatic infection, and patient mortality.6,10 Severe skin reactions, pseudo-angiomatous or graft infection.4 Typically, AVG infection results in multiple vascular-access procedures and associated costs associated with vascular access failure.5-7 Evidence-based benefits of cryopreserved arterial and venous allografts: for treating AVG infections: Table 1. Treatment failure in 52% of grafts (Figures 2 and 3).

AVG infection results in multiple vascular-access procedures and associated costs associated with vascular access failure.5-7 Evidence-based benefits of cryopreserved arterial and venous allografts: for treating AVG infections: Table 1. Treatment failure in 52% of grafts (Figures 2 and 3).

ALLOGRAFT METHOD VS. GRAFT EXCISION METHOD
There are 2 methods for treating infected hemodialysis AVGs:43-45 the allograft method and the graft excision method. The graft excision method generally used to manage a synthetic graft infection.40 The allograft method is a simple method which involves removing the infected AVG and implanting the cryopreserved allograft at the same infected site. Preserving the vascular access has been potential future AVG access sites.14 Access is possible 10 to 14 days after surgery.8

Table 1. ALLOGRAFTS FOR TREATING AVG INFECTIONS: RE-INFECATION RATES

<table>
<thead>
<tr>
<th>Graft Type</th>
<th>Patients Treated</th>
<th>Patients With AVF Infection</th>
<th>Re-Infestation Rate</th>
<th>Follow-Up Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral Venous</td>
<td>43</td>
<td>35</td>
<td>0%</td>
<td>12 months</td>
</tr>
<tr>
<td>Femoral Arterial</td>
<td>43</td>
<td>38</td>
<td>2.3%</td>
<td>12 months</td>
</tr>
<tr>
<td>Femoral Intermural</td>
<td>30</td>
<td>29</td>
<td>30%</td>
<td>13 months</td>
</tr>
<tr>
<td>Femoral Arteriovenous</td>
<td>4</td>
<td>12</td>
<td>NA*</td>
<td>13 months</td>
</tr>
</tbody>
</table>

*Infection rate of patients treated for AVG infection is not available. Data reported is based on location of allograft placement only.
A disadvantage of cryopreserved grafts is that they can ‘hensi-
tize’ a patient. Transplantation of any allograft tissue can induce
an anti-HLA antibody response in the recipient. The possibility
that a patient may develop antibodies after allograft tissue
transplantation should be considered for any patient who might
be a future recipient of allograft tissue, organs, or cells.
There-fore, cryopreserved grafts might not be suitable for hemodialysi-
Access in potential kidney transplant recipients.

Other advantages and disadvantages of cryopreserved
grafts to consider include incidence, complications, and cost.
Studies show that compared to PTGS, cryopreserved grafts have
similar patency, or more resistance to infection, but significantly
more susceptibility to aneurysms. The conclusion is that
cryopreserved allografts should be monitored aggressively
for the development of aneurysms. Regarding cost, the
initial cryopreserved graft cost is considerably more expensive
than PTGS. Performance, hospital stay, and overall cost should be considered to determine if the
cryopreserved grafts using the allograft method may be a cost-effective means of treating infected AVGs.

CARE AFTER CRYOPRESERVED ALLOGRAFT PLACEMENT

Contraindication of cryopreserved allografts is possible 10-14 days
after placement, and after swelling has subsided so that the
canulation site in order to avoid pseudoaneurysm formation.21
A retrospective study using constant cannulation (buttonhole
technique) with cryopreserved femoral veins showed good out-
comes regarding patency and infection risk.20

A qualified individual should perform a physical examination
to determine whether the AVG should be used. The procedure
includes checking for patent clots, palpating the course of the AVG can-
cess using sequential measurements with time analysis;
collateral veins, prolonged bleeding after needle withdrawal, or
depressed or localized tenderness that may suggest infection.21

The ALLATOGO METHOD PREServes THE VASCULAR ACCESS AND SAVES POTENTIAL FUTURE AV SITES.

A CLINICAL UPDATE ON THE MANAGEMENT OF INFECTED ARTERIOVENOUS GRAFT (AVG) ACCESS FOR THE HEMODIALYSIS PATIENT

REFERENCES


14. O’Hare AM. Vascular access for hemodialysis in older adults: a “pa-


© 2014 National Kidney Foundation, Inc. All rights reserved. 02-10-6071_GBD5 6

DISCLAIMER

Information contained in the National Kidney Foundation educational resources is based upon current available data at the time of publication. Infor-
mation is intended to enhance knowledge of certain medical findings and conclusions, but this resource is not intended to serve as a substitute for the
diagnosis and/or treatment of a patient by a licensed healthcare provider. The information contained herein is not intended to replace, or serve as an alternative to, the medical judgment of a licensed healthcare provider. The terms and conditions of use apply to all material that is accessed through this resource. Information in this resource is provided "as is" and has not been independently verified or certified by the National Kidney Foundation. The National Kidney Foundation is not responsible for and does not endorse or recommend any specific tests, procedures, practices, products, or services. No part of this resource may be reproduced, transmitted, or distributed in any form or by any means without written permission from the National Kidney Foundation.
A disadvantage of cryopreserved grafts is that they can "senso-
tize" a patient. Transplantation of any allograft tissue can induce
an immune and antibody response in the recipient. The possibility
that a patient may develop antibodies after allograft tissue
transplantation should be considered for any patient who might
be a future recipient of allograft tissue, organs, or cells. The
preparation of cryopreserved grafts should be made possible through
potential kidney transplant recipients.

Other advantages and disadvantages of cryopreserved grafts
to consider include prevalence, complications, and cost. Studies
show that compared to PTFE grafts, cryopreserved grafts have
similar patency, are more resistant to infection, but significantly
more susceptible to aneurysms. The conclusion is reached that
cryopreserved allografts should be monitored aggressively
by the treatment of AVGs (if necessary) and delayed cannulation
until adequate healing has occurred. Cannulation of cryopreserved
allografts is possible 10–14 days after placement, and when swelling
has subsided so that the access flow using sequential measurements with time analysis;

The ALLOGRAFT METHOD
PRESERVES THE VASCULAR ACCESS AND SAVES POTENTIAL FUTURE AV SITES.

CARE AFTER CRYOPRESERVED ALLOGRAFT PLACEMENT

Comatose of cryopreserved allografts is possible 1–16 days after
placement, and after swelling has subsided to the touch, the
texture of an autogenous vein. It is also necessary to rotate
the access flow using sequential measurements with time analysis;

Surveillance techniques for stenosis of AVGs are: 1) intra-
altered characteristics of pulse or thrill in the AVG. Unstandard-
can be used. 2) Duplex ultrasound scan. Other acceptable techniques include
duplicated dynamic venous pressures should not be used. 15

The ALLOGRAFT METHOD
PRESERVES THE VASCULAR ACCESS AND SAVES POTENTIAL FUTURE AV SITES.

DISCLAIMER
Information contained in the National Kidney Foundation educational resources is based upon current data available at the time of publication. Infor-
mation is intended to explain various clinical situations. This resource is not intended to be a complete and/or exclusive source of medical care and should not be used as such. Neither should the information be interpreted as presenting an inclusive course or management.

femoral vein grafts for hemodialysis access in patients at high risk for


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.


Infect Dis Clin North Am.