

# Occupational infection risks in interventional radiology

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## Abstract

South African radiologists performing interventional and angiographic procedures are at risk of occupational exposure to hepatitis B and C and the human immunodeficiency virus (HIV). Simple precautions reduce this risk substantially. It is important that radiologists and personnel working in the interventional suite are aware of the risk of infection, how to reduce the risk and how to prevent seroconversion after needle stick injuries.

Occupational exposure to viral material during invasive procedures is a major concern to health professionals in many countries.<sup>1</sup> South Africa has a particularly high prevalence of HIV and hepatitis B and C infection in the population.<sup>2,3</sup> Radiologists, radiographers and nurses who perform and assist with angiography or interventional procedures are at risk through needle stick injuries or corneal splashes from blood.<sup>4,5</sup> It is important that radiologists be aware of the risk, how to reduce the risk and what to do after needle stick injuries.<sup>6</sup>

## Risk of HIV infection

South Africa currently has an epidemic of HIV infection from heterosexual spread. The latent period from seroconversion to the development of the acquired immunodeficiency syndrome (AIDS) is approximately ten years. Many of our patients requiring interventional or invasive procedures will be incidentally seropositive. The HIV positivity rate varies from less than 5% in the Western Cape to 23% in routine antenatal clinic screening in KwaZulu Natal.<sup>2</sup> Patients with clinical AIDS are more likely than other patients to have invasive procedures such as biopsies, drainage of intra-abdominal collections or abscesses and angiography for arterial occlusions and aneurysms.

It is very important for the radiologist, radiographer and nurse to be aware of the occupational risk from HIV. Data about the risk of seroconversion are derived mostly from studies in the United States reported by the Center for Disease Control and Prevention (CDC). Occupational infection has been definitely

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documented in 52 health professionals and probably in 111 other workers.<sup>7</sup> The majority of the documented cases (90%) involved blood exposure. Eighty-seven percent of all these cases followed needle stick injuries. The CDC reviewed 25 studies of HIV seroconversion from 1983 to 1994 recently.<sup>6,7</sup> The documented risk for percutaneous exposure is 0.3% (21 infections in 6498 documented exposures).<sup>7</sup>

A retrospective review comparing incidents involving seroconversion versus those workers who did not seroconvert, found that those workers who seroconverted had the following increased risks: a deep percutaneous injury, visible blood on the instrument or needle, the instrument was used for arterial or venous access, and the patient was terminally ill.<sup>7</sup> Seroconversion is more likely with a large volume of blood and a high viral load.<sup>8</sup> The risk for mucous membrane exposure was estimated to be 0.1% and for intact skin exposure less than 0.1%.<sup>8</sup>

## Risk of hepatitis B infection

Hepatitis B is the most common occupational infection world-wide.<sup>1</sup> In South Africa the prevalence of hepatitis envelope antigen (HBeAg) is particularly high, in the region of 10%.<sup>3</sup> Hepatitis B is extremely infectious because of much higher circulating blood viral antigen levels ( $10^{13}$  viral particles per ml) than with HIV. The virus survives in dried blood for up to a week, unlike HIV, which dies within minutes. The risk of seroconversion is 12% in non-immunised workers after percutaneous inoculation of the hepatitis surface antigen (HBsAg). The risk increases to

30% after exposure to the envelope antigen of the virus (HBeAg).<sup>9</sup> However the risk of seroconversion is minimal in the fully immunised worker.<sup>10</sup>

It is essential that all health workers have full immunisation for hepatitis B. The recombinant DNA vaccine is proven to be extremely safe and effective. It is critically important that a protective antibody level greater than 10 mIU/ml be documented in all workers to ensure effective immunisation. Immunisation failure is due to a variety of reasons, usually including incorrect administration of the vaccine or failure to receive the 6 month and 5 year boosters. Health workers should not be allowed to work in the interventional room without immunisation.

Infection with hepatitis B may result in chronic hepatitis in 10-25% of patients. The risk of resultant cirrhosis and hepatoma is about 10%. The CDC estimates that in the United States 8 700 health professionals are infected every year with hepatitis B. This results in up to 190 deaths from hepatitis per year.<sup>10</sup>

## Risk of hepatitis C infection

Hepatitis C is the most common cause of non-A and non-B hepatitis infections from blood transfusions. The prevalence of hepatitis C is in the region of 1.2% in donated blood in South Africa.<sup>3</sup> In the USA the prevalence is 0.6%. The risk of developing chronic liver disease is much higher than with hepatitis B, with 85% of patients with acute infections remaining chronically infected. Twenty percent of these patients develop chronic liver disease and cirrhosis. The estimated risk of infection following a percutaneous injury is between 6 and

10%, making it more infectious than HIV but far less infectious than hepatitis B. No vaccine has been developed yet and there is no obvious benefit in giving hyperimmune globulin for post exposure prophylaxis.

## Precautions

Most precautions involve common sense. Remember to treat every patient as infectious until proven otherwise. Normal precautions include:

1. **Do not recap needles** - this is the single most important precaution you can take. Most needle sticks occur during recapping of the needle. Great care must be used when reinserting the stylet of the Potts needle into the cannula. Never hand a sharp needle or instrument to an assistant. Always place sharps on the tray first.
2. **Do not use glass syringes** for contrast injections because of the risk of shattering. Polycarbonate syringes are much stronger than conventional plastic syringes.
3. **Ensure adequate lighting** over the working area during the procedure. There has been shown to be a risk in many interventional rooms where lighting is poor.
4. **Always wear latex gloves**, preferably double-gloving. Occult perforations occur in 10% of gloves during interventional procedures, increasing to 23% in those procedures lasting more than two hours. Double gloving reduces this risk substantially, particularly during long procedures.
5. Always wear a sterile gown, mask and **transparent face shield** when performing procedures, particularly angiography. It is extremely important to remember to use facemasks with

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the attached plastic shield to cover the eyes to prevent corneal splashes.

6. The modified arteriography Pott's needle with a vacuum side arm prevents blood splashes during arterial puncture. It is now available in South Africa and costs R15 more than the conventional needle.

7. A **closed angiographic flush** system avoids blood splashes when flushing syringes. One can aspirate heparinised saline and contrast and dispose of bloody fluid into a closed drainage container. Try to avoid using open bowls on the tray, as there is a substantial risk of splashes. The closed flush system is available commercially. However one could probably make one's own from drip tubing, a three way tap, a vacolitre of normal saline and a urine bag for blood disposal.

8. Remember to cover the image intensifier with sterile plastic to prevent blood splashes.

## Exposure to blood

If you are splashed with blood, wash the exposed skin with soap and water, and flush mucous membranes and eyes with water. If a sharp injury occurs, you must notify the infection control officer in your hospital. Take blood from the patient with his or her written consent to check the HIV status. Your blood will be required for baseline HIV testing. If the patient is HIV positive, postexposure prophylaxis should be started as soon as possible, preferably within 1 to 2 hours. Early prophylaxis is critical in preventing seroconversion. The window of opportunity to prevent viral spread is a few hours. Zidovudine (AZT) 200 mg tds and Lamivudine (Epivir) 150 mg bd for four weeks is currently recommended by the CDC in the

USA (CDC website address for current information is <http://www.cdc.gov>).<sup>11</sup> It is important that early counselling of the risks of seroconversion commences as soon as possible. Testing for HIV should be repeated at 6 weeks, 3 months and 6 months. This prophylaxis is highly effective, reducing the risk of seroconversion by 79%. If the patient is positive for hepatitis B, and you are not fully immunised, immune globulin must be administered within 24 hours and the hepatitis B booster given. There is no evidence that hyperimmune globulin prevents hepatitis C infection.

## Conclusions

It is critically important that all health care workers, especially radiologists performing interventional procedures, be aware of the risk of infection in their daily practice. Precautions involve common sense and care when handling sharps. You must be aware of your local hospital policy on post exposure prophylaxis, whom to contact and try to educate your working colleagues on safe working conditions in the interventional room.

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