Ross River Virus Infection

**Synonym:** epidemic polyarthritis

Ross River virus (RRV) is an RNA alphavirus. It is an arbovirus transmitted to man by mosquitoes, causing a polyarthritis and arthralgias. It is endemic in Australia where it is the most common mosquito-borne disease affecting humans. Infection can occur as a few sporadic cases, a small outbreak, or a major epidemic in certain climatic conditions.

An RRV outbreak was first described in 1928 in New South Wales, with further outbreaks occurring during World War Two among troops based in the Northern Territory and Queensland. The virus was isolated in 1959 from a mosquito along the Ross River Valley in Queensland - hence the name. It was confirmed as the cause of RRV disease in 1971 after its isolation from the blood of a boy with the disease.

**Epidemiology**

- Approximately 60% of cases arise in tropical and central Queensland (most commonly between January and May) but cases do occur throughout the rest of Australia and outbreaks have occurred in major Australian cities.
- The largest documented Ross River virus (RRV) outbreak occurred in the Western Pacific between 1979-1980 and involved more than 60,000 people. Papua New Guinea, Indonesia and the Solomon Islands continue to have endemic RRV.
- Outbreaks are associated with high rainfall or high tides affecting salt marshes. This leads to an increase in mosquito numbers.
- A similar mosquito-borne alphavirus, the Barmah Forest virus (BFV), is the second most common mosquito-borne disease in Australia. The majority of notifications are in Queensland. It causes similar symptoms to RRV.
- RRV does not occur in the UK but has potential to affect returning travellers.

**Incidence**

- On average, 5,000 cases are notified each year in Australia.
- There is likely to be significant underdiagnosis and under-reporting.
- BFV is less common but is becoming increasingly prevalent, possibly due to better recognition.

**Transmission**

- A variety of species of mosquito act as vectors for transmission of the virus from animal to human or human to human. The mosquito species most strongly associated with Ross River virus (RRV) transmission include *Ochlerotatus vigilax*, *Ochlerotatus camptorhynchus* and *Culex annulirostris*.
- There is a primary mosquito-mammal cycle involving kangaroos, wallabies, horses, possums, rodents and other vertebrates.
- A human-mosquito cycle may occur during epidemic outbreaks.
- The incubation period is 3-21 days (average 9 days).
- There have been no documented cases of transfusion-transmitted RRV to date.

**Risk factors**

- Camping increases risk eightfold.
- Failure to take antimosquito precautions.
- Adults aged 25-44 years (rarely affects young children).

**Presentation**

Not all those infected with Ross River virus (RRV) will become symptomatic - about a third have a subclinical infection.

**Cardinal features**

- **Fever:** mild pyrexia and minor constitutional symptoms of viral infection.
- **Rash:** can precede or follow other symptoms by up to 2 weeks and lasts for 7-10 days. It may vary from a few spots on the hands and feet to whole-body involvement and can be indistinguishable from other viral exanthems such as rubella. Papules may be hypersensitive to touch and small vesicles can develop. Buccal and palatal lesions can occur.
- **Symmetrical polyarthritis/migratory polyarthralgia:** present in most except a few who just have rash alone. It can be markedly painful. Ankles, knees, fingers, elbow, feet and wrists are the most commonly affected joints, but others may be involved.
Other features
- Cervical lymphadenopathy can occur.
- Tendons (particularly the Achilles tendon) may become inflamed and sore.
- Paraesthesiae and tenderness of the palms and soles occurs in a few cases.
- Fatigue (90%).
- Anorexia, nausea, decreased libido (30%).
- Case reports of splenomegaly, haematuria, glomerulonephritis, meningitis, encephalitis.

Differential diagnosis
- Infectious mononucleosis.
- Dengue fever.
- Reactive arthritis (eg Reiter's syndrome, post-gastroenteritis).
- Ankylosing spondylitis.
- Acute rheumatic fever.
- Lyme disease.
- Q fever.
- Rheumatoid arthritis, psoriatic arthritis.
- Enteropathic arthropathies.
- Systemic lupus erythematosus.
- Other causes of viral arthritis: parvovirus B19, viral hepatitis, rubella, HIV infection, mumps.

Diagnosis
- The diagnosis is confirmed by detection of specific antibodies to the Ross River virus (RRV) using paired sera. A fourfold or higher rise in IgG antibody titre in acute and convalescent sera is usually seen.[6]
- The virus may be isolated from the blood of acutely ill patients in the early period of the disease.
- Enzyme-linked immunosorbent assay (ELISA) techniques have been developed for the rapid detection of antibodies.[8]

Management
- There are no curative therapies.
- Treatment is directed at symptom relief and maintaining joint mobility.
- Paracetamol and non-steroidal anti-inflammatory drugs are effective in reducing the severity of joint pain.

Prognosis
Progressive resolution over 3-6 months is usual[9, 10]. A prolonged relapsing-remitting course with arthralgias, tiredness and depression over years following diagnosis has been described. However, this was largely based on retrospective data. Prospective studies suggest:
- Recovery can occur in less than 1 month in mild cases.
- Infection in the majority is associated with significant arthralgia and incapacity for at least 3 months after diagnosis. About half of patients require time off work. Arthralgias resolve in the majority of patients by 5-7 months.
- Complete recovery is eventually seen in all cases, with no long-term joint damage or complications.
- Premorbid and concurrent disease may influence the course of Ross River virus (RRV) disease.
- Infection probably means subsequent lifelong immunity.

Prevention
- Public health mosquito control measures (eg identification of mosquito breeding places and animal reservoirs, airport vector control).
- Climate analysis and epidemic prediction models.[11]
- Use of mosquito repellents and coils.
- Use of insect-knockdown sprays before retiring.
- Antimosquito mesh on doors/windows in houses in affected areas.
- Avoidance of water-storing objects around the house.
- Use of mosquito nets if camping.
- Wearing light-coloured loose-fitting clothing that covers all of the arms and legs.
- Avoiding outdoor activity in mosquito-prone areas between dusk and dawn (when mosquitos usually bite).
- Research into potential vaccines is currently underway.[12]

Other alphaviruses[13]
All alphaviruses are transmitted by mosquitoes. They tend to cause symptoms including fever, rash, myalgia and arthralgia. Some can cause encephalitis. Infection can also be asymptomatic. Alphaviruses are widely distributed and examples of other infections that they cause include:
- Chikungunya Fever (East Africa, India, South East Asia, Philippines).
- O'nyong-nyong virus (East Africa).
Mayaro virus (Central and South America).
Sindbis virus (Asia, Africa, Europe, Australia, Philippines).
Eastern equine encephalitis virus (eastern states of North, Central and South America).
Western equine encephalitis virus (North and South America).
Venezuelan equine encephalitis virus (Southern USA, Central and South America).

Further reading & references
5. University of Sydney Department of Medical Entomology; Ross River and Barmah Forest. No date available

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