Fact sheet for Health Professionals

Clinical guidance for medical practitioners regarding patients at risk of NTM infection following cardiac surgery: UPDATE September 2017.

This information is intended to provide clinical advice to general practitioners and specialists caring for patients who have undergone open cardiac surgery and who may be at risk of *Mycobacterium chimaera* infection.

Key points

- There is potential for exposure to a nontuberculous mycobacterium (NTM), *Mycobacterium chimaera*, during open cardiac surgery
- The risk of patient infection is LOW and mainly in those who have undergone procedures involving valve replacement / repair or mediastinal vascular graft insertion; the risk for other cardiac operations including coronary artery bypass grafting (CABG) is extremely low but not zero
- The risk period for Queensland patients is for operations performed between 1 October 2011 and August 2016
- The source of infection is aerosol transmission from contaminated heater cooler units used during cardiopulmonary bypass
- Diagnosis requires heightened awareness and specialised testing
- Infection manifests as prosthetic valve endocarditis and/or disseminated disease; mortality is potentially high
- Treatment requires consultation with an infectious diseases specialist and involves multiple antibiotics for more than one year

Background

Mycobacterium chimaera (M. chimaera) is an uncommon cause of NTM infection in Queensland. It is a member of the “MAC” complex organism and not routinely identified to species level.

There have been clusters of *M. chimaera* infections reported in multiple countries, predominately resulting in prosthetic valve endocarditis (PVE) and/or disseminated disease following cardiac surgery where a heater cooler unit (HCU) has been utilised.

Heater Cooler Units (HCUs) regulate temperature of the patient and cardioplegic solution during cardiopulmonary bypass when undergoing open heart surgery. While the HCU does not come into contact with the patient, there is overwhelming evidence that infection results from inoculation of the operative field by aerosols containing *M. chimaera*. Such aerosols arise from contaminated water within the tanks of the HCU which is then disseminated by a cooling fan located to the rear of the unit.

Epidemiological investigations indicate contamination has occurred at the point of manufacture and persist through development of biofilm within the tanks. Patient infection has only been associated with the

Stockert 3T HCU (LivaNova) manufactured in Germany. The Stockert 3T is the most popular unit in use in many countries including Australia. Most but not all contaminated Stockert 3T units were manufactured before September 2014 at which point the manufacturer strengthened disinfection processes.

Risk

Recent information indicates that the infections are almost exclusively associated with surgery involving some form of prosthetic implant (e.g. valves or grafts) suggesting that the organism requires a prosthetic surface on which to adhere. Public Health England provides the following risk estimates:

- Cardiac valve repair/replacement: 1 in 5,000 but in worst affected settings 1 in 100. In Queensland to date only one case has been identified which is consistent with a 1 in 5000 risk overall
- Coronary Artery Bypass Graft (CABG): <1 in 100,000

Isolated cases of *M. chimaera* infection following CABG, ventricular assist devices and transplantation have been reported overseas.

The time to diagnosis can be several years following exposure to this organism, as the incubation period for infection can be up to five years, although median time to symptoms is approximately 18 months.

Without knowing whether a patient was actually exposed to a *M. chimaera* contaminated HCU, it is difficult to estimate individual risk. Universally the risk is considered very low. Patients who have had cardiopulmonary bypass for coronary bypass grafting, transplantation or other cardiac procedure not involving prosthetic material, appear to be at extremely low risk of any infection.

Initial patient assessment

Every effort should be made by the general practitioner and/or attending specialist to perform an initial patient assessment prior to referral to an infectious disease (ID) physician.

Clinicians should be vigilant for non-specific signs and symptoms of *M.chimaera* infection which may include one or a combination of the following, occuring for two weeks or more:

- unexplained fevers
- unexplained weight loss
- increasing shortness of breath
- night sweats
- joint or muscular pain
- nausea, vomiting or abdominal pains
- malaise (note: fevers or night sweats or weight loss should also be present if malaise)
- pain, redness, heat or pus around the surgical site
- failure to gain weight (paediatrics only)
- visual disturbance
- sternotomy wound infection

More common causes of the above symptoms should be considered before referral and specialised testing for disseminated mycobacterial infection is undertaken. Conventional blood cultures should always be performed early with presentation of the above symptom complex. This should be particularly noted in diagnosing other causes of prosthetic valve endocarditits, which occur at a rate of 1-3% in the first year after surgery and 3-6% after five years.

Patient assessment for Mycobacterial PVE or disseminated disease

Diagnosis of PVE or disseminated infection due to M chimaera is based on the following:

- detailed patient history
- physical examination – signs of valvular pathology, splenomegaly and signs of retinal involvement should all be clinically reviewed
- routine blood tests: FBE, Biochemistry ,CRP - disseminated NTM infections should be considered in the symptomatic patient with unexplained anaemia, thrombocytopenia, pancytopenia or unexplained elevated liver function tests
- imaging studies based on signs and symptoms
- echocardiography including transoesophageal echocardiography
- biopsy of any tissues as may be implicated with a systemic infection
- culture of tissue from an infected sternotomy wound especially if routine cultures do not grow conventional pathogens

Specialised testing involving **blood culture for NTM** ("AFB blood culture") and **bone marrow culture for NTM** should only be ordered by (or on advice from) an ID physician or consultant microbiologist. When recommended, two MycoF lytic bottles should be collected on separate days to investigate possible PVE or disseminated non-tuberculous mycobacteria infection including *M. chimaera*.

Only patients who have signs and symptoms consistent with prosthetic valve endocarditis or a disseminated infection syndrome such as Pyrexia of Unknown Origin (PUO) should be investigated. There is **NO** indication to investigate asymptomatic patients for possible systemic NTM infection.

There is no recommended screening laboratory test, culture or imaging modality for the asymptomatic patient. Patients should be informed of the risk and limitations of tests in asymptomatic patients.

For a symptomatic patient with a prolonged period of unexplained illness of two weeks or more, despite routine work-up, strongly consider referring the patient to their treating cardiologist or cardiac surgeon (especially if surgery is recent) and/or an ID physician. They will be able to perform further investigations.

HCU associated infections have not included isolated pulmonary infections, and sputum cultures for mycobacteria are not indicated unless investigating pulmonary disease for other reasons.

Patient treatment

Treatment for NTM infection requires multiple antibiotic therapies and should be prescribed by an ID physician.

The optimal duration of therapy is unknown, but should be 12 months or longer.

In cases reported overseas, revision cardiac valve surgery is commonly required.

There is no antimicrobial prophylaxis treatment for the potentially exposed patient. In this instance, antimicrobial prophylaxis could promote resistance if subclinical disease is already present.

Patient referrals and notification

It is strongly recommended that an ID physician be consulted prior to requesting specialised tests for mycobacteria especially as laboratory capacity to provide such testing is very limited. Long term management requires an interdisciplinary approach and is best managed and co-ordinated by an ID physician experienced in the treatment of mycobacterial diseases.

All patient cases of *M. chimaera* or other mycobacteria are notifiable in Queensland under the Public Health Act 2005.

In February 2017, Queensland Health finalised the distribution of letters to every patient who had open cardiac surgery involving a heart valve or mediastinal vascular graft surgery in a public hospital between the dates of October 2011- August 2016. Each letter outlines whether recent tests undertaken had identified the presence of absence of *M. chimaera* in the heater cooler units used at the hospital where surgery occurred. Recommendations on seeking further health advice were outlined. Patients who received letters may present for an appointment with you and have been advised to take the letter with them.

Key references

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