QUEENSLAND COURTS

CORONERS COURT OF QUEENSLAND

FINDINGS OF INVESTIGATION

CITATION:	**Non-inquest findings into the death of ML**
TITLE OF COURT:	Coroners Court
JURISDICTION:	BRISBANE
DATE:	02/09/2017
FILE NO(s):	2016/3059
FINDINGS OF:	Ainslie Kirkegaard, Coronial Registrar
CATCHWORDS:	CORONERS: Diagnosis and investigation of suspected aortic dissection, use of pre-non contrast CT-aortagram prior to contrast CT-aortagram

Table of Contents

Background

ML was a 71 year old woman who died at a regional public hospital on 25 July 2016. She ordinarily resided with her husband, and their daughter.

Mrs L's death was reported to the coroner because the cause of her sudden unexpected death was unknown.

Mrs L's medical history

Review of Mrs L's medical records shows she had a medical history including hypertension, a previous heart attack, heartburn and migraines. She was under the care of a private cardiologist.

On Sunday 24 July 2016, Mrs L complained of sudden tightness in the chest radiating to her jaw, headache and nausea. The ambulance was called after she fainted. She was then transported to a regional public hospital emergency department, arriving there around midday.

On arrival in the emergency department Mrs L gave a history of going to bed the previous evening with a mild headache, consistent with her usual headache. She woke up with the same headache. That morning she received news that her brother had died the previous evening. She developed jaw pain that morning. She visited her sister and returned home still feeling unwell. She became nauseous and fainted, with a brief loss of consciousness. She then vomited.

On examination in the emergency department she was noted to be hypotensive and had an alerted level of consciousness. She reported some upper chest pain but it was not radiating to her back. It is described in the emergency department notes as "feels musculoskeletal".

An ECG performed shortly after arrival was unremarkable and troponin markers were not indicative of an acute myocardial infarction. A chest x-ray showed a widened mediastinum. Mrs L underwent an urgent CT-aortagram with contrast which revealed a "moderate volume" 10mm pericardial effusion described by the reporting radiologist as "haemodynamically insignificant" and "nonspecific" and may be the result of heart failure or alternatively a reflection of pericarditis. There was no evidence of cardiac compression. There was mild acute pulmonary oedema but no pleural effusion. There was moderate dilation of the ascending thoracic aorta (with maximal transverse measurement of 42mm). There was no evidence of aortic dissection, thrombosis or rupture. CT head revealed no acute intracranial pathology.

She had persistent hypotension while in the emergency department (blood pressure 72/60 – 104/66) requiring intravenous fluids and intravenous medications to raise her blood pressure.

Mrs L was admitted to the coronary care unit at 7:15pm that evening under the cardiology team with no clear diagnosis. She was reviewed by the cardiology team at around 8:00pm who performed a bedside transthoracic echocardiogram. This revealed normal left and right ventricular size and function, with an ejection fraction of 60%; no significant aortic regurgitation; abnormal appearance to ascending aorta with thickened walls and dilatation (the aortic root and the ascending aorta were dilated, with the latter having a thickened wall up to 5mm); and pericardial effusion with evidence of right ventricular early diastolic collapse. The reporting radiologist commented that a formal transthoracic echocardiogram

was required during day hours. The scan was inconclusive due to the presence of bilateral breast implants. Mrs L's case was discussed with the cardiology consultant and she was planned for a formal transthoracic echocardiogram the next day, with consideration for a transoesophageal echocardiogram if the transthoracic echocardiogram was inconclusive.

A nursing entry made at 7:30am the next day, Monday 25 July, indicates Mrs L slept intermittently overnight. She is documented to have complained of chest pain with breathing (for which she was given Panadol) and one episode of sharp jaw pain ("5/10" severity) for which she was given intravenous fentanyl 25mcg. Her pain reportedly reduced to "slight" before an ECG could be obtained (because the ECG had run out of paper). She was noted to be pain free after that. She had a cup of tea around 4:00am. She was otherwise being kept nil by mouth in anticipation of the formal transthoracic echocardiogram that day.

At around 8:15am, Mrs L was found to be unresponsive and without a pulse. A Code Blue was activated and emergency resuscitation efforts commenced. A bedside echocardiogram showed a 2-3cm effusion. A pericardial drain was inserted and drained ~500ml frank blood. This lessened the effusion significantly and achieved a return of cardiac output but Mrs L required high inotrope support. Unfortunately despite prolonged resuscitation efforts (over one hour), including activating the massive transfusion protocol, Mrs L was unable to be revived.

Police attended the hospital and were satisfied there were no suspicious circumstances.

Autopsy findings

An external examination and partial internal autopsy (chest only) were performed on 27 July 2016. The autopsy revealed both sides of the chest completely filled with blood (haemothorax) as well as some bleeding around the heart (haemopericardium) and in the abdomen. This torrential bleeding resulted from a ruptured dissecting aneurysm of the thoracic aorta. The underlying aorta appeared not to be severely affected by atherosclerosis suggesting it likely there was an underlying abnormality in the integrity and structural strength of the aortic wall.

Hospital & Health Service clinical review outcomes

The relevant Hospital and Health Service (HHS) subsequently undertook a formal clinical review of the care provided to Mrs L given the failure to diagnose her dissecting aortic aneurysm.

The clinical review included a specialist peer review of the transthoracic echocardiogram and the CT-aortagram images.

The review identified that Mrs L had not undergone a pre-contrast CT-aortagram prior to the post-contrast scan. It was felt that had this omission not occurred, it is possible that a small aortic arch mural haematoma or pericardial haematoma may have been identified. However, it is unknown whether this would have changed her clinical course or the decision to admit her to the ward locally for observation and formal echocardiogram delayed scan the following day.

It was suggested than an interval (progress) CT scan a few hours after the initial scan may have demonstrated new radiological evidence to support the diagnosis of an aortic dissection and prompted earlier intervention/referral to a specialist cardiothoracic service. Given Mrs L's ongoing chest pain overnight and the high clinical concern regarding this diagnosis on presentation this option could have been pursued. However, the review team

felt it was unlikely to have been considered clinically indicated as the initial investigations had revealed no evidence of acute aortic syndrome. As such, the review team considered it at best speculative to comment on whether an interval scan would have yielded actionable information.

The review team audited the CT-aortagrams performed at the various HHS emergency departments over the previous four months and found that five different protocols existed for acquiring a thoracic angiogram and of these, some did not mandate a preliminary non-contrast scan. Consequently the review team recommended the urgent development and implementation of a uniform guiding procedure across the HHS mandating a preliminary non-contrast scan for all CT scans assessing acute aortic pathology.

The review team noted there was already heightened awareness within the regional public hospital emergency department following education within HHS emergency departments following the delivery of the State Coroner's inquest findings into the death of Rick Dickinson which examined a missed diagnosis of aortic aneurysm dissection. The review team recommended further annual departmental education about aortic syndromes for radiology registrars and consultants (specially covering intramural haematoma, penetrating atherosclerotic ulcer and aortic dissection as well as other caused of aortic wall thickening).

Independent clinical review

I arranged for an independent doctor from the Department of Health Clinical Forensic Medicine Unit to review the patient records and comment on the reasonableness of Mrs L's clinical management.

The reviewing doctor was satisfied that the emergency department staff correctly suspected the presence of an aortic dissection immediately on Mrs L's arrival and appropriately performed a CT-aortagram with contrast. The emergency treating team also noted the absence of signs of an aortic arch syndrome. There were no neurological signs indicating disturbance of the sympathetic chain. There was no evidence, even on subsequent peer review, of dissection, thrombosis or rupture at that time.

The reviewing doctor noted that after the inconclusive transthoracic echocardiogram, Mrs L's chest pain remained undifferentiated and her blood pressure remained low despite supportive measures. Her arterial pressure was still trending downwards.

The reviewing doctor suggested that the clinical picture of persisting chest pain, persistent low blood pressure and the possibly unexplained widening of the mediastinum noted on initial chest x-ray with a mildly dilated aorta in a 71 year old patient, should perhaps have been discussed with a tertiary hospital specialist team. This consultation may have yielded a recommendation to perform an interval scan (as identified with hindsight by the HHS clinical review team) or transfer to a tertiary hospital for further management.

Conclusion

ML died from natural causes.

Aortic dissection is a rare but life threatening medical condition. As noted by the State Coroner in his findings in the inquest into the death of Rick Dickinson, the incidence of aortic dissection is three patients per 100 000 per year. In Queensland this equates to only around 140 cases per year; by comparison the incidence of acute myocardial infarction is 800 times that of aortic dissection. Only a handful of cases are likely to present to any Queensland emergency department each year.

Diagnosis of aortic dissection can be difficult even for the most competent and experienced emergency physicians because the range of symptoms it presents is very broad. There is no validated clinical tool or one sign or symptom that can positively diagnose the condition. Hypertension is an important risk factor for aortic dissections.

I am satisfied that the regional public hospital emergency department staff quickly identified and acted appropriately on the clinical suspicion of aortic dissection. An urgent CT-aortagram with contrast and subsequent bedside transthoracic echocardiogram revealed no evidence of dissection, thrombosis or rupture, and no clear diagnosis. As such Mrs L was planned for further investigations with a formal transthoracic echocardiogram +/- transoesophageal echocardiogram the following day. Unfortunately she deteriorated acutely the next morning before these further investigations could be commenced.

Subsequent specialist peer review of the imaging has confirmed no evidence of acute aortic syndrome at the time the imaging was performed. With the benefit of hindsight, a pre-contrast CT-aortagram prior to the post-contrast scan may have assisted in identifying a small aortic arch mural haematoma or pericardial haematoma and/or an interval progress CT scan performed some hours later may have demonstrated new radiological evidence to support diagnosis of an aortic dissection and prompted earlier intervention or referral to a specialist cardiothoracic service. I agree with the clinical review team that it can only be speculated that either or both of these investigations would have yielded findings on which to take a different course of action for Mrs L which may or may not have changed the outcome for her.

The HHS has since taken steps to implement a consistent guideline mandating the performance of a preliminary non-contrast scan for all CT scans investigating acute aortic pathology.

Findings required by s. 45 of the *Coroners Act 2003*

Identity of the deceased:	ML
How she died:	ML died from natural causes
Place of death:	Regional Public Hospital
Date of death:	25 July 2016
Cause of death:	1(a) Haemothorax and haemopericardium 1(b) Ruptured dissecting aneurysm of thoracic aorta

I close the investigations.

Ainslie Kirkegaard, Coronial Registrar
Coroners Court of Queensland

02 September 2017