IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

Court Reference: COR 2012 004930

FINDING INTO DEATH WITHOUT INQUEST

Form 38 Rule 60(2)
Section 67 of the ***Coroners Act 2008***

I, ROSEMARY CARLIN, Coroner having investigated the death of THI DIEP ANH LU without holding an inquest:
find that the identity of the deceased was THI DIEP ANH LU
born on 29 May 1976
and that the death occurred on 20 November 2012
at Sunshine Hospital, 176 Furlong Road, St Albans, Victoria, 3021
from:

1(a) HAEMORRHAGE COMPLICATING ELECTIVE CAESAREAN SECTION (PLACENTA PRAEVIA ACCRETA)

Pursuant to section 67(1) of the *Coroners Act 2008* there is a public interest to be served in making findings with respect to the following circumstances:

1. Ms Thi Lu was born on 29 May 1976 and she was 36 years of age at the time of her death. She resided with her family in St Albans, Victoria and is survived by her husband and children.

Relevant background and circumstances

2. On 2 April 2012, Ms Lu was referred to Sunshine Hospital by her general practitioner for pregnancy care. On 14 June 2012, at approximately 15 weeks gestation, Ms Lu attended Sunshine Hospital's pregnancy care clinic and was identified as a high risk obstetrics patient due to two previous caesarean sections, both performed in Vietnam.

3. On 9 August 2012, at 24 weeks gestation, Ms Lu had an obstetric ultrasound which revealed that the right lateral placenta was completely covering the internal orifice of the uterus, consistent with placenta praevia.[1]

4. On 13 August 2012, Ms Lu again attended the pregnancy care clinic and was seen by Dr Ana Hernandez. Dr Hernandez gave Ms Lu advice about placenta praevia , the risk of placenta accreta[2] and the possibility of the need for a hysterectomy.

5. On 22 October 2012, at approximately 34 weeks gestation, an obstetric ultrasound again noted an 'anterior placenta praevia with no evidence of accreta'. On 24 October 2012, a pelvic magnetic resonance imaging (MRI) scan was performed and the placenta was found to be anterior and covering but not crossing the internal cervical os. The radiologist consulted with another senior radiologist prior to finalising his report. The MRI report concluded there was 'Placenta praevia', but no MRI features of placental adhesive disorder. The report noted that placenta accreta could not be categorically excluded.[3]

6. Ms Lu attended further pregnancy care clinic appointments at Sunshine Hospital on 30 October 2012 and 13 November 2012. On 30 October Ms Lu signed a consent for procedure form. This was a general consent form with Ms Lu's specific procedure handwritten as 'caesarean section and tubal ligation'. The form indicated that she consented to 'such further operative procedures as may be found necessary' and 'the risks of blood product administration have been explained to me'. The form did not indicate specifically what risks had been explained to Ms Lu.

7. Ms Lu's caesarean section was planned for 20 November 2012, at 38 weeks gestation. On 15 November 2012 at approximately 37 weeks gestation, Ms Lu presented to the Sunshine Hospital, having experienced a small antepartum haemorrhage at home. Ms Lu was admitted, and remained in hospital until the scheduled caesarean section.

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1 Placenta previa is when the placenta has implanted at the bottom of the uterus and covers the cervix.

2 Placenta accreta occurs when the placenta attaches too deeply into the uterine wall but it does not penetrate the uterine muscle. After birth the placenta is unable to detach from the uterus normally and may cause serious haemorrhage.

3 In the 2011 Royal Australian and New Zealand Collage of Obstetricians and Gynaecologists clinical guideline, antenatal imaging techniques that can help to raise the suspicion of a morbidly adherent placenta should be considered in any situation where any part of the placenta lies under the previous caesarean section scar, but the definitive diagnosis can only be made at surgery. These techniques include ultrasound and magnetic resonance imaging (MRI).

8. At 9 am on the morning of 20 November 2012, Ms Lu met with Dr Jensen, the obstetrics registrar. Hospital progress notes record 'discussed risks including massive bleeding and hysterectomy (with Vietnamese interpreter). The notes also record Ms Lu requesting tubal ligation and Dr Jensen advising that it would be discussed with the consultant, but may not be appropriate in the event of bleeding.

9. Later that morning Ms Lu was transferred from the ward and admitted to theatre. The preparation for surgery included a cross match for blood type, group and hold, with five units of packed cells reserved for immediate use if required. The low-lying placenta was assessed as a grade II placenta praevia.[4] At approximately 11.24 a.m., consultant obstetrician Dr Sedgely, performed the surgery. Dr Jensen assisted him and Dr Jeffreys, was the anaesthetist. Dr Jeffreys chose a general rather than a spinal anaesthetic in case hysterectomy was required.

10. At 11.56 a.m., a baby girl was delivered and was observed to be in good condition. Immediately after birth, Dr Sedgley attempted to separate the placenta, but found that Ms Lu had a morbidly, partially adhered placenta[5] with ongoing heavy bleeding from the placental bed. He also noted significant anatomical distortion related to scar tissue and adhesions between the uterus, abdomen and abdominal wall from Ms Lu's two previous caesarean sections.

11. At 12.10 p.m., Ms Lu's systolic blood pressure was 70 mmHg and the first unit of packed red blood cells was delivered intravenously. Between 12.12 p.m. and 12.15 p.m., two further units of packed cells were infused. A Bakri balloon[6] was inserted to provide uterine tamponade and to control bleeding. At this time Ms Lu was haemodynamically unstable and hypotensive. There was no obvious vaginal bleeding, but her uterus remained uncontracted and atonic and continued to haemorrhage.

12. Dr Jensen, retrospectively documented in the progress notes that she 'again' suggested they call for assistance from another surgeon but 'Dr Sedgely did not want to'. In his statement, Dr

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4 Placenta praevia are divided into 4 grades depending on the relationship and distance to the internal os of the cervix. In grades I and II the placenta is close to or abutting the internal opening (or os) of the cervix, respectively. In grade III the placenta partly covers the internal cervical os and in grade IV the placenta completely covers it.

5 A morbidly adherent placenta refers to the spectrum of placenta accreta, increta and percreta as the placental tissue penetrates through the myometrium. Placenta accreta is the most common, and occurs when all or part of the placenta attaches abnormally to the myometrium, the uterine muscle wall. Placenta increta and percreta refer to penetration into and through the myometrium respectively.

6 A Bakri balloon is a 24 French gauge, 54 cm long silicone catheter with a filling capacity of 500mLs. The device is inserted in to the uterine cavity and inflated to apply pressure on the uterus to temporarily control post partum haemorrhage.

Sedgley indicated that he declined the offer to call an obstetrician from the theatre next door because he knew the next step would be a hysterectomy which he was capable of performing with his assistant; he was concerned that involving a new obstetrician would involve unnecessary delay and finally, although he knew Ms Lu had lost a result of blood, he did not realise 'that was life threatening yet'.

13. In any event, Dr Jensen requested that another theatre staff member call a second consultant obstetrician and at approximately 12.20 p.m. consultant obstetrician, Dr Sherwood arrived in theatre. Ms Lu was still haemodynamically unstable, and a decision was made to perform an immediate hysterectomy. The hysterectomy was performed and completed within 15 to 20 minutes of Dr Sherwood arriving in theatre.

14. At 12.30 p.m., Mrs Lu developed a broad complex ventricular tachycardia[7]. A code blue was called, cardiopulmonary resuscitation (CPR) was commenced intraoperatively and a further twelve units of packed cells and three units of fresh frozen plasma were administered.

15. Ms Lu continued to deteriorate despite CPR. At 1.10 p.m., 40 minutes into CPR, there was clinically apparent coagulopathy[8] and Ms Lu was found to be severely acidotic, with a pH of 6.804.[9] After 1 hour and 15 minutes CPR was ceased and Ms Lu died at approximately 1.45 p.m..

Post Mortem Examination

16. Dr Noel Woodford, Senior Forensic Pathologist with the Victorian Institute of Forensic Medicine (VIFM) performed an autopsy on Ms Lu's body. Specialist examination of the uterus and placenta showed evidence of placenta accreta.[10] Dr Woodford recorded the medical cause of death as 1(a) haemorrhage complicating elective caesarean section (placenta praevia accreta).

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7 In the emergency setting most broad complex tachycardia have a ventricular origin, and in this situation hypovolaemia.

8 Coagulopathy is a condition in which the blood's ability to clot is impaired. This can occur in massive haemorrhage as the body loses clotting factors and platelets in the blood, which must be replaced in addition to packed red blood cells. Severe shock also promotes spontaneous formation of clots throughout the circulation, consuming the remaining platelets and clotting factors available. Fresh frozen plasma contains donor clotting factors and is used to correct this.

9 Normal pH is 7.35 to 7.45. Severe acidosis indicates severe shock as the circulation fails to deliver oxygen and anaerobic metabolism commences to support tissue function, producing lactic acid as a by-product. As lactic acid builds up the pH decreases. Severe acidosis progressively impairs cardiac muscle and other cell functions.

10 This is an abnormality of the placenta-uterine junction where there is deeper than normal implantation of chorionic villi into uterine muscle.

Coronial investigation

17. My investigation into the circumstances of Ms Lu's death was conducted with the assistance of the Coroners Prevention Unit (CPU).[11] The hospital records were obtained and Ms Lu's treating clinicians provided statements.

18. The Western Health Adverse Outcomes Committee also conducted a review of Mrs Lu's death, which was finalised in April 2013. Associate Professor Glyn Teale, the Director of Clinical Services, Women's and Children's Services at Western Health, provided a summary of the hospital review. The review identified contributing factors and issues requiring improvement by the hospital, including:

    - That the consultant obstetric surgeon was only made aware Mrs Lu's clinical situation on the day prior to her surgery
    - That there was a delay in calling for a second senior surgeon
    - That there was an absence of a massive haemorrhage procedural guideline.

    The recommendations from the hospital review resulted in a process for early notification of high-risk obstetric cases and a procedure for the management of a massive obstetric haemorrhage.

19. Expert opinions were sought in order to ascertain whether there was an opportunity for earlier intervention. VIFM consultant radiologist Dr O'Donnell, and obstetrician and gynaecologist Professor Jobling provided expert opinions in this regard for which I am grateful.

20. I also had regard to relevant clinical practice guidelines on the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) website, the Finding into the Death of Linda Parker (COR 2010 2497) and invited interested parties to make any submissions in relation to my anticipated findings should they wish to do so.

11 The Coroners Prevention Unit (CPU) is a specialist service that assists coroners during the course of an investigation, particularly in fulfilling their prevention role. The CPU is staffed by a range of professionals including researchers and health professionals. Further information about CPU is available on the Coroners Court Website.

Discussion

21. There are three relevant clinical practice guidelines published on the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) website relevant to the review of Mrs Lu's death from haemorrhage, caused by a morbidly adhered placenta accreta. The first is a comprehensive United Kingdom (UK) guideline to assist diagnosis and management, developed by the Royal College of Obstetricians and Gynaecologists (RCOG) titled 'Placenta praevia, Placenta praevia accreta and vasa praevia'. The second is RANZCOG's own guideline titled 'Placenta accreta' first endorsed in November 2003 and last reviewed in March 2014. The third is the 2011 RANZCOG guideline 'Management of Postpartum Haemorrhage [PPH]'; defined as excessive bleeding (greater than 500mls) that makes the woman symptomatic.

22. Literature indicates PPH remains a major cause of both maternal morbidity and mortality within Australia and New Zealand[12].

23. Whilst antenatal imaging techniques can help raise the suspicion of a morbidly adherent placenta, definitive diagnosis may only occur during surgery. This was the situation presented to Ms Lu's surgical team. The diagnosis of placenta accreta was only confirmed when the placenta was unable to be removed after the delivery of Ms Lu's child. The difficulties of diagnosing placenta accreta and planning for delivery are highlighted in the RCOG clinical practice guideline, which states the importance of assuming the presence of placenta accreta in high risk pregnancies.

24. The UK National Patient Safety Agency (NPSA) in a collaborative research project with the RCOG determined there were six elements considered reflective of good care when a placenta accreta is suspected, namely:

    - Consultant obstetrician planned and directly supervising the delivery
    - Consultant anaesthetist planned and directly supervising anaesthetic at delivery
    - Blood and blood products available
    - Multi disciplinary involvement in pre-operative planning

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[12] Henry A, Birch A, Sullivan E et al. Primary PPH in an Australian tertiary hospital: a case-control study. Australian and New Zealand Journal of Obstetrics and Gynaecology. 2005; 45: 233-23.

- Discussion and consent includes possible interventions (such as hysterectomy, leaving the placenta in place, cell salvage[13] and interventional radiology)

- Local availability of a level two critical care bed[14]

25. The expert opinion provided by Professor Jobling highlighted the difficulties in planning and managing women with known placenta praevia and possible accreta. He commented 'these types of surgical cases are always associated with significant haemorrhage and that the ability to accurately diagnose placenta accreta/percreta is notoriously difficult, even by experienced radiologists'.

26. In this regard radiologist Dr O'Donnell advised that a retrospective review of the MRI imaging of Ms Lu suggested evidence of placenta accreta at the level of the lower uterine segment scar, although the findings were subtle and he would not necessarily have expected a radiologist to diagnose it prospectively.

27. According to the Western Health statement, 'a process was developed in response to Mrs Lu's death, to ensure early notification of high-risk obstetric cases'. Professor Jobling cites the Monash Health notification practice, where the oncology gynaecology surgeons[15] are notified in advance of any potential surgical cases, which may involve a morbidly adherent placenta, and therefore a high likelihood of significant obstetric haemorrhage. This ensures timely surgical assistance in an emergency.

28. Professor Jobling comments 'the time of delivery until the cardiac arrest was only 35 minutes, which would seem to be a relatively short period of time and this does raise the question as to whether the recognition of the extent of the haemorrhage was sufficient to allow more rapid resuscitation efforts'.

29. In his expert report, Professor Jobling acknowledged the difficult situation presented to the surgical team where there was massive obstetric haemorrhage, combined with the inability to accurately view pelvic anatomy.

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13 Intraoperative Cell Salvage is the intraoperative collection and re-infusion of the patient's own red blood cells. It is a blood conservation measure that decreases net perioperative blood loss, maintains postoperative haemoglobin and reduces the requirements for allogeneic blood transfusion.

14 Equivalent to an Australian High Dependency Unit (HDU) bed.

15 Oncology gynaecology surgeons have advanced training and expertise in complicated major uterine surgery.

30. The initial attempts at controlling the haemorrhage, especially using a Bakri balloon, were not effective. In hindsight, Professor Jobling believed the attempts at tamponading the uterus with a Bakri balloon was possibly 'misguided given that the definitive action of emergency hysterectomy immediately upon recognition of significant anatomical problems and massive blood loss may have been a better option'.

31. Professor Jobling was of the view that in such cases assistance from a senior surgeon is always of benefit. He also commented that in his experience the only way massive obstetric haemorrhage can be controlled is by very rapid resort to hysterectomy.

Findings

32. I am satisfied further investigation is not necessary. I acknowledge the considerable assistance of the CPU to this finding.

33. Conscious that the conduct of any medical professional must be assessed according to the prevailing standards of his or her particular specialty and without the benefit of hindsight, I make the following findings based on all the material.

34. Mrs Lu was in a high risk category for developing placenta accreta due to a uterine scar from two previous caesarean sections, in combination with a low-lying placenta praevia sitting over her previous uterine scars.

35. A MRI performed late in the pregnancy did not identify placenta accreta. Retrospective review of the MRI scan performed on Ms Lu on 24 October 2012 suggested placenta accreta at the level of the lower uterine segment scar. However, these findings were so subtle that it could not be expected that a specialist radiologist would diagnose placenta accreta at first instance.

36. Although not diagnosed prior to surgery, the possibility of a placenta accreta was appropriately recognised by Ms Lu's treating clinicians and preparations were made in case it was present.

37. Placenta accreta was diagnosed during Ms Lu's surgery. The extent of the bleeding and the anatomical distortion of Ms Lu's pelvic anatomy meant that this was a medical emergency. Optimal care would have involved the attendance of another senior surgeon and immediate hysterectomy.

38. It is not possible to determine whether immediate hysterectomy could have saved Ms Lu, however it would have provided her the best chance of survival.

39. Dr Sedgely initially failed to appreciate the catastrophic nature of the bleeding and the desirability of the attendance of another obstetric consultant or surgeon, however I am not satisfied that his conduct fell below the prevailing standards of his profession.

40. Whilst Western Health did not have a protocol for the identification and management of high risk obstetric cases at the time of Ms Lu's pregnancy and surgery, it has since developed such protocols. The lack of any protocol at the time was not a contributing factor to Ms Lu's death.

41. Ms Thi Lu died on 20 November 2012 from haemorrhage complicating elective caesarean section (placenta praevia accreta).

COMMENTS

Pursuant to section 67(3) of the Coroners Act 2008, I make the following comment(s) connected with the death:

1. This case highlights the limitations of radiology (including MRI and ultrasound) in definitively ruling out placenta accreta and the need for obstetric services to maintain a high degree of suspicion in high risk mothers, even in the setting of apparently normal imaging.

2. Pre-operative anticipatory planning in possible placenta accreta is instrumental to safe deliveries and this includes careful planning and delivery in a setting that provides adequate obstetric, surgical, intensivist, blood bank and interventional radiology for high risk deliveries.

3. An expert opinion identified an opportunity for prevention by the timely notification of a second senior surgeon who may have been more inclined to proceed directly to hysterectomy. Although it should not have been a consideration in this case given Ms Lu's desire for tubal ligation, Professor Jobling notes that the decision to resort to hysterectomy is often more easily made by a third party expert surgical assistant who may be less influenced by the desirability of preserving fertility.

4. It is never easy for junior medical staff to suggest escalation and additional support to more senior clinicians or supervisors. Dr Jensen's decision to call for additional support was clearly appropriate and in the patient's interests. Fostering a working culture that promotes and protects decisions to escalate care is an important part of ensuring that escalation can occur when appropriate.

RECOMMENDATIONS

Pursuant to section 72(2) of the *Coroners Act 2008*, I make the following recommendation(s) connected with the death:

1. That the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) Women's Health Committee considers highlighting the following, in its 'Placenta Accreta' guideline:

    a. that because of the difficulty in diagnosing placenta accreta prior to birth, high risk pregnancies should be managed on the assumption that placenta accreta exists. This means the patient, the surgeon and the anaesthetist should all be prepared for immediate hysterectomy with possible massive blood transfusion; and

    b. that the surgeon should be prepared for rapid referral to an additional senior surgeon for decision on the need for and implementation of immediate hysterectomy.

I direct that this finding be published on the internet and that a copy of this finding be provided to the following:

The family of Ms Thi Lu;
Professor Jobling;
Western Health;
The Coroner's Investigator, Victoria Police; and
Interested parties.

Signature:

ROSEMARY CARLIN
CORONER
20 October 2015