



The Royal College of Pathologists
Pathology: the science behind the cure

Guidelines on Autopsy Practice
Scenario 9: Stillborn infant (singleton)

June 2006

Unique document number	G001
Document name	<i>Guidelines on Autopsy Practice. Scenario 9: Stillborn infant (singleton)</i>
Version number	1
Produced by	The Working Party on Autopsy of the Specialist Advisory Committee on Histopathology, in consultation with the College membership and Lay Advisory Committee
Date active	19 June 2006
Date for review	June 2008
Comments	Best-practice scenario related to <i>Guidelines on Autopsy Practice</i> (September 2002)

In accordance with the College pre-publications policy, this document was put on The Royal College of Pathologists' website for consultation from 14 October to 4 November 2005. Three pieces of feedback were received. Dr Chris Wright and Professor Sebastian Lucas considered the feedback on behalf of the Working Party of the Autopsy, and amended the document accordingly. Please email publications@rcpath.org if you wish to see their responses to the feedback received.

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Director of Publications

Guidelines on Autopsy Practice

Scenario 9: Stillborn infant (singleton)

The role of the autopsy

- To establish the immediate cause and timing of intrauterine death.
- To identify concomitant diseases, particularly those with implications for subsequent pregnancies (e.g. growth restriction, malformation, maternal diabetes).
- To exclude trauma as a cause of intrapartum death.
- To provide information for audit purposes (e.g. antenatal diagnosis).

Pathology encountered at autopsy

- Hypoxia:
 - visceral petechial haemorrhages
 - inhaled amniotic material
 - hypoxic-ischaemic injury of brain and other internal organs.
- Growth restriction: symmetric, asymmetric (nutritional).
- Infection:
 - amniotic fluid infection (chorioamnionitis, funisitis, pneumonia)
 - haematogenous infection (including villitis).
- Malformation.
- Trauma: cranial, extracranial.
- Blood loss, e.g. cord, feto-maternal, internal.
- Hydrops.
- Maternal disease, e.g. diabetes, hypertension and pre-eclampsia.
- Placental and cord disease, including:
 - pathology of fetoplacental and uteroplacental circulations (e.g. fetal vessel thrombosis, placental haemorrhage/thrombosis, placental infarction)
 - features of amniotic fluid infection (chorioamnionitis/funisitis)
 - villitis
 - abnormal cord insertion, cord knots.
- Changes in the baby and placenta secondary to intrauterine death (e.g. maceration, placental vascular involution).

Specific health and safety aspects

The pathologist needs to know the results of the antenatal infection screens.

In regions of high maternal HIV prevalence, autopsy practice using universal precautions will significantly protect against accidental transmission.

Clinical information relevant to the autopsy (best obtained using structured request form)

- Maternal age.
- Relevant medical and family history.
- Obstetric history, including previous fetal losses, malformation and growth restriction.
- History of current pregnancy, including:
 - estimated delivery date
 - antenatal infection screen, including HIV
 - abnormal findings from ultrasound or other antenatal investigations
 - hypertension/bleeding/pyrexia/membrane rupture
 - events leading up to intrauterine death and/or delivery
 - delivery: mode, complications and use of instrumentation.

The autopsy procedure

- Requires availability of appropriately sized instruments; balances for weighing body (i.e. up to approximately 6 kg) and organs (to nearest 0.1 g); charts of normal values (baby and placenta).
- Whole body X-ray for gestational assessment, malformation, etc. Mandatory for suspected skeletal dysplasia.
- Photography to document external and internal abnormalities.
- Routine external body measurements (body weight, crown-rump length, crown-heel length, foot length, occipito-frontal circumference).
- Detailed external examination, including: nutritional status/soft tissue and muscle bulk, maceration, local/generalised oedema, pallor, meconium staining, dysmorphism, evidence of trauma (intrapartum death) and other iatrogenic lesions, assessment of patency of orifices (including choanae) and palatal fusion.
- Examination for skull fracture or osteodiastasis
- T- or Y-shaped incision; measurement of sternal fat thickness.
- Central nervous system (CNS) examination:
 - paramedian skull incisions to allow assessment of falx and venous sinuses
 - assessment of falcine and tentorial injury and meningeal haemorrhage (intrapartum death)
 - assessment of skull fracture and osteodiastasis (intrapartum death)
 - exclusion of spinal injury by posterior approach (intrapartum death)
 - if suspected CNS malformation (including ventriculomegaly): examination of posterior fossa structures by posterior approach
 - observation of gyral pattern to assist gestational assessment
 - with marked autolysis: removal under water and perhaps in dura will permit weighing and assessment of gyral pattern.
- Detailed systematic examination of other internal organs, including:
 - umbilical arteries and vein, ductus venosus
 - in situ examination of the heart and great vessels with sequential segmental analysis of malformations
 - thoracic and abdominal organs removed in continuity to assess structures (normal and abnormal) crossing diaphragm
 - weights of all major organs including thymus.

- Detailed examination of placenta and umbilical cord, including:
 - weight (after extraplacental membranes and cord detached)
 - dimensions of placenta, cord length
 - membranes
 - fetal surface/chorionic vessels
 - maternal surface
 - slicing at approximately 1 cm intervals to evaluate parenchyma.

Specific significant organ systems

None – all are of significance.

Organ retention

- Extra-cranial organs with congenital malformations (particularly heart) if input not available on site at the time from a perinatal pathologist or cardiac morphologist, and the abnormality cannot be satisfactorily recorded by photography.
- Brain for macroscopic and histological assessment of hypoxic-ischaemic injury (timing, extent and severity), haemorrhage, malformation, infection, etc. Depending on circumstances, brain retention and possibly referral for specialist neuropathology may be indicated. However, submersion for several days, either in formalin with 5% acetic acid at room temperature or in 40% formalin at 37°C, may produce sufficient fixation to allow adequate sectioning and block sampling if the brain is to be returned to the body before release.
- The consent form must be carefully checked for consistency with respect to tissue retention and achieving the aims of the autopsy. Permanent archiving of tissues blocks and slides should be the norm.

Minimum blocks for histological examination

- Thymus.
- Heart (septum).
- Lungs (right and left).
- Liver.
- Pancreas.
- Adrenal gland.
- Kidney.
- Bone (including growth plates) mandatory for suspected skeletal dysplasia.
- Brain: at least single blocks from cerebral hemisphere and hindbrain, but when systematically assessing hypoxic-ischaemic injury or malformation blocks should if possible include cerebral cortex (several lobes), periventricular white matter, deep grey matter, hippocampus, midbrain (inferior colliculi), pons, medulla (inferior olives), cerebellum with dentate nucleus. Sampling may by necessity be more restricted if there is advanced autolysis.
- Other organ lesions as appropriate.
- Placenta (at least two full-thickness blocks, plus focal lesions).
- Membrane roll.
- Umbilical cord (at least two).

Other samples required

- Bacteriology (may still be helpful when there is maceration):
 - lung
 - blood
 - other, as dictated by clinical history or macroscopic findings.
- Genetics:
 - skin/muscle
 - cardiac blood
 - placenta
 - **or** samples recommended by local cytogenetics department.
- Samples for virology, biochemistry, haematology if indicated by history of macroscopic findings.
- For details on investigation of metabolic disorders, consult that Neonatal Metabolic Biochemistry Network website.⁴

The clinico-pathological summary

Should include:

- an assessment of gestation age
- a summary of the findings
- a discussion of the likely mechanism of death
- explicit statements regarding the presence/absence of growth restriction, malformation, infection and (where appropriate) trauma (negative findings are helpful and may be crucial)
- identification of those cases with an increased risk of recurrence (including growth restriction and maternal diabetes).

Specimen cause of death opinions/statements

- Idiopathic acute antepartum hypoxia; no associated growth restriction; incidental ventricular septal defect.
- Antepartum hypoxia due to impaired uteroplacental perfusion with associated placental infarction, fetal growth restriction and maternal pre-eclampsia.
- Amniotic fluid infection by group B streptococcus with chorioamnionitis and intrauterine pneumonia.
- Intrauterine CMV infection with placental villitis and associated growth restriction.

References

1. Wigglesworth JS. *Perinatal Pathology*. Philadelphia: WB Saunders, 1996.
2. Keeling JW. The perinatal necropsy. In: Keeling J (editor). *Fetal and Neonatal Pathology*. London: Springer, 2001. pp. 1–46.
3. Bove KE. Practice guidelines for autopsy pathology – the perinatal and pediatric autopsy. *Arch Pathol Lab Med* 1997;121:368–376.
4. Neonatal Metabolic Biochemistry Network website. www.metbio.net

The RCPATH Working Party on the Autopsy

June 2006