Ultrasound in the perinatal necropsy

M E FURNESS, R C WECKERT, S A PARKER, AND SIMON KNOWLES

From the Departments of Radiology and Pathology, The Queen Victoria Hospital, Rose Park, South Australia 5067.

SUMMARY Although plain and contrast radiology have become a well established part of the perinatal and fetal necropsy, the role of ultrasound has been less comprehensively explored. We have found a variety of ultrasonographic approaches to be of value in diagnosis, quality control, and teaching. Ultrasound is of particular help where consent for formal necropsy has been declined.

Optimal counselling of parents who have suffered a perinatal loss requires accurate and complete diagnosis.¹ Plain film and contrast radiography are well recognised components of the perinatal necropsy,²⁻⁶ but ultrasound also has potential for contributing information in specific circumstances. Some techniques can also be applied to older children and to adults.

Technical aspects

A high frequency scanner is used with a small transducer to maximise flexibility of access. The transducer and the hands of those scanning and assisting with the positioning of the infant, fetus, or

organ are gloved as protection against potentially infective agents. Small fetuses and isolated viscera can be scanned in a waterbath; contact scanning generally produces better results in the larger stillbirths and neonates. Gelatin fixation of isolated viscera, especially the soft fetal brain, facilitates manipulation, quality of image, and subsequent pathological sectioning⁷ (fig 1). Artefacts may make some modification of technique necessary, especially with waterbath scanning; this is best learned by experience and, unlike other workers,⁸ we have not found this technique to be unsatisfactory. Air bubbles within the water of the water bath do not materially interfere with interpretation. Gas may accumulate in the heart and great vessels after death and this does interfere with visualisation. Pleural and pericardial effusions are common after prostag-

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FIG 1 Scan of a gelatin embedded fixed brain in a waterbath: (a) coronal, (b) near median sagittal. S=superior, P=posterior.

landin termination of pregnancy as a result of terminal cardiac failure.

Applications

THE MINIMAL NECROPSY

Parents who are unwilling to consent to a formal necropsy on their infant may permit ultrasound

scanning for anatomical detail,⁹ for ultrasound guided needle biopsy (fig 2), biochemical analysis of aspirate, or contrast radiography (fig 3). Any degree of invasion, albeit as minimal as fine needle aspiration, requires written consent. It is occasionally possible to use existing drain holes,³ for example where pneumothoraces have been tapped, as a route for biopsy to eliminate the need for further puncture

FIG 2 A term infant with respiratory difficulties, hypotonia, and bulbar palsy who died at 28 days of age. Necropsy was limited to ultrasound guided tissue sampling of an area of tiny lucencies in the region of the basal ganglia. Tru-cut specimens showed ferruginated neurones (arrow) and astrocytosis consistent with a reasonably old hypoxic event. (H&E.)

FIG 3 (a) A stillborn twin with palpably enlarged kidneys and oligohydramnios sequence. Transverse scan of the left kidney showed parenchymal cysts (arrowheads) and a dilated collecting system. A needle (arrow) has been placed in the pelvis for urinary sampling and injection of contrast medium. M=medial. (b) Anteroposterior x ray of the same case. There is obstruction at the distal end of the ureter and there are fine communications between the collecting system and the subcapsular cysts. There is some extravasation of contrast medium.

of the skin. However, parents will rarely object to additional small Tru-cut marks. It must be emphasised that this approach is no substitute for a formal necropsy but it may well be better than nothing, particularly if supplemented with radiology, accurate anthropomorphic measurement, and photography.

PROBLEM AREAS AT NECROPSY

Macerated material

Ultrasound may provide quite striking detail despite advanced tissue autolysis. Where the pathologist

would be required to undertake time consuming exercises such as the removal of the fetal brain within its meninges,¹⁰ ultrasound may obviate the necessity by showing normal gyral development and ventricle size.

Where it is desirable to preserve a specimen intact

The process of dissection inevitably leads to some destruction of anatomy. This also applies when a specimen should be preserved for museum purposes (fig 4). Retrospective assessment of fixed material is also possible, as in the case illustrated.

FIG 4 Craniopagus conjoined twins at 17 weeks' gestation. This is a museum specimen scanned to show the intracranial structures. Large arrowheads=orbits. Small arrowheads=midline.

QUALITY CONTROL

Prenatal ultrasound

This is a comparatively new area where myths are readily perpetuated and errors have far reaching effects. It is crucial for the sonologist to recognise mistakes and explore their origins. For example, fig 5 shows an adrenal gland simulating the fetal lobulation of a kidney in a case of bilateral renal agenesis.

Pathology

Ultrasound can be used to explore areas of poor correlation between prenatal ultrasound results and postnatal necropsy findings. For example, fluid collections in the neck ('cystic hygromas') may be less than convincing at necropsy because the delivery procedure has caused their partial or complete disappearance (fig 6).

It has been suggested that failure to confirm a prenatal diagnosis of hydrocephalus or ventriculomegaly may be the result of delivery trauma and

FIG 5 Longitudinal scan of the right upper quadrant of a neonate with renal agenesis. Adrenal gland (between arrowheads): echogenic medulla mimics renal hilum while hypoechoic cortex resembles renal parenchyma.

FIG 6 (a) Prenatal coronal scan of a hydrotic 19 week fetus with trisomy 21 showing large fluid filled cervical spaces (arrowheads). (b) Postnatal scan 24 hours later, after prostaglandin termination. Ascites and pleural effusions are still present but the collections in the neck have virtually disappeared. H=head, T=thorax.

delay in performing the fetal examination. However, we have been unable to show any significant change in ventricular size in six mid-trimester fetuses, one of which was known to have ventriculomegaly, over a one week period after prostaglandin termination.

TEACHING

Postnatal scanning allows the investigator optimal positioning and visualisation together with the advantage of wisdom after the event. These attributes facilitate ultrasonographic, pathological, and radiological correlation (fig 7). The technique can be used to explain normal or variant prenatal findings. Teaching films of rare conditions may be

obtained where there was no opportunity for prenatal study. Examples of artefacts and red herrings may be generated.

Conclusions

In tertiary obstetric units, many anomalies detected prenatally are discussed by multidisciplinary dysmorphism groups. The introduction of ultrasound into the fetal and perinatal necropsy arose as a logical extension of the discussions of one such group. We have found that the studies have improved our understanding of features shown prenatally and have fostered greater rapport between the various diagnostic and clinical departments.

FIG 7 (a) Radiograph of a radial club hand in trisomy 18. (b) Waterbath scan, postnatally with clenched fist. Ulna arrowed.

Unlike plain film radiology, postmortem ultrasound is too time consuming to use routinely. However, it can be of considerable diagnostic value in selected cases, especially where consent for necropsy has not been forthcoming.

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Correspondence to Dr M E Furness, Department of Radiology, The Queen Victoria Hospital, 160 Fullarton Road, Rose Park, South Australia 5067, Australia.