

# Benefits of examination by post mortem performed magnetic resonance imaging of foetus: haemorrhage in germinal matrix

Manuela VANECKOVA<sup>1</sup>, Zdenek SEIDL<sup>1,2</sup>, Barbara GOLDOVA<sup>3</sup>,  
Ivana VITKOVA<sup>3</sup>, Pavel CALDA<sup>4</sup>

1 Department of Radiology, 1<sup>st</sup> Faculty of Medicine, General Teaching Hospital, Charles University in Prague, Czech Republic

2 Medical College, Prague 5, Czech Republic

3 Department of Pathology, 1<sup>st</sup> Faculty of Medicine, General Teaching Hospital, Charles University in Prague, Czech Republic

4 Department of Obstetrics and Gynaecology, 1<sup>st</sup> Faculty of Medicine, General Teaching Hospital, Charles University in Prague, Czech Republic

*Correspondence to:* Assoc. Prof. Manuela Vaneckova, MD., PhD.  
MRI Unit, Department of Radiology,  
1<sup>st</sup> Faculty of Medicine, Charles University in Prague,  
Katerinska 30, 128 08 Praha 2, Czech Republic.  
TEL: +420 224965454; FAX: +420 224965058; E-MAIL: man.van@post.cz

*Submitted:* 2009-01-06    *Accepted:* 2009-03-30    *Published online:* 2010-02-17

*Key words:*                    **magnetic resonance imaging; autopsy; foetus; haemorrhage; germinal matrix**

Neuroendocrinol Lett 2010; **31**(1):40–42    **PMID:** 20150878    NEL310110A16    © 2010 Neuroendocrinology Letters • [www.nel.edu](http://www.nel.edu)

## Abstract

Post mortem magnetic resonance imaging is demonstrated as a supplementary method to classic pathological-anatomical autopsy in determining anomalies of the foetus. Frequently it plays a key role; primarily where the possibilities of performing autopsy are somehow limited (autolysis, ventricular dilatation). Specification of the final diagnosis subsequently enables us to improve prenatal diagnostics, both by means of magnetic resonance imaging and primarily by correlation with the prenatal ultrasound scan; this feedback improves the later method.

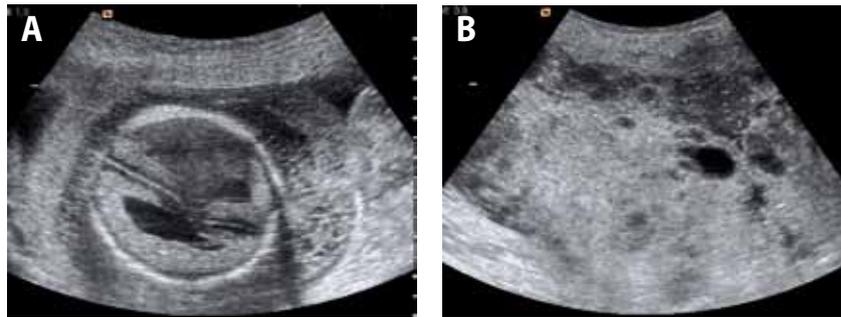
This case report demonstrated that post mortem magnetic resonance imaging, in contrast with prenatal ultrasound examination, showed extensive haemorrhage in the germinal matrix, and also illustrated indirect symptoms testifying to agenesis of the corpus callosum. Prenatal ultrasound examination showed only hydrocephalus and absence of septum pellucidum. Pathological-anatomical autopsy of the brain was insufficient with regard to advanced autolysis and brain haemorrhage.

## CASE

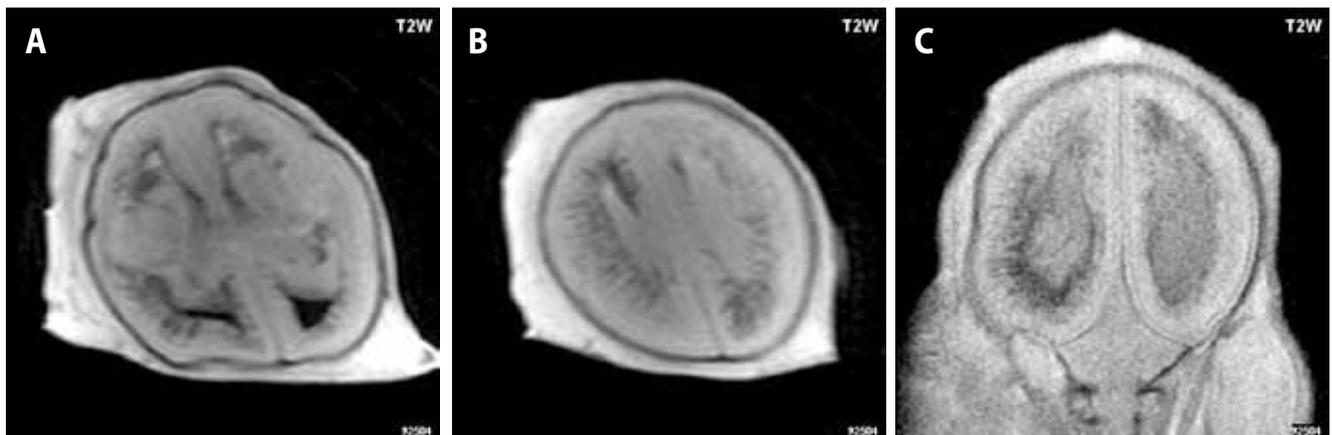
28 years old quadrigravida, with one previous miscarriage in 1<sup>st</sup> trimester and one pregnancy termination in the 1<sup>st</sup> trimester. Course of current pregnancy without complications. Ultrasound examination in 21<sup>st</sup> week of gestation determined severe oligohydramnios and oedematous placenta, with height of up to 60 mm. In addition a miss-

ing septum pellucidum and hydrocephalus were described (Figure 1A,B). The vital signs of the foetus were still present two days before induction of abortion due to foetus mortuus.

The MRI, which was conducted immediately following the abortion, displayed extensive haemorrhage in the germinal matrix, with bursting into



**Fig. 1.** **A** - Prenatal ultrasound examination in 21st week shows dilatation of the ventricle system and absence of septum pellucidum. **B** - Prenatal ultrasound examination shows oedematous placenta, severe oligohydramnios.



**Fig. 2.** Post mortem MRI, transverse cross-sections in T2WI (**A**, **B**). Periventricular there were deposits with low signal intensity, corresponding to haemorrhages in the germinal matrix. Lateral ventricular dilatation is evident, haemorrhaging burst into ventricles, haemorrhage in germinal matrix is evident. On coronary cross-section in T2WI blood in brain ventricles and haemorrhage in germinal matrix is evident.

the ventricles, which were distended (level III according to the Burstein classification). In addition there were evident lined (striped) deposits with a low signal intensity, which in their shape and localisation corresponded to venous infarctions (according to classification the level IV). There was lateral ventricular dilatation as well as dilatation of the third ventricle (triventricular hydrocephalus). Corpus callosum was not displayed; indirect symptoms indicating agenesis thereof (parallel lateral ventricles, inside concave shape of frontal horns of lateral ventricles) (Figure 2A,B,C). Immediately following MRI a pathological-anatomical autopsy was performed. This concerned intrauterine death of the foetus with advanced autolysis. Even despite brain fixation performed in situ it was not possible to distinguish the individual ventricles of the brain, brain tissue with advanced autolysis and haemorrhage was found in the cranial cavity (Figure 3).

Focally oedematous tracts of tissue of a gelatinous consistency were found on the placenta by macroscopic analysis, some chorionic villi were of a diameter of 4 mm. The histological examination showed micromolar degeneration of the placenta and incipient chorionitis.

## DISCUSSION

According to the comparison the largest part of the information relating to the pathological finding in CNS was provided by the MRI, which demonstrated both haemorrhage in the germinal matrix and agenesis of the corpus callosum. With regard to autolysis the autopsy finding was considerably limited, describing only brain tissue with haemorrhage, without a more detailed evaluation (it was not possible to state a finding with regard to the presence of congenital development defects – here agenesis of the corpus callosum). The ultrasound finding displayed only ventricular dilatation and an absence of medial structures. The ultrasound examination illustrated the pathology in the area of the placenta optimally, changes were confirmed in the pathological-anatomical autopsy.

Haemorrhage in the germinal matrix occurs in prematurely born babies (<32 weeks gestation and 1500 grams) most frequently in the first week after birth, less frequently haemorrhage may be observed prenatally, which was the case of our casuistic report, or later after birth. Periventricular leukomalacia occurs less

frequently in comparison with haemorrhagic manifestations, affecting only 5–15% of prematurely born babies (Osborn *et al.* 2004). In the pathogenesis of haemorrhage and ischemia in prematurely born babies, ischemia plays an important role, which contributes to an erosion of the wall of fragile blood vessels of the germinal matrix (Garel 2004; Fusch *et al.* 1997). In this case study, as in the work of Fusch *et al.*, pathology of the placenta led to intrauterine hypoxia of the foetus, which culminated in haemorrhage in the germinal matrix (Fusch *et al.* 1997). This was the last degree in which haemorrhage with bursting into the ventricles first of all led to dilatation thereof, causing serious venous drainage, in turn leading to intraparenchymal haemorrhagic necrosis (Osborn *et al.* 2004; Garel 2004).

MRI helped to clarify in further detail the final diagnosis, primarily relating to the finding on CNS. Prenatal ultrasound examination described only hydrocephalus, lack of medial structures and pathology of the placenta, and an amount of amniotic fluid. With regard to the advanced autolysis in the brain area the pathological-anatomical autopsy was insufficient.

Griffiths *et al.* (2003) correlated findings on post mortem MRI with autopsy analysis, in 8 cases out of 40 the autopsy was inconclusive (for advanced autolysis), in 28 out of 32 cases there was concurrence and in 4 cases the diagnosis differed. These 4 cases were reviewed, in 3 cases MR imaging provided more information, in one case diagnosis from MRI was lacking (Griffiths *et al.* 2003).

A limitation of examination of the foetus, for both autopsy and MRI, is autolysis of the foetus. The degree of autolysis is influenced by two factors: 1. the length of time during which the dead foetus was in the womb and 2. the length of time from abortion to the performance of MRI. It is not possible to influence the duration of the actual induction of the abortion and whether necrosis of the foetus takes place in the womb. After abortion it is possible to ensure that MRI is conducted very quickly, and in this manner it is possible to prevent autolysis of the aborted foetus (Sabire 2006).

Post mortem MRI is performed on foetus for a number of fundamental reasons. One is the above-mentioned correlation of the MRI finding with the pathological-anatomical autopsy, the aim of which is the most precise possible diagnosis of the pathological state. A further reason is to compare how far prenatal ultrasound examination is capable of determining precisely what kind of defect (or pathological state) is concerned, and whether it is applicable to supplement prenatal MRI (Fusch *et al.* 1997; Griffiths *et al.* 2003; 2005; Sabire 2006, Whitby *et al.* 2006; Grandjean *et al.* 1999).



Fig. 3. Foetus mortuus.

We believe that post mortem MR examination may be of significant help in increasing the precision of prenatal diagnosis, primarily where the possibilities of pathological-anatomical autopsy are limited (above all in cases of advanced autolysis or extensive dilatation of the ventricle system).

## ACKNOWLEDGEMENTS

This study was supported by the grant MZOVFN2005 and MSMT021620849.

## REFERENCES

- 1 Osborn AG, Blaser SI, Salzman KL, Katzman GL, Provenzale J, Castillo M, Hedlund GL, Illner A, Harnsberger HR, Cooper JA, Jones BV, Hamilton BE. (2004). Cerebral ischemia and infarction. In Diagnostic imaging brain. Salt Lake City, Utah : Amirsys Inc, 1-4-68-72.
- 2 Garel C. (2004). Abnormalities of the fetal cerebral parenchyma: ischemic and haemorrhagic lesions. In MRI of the fetal brain. Garel C. Berlin Heidelberg: Springer-Verlag. p. 247–261.
- 3 Fusch C, Ozdoba C, Kuhn P, Dürig P, Remonda L, Müller C, *et al.* (1997). Perinatal ultrasonography and magnetic resonance imaging findings in congenital hydrocephalus associated with fetal intraventricular hemorrhage. *Am J Obstet Gynecol.* **177**(3): 512–8.
- 4 Griffiths PD, Variend D, Evans M, Jones A, Wilkinson ID, Paley MN, *et al.* (2003). Postmortem MR Imaging of the fetal and stillborn central nervous system. *AJNR Am J Neuroradiol.* **24**: 22–27.
- 5 Sebire NJ. (2006). Towards the minimally invasive autopsy? *Ultrasound Obstet Gynecol.* **28**: 865–867.
- 6 Whitby E, Paley MN, Cohen M, Griffiths PD. (2006). Post-mortem fetal MRI: What do we learn from it? *Eur J Radiol.* **57**: 250–255.
- 7 Griffiths PD, Paley MNJ, Whitby EH. (2005). Post-mortem MRI as an adjunct to fetal or neonatal autopsy. *Lancet.* **365**: 1217–73.
- 8 Grandjean H, Larroque D, Levi S. (1999). The performance of routine ultrasonographic screening of pregnancies in the Eurofetus study. *Am J Obstet Gynecol.* **181**: 446–454.