

MRI가

가?¹

2 .

: MRI , MRI가
 가 .
 : 13 , 가 7
 5 25 .
 20 - 41 28.2 . 가 17 , 가 8 가
 4 7
 MRI . MRI 1.0 T 1.5 T . MRI .
 T1 T2 가 ,
 가 ,
 MRI 가
 MRI MRI
 : MRI 25 7 18 - 2 ,
 Dandy - Walker , , 1 .
 (100%). 38.3% (23/60) ,
 29.6% (8/27), 45.5% (15/33) .
 MRI 가 ,
 , Meckel ,
 : MRI
 가 1000 5
 (1) 가 MRI 가
 12 - 50%
 가
 (2 - 5). 가 MRI
 가 MRI
 MRI

¹
²

2000 7 12 2000 11 25 . 25 13

, 5 (2), (2),
 (1)
 , 7 1
 1 7 (2),
 (2) (2)
 가 6 , 1
 20-41 28.2
 가 17 , 가 8 가
 4
 7 MRI
 . MRI 1.0T (Magnetome
 Expert: Simens, Erlangen, Germany) 1.5T
 (Signa: General Electric Medical System, Milwaukee, WI,
 U.S.A.) . T1 (TR/TE: 400/15,
 500/9) T2 (TR/TE: 3500/99, 3500/84)
 1cm
 (field of view)
 (matrix) 256 x 144 - 224,
 (acquisition) 2
 (major finding)
 (minor finding)
 (external

: MRI가 가?
 가 (internal find-
 ing)
 MRI 가
 MRI
 MRI
 MRI MRI
 MRI
 MRI
 25 7 (Fig. 1) 18-
 (Fig. 2) 2 , Dandy - Walker ,
 (Fig. 3), (cystic hygroma)
 (hydrops fetalis) (Fig. 4) 1
 MRI
 25 9 16
 MRI 38.3% (23/60)
 45.5% (15/33), 29.6% (8/27)

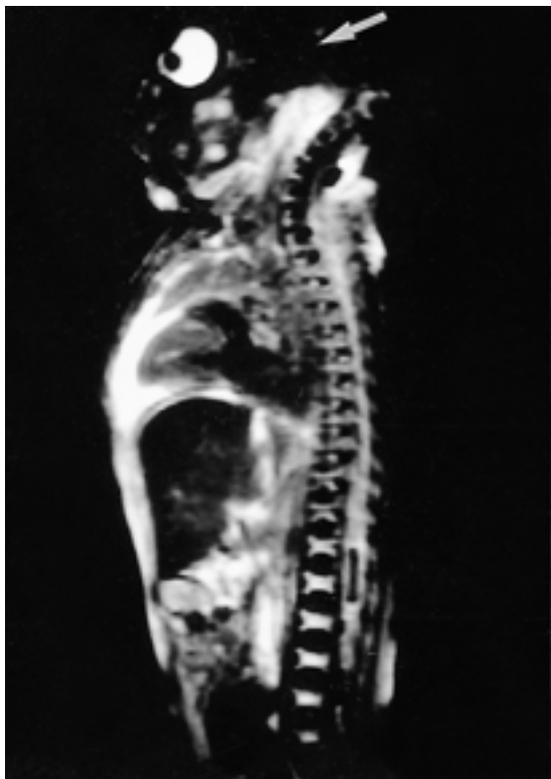


Fig. 1. MR image of an anencephaly fetus.
 T2-weighted sagittal image of a fetus shows no brain tissue in the fetal head.

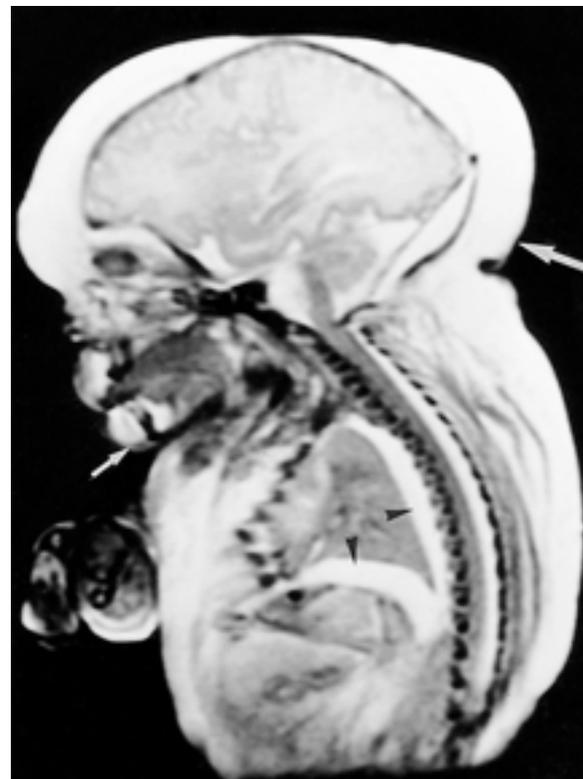


Fig. 2. MR image of a 18-trisomy fetus.
 T2-weighted sagittal image shows abnormal shape of fetal head, thickened nuchal fold (arrow), micrognathia (small arrow), and moderate amount of pleural effusion (arrowheads).

| MRI | Table 1 | MRI | MRI |
|---------------|----------------|-------|-----|
| | T2 | | |
| | (Fig. 2, 3) | | |
| MRI | | | |
| , Meckel | | | |
| MRI | | | |
| (scalp edema) | (micrognathia) | | |
| MRI | | 58 | 25 |
| | | 43.1% | |
| 가 | | 가 | |
| | 가 | | |
| MRI | | | 가 |
| | | | 가 |



Fig. 3. MR image of a fetus with congenital diaphragmatic hernia. T2-weighted coronal image shows herniated bowel loops and spleen (arrows). There is large amount of pleural effusion in both thoracic cavities and both lungs are collapsed. The left lung (small arrow) is hypoplastic.

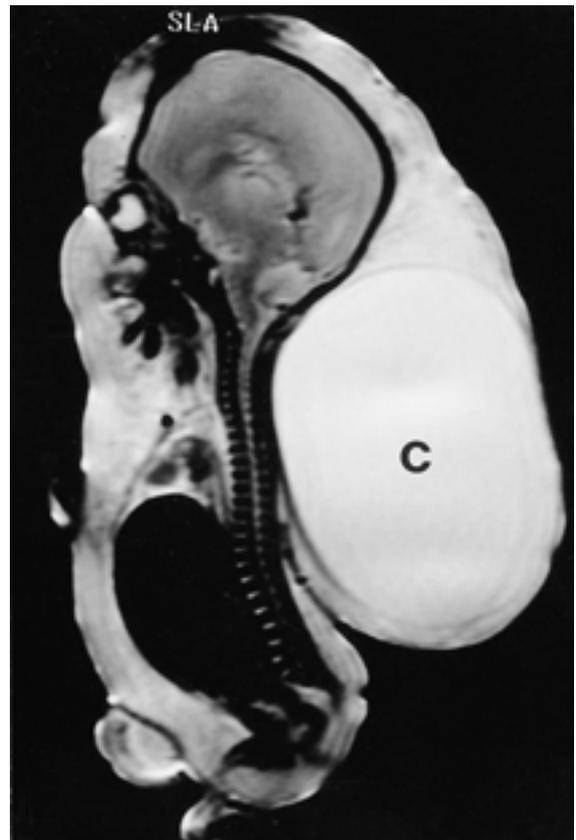


Fig. 4. MR image of a fetus with large cystic hygroma. T2-weighted sagittal image shows a huge cyst (C) in the fetal neck and back. The entire fetal subcutaneous tissues are thickened due to associated lymphedema.

Table 1. Detection Rates of Minor Abnormalities on MRI

| Internal findings | | External findings | |
|-------------------------------|----------------------|---------------------------|---------------------|
| CNS | 4/7 | Head & Neck | 3/6 |
| Anencephaly | 2/2 | Scalp edema | 2/2 |
| Agenesis of cerebellar vermis | 1/2 | Cystic hygroms | 1/1 |
| Posterior fossa cyst | 1/1 | Short neck | 0/2 |
| Arnold-Chiari malformation | 0/1 | Kyphosis | 0/1 |
| Agenesis of corpus callosum | 0/1 | | |
| Heart | 2/5 | Face | 2/9 |
| VSD | 0/3 | Micrognathia | 2/3 |
| Pericardial effusion | 2/2 | Cleft lip & palate | 0/2 |
| | | Flat nose | 0/2 |
| | | Low-set ear | 0/2 |
| Lung | 5/7 | Extremity | 1/8 |
| Lung hypoplasia | 1/3 | Short extremity | 1/2 |
| Plural effusion | 3/3 | Contracture | 0/1 |
| Diaphragmatic hernia | 1/1 | Rocker-bottom foot | 0/2 |
| | | Syndactyly | 0/1 |
| | | Clenched hand | 0/1 |
| | | Amputation of finger | 0/1 |
| Gastrointestinal tract | 2/4 | Abdominal wall | 2/2 |
| Ascites | 2/2 | Omphalocele | 2/2 |
| Malrotation | 0/1 | | |
| Mekel's diverticulum | 0/1 | | |
| Genitourinary tract | 2/8 | Others | 0/2 |
| Horseshoe kidney | 1/2 | Spina bifida | 0/1 |
| Hydronephrosis | 1/1 | Anterior location of anus | 0/1 |
| Hydroureter | 0/2 | | |
| Undescended testicle | 0/1 | | |
| Agenesis of adrenal gland | 0/1 | | |
| Adrenal hypoplasia | 0/1 | | |
| Others | 0/2 | | |
| Double spleen | 0/1 | | |
| Bifid sternum | 0/1 | | |
| Total | 15/33 (45.5%) | Total | 8/27 (29.6%) |

MRI 가 가 MRI
 MRI가 (6-9), 가 7
 (10-15).
 MRI 가 MRI
 (15, MRI
 (17-20). MRI 가 MRI
 가 MRI
 (21-23) 가 가 가
 MRI 100%
 가 가 MRI

Can Postmortem Fetal MR Imaging Replace Autopsy?¹

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Purpose: The purposes of this study were to compare postmortem fetal MRI findings with autopsy findings and to assess whether postmortem MRI can replace autopsy.

Materials and Methods: The study group consisted of 13 stillborn fetuses, seven that died immediately after birth, and five terminated because of anomalies seen on prenatal sonograms. A total 17 were male, and eight were female, and their gestational ages were from 20 to 41 (average; 28.2) weeks. Spin-echo T1- and T2-weighted axial, sagittal, and coronal MR images were obtained, and autopsy findings were divided into major and minor. A major finding was defined as an anomaly or syndrome which caused fetal death or termination of the pregnancy; minor findings were classified, on the basis of gross inspection, as internal or external. MR images were retrospectively analyzed by two radiologists unaware of the autopsy findings, and by comparison with these, the postmortem MRI detection rates for major and minor findings was then determined.

Results: In seven of 25 fetuses, MR imaging revealed major findings, a detection rate of 100%. There were two cases of anencephaly, two of trisomy-18, and one each of hydrops fetalis with large cystic hygroma, diaphragmatic hernia, and Dandy-Walker malformation. Twenty-three of 60 minor findings (38.3%) were detected by MRI. The detection rates for external and internal findings were 29.6%(8/27) and 45.5%(15/33), respectively.

Conclusion: Although a limitation of our study is the low detection rate for minor findings, postmortem fetal MRI may help diagnose the major cause of fetal death.

Index words : Fetus, abnormalities

Fetus, death

Fetus, MR

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