Amniotic fluid levels of glial acidic fibrillary protein in fetal rats with retinoic acid induced myelomeningocele: a potential marker for spinal cord injury

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Objective

Our ability to prenatally predict the severity of spinal cord injury in myelomeningocele (MMC) is limited. We thought to investigate whether amniotic fluid (AF) levels of glial acidic fibrillary protein (GFAP) reflect MMC-related neurodegeneration in fetal rats with retinoic acid (RA) induced MMC.

Material and Methods

Time-dated (E10) pregnant Sprague-Dawley rats were gavage fed 60mg/kg/bodyweight RA dissolved in olive oil or olive oil alone. At various time points throughout gestation MMC, RA-exposed-no-MMC (RA), and control fetuses (OIL) were harvested. A standard set of pinching tests was performed to exam sensorimotor function of hindpaws and tails. Results were considered conclusive if identical reactions were elected in three consecutive pinches. AF-GFAP levels were analyzed by standard ELISA techniques.

Results

Functional data are summarized in Table. AF-GFAP levels were similar between groups at E14, E16, and E18, respectively. Compared to controls, AF-GFAP levels were significantly increased in MMC fetuses at E20 and E22 ($P<0.001$). While at E20 only the defect size correlated with AF-GFAP levels ($P=0.02$), a significant association between AF-GFAP levels; defect size ($P<0.001$), presence of clubfoot deformity ($P=0.0004$) and absence of sensorimotor function ($P<0.01$) was observed at E22.

Conclusion

AF-GFAP levels might be of prognostic value in MMC as intraamniotic GFAP concentration not only correlates with the presence of MMC earlier in pregnancy, but also with the severity of spinal cord injury later in gestation. Confirmatory clinical studies may provide important information to optimize timing and patient selection for fetal surgery.

	Normal response to hindpaw pinching			**Normal response to tail Pinching**			**Presence of Club foot deformity**		
	OIL	**RA**	**MMC**	**OIL**	**RA**	**MMC**	**OIL**	**RA**	**MMC**
E14	NA	NA	NA	NA	NA	NA	NA	NA	NA
E16	NA	NA	NA	NA	NA	NA	NA	NA	NA
E18	6 (100%)	5 (100%)	16 (94%)	6 (100%)	6 (100%)	12 (71%)	0%	0%	2 (12%)
E20	6 (100%)	5 (100%)	9 (64%)	6 (100%)	5 (100%)	7 (50%)	0%	0%	4 (29%)
E22	8 (100%)	7 (100%)	10 (43%)	8 (100%)	7 (100%)	1 (4%)	0%	0%	13 (57%)

Data presented as n (%); NA, prior E18 neuromuscular development was too immature to stimulate pain. responses.