

EMBRYONIC DEVELOPMENT OF VERTEBRATES : MRI STUDY

D.Šuput[#], B.Zalar⁺, D.Abramič⁺ and F.Demsar⁺

[#] *Institute of pathophysiology, Medical School of Ljubljana*

⁺ *J.Stefan Institute, E.K. University of Ljubljana, Yugoslavia*

MRI provides a new and powerful tool for noninvasive and continuous investigation of embryonic development (1,2). In the present study an attempt has been made to monitor the complete development of chick embryo. The study of the guinea pig embryo has been performed, too.

Eggs of the domestic chicken (*Gallus domesticus*) have been kept in a thermostat at 38°C and 60% relative humidity. Measurements were performed on small animal Bruker MRI tomograph (2.35T). Multi slice multi echo technique was used and T₁ and T₂ weighted images were recorded. Slice thickness was 2 mm and time for measurement 20 min.

On a four days incubated egg it is possible to distinguish an embryo from the bulk of the yolk. Embryo is located on a "disc" of bright substance, which is connected to the bright core with a narrow funnel. The spread of the yolk sac with its vascular downgrowth is indicated by an evident digestion of the yolk. Allantois is seen very well around the sixth day of incubation, together with its vascular net. At 10th day allantois spreads over major part of the inner surface of shell of the egg. The volume of albumin decreases while the volume of yolk does not change much despite its intensive digestion by the developing chick. This could indicate transport of water from one to the other compartment. During efflux of water from the albumin its MR signal intensity decreases and image becomes darker. In addition to the development of these major structures it is also possible to monitor development of blood vessels,

especially in allantois. Most of them are less than 0.25 -0.5 mm in diameter which indicates the resolution power of the employed method.

During the first four days of incubation the embryo can not be accurately distinguished from the rest of the egg by MRI. By the fifth/sixth day it is possible to distinguish the amnion, the eye, the heart and major blood vessels from the nearly homogeneous body of the embryo. By the eight day of embryonic development the eye is still the most prominent organ, but the thorax and abdomen with internal organs are seen as well. The structure of these organs in the thorax and in abdomen as well as the eye and the brain was observed on 10 days old embryos. Longer incubations of the egg enable better resolution of internal organs until the embryo is twisted in the egg too much after approximately 15 days of incubation.

The study of the guinea pig embryo has been performed on pregnant and anesthetized females at four weeks of pregnancy. The fetus could be easily located and its internal organs could be fairly well distinguished from the background, although the movements of embryo severely restrict observations at the later stage of pregnancy (3). The best contrast was seen on the spinal cord.

References:

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