



# Agensis of Corpus Callosum in a Fetus at 22 Weeks: Role of MRI Based Scoring and MR Tractography in Clinical Decision Making

Nitin P. Ghonge<sup>1</sup>

<sup>1</sup>Department of Radiology, Indraprastha Apollo Hospitals, Delhi, India

Address for correspondence Nitin P. Ghonge, MBBS, MD, DNB, Department of Radiology, Indraprastha Apollo Hospitals, Delhi 110076, India (e-mail: drnitinghonge@gmail.com).

J Fetal Med 2024;11:172–174.

## Abstract

### Keywords

- ▶ agensis
- ▶ corpus callosum
- ▶ fetal brain
- ▶ fetal MRI
- ▶ MR tractography

A 32 year old woman at 22 weeks gestation underwent fetal magnetic resonance imaging (MRI) after an ultrasound detected corpus callosum agensis. MRI confirmed complete agensis and showed an enlarged left temporal lobe, moderate ventriculomegaly, and abnormal hippocampal orientation. The fetal MRI scoring system indicated a poor prognosis. MR tractography revealed abnormal neuronal connections. Parents were counseled and the pregnancy was terminated due to poor prognosis. This case highlights the value of fetal MRI and tractography in assessing agensis of the corpus callosum and guiding clinical decisions.

## Case

Magnetic resonance imaging (MRI) of the fetal brain was performed in a 32 year female at 22 weeks gestation, following the ultrasound diagnosis of corpus callosum agensis. There was complete nonvisualization of corpus callosum and cavum septum pellucidum (▶**Fig. 1A–E**). Transverse T2-turbo spin echo (TSE) image of the fetal brain showed asymmetry in the dimensions of the temporal lobes, which was enlarged on the left side (▶**Fig. 1A**). Both Sylvian fissures showed optimal operculization with normal signal intensity and the appearance of bilateral basal ganglia (▶**Fig. 1B**). There was moderate ventriculomegaly with colpocephaly and parallel nonconverging lateral ventricles (▶**Fig. 1C**, black arrows). A dorsal interhemispheric cyst was noted (\*). No signs of abnormal sulcation-gyration were identified (▶**Fig. 1B–E**).

Coronal T2-TSE image of the fetal brain showed altered vertical orientation of the hippocampal cortex on both sides (▶**Fig. 2A**, white arrows). Transverse color-coded diffusion weighted MRI images of the fetal brain showed a 5 layered cerebral mantle with preserved telencephalic lamination

(▶**Fig. 2B**). Based on the above mentioned morphological parameters, the fetal MRI based scoring system<sup>1</sup> revealed a score of 5/11, which annotates poor neurodevelopmental prognosis in this case.

MR tractography transverse image showed prominent Probst bundles in bilateral frontal lobes with anteroposterior orientation (▶**Fig. 3A**, vertical arrows). Though not seen crossing the interhemispheric fissure, the altered curvilinear course of fibers suggests an aberrant neuronal connection between the right frontal and left occipital lobe, possibly the sigmoid bundle (▶**Fig. 3B**, horizontal arrow). These findings further suggested poor neurodevelopmental outcomes and the parents were counseled accordingly. The pregnancy was promptly discontinued, as the upper gestational age limit for termination of pregnancy in India is 24 weeks.

Fetuses with agensis of the corpus callosum (ACC) may have a wide spectrum of neurodevelopmental outcomes ranging from completely normal cognitive and motor functions to severe neurodevelopmental delay. Fetal MRI allows for a detailed assessment of the brain in fetuses with an ultrasound diagnosis of isolated ACC. A fetal MRI based

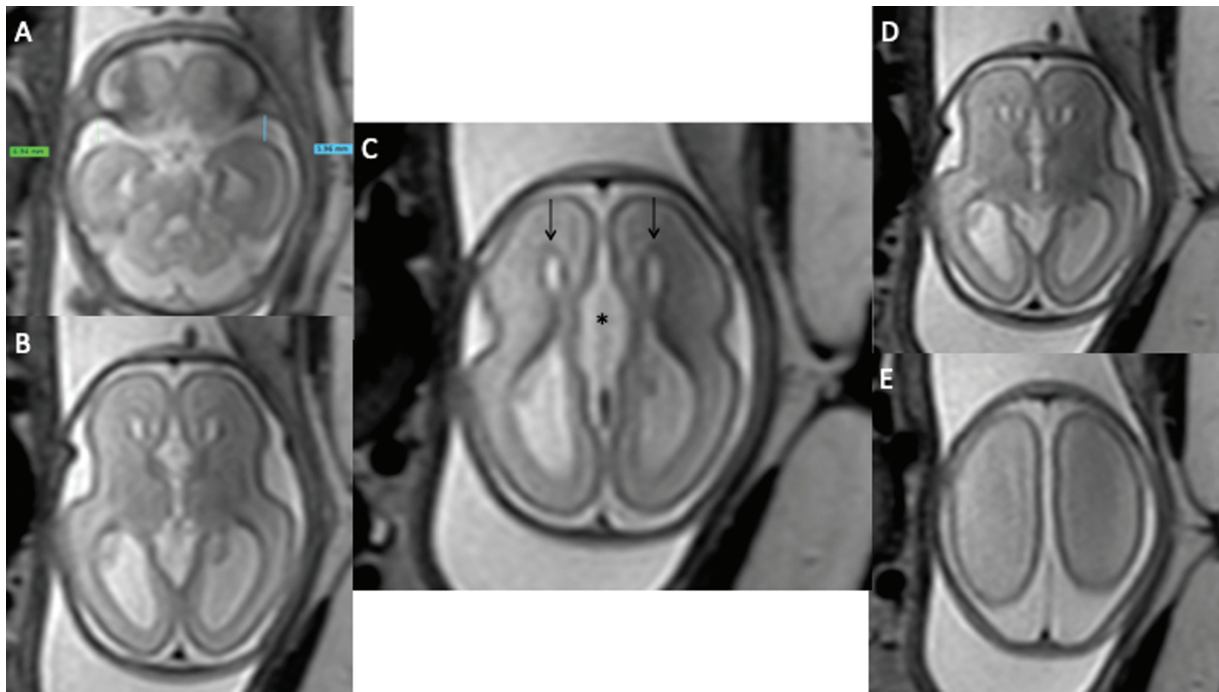
article published online  
July 22, 2024

DOI <https://doi.org/10.1055/s-0044-1788300>.  
ISSN 2348-1153.

© 2024. Society of Fetal Medicine. All rights reserved.

This is an open access article published by Thieme under the terms of the Creative Commons Attribution-NonDerivative-NonCommercial-License, permitting copying and reproduction so long as the original work is given appropriate credit. Contents may not be used for commercial purposes, or adapted, remixed, transformed or built upon. (<https://creativecommons.org/licenses/by-nc-nd/4.0/>)

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

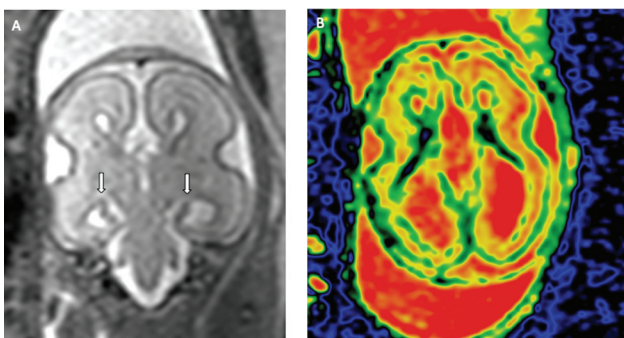


**Fig. 1** There was complete nonvisualization of corpus callosum and cavum septum pellucidum (A–E). A transverse T2-turbo spin echo (TSE) image of the fetal brain showed asymmetric enlargement of the left temporal lobe (A). Both Sylvian fissures showed optimal operculization with normal signal intensity and the appearance of bilateral basal ganglia (B). There was moderate ventriculomegaly with colpocephaly and parallel nonconverging lateral ventricles (C, black arrows). A dorsal interhemispheric cyst was noted (\*). No signs of abnormal sulcation–gyration were identified (B–E).

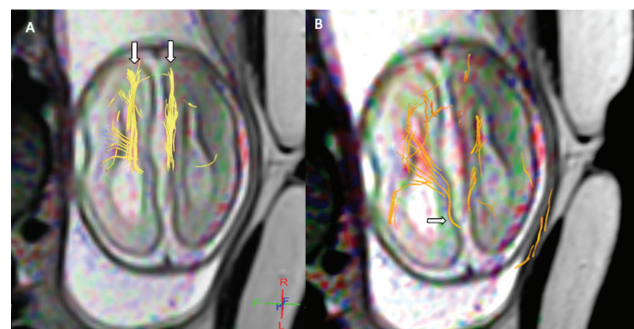
scoring system helps further categorize these fetuses in terms of neurodevelopmental prognosis and, therefore, helps in better parental counseling and clinical decision making.<sup>1</sup>

MR tractography allows visualization of the neuronal connections in fetuses with ACC. Prenatal delineation of white matter connectivity provides greater insight into clinical outcomes and may improve neurological counseling.<sup>2</sup> MR tractography results correspond well with histology based tractography of fetal brain sections and show a positive correlation with neurological outcomes.<sup>3,4</sup>

As illustrated in this case, a detailed anatomical assessment of the fetal brain using the MRI based scoring system along with MRI tractography offers greater insights into fetal brain anatomy and the brain neuronal networks. Appropriate fetal MRI and MR tractography use in fetuses with ultrasound diagnosis of isolated ACC provides an additional dimension in anatomical assessment and neurodevelopmental prognostication as early as 22 weeks of gestation. This will likely help in more effective parental counseling and may allow appropriate and timely clinical decisions, as illustrated in this case.



**Fig. 2** Coronal T2-turbo spin echo (TSE) image of the fetal brain showed altered vertical orientation of the hippocampal cortex on both sides (A, white arrows). Transverse color-coded diffusion-weighted magnetic resonance imaging (MRI) images of the fetal brain showed a 5 layered cerebral mantle with preserved telencephalic lamination (B).



**Fig. 3** Magnetic resonance (MR) tractography transverse images showed prominent Probst bundles in bilateral frontal lobes with anteroposterior orientation (A, vertical arrows). Though not seen crossing the interhemispheric fissure, the altered curvilinear course of fibers suggests an aberrant neuronal connection between the right frontal and left occipital lobe, possibly the sigmoid bundle (B, horizontal arrow).

**Conflict of Interest**

None declared.

**References**

- 1 Diogo MC, Glatter S, Prayer D, et al. Improved neurodevelopmental prognostication in isolated corpus callosal agenesis: fetal magnetic resonance imaging-based scoring system. *Ultrasound Obstet Gynecol* 2021;58(01):34–41
- 2 Kasprian G, Brugger PC, Schöpf V, et al. Assessing prenatal white matter connectivity in commissural agenesis. *Brain* 2013;136(Pt 1):168–179
- 3 Mitter C, Jakab A, Brugger PC, et al. Validation of in utero tractography of human fetal commissural and internal capsule fibers with histological structure tensor analysis. *Front Neuroanat* 2015;9:164
- 4 Song JW, Gruber GM, Patsch JM, Seidl R, Prayer D, Kasprian G. How accurate are prenatal tractography results? A postnatal in vivo follow-up study using diffusion tensor imaging. *Pediatr Radiol* 2018;48(04):486–498