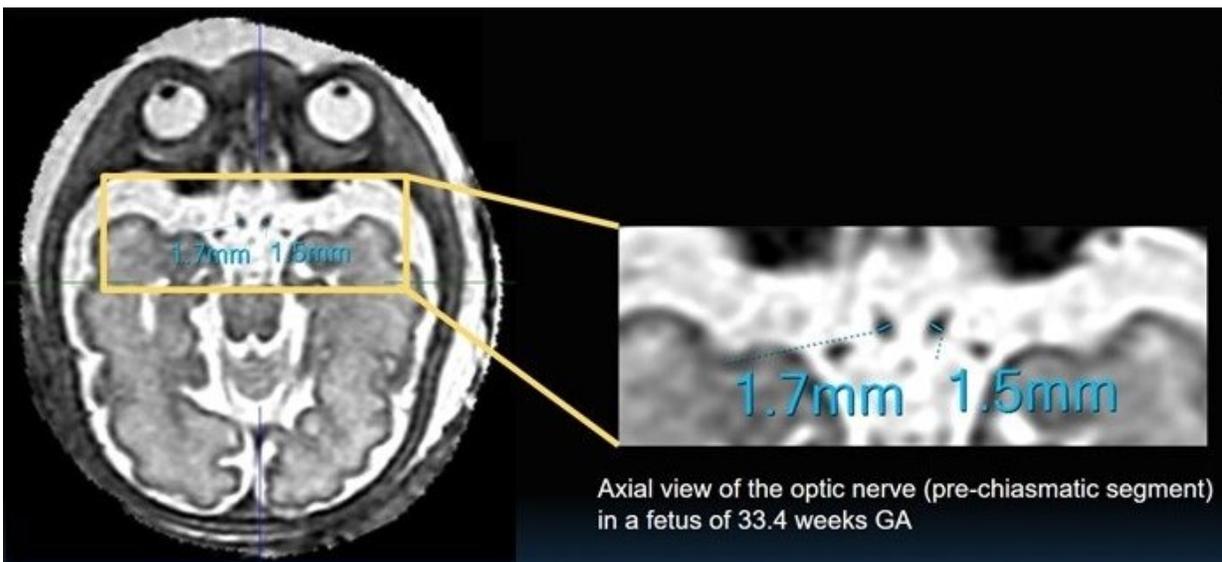


## 3D SVR MRI helps delineate fetal optic nerve pathway

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Measurements complete by medical student under supervision of two pediatric neuroradiologists with more than 8 years of reading experience. Credit: ARRS

A Scientific Online Poster presented during the [2023 ARRS Annual Meeting](#), held April 16–20 on the island of Oahu, explained how the novel technique of three-dimensional (3D) slice-to-volume (SVR) MRI allows for precise delineation and measurement of the fetal optic pathway (FOP).

Noting the limited fetal presentation and low reproducibility of

ultrasound-based techniques, as well as conventional MRI's inconsistencies in FOP visualization due to low resolution (i.e., large slice thickness), "our preliminary results nevertheless demonstrate the promises and utility of this technique," said Eric Juang, MS, of Creighton University School of Medicine's Phoenix Regional Campus and Phoenix Children's Hospital in Arizona.

In Juang and colleagues' [retrospective study](#), all fetal MRI examinations performed at Phoenix Children's Hospital between January 1, 2020, and August 1, 2022, were reviewed to find those with sufficient quality to reconstruct a 3D SVR image. First, a medical student reader examined the unprocessed fetal brain MRI—either from balanced turbo-field-echo or T2-weighted single-shot fast spin echo (T2 SSFSE) sequences—attempting FOP measurements where feasible. Then, 3D SVR reconstructions of fetal brain images were performed using a minimum of six T2 SSFSE imaging sequences. With that same reader next examining the reconstructed imaging and recording FOP measurements, two pediatric neuroradiologists with nearly a decade of experience read all FOP measurements. And to estimate the relationship between FOP measurements of normal fetuses and gestational age, nomograms were generated accordingly.

Ultimately, out of 70 fetal MRI scans selected for this ARRS Annual Meeting Summa Cum Laude award-winning Online Poster, FOP was visualized in nine cases in unprocessed fetal MRIs, compared to 55 cases in 3D SVR images. Furthermore, among the 55 3D SVR cases, pre-chiasmatic optic nerve width was successfully measured bilaterally in 53 cases, optic chiasm width in all 56 cases, and bilateral optic tract width in 30 cases.

Specifically, a linear regression fit estimated the relationship between optic chiasm width (OCW) in millimeters in normal fetuses and gestational age (GA) in weeks as  $OCW = 0.11 \times GA + 2.0$  ( $R^2 = 0.30$ );

similarly, the relationship between pre-chiasmatic (PC) optic nerve width and GA was estimated as  $PC = 0.04 \times GA + 0.24$  ( $R^2 = 0.34$ ).

"Further results are pending," Juang and colleagues added, reiterating that early detection of FOP defects remains critical for improving patient outcomes.

Provided by American Roentgen Ray Society

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