shunting of umbilical venous blood straight to the heart through the ductus venosus (DV) is a preterminal event under the latter conditions and seldom, if ever, occurs at >34 weeks of gestation.[3]

In the PORTO study,[1] only 46% of the IUGR fetuses had an abnormal UA pulsatility index (PI); the mean gestational age at enrollment to the study was 30.1 weeks, but the mean gestational age at delivery was 37.8 weeks. With late IUGR near term and with normal umbilical PI, the best predictor of fetal adaptation to hypoxemia is the middle cerebral arteries (MCA) PI.[1] Under these circumstances, only the MCA/UA (cerebroplacental) ratio may be of value in assessing fetal and neonatal risks.[4] If Doppler interrogation is put into a gestational perspective, it is obvious that this cohort of late IUGR, abnormal UA, and MCA Doppler velocimetry remain the strongest predictors of adverse outcome. However, it is important to acknowledge that this statement misses its point when deprived of its time domain.

Unfortunately, in the PORTO study, the criteria for delivery differed among centers and staff members. This might bring in relevant observational bias in sequential observations, especially with severe early-onset IUGR. Similarly, I have concerns over what the PORTO investigators interpreted as an abnormal DV. In our experience and apparently in the TRUFFLE study centers, there is no single case of an abnormal DV Doppler velocimetry that persisted for 37 days without being censored by an abnormal low short-term variability at computerized cardiotocography within a matter of a few days. The main problem in understanding the bulk of the PORTO longitudinal observations is that, despite the statement "no statistical differences in the evolution of the main six patterns," no information is presented on gestational age and birthweight of the different "patterns" and their outcome.

I sincerely hope that, in the future research outputs of the PORTO group, the language of elegant longitudinal investigation of late IUGR might be translated into the realm of fetal physiologic condition along gestation. Without this approach to the PORTO data, clinicians might be induced to think that 60 years of scientific advancements in the field of human fetal physiology are closed and forgotten in the drawers of history. ■

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The author reports no conflict of interest.

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REPLY

We thank Dr Ferrazzi for his interest in the Prospective Observational Trial to Optimize Pediatric Health in IUGR (PORTO) study[1] and would like to respond to his comment regarding the gestational age perspective of Doppler interrogation of intrauterine growth-restricted (IUGR) fetuses.

We acknowledge the mentioned limitations of our study, namely that not all fetuses enrolled in PORTO had abnormal umbilical artery Doppler studies, the later gestational age at delivery for the overall cohort, and the lack of prespecified delivery indicators. PORTO did not claim to be an interventional study. Its prospective observational design, however, afforded the opportunity to study a large cohort of fetuses with estimated fetal weight at <10th percentile, which gave valuable insight into prenatal events and clinicians' decision-making processes. We wish to clarify that the Trial of Umbilical and Fetal Flow in Europe enrolled singleton fetuses between 26 and 32 weeks gestation with abdominal circumference <10th percentile and umbilical artery pulsatility indices >95th percentile, irrespective of uterine artery Doppler findings.

PORTO documented the sequence of Doppler events on an individual fetal patient level over time rather than presenting cumulative abnormalities within a defined cohort. We found that there simply was no single predominant Doppler pathway; undoubtedly, this observation came as a bit of a surprise to us, given the previous presumption that IUGR followed a predictable progressive deterioration in utero. In addition, we evaluated longitudinal changes in a subgroup of fetuses with EFW <3rd percentile and those who required delivery at <34 weeks' gestation, which attested to the severity of IUGR that did not differ from patterns in the overall cohort.[1] PORTO was not simply a study of late onset IUGR; we had a significant proportion of severe early-onset IUGR cases, and our conclusions were similar among both early- and late-onset cases.

We certainly do not dismiss the research efforts that have gone into the longitudinal Doppler evaluation with the aim of understanding the underlying pathophysiologic condition, optimizing surveillance strategies, and guiding the optimal timing of delivery. However, it is a common misconception among readers of previous studies of Doppler events in the setting of IUGR that the accumulated data refer to a pattern of deterioration in individual fetuses; this is not the case. Our data highlight the complexity and often unpredictability of

Doppler deterioration in the IUGR setting. In fact, many publications in this field acknowledge the large variability in manifestation of Doppler abnormalities that occur in IUGR with only a minority of fetuses exhibiting 1 single predominant pathway.[2,3]

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