

Home Fetal Heart Rate Monitoring for Surveillance of Fetal Arrhythmias: A Cohort Analysis

Freire G.A.(1), Hanson J.(1,2), Morelli D. (2), Wilhm M. (1), Amankwah E. (3,4), Goldenberg N. (2,5)
Johns Hopkins All Children's Heart Institute, Johns Hopkins All Children's Hospital, St. Petersburg, FL, USA (1)Johns Hopkins All Children's Clinical and Translational Research Organization, Johns Hopkins All Children's Hospital, St. Petersburg, FL, USA (2)Johns Hopkins All Children's Health Informatics Core, Johns Hopkins All Children's Hospital, St. Petersburg, FL, USA (3)Department of Oncology, Johns Hopkins University School of Medicine, Baltimore, MD, USA (4)Departments of Pediatrics and Medicine, Johns Hopkins University School of Medicine, Baltimore, MD, USA (5)

Background: Sustained fetal arrhythmias (SFAs) can result in fetal demise. Traditionally, monitoring at-risk fetuses is performed episodically via serial in-office assessments. However this monitoring approach may be impractical, costly, and suboptimally sensitive to the development of clinically significant arrhythmias. In recent years, hand-held Doppler monitors have been introduced into clinical practice at some centers as an alternative for fetal heart rate (FHR) monitoring. The overall objective of this work was to conduct an analysis of a single-institutional mixed retrospective-prospective cohort of pregnant women undergoing FHR monitoring at Johns Hopkins All Children's Hospital, comparing traditional monitoring versus home-based monitoring.

Methods: The study included a contemporary cohort of pregnant women carrying fetuses at increased risk of SFA, using FHR home monitoring (3 times/day) in addition to regularly-scheduled clinic visits, and a historical cohort monitored with clinic visits. At risk: non-sustained tachycardia (HR > 180 bpm for < 12h/day), complex ectopy or bradycardia (HR <100 bpm) were included. SFA was defined as arrhythmia present > than 12 hours/day. Compliance with documentation was evaluated using FHR home Measurement logs. Agreement in FHR between Doppler ultrasound-based home monitors (HDUM) and in-office Doppler ultrasound (ODU) was measured using Bland-Altman analysis. The time to detection (TTD) to SFA was compared between cohorts by independent t-test and frequencies of clinical outcomes (hydrops and mortality) with Fisher's exact Chi-squared testing.

Results: There were 44 subjects in the retrospective cohort (traditional FHR monitoring) and 21 in the prospective cohort (home-based FHR monitoring). Agreement in FHR measurement (HDUM vs ODU) was very strong, with ICC=0.986 (95% CI, 0.98-1.0). The median TTD to a SFA was longer in the retrospective cohort than the prospective cohort (11, range 5-48 vs. 9, range 9-14 days; p=0.49). There were 3 cases of hydrops (7%) in the retrospective cohort and none (0%) in the prospective (P = 0.49).

Conclusions: Home FHR monitoring appears to be feasible in at-risk fetuses and has the potential to lead to earlier identification of (and intervention for) SFAs. Larger cooperative studies are needed to further substantiate a potential benefit of home FHR monitoring on clinical outcomes in at-risk patients.