Improvement of fetal weight estimation in small and large for gestational age fetuses by incorporating an algorithm-based approach.

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Introduction
The aim of this study was to improve birth weight prediction in small (SGA) and large for gestational age (LGA) fetuses by using a sonographic algorithm-based approach incorporating subgroups with distinct biometric characteristics.

Methods
In this retrospective single-center study all singleton live births between 2013 and 2017 were included. Published formulas for estimation of fetal weight (EFW) were identified from a systematic literature review and were applied using sonographic parameters obtained within 7 days before delivery: biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC) and femur length (FL). The results were then compared with the actual birth weight. The fetuses were subdivided into subgroups according to fetal characteristics and biometric parameters: BPD, HC, AC, HC+FL, AC+FL, HC+AC, AC+FL+HC under the 10th and over the 90th percentile respectively and the Euclidean Distance (sqrt [systematic error2 + random error2]) was calculated. The accuracy of the formulas was then assessed and ranked according to the Euclidean Distance in these subgroups. Finally, an algorithm was developed based on the most appropriate formula in each subgroup.

Results
Overall, 1577 pregnancies were included: 537 (34.1%) newborns were classified as SGA and 1040 (65.9%) as LGA. Significant variation in accuracy of the published formulas in both the SGA (SE: -17.55–42.66) and the LGA group (SE: -31.6–45.0) was observed. In the SGA group, the formula by Dudley et al. had the lowest Euclidean Distance (8.88). In the LGA group, the formula by Ferrero et al. performed best with the lowest Euclidean Distance (7.32). The most appropriate formulas in the SGA and LGA subgroups included at least two biometric parameters. The algorithm did not improve EFW (6.89 g weight difference) compared to the conventional Hadlock formula in the SGA, but improved it by 191.97 g in the LGA group.

Conclusion
An algorithm-based approach that incorporates fetal biometric characteristics can improve the accuracy of fetal weight estimation in LGA fetuses, but does not improve accuracy in SGA fetuses.