

Investigating intrauterine fetal growth after IVF-assisted conception

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Background

- IVF-conceived pregnancy is increasingly common (1).
- Birthweight (BW)** differs by **mode of conception (MOC)**: spontaneously conceived (SC), fresh/frozen embryo transfer (ET) (2).
- Existing literature fails to account for confounding by **prematurity**.
- It is unknown whether IVF is associated with true aberrant fetal growth
- There is a gap in knowledge of how IVF-conceived fetuses grow *in utero*.

Hypothesis and Aims

“In utero growth and birthweight differ by mode of conception”

- 1.** To compare gestation-adjusted BW by MOC
- 2.** To describe the pattern of *in utero* fetal growth according to MOC

This study collected pilot data to test feasibility and generate further research hypotheses

Materials and Methods

A prospective IVF-conceiving cohort was recruited to START clinic study (REC: 20/NE/2022). A historic prospectively-studied SC control cohort was used as comparison (NUPS; REC: 10/H1013/9).

Aim 1: BW z-scores were compared between MOC by linear regression

Aim 2: serial ultrasound biometric parameters were measured (BPD, HC, AC, FL, TVol, AVol, 2D/3D EFW).

Ultrasound scan (USS)-determined gestational age was used for all pregnancies.

Serial 2D/3D USS measurements of fetal biometric parameters were plotted to map fetal growth by MOC.

- Gradients of the generated plots were used as summary measures to compare fetal growth by MOC
- Mixed models average fetal growth trajectories between MOC

N=131 (SC N=103; fresh ET N= 9; FET N= 20).

FET-conceived infants are born heavier than SC infants

Table 1. Birthweight z-scores differ with mode of conception.

	Fresh ET- SC	FET- SC	FET- Fresh ET
	Predicted difference in BW (95% CI)		
BW z-score	0 (-0.6, 0.5)	0.5 (0.1, 0.9)	0.6 (-0.1, 1.2)
Adjusted BW z-score	0.1 (-0.5, 0.7)	0.6 (0.2, 1.0)	0.6 (-0.1, 1.2)

FET-conceived infants were born heavier for gestation than spontaneously conceived infants, even after adjusting for gestation at birth, maternal age and parity.

This suggests that birth weight differences are not simply due to longer gestational ages

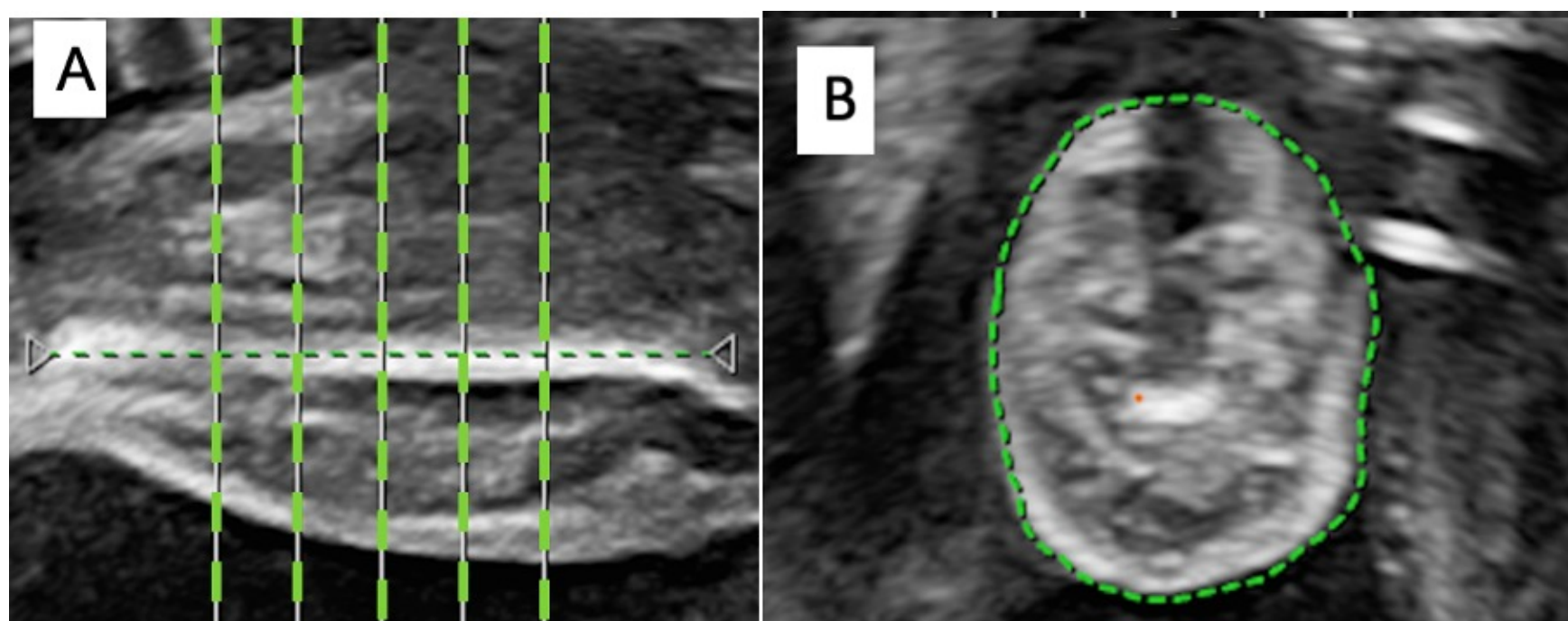


Figure 1. Fractional thigh volume quantified by A) marking diaphysis length and B) manually tracing five slices.

Results

Peripheral fetal soft tissue deposition may differ between MOC

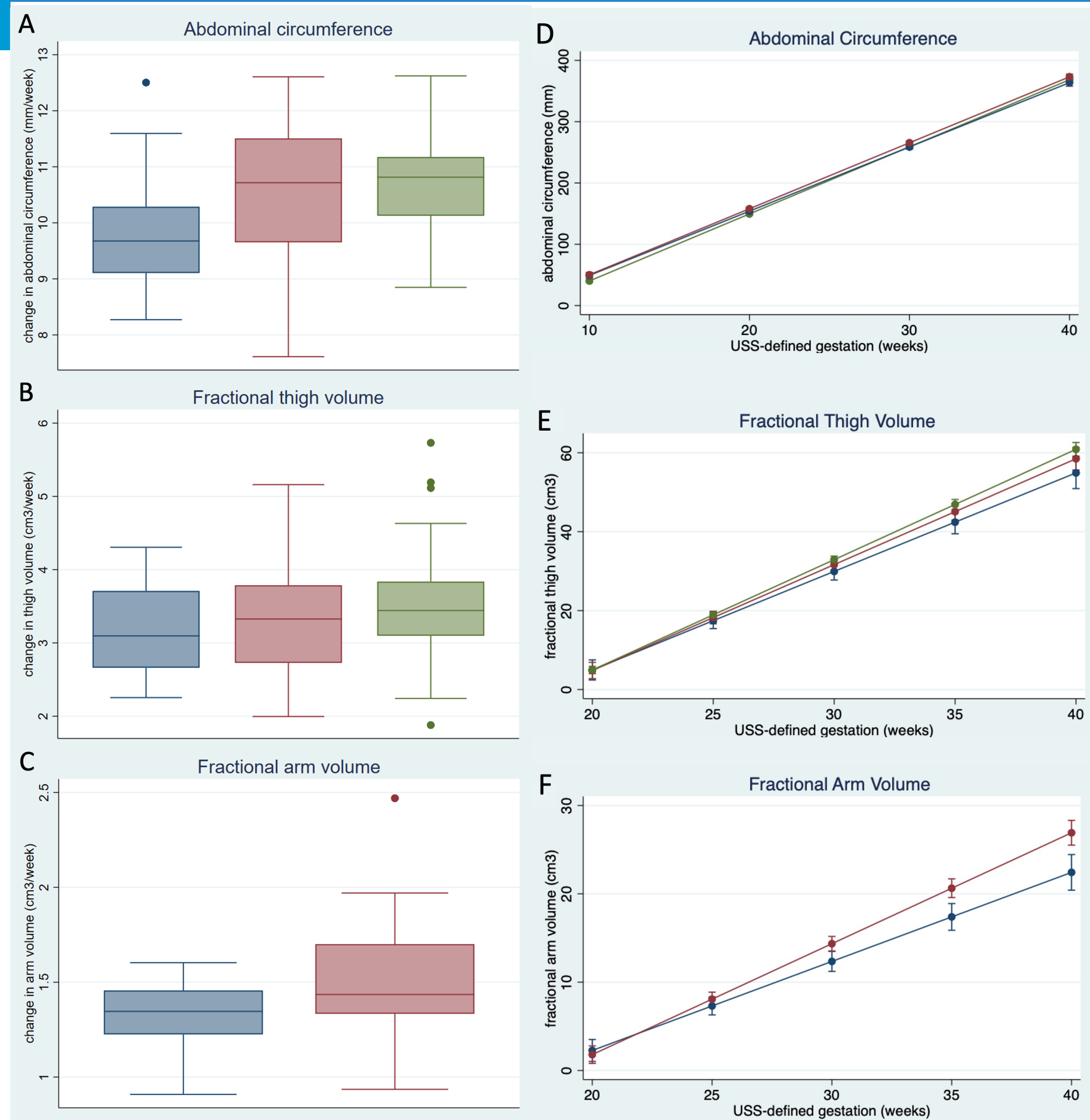


Figure 2. A-C) Box and whisker plots displaying the individual gradients for each measure of fetal soft tissue deposition.

D-F) Graphs displaying the average change in fetal parameters representative of soft tissue deposition by conception group (AVol data was not available for SC cohort).

There was no suggestion of difference in skeletal growth between MOC type ($P>0.1$; data not shown).

Differences in parameters influenced by soft tissue growth between SC and IVF groups were very subtle when graphed. Frozen ET pregnancies tended to lay down soft tissue faster than Fresh ET pregnancies

KEY:
Blue = fresh ET.
Red = frozen ET
Green = SC.

FET-conceived fetuses have greater EFWs than SC peers

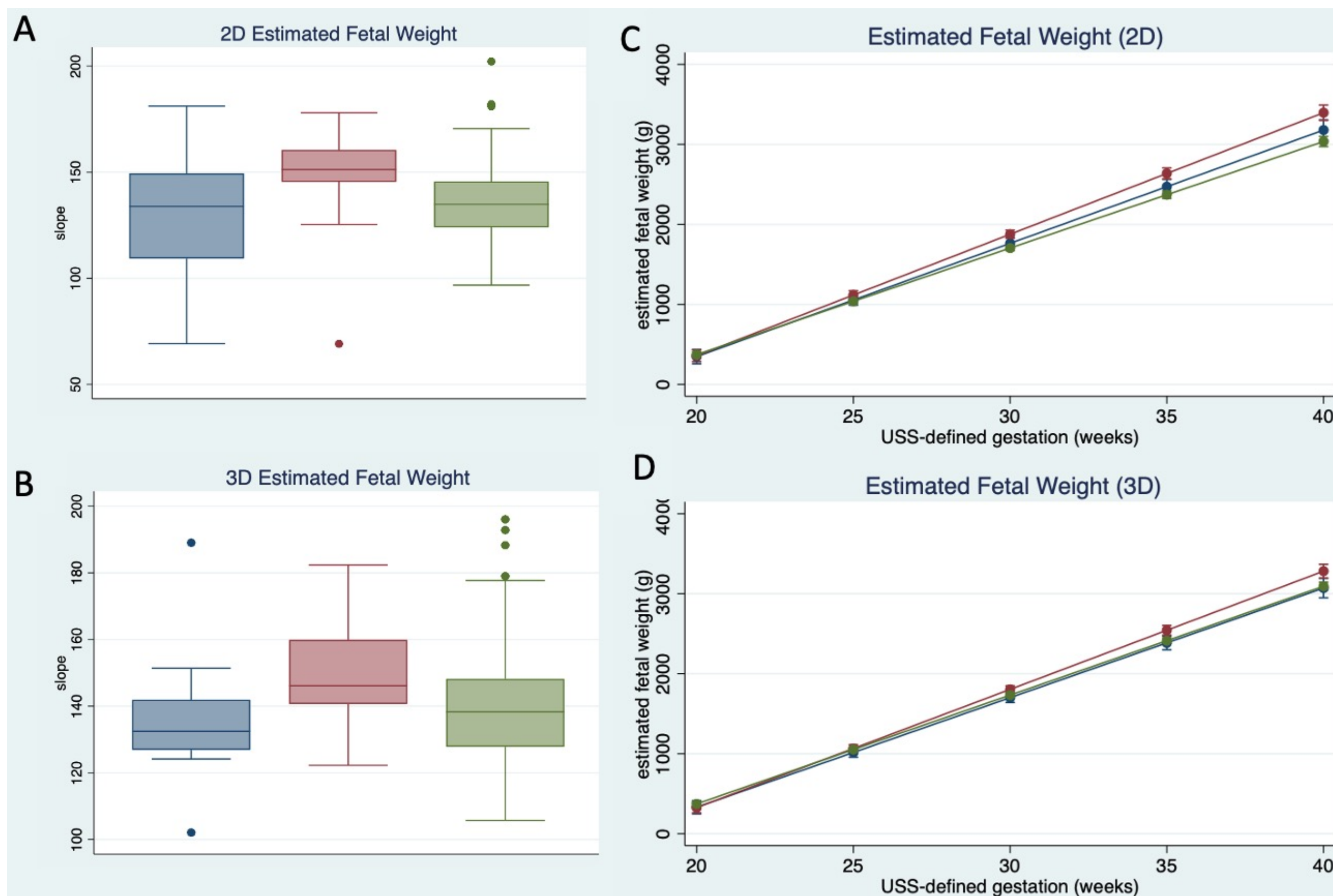


Figure 3. A-B) Box and whisker plots displaying the individual rate of change in 2D and 3D calculated EFW.

C-D) Graphs displaying the average change in estimated fetal weight by conception group.

Frozen ET pregnancies demonstrate a subtly faster rate of EFW increase than SC and fresh ET pregnancies.

KEY: Blue = fresh ET. Red = frozen ET. Green = SC.

Discussion

Frozen ET conceived infants had higher BW (Table 1) compared to SC peers, even after accounting for gestational age, supporting current literature (3) and suggesting presence of potentially accelerated intrauterine growth.

Our results suggest potential differences in fetal soft tissue deposition may exist. The direction of such differences are inconsistent and limited by a lack of AVol data in the SC cohort.

Strengths

- Trends in keeping with current literature
- Novel comparison of BW z-scores
- Longitudinal growth measurements including 3D measures

Limitations

- Potential inter-examiner variability
- Assessment of fetal growth is highly variable
- Exploratory study with low power

References

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