

Quantifying Fetal and Maternal Body Composition Using 3-D Stack-Of-Radial Free-Breathing MRI

Katie M. Strobel M.D.¹, Sevgi Gokce Kafali M.S.², Shu-Fu Shih M.S.², Rinat Masamed M.D.², Holden H. Wu Ph.D.², Kara L. Calkins M.D.¹

¹Department of Pediatrics, Division of Neonatology, ²Department of Radiological Sciences, David Geffen School of Medicine at UCLA

BACKGROUND

- Obesity and associated metabolic diseases have fetal origins
- Body composition is an important biomarker for obesity
- Our lab developed 3D “free-breathing” MRI technology to assess body composition
- We can measure fat volume and PDFF (a marker of liver fat, protons in triglycerides/protons in triglycerides + H₂O)

OBJECTIVES

- Investigate associations between maternal and fetal body composition in healthy pregnancies and pregnancies complicated by fetal growth restriction (FGR) and gestational diabetes (GDM)

METHODS

- 3T MRI of mother's abdomen (30-36 weeks gestation)
- T2 Haste sequences acquired for anatomic reference (Fig 1A)
- 3D axial stack of radial PDFF maps acquired at level of fetal liver, abdomen, and thorax and reformatted to coronal (Fig 1A-D)
- 3D axial stack of radial PDFF maps acquired at level of maternal liver (Fig 2A-C)
- Total scan time 45-60 minutes

FETAL MEASUREMENTS

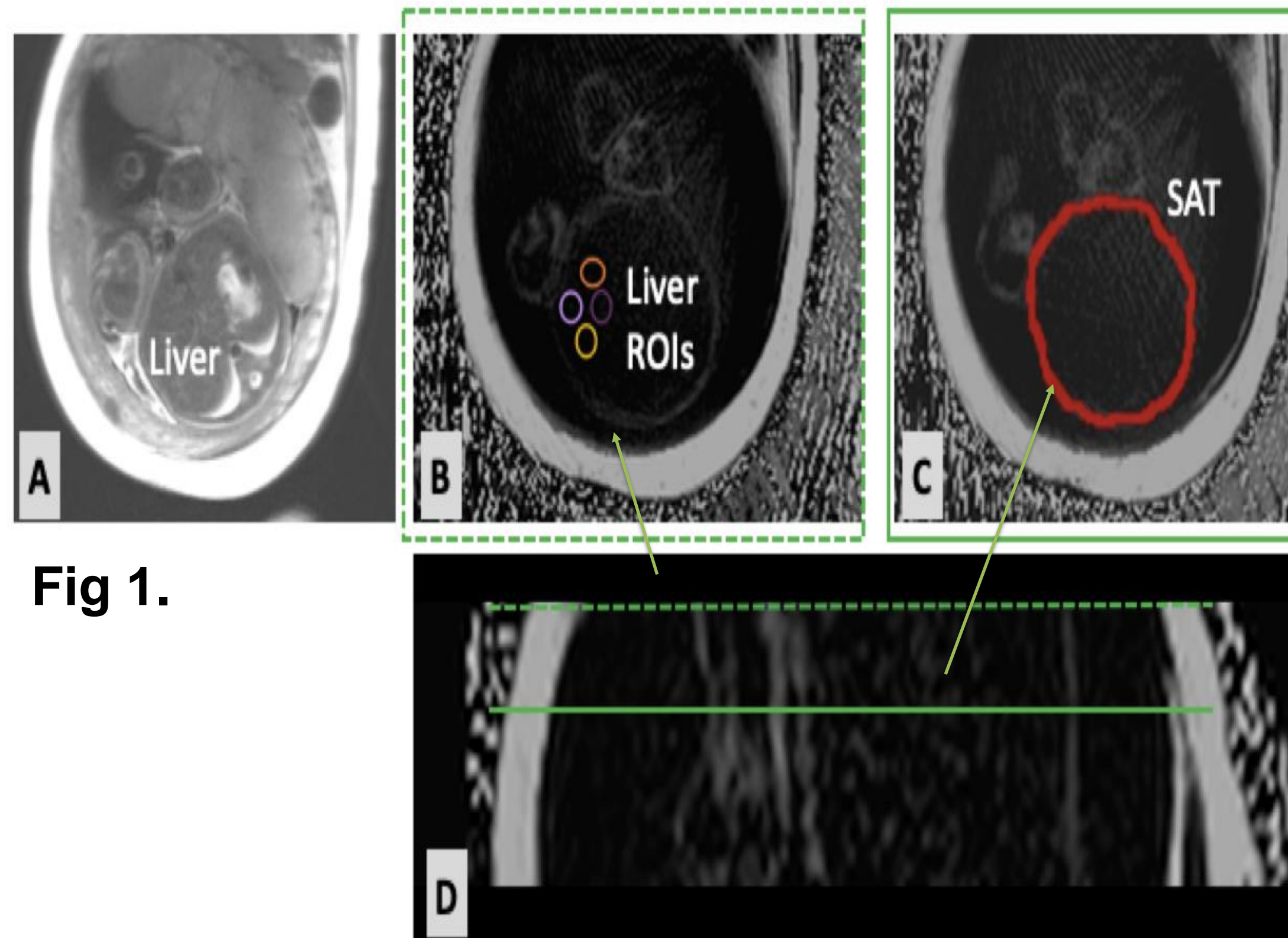


Fig 1.

PDFF=proton density fat fraction, liver fat
 SAT=Subcutaneous adipose tissue volume
 VAT=Visceral adipose tissue volume

MATERNAL MEASUREMENTS

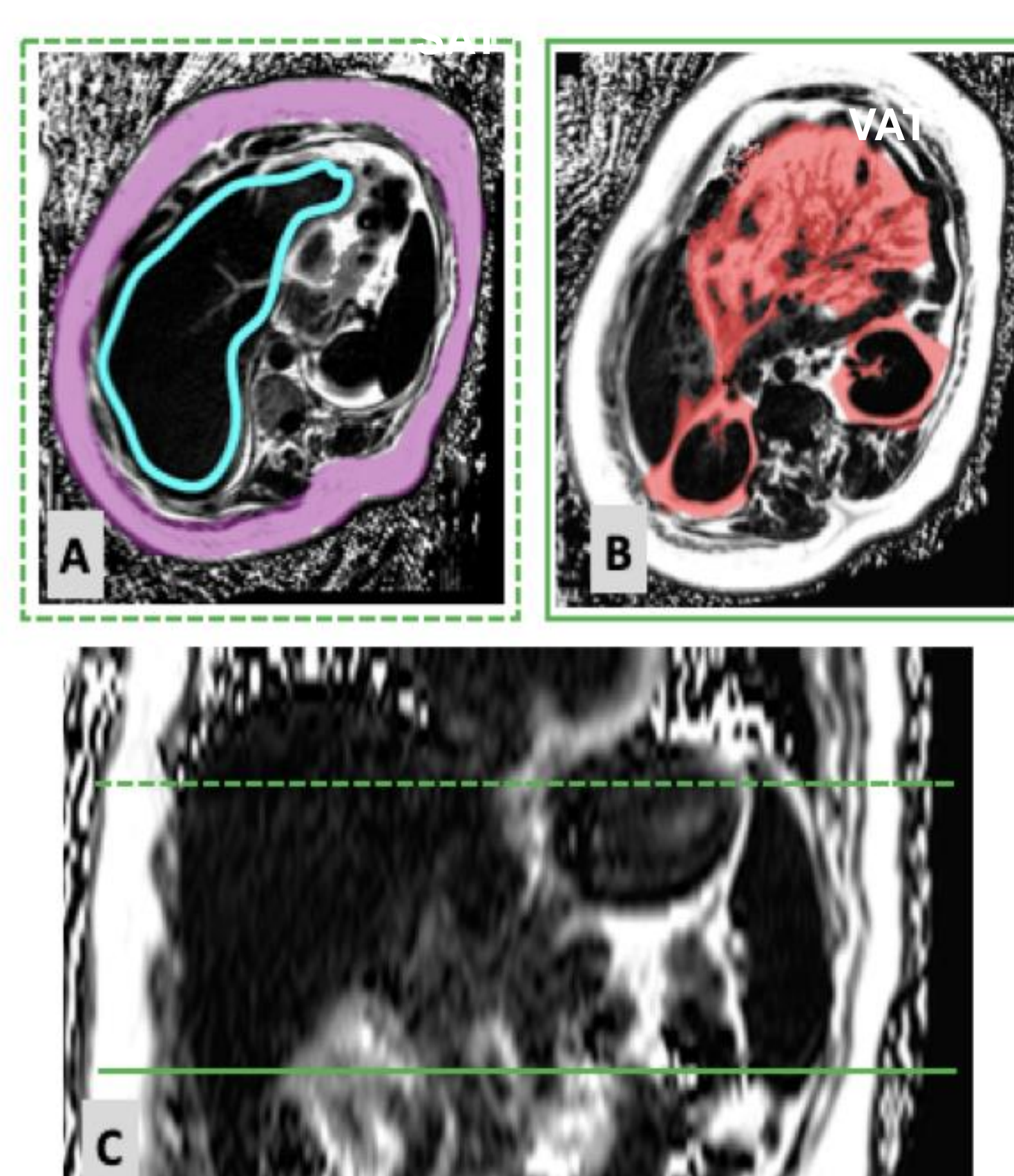


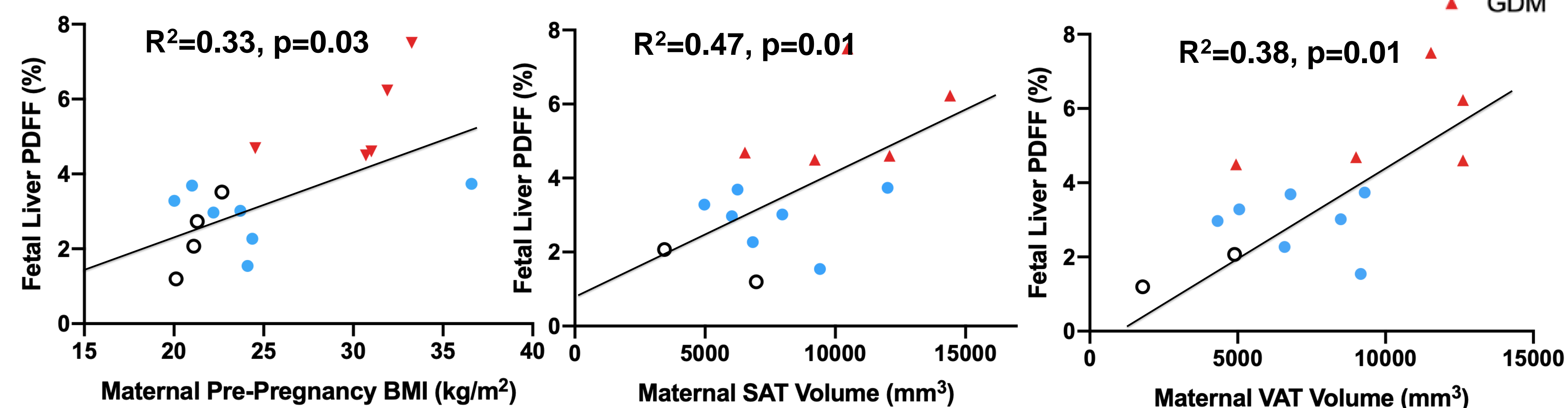
Fig 2.

RESULTS

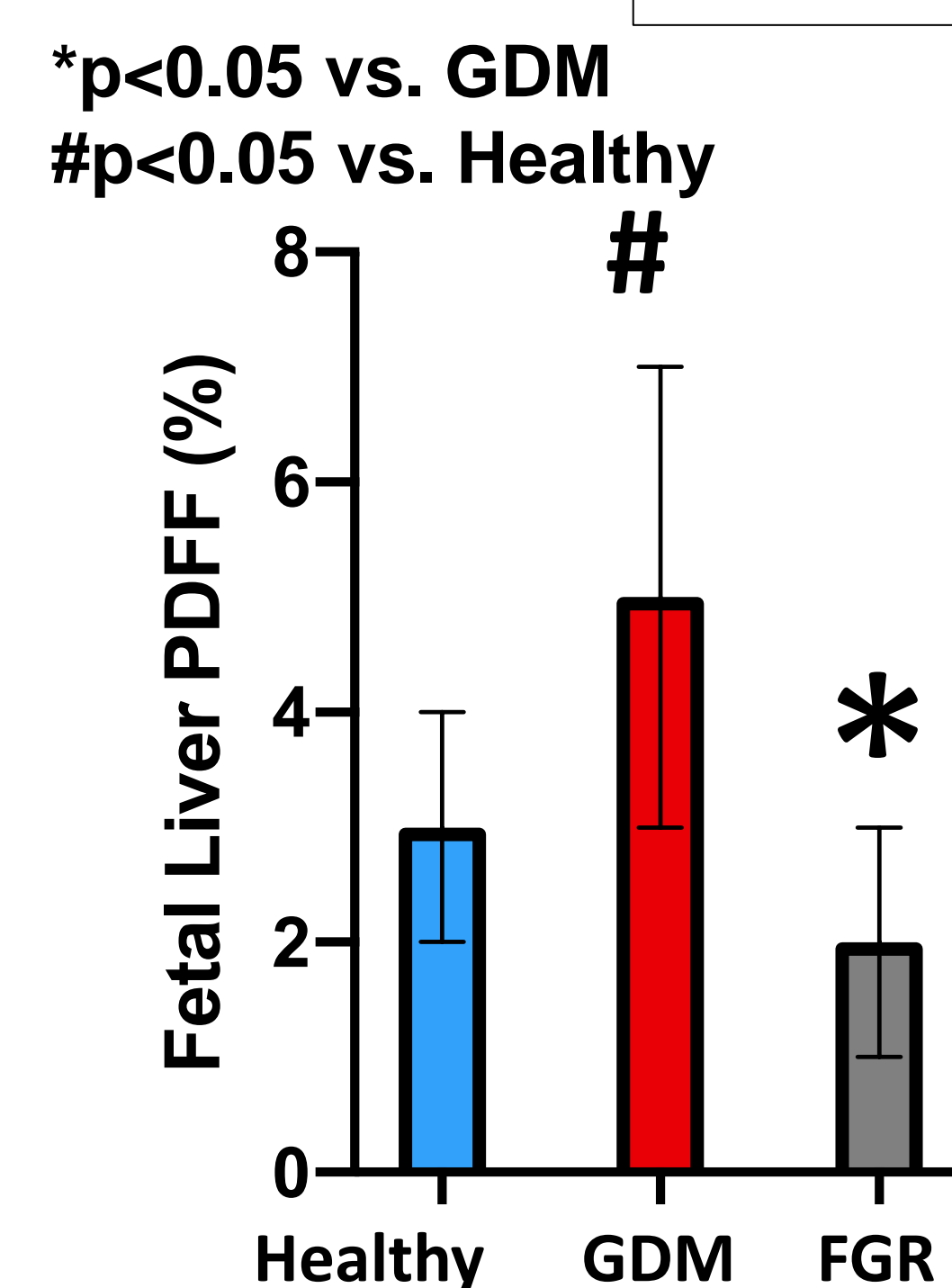
	Healthy (N=9)	Gestational Diabetes (N=5)	Fetal Growth Restriction (N=5)
Maternal Age (years)	34 (30-38)	33 (31-37)	33 (28-37)
Pre-Pregnancy BMI (kg/m ²)	24 (22-34)	31 (28-33)	21 (20-22)*

*p<0.05 vs. GDM

FETAL LIVER FAT IS ASSOCIATED WITH MATERNAL ADIPOSITY



GESTATIONAL DIABETES INFLUENCES FETAL LIVER FAT



Stepwise backward/forward model. Pre-pregnancy BMI placed for biological relevance (r²=0.74, BIC 49)

	Estimate (SEM)	P-Value
Pre-Pregnancy BMI	0.06 (0.07)	0.42
GDM=yes/no	1 (0.4)	0.02
Visceral Adipose Tissue Volume (mm ³)	0.0001 (0.0001)	0.37

CONCLUSION

- Future studies will disentangle the relationship between GDM, obesity, and fetal liver fat

