

Difference in fetal brain and placenta oxygenation revealed on functional MRI in a complicated monochorionic twin pregnancy

L N I Frei, T Woodgate, S Duignan, J A Verdera, D J West, W Norman, Surabhi Nanda, J Hutter, L Story, D F A Lloyd

BACKGROUND

Twin-to-twin transfusion syndrome (TTTS) and selective fetal growth restriction (sFGR) affect around **15% of monochorionic diamniotic (MCDA) pregnancies**, and twins remain at risk of brain injury even after successful fetoscopic laser surgery. Fetal MRI is currently recommended only when neurosonography is abnormal, and **functional T2* sequences**, which reflect **tissue oxygenation**, are not yet used clinically.

CASE REPORT

Nulliparous woman with an MCDA pregnancy complicated by **TTTS stage 3** and **sFGR type 2** (49% discordance) at 24+1 weeks, treated with fetoscopic **laser surgery**. **TTTS resolved** with normal Doppler in both twins, and the ex-donor's (Ex-D) **growth improved**. However, the **ex-recipient** (Ex-R) showed a reduced cerebro-placental ratio (CPR), suggesting **cerebral redistribution**. At 28+2 weeks, research ultrasound (US) and **fetal MRI with acute maternal hyperoxygenation (AMH)** were performed as part of the PLACARD (Placenta-cardiac) study.

RESULTS

Conventional MRI showed normal brains and placental appearance. However, **T2* sequences** revealed **hypointense signal** (fig 1) and **reduced mean placental T2* values near the Ex-R cord insertion** (81.4 vs 93.5; $p < 0.001$) (fig. 2), with a **slower rise during AMH** compared to the Ex-D region (0.02 vs 0.1/sec; $p < 0.001$) (fig. 2). In contrast, mean **cerebral T2* values rose more in the Ex-R** (0.1 vs 0.02/sec; $p < 0.001$) (fig. 2), mirrored by an increase in CPR on US (4th to 8th centile), while the Ex-D showed no change (1.5).

CONCLUSION

This case shows the potential of T2* MRI to detect regional placental dysfunction and differential fetal brain oxygenation not visible on conventional imaging. Further studies are needed to establish its clinical role in MCDA pregnancies.

