

[07-064]

Emergent fetoscopic laser ablation for acute stage V twin-to-twin transfusion syndrome: initial results

Rodrigo Ruano, MD PhD *; Rima Hajjar, MD; Kylie Roslin BS; Julia McAleavy BS; Ana Frederica Tomlinson, MS; Edna Kathy Porter, MD

Division of Maternal-Fetal Medicine, UM Jackson Fetal Care Center, Department of Obstetrics, Gynecology & Reproductive Sciences, University of Miami Miller School of Medicine & Jackson Memorial Hospital, Miami, FL, USA;

* Correspondence: Rodrigo Ruano, MD PhD, Department of Obstetrics, Gynecology & Reproductive Sciences, University of Miami Miller School of Medicine

Conflicts of Interest: The authors report no conflict of interest.

Funding: This research received no external funding.

Abstract:

Objective: Stage V twin-to-twin transfusion syndrome (TTTS) is associated with increased risk of co-twin demise and/or cerebral palsy. We hypothesized that urgent/emergent fetostoscopic laser ablation (FLA) of placental anastomoses could prevent complications in the survival co-twin. We report here our initial results.

Methods: We prospectively offered urgent/emergent FLA with Solomon technique within 48 hours after demise of one twin in monochorionic pregnancies complicated by TTTS with elevated MCA-PS in the surviving twin. The surviving twin was followed weekly by ultrasound, fetal MRI at 28-30 weeks and postnatal neurological evaluations.

Results: In a period of one year, five pregnant women were identified with acute stage V TTTS and elevated MCA-PS in the surviving twin, who underwent emergent FLA. All of the surviving co-twin fetuses had improvement of the MCA-PS one week after the procedure. All co-twins were delivered and demonstrated appropriate neurodevelopmental milestones.

Conclusion: Our initial results support the hypothesis that emergent FLA may prevent acute demise and cerebral palsy of the co-twin in stage V TTTS.

Keywords: Fetoscopic laser ablation, twin-to-twin transfusion syndrome, monochorionic twins, prenatal diagnosis, fetal demise, fetal intervention, fetal surgery, laser.

[07-065]

Intrauterine Transfusion for Acute Feto-Fetal Transfusion in Quintero Stage V Twin-to-Twin Transfusion Syndrome: Technical Challenges and Peri-Transfusion Cardiac Functional Assessment

Rachmat Dediati Kapnosa Hasani^{1,2}, Didi Danukusumo¹, Gatot Abdrurrazak¹, Irvan Adenin¹, Mohammad Adya Firmansha Dilmy²

¹Harapan Kita Mother and Children Hospital Department of Obstetrics and Gynecology

²Faculty of Medicine, University of Indonesia Department of Obstetrics and Gynecology

Twin-to-twin transfusion syndrome complicated by single fetal demise may result in acute feto-fetal transfusion, severe anemia, and hemodynamic compromise in the surviving cotwin. 27-year-old patient with monochorionic twin pregnancy at 22 weeks of gestation, complicated by Quintero stage V twin-to-twin transfusion syndrome. The recipient twin had died, with positive Robert's sign and negative Spalding sign, suggesting fetal death within approximately 1–4 days, accompanied by polyhydramnios. The surviving donor twin had oligohydramnios and hydrops, characterized by scalp edema and pleural effusion. Middle cerebral artery peak systolic velocity (MCA-PSV) was elevated at 66.5 cm/s, corresponding to 2.34 multiples of the median (MoM), consistent with severe fetal anemia. Speckle-tracking assessment of the left ventricle demonstrated increased cardiac output, suggesting high-output cardiac failure secondary to acute anemia caused by feto-fetal transfusion. Cordocentesis and intrauterine transfusion were planned; however, the surviving donor twin was fixed posteriorly, making vascular access technically difficult. Amnioreduction of 1500 mL from the recipient sac improved access and created a narrow passage for cordocentesis. Fetal blood sampling showed hemoglobin 7.5 g/dL and hematocrit 25%, followed by transfusion of 25 mL packed red cells. Post-transfusion MCA-PSV decreased to 51 cm/s (1.7 MoM), and cardiac output normalized. Hydrops resolved 10 days after transfusion.

[07-066]**Placental damage and pregnancy outcomes using the Solomon technique****Femke Slaghekke**

Leiden University Medical Center, The Netherlands Obstetrics and Fetal Therapy

Background:

The Solomon technique reduces twin-anemia-polycythemia sequence (TAPS) and recurrent twin-to-twin transfusion syndrome (TTTS), but its continuous coagulation line may cause considerable placental tissue damage. This study evaluates how specific laser power and total energy settings affect placental damage and pregnancy outcomes.

Methods:

This retrospective cohort study analyzed digital photographs of dye-injected placentas from TTTS cases treated exclusively with the Solomon technique post-Solomon trial. Placental damage was quantified using an established grading system. Analyzed parameters included laser power, total energy, gestational age (GA) at laser, GA at birth, laser-to-delivery interval, survival and preterm prelabor rupture of membranes (PPROM).

Results:

Data collection for this cohort is complete. Consecutive cases are undergoing formal image and statistical analysis. Analysis is being performed to correlate specific laser parameters with quantified placental damage and their subsequent impact on survival, GA at birth, laser-to-delivery interval, and PPRM rates. Final statistical outcomes are being finalized for congress presentation.

Conclusions:

To minimize collateral damage, routine post-laser placental injections and evaluations are recommended to optimize surgical techniques. It is anticipated that a complete vascular occlusion is best achieved using higher wattage settings combined with a shorter duration, thereby limiting thermal tissue damage.

[07-067]**Perinatal outcome and complications using the Solomon technique****Femke Slaghekke**

Leiden University Medical Center Obstetrics and Fetal Therapy

Background:

The Solomon randomized controlled trial demonstrated that the Solomon technique significantly reduces recurrent twin-to-twin transfusion syndrome (TTTS) and twin anemia-polycythemia sequence (TAPS). This study aims to evaluate the clinical outcomes and complication rates of all TTTS cases treated with the Solomon technique after completing the Solomon trial.

Methods:

This retrospective cohort study included all TTTS cases treated exclusively with the Solomon technique after the Solomon trial. Baseline characteristics collected included Quintero stage and gestational age (GA) at the time of laser surgery. Primary outcomes consists of perinatal survival, post-laser TAPS and recurrent TTTS. Secondary outcomes included preterm prelabor rupture of membranes (PPROM), GA at birth, laser-to-delivery interval, iatrogenic monoamnioticity, amniotic band syndrome and placental abruption.

Results:

Data collection for this cohort has been completed, and formal statistical analysis is currently underway. All consecutive cases meeting the inclusion criteria are being analyzed to establish definitive rates for perinatal survival, post-laser TAPS, and recurrent TTTS, incidences of PPRM, iatrogenic monoamnioticity, amniotic band syndrome, and placental abruption within this cohort are being finalized and will be completed and presented at the congress.

Conclusions:

This study provides crucial insight into the clinical outcomes and complication rates following the completion of the Solomon trial.

[07-068]

Outcomes of laser therapy for TTTS at the UC Davis Fetal Care and Treatment Center

David Rosas

University of California, Davis Surgery

We present outcome data from the UC Davis FCTC for patients who underwent laser therapy for twin-twin transfusion syndrome (TTTS).

We performed a retrospective analysis of 30 patients with pregnancies affected by TTTS treated with fetal intervention from 2016 to 2026.

We reviewed 30 total patients with 60 total fetuses. The average age of pregnant mothers was 30.3 years. The median GA at delivery was 32.9 weeks (29.1-36.6). The overall survival of fetuses was 53/60 (88.3%). The dual survival rate was 25/30 (83.3%) of pregnancies treated. The survival rate of at least one twin was 29/30 (96.7%). The rate of PPROM in the 7 days following the procedure was 3/30 (10%); the overall rate of PPROM was 12/30 (40%). The dual survival rate was not different based on severity of TTTS at procedure (I/II 88.9% vs III/IV 81.0%, $p = 0.59$).

Fetal laser therapy for TTTS has a high likelihood of dual-twin survival and a very high likelihood of survival of at least one twin. Though rates of PPROM following the procedure are low, the overall risk of PPROM is consistent with reported ranges of 20-40%. Survival rates did not vary significantly with the severity of TTTS.

[07-069]**Laser for TTTS at periviability – postoperative delivery risk to inform NICU resource planning.****Bettina Paek**

Seattle Childrens Hospital The Fetal Center

OBJECTIVE: To evaluate delivery risk following fetoscopic laser surgery for twin-twin transfusion syndrome (TTTS), emphasizing periviable gestations and implications for patient counseling, NICU resource planning, and antenatal corticosteroid administration.

METHODS: Retrospective review of a single-institution TTTS database from 2003–2025. Periviability was defined as 22.0–25.9 weeks' gestation. The primary outcome was delivery prior to discharge from surgery. The secondary outcome was delivery within 2 weeks.

RESULTS: 697 patients underwent laser surgery for TTTS; 29.6% (n=207) were treated at a periviable gestational age. Delivery prior to discharge occurred in 2.0% overall and 2.4% of periviable cases. Neither gestational age at intervention nor cervical length was significantly associated with delivery prior to discharge. In contrast, delivery within 2 weeks increased with advancing gestational age (3.3% prior to 22 weeks, 8.3% between 22–25.9 weeks, and 11.1% at or beyond 26 weeks - $p=0.014$). In addition, shorter preoperative cervical length and maternal symptoms were associated with delivery within 2 weeks ($p=0.008$ and 0.016 respectively).

CONCLUSION: Delivery within 24 hours of surgery for TTTS is rare, including at periviability. However, risk of delivery within 2 weeks increases with advancing gestational age, shorter cervical length, and maternal symptoms, informing counseling and antenatal corticosteroid administration.

[07-070]

Hypoxia-reoxygenation injury-mediated Ferroptosis in Donor Placenta of Twin-to-Twin Transfusion Syndrome

Kazuhiro Kajiwar^{1,2}, Tomona Matsuoka², Jin Muromoto¹, Rika Sugibayashi¹, Katsusuke Ozawa¹, Seiji Wada¹, Haruhiko Sago^{1,3}

¹ National Center for Child Health and Development Center for Maternal-Fetal, Neonatal and Reproductive Medicine

² National Center for Child Health and Development Center for Regenerative Medicine

³ Sanno Birth Center

Objective:

Twin-to-twin transfusion syndrome (TTTS) is associated with unbalanced placental perfusion, which may lead to hypoxia-reoxygenation injury (H/R). Ferroptosis, an iron-dependent form of cell death driven by lipid peroxidation, can be triggered by H/R. This study aimed to evaluate the clinical relevance of H/R-induced ferroptosis in placentas from TTTS pregnancies.

Methods:

Placental tissues were collected from 10 uncomplicated monochorionic diamniotic (UC-MD) twin pregnancies and 10 TTTS cases (2021–2025). Donor and recipient regions were analyzed separately. Lipid peroxidation was assessed by measuring malondialdehyde (MDA) levels and performing 4-hydroxynonenal (4-HNE) immunostaining. Expression of H/R-related genes (FPN, HO1) and ferroptosis-related genes (FSP1, GPX4) was quantified by qPCR.

Results:

MDA levels were significantly elevated in TTTS donor placentas compared with UC-MD controls (1.12 vs. 0.45 $\mu\text{mol/L}$, $p < 0.01$), with no difference in recipient regions. Consistently, 4-HNE accumulation was observed in trophoblasts of donor placentas. Donor placentas showed marked downregulation of HO1 and FPN (9.74-fold, $p < 0.01$ and 45.8-fold, $p = 0.03$, respectively). Notably, GPX4 and FSP1 were also significantly reduced (1.78-fold, $P=0.01$ and 1.65-fold decreases; $p = 0.02$, respectively).

Conclusion:

Ferroptosis is activated in TTTS donor placentas in association with H/R.

[07-071]

Surveillance with Delayed Intervention versus Prompt Laser Therapy for Stage II Twin-Twin Transfusion Syndrome before 18 weeks Gestational Age

Clifton O Brock

Allina Health Midwest Fetal Care Center

Background: Twin-twin transfusion syndrome (TTTS) treated before 18 weeks gestational age (GA) is associated with worse outcomes.

Methods: This secondary analysis of data from three fetal centers evaluates management of Stage II TTTS diagnosed before 18 weeks GA. We compared outcomes between surveillance with intent for delayed intervention (SDI) at 18-19 weeks GA to prompt intervention (PI) with fetoscopic laser surgery (FLS).

Results: Stage II TTTS before 18 weeks GA was observed in 78 cases with 34 (44.6%) in the SDI group and 44 (56.4%) in the PI group. FLS was performed in the SDI and PI groups at a median GA of 18.1 and 17.3 weeks respectively ($p < 0.1$). During surveillance, 21/34 (61.8%) patients had FLS at 18-19 weeks, while early FLS was required in 7/34 (20.6%) for Stage III disease and in 4/34 (11.8%) for progressive polyhydramnios. One patient requested early FLS and another case spontaneously resolved. Rates of donor survival (88.2% vs. 77.3%, $p = 0.25$) and dual survival (85.3% vs. 72.7%, $p = 0.18$) were higher in the SDI group (n.s.). GA at delivery was similar between groups (30.2 vs. 30.9 weeks, $p = 0.30$).

Conclusion: SDI for early Stage II TTTS was noninferior to PI and merits further investigation.

[07-072]

From Placenta to Parenchyma: Extrauterine Twin-Twin Transfusion Syndrome in Conjoined Omphalopagus Twins

Nahla Khalek

Richard D. Wood Jr. Center for Fetal Diagnosis and Treatment General, Thoracic and Fetal Surgery at Children's Hospital of Philadelphia

Objective: To describe a rare case of extrauterine twin-twin transfusion syndrome (TTTS) in conjoined omphalopagus twins and to highlight diagnostic challenges, pathophysiology, and implications for perinatal and surgical management.

Methods: We report a case of prenatally diagnosed conjoined omphalopagus twins with features suggestive of extrauterine TTTS. The pregnancy was diagnosed at 16 weeks and followed serially. There were no prenatal sonographic signs of TTTS and good interval fetal growth was appreciated. Low transverse cesarean delivery was performed at 34 4/7 weeks secondary to preterm labor. Placental and vascular anatomy were analyzed to characterize intertwin circulatory dynamics.

Results: Following delivery, persistent hemodynamic imbalances between the twins were observed with oliguria progressing to anuria in one infant and relative polyuria in the other. Contrast-enhanced liver ultrasound identified hepatic vascular communications facilitating unbalanced intertwin transfusion. Urgent separation was performed on day of life 7 with renal recovery.

Conclusion: Unbalanced vascular communications in conjoined omphalopagus twins can mimic and perpetuate TTTS physiology independent of classic placental mechanisms. Recognition of this entity is critical for anticipatory counseling, delivery planning, and surgical decision-making. Multidisciplinary coordination is essential to optimize outcomes, and further studies are needed to better understand the postnatal hemodynamic interplay of conjoined twin circulations.

[07-073]

Fetoscopic Laser Photocoagulation for Twin-Twin Transfusion Syndrome in the Setting of Active Maternal Syphilis: A Case Report

Nkechinyelum Ogu, Michelle Kominiarek, Janelle Bolden

Northwestern University Obstetrics and Gynecology, Maternal-Fetal Medicine

Twin-twin transfusion syndrome (TTTS) affects 10-15% of monochorionic diamniotic (MCDA) twin gestations due to unbalanced blood flow through shared placental vascular anastomoses. If untreated, TTTS is associated with significant fetal morbidity and mortality. Fetoscopic laser photocoagulation is the standard treatment but requires traversal of the maternal-fetal interface, raising concerns in the setting of active maternal infection.

We present a case of a 21-year-old G1 at 20w2d with an MCDA twin gestation referred for evaluation of TTTS. Ultrasound demonstrated polyhydramnios, a pulsatile umbilical vein, and intermittent A-wave reversal of the ductus venosus in the recipient twin, consistent with Quintero stage III disease. Evaluation also revealed untreated syphilis of unknown duration with an RPR titer of 1:32. The patient was counseled regarding the risks of TTTS progression, fetal loss, and the uncertain risk of congenital syphilis associated with fetal intervention during active maternal infection. She elected to proceed with fetoscopic laser photocoagulation after her first dose of penicillin. The procedure was uncomplicated, and amniotic fluid testing was negative for *Treponema pallidum*. The pregnancy remains ongoing without evidence of congenital syphilis. To our knowledge, this is the first reported case of fetoscopic laser photocoagulation performed in the setting of active maternal syphilis infection.

[07-074]

Maternal Obesity Should Not Be a Barrier to Fetoscopic Laser Surgery for Twin-Twin Transfusion Syndrome

Bettina Paek

Seattle Childrens Hospital The Fetal Center

OBJECTIVE: To evaluate whether elevated maternal body mass index (BMI) affects survival or procedural outcomes following fetoscopic laser surgery for twin-twin transfusion syndrome (TTTS).

METHODS: Retrospective single-center cohort study of TTTS pregnancies undergoing fetoscopic laser surgery between 2003–2025. The primary outcome was dual survival at birth. Secondary outcomes included stage at presentation, operative time, preterm premature rupture of membranes (PPROM), gestational age at delivery, and overall survival. The association between BMI and dual survival was evaluated with univariable and multivariable logistic regression. Additional analyses compared outcomes across BMI categories, including class III obesity (BMI ≥ 40).

RESULTS: A total of 596 pregnancies were included. Median maternal BMI was 28 kg/m² (IQR 25–33); 222 (37%) patients had BMI ≥ 30 , 100 (17%) had BMI ≥ 35 , and 43 (7%) had BMI ≥ 40 . Increasing BMI was not associated with decreased dual survival (OR 1.00 per kg/m² increase, 95% CI 0.97–1.03, $p=0.83$). No maternal BMI category was associated with differences in stage at presentation, operative time, rate of PPRM, or gestational age at delivery.

CONCLUSION: Maternal BMI was not associated with worse survival or procedural complications. Elevated BMI alone should not be considered a barrier to referral or treatment for TTTS.