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# Fetoscopic laser treatment of twin-to-twintransfusion syndrome (TTTS).

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## Fetoscopic Laser Treatment of Twin-to-twin Transfusion Syndrome (TTTS)



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Sir,

### Abstract

The aim of this study was to report the results of the first 10 cases of fetoscopic laser surgery for twin-to-twin transfusion syndrome by the Rotunda Hospital Fetal Treatment Programme. All cases of severe TTTS managed by our team from 2006 to 2007 were included. All fetoscopic laser surgeries were performed by a single specialist in fetal medicine. All pregnancies were followed up to pregnancy completion and a minimum of six weeks neonatal life. Laser surgeries were performed with ultrasound guidance and percutaneously using local anaesthesia via a 2.8mm rigid fetoscope. Selective laser ablation of placental vessels was accomplished with a neodymium:YAG laser. The first 10 cases of severe TTTS managed by our team are reported. Laser ablation of placental vessels was accomplished successfully in all cases. Two pregnancies were complicated by preterm premature rupture of membranes before 22 weeks and both pregnancies were lost. Of the remaining 16 fetuses, one was diagnosed with significant ventriculomegaly postoperatively and underwent selective termination in the United Kingdom. The overall intact neonatal survival rate was 65%. Fetoscopic laser ablation of placental vessels for severe twin-to-twin transfusion syndrome is now available in Ireland, and our programme has delivered results that are in keeping with international best practices in this regard.

### Introduction

Twin-to-twin transfusion syndrome (TTTS) presenting as oligohydramnios / polyhydramnios sequence is a major complication of monochorionic twin pregnancies and is due to inter-twin blood transfusion via placental vascular anastomoses. Fetoscopic laser coagulation of placental vascular anastomoses is today considered to be the treatment of choice in severe second trimester TTTS. The objective of laser coagulation is to separate the 2 circulations completely, with the intention of reversing the haemodynamic disturbances, and to protect one twin should the co-twin die in utero<sup>1</sup>. Fetoscopic laser surgery for TTTS is associated with significantly improved outcome compared to serial amnioreduction<sup>1,2</sup>. Until the Rotunda Hospital Fetal Treatment Programme was launched in 2006, this novel therapy was not available in Ireland, with affected patients either foregoing treatment or having to travel to the United Kingdom for surgery.

Following the launch of this national referral programme at the Rotunda, we sought to audit our initial results of fetoscopic laser surgery for severe second trimester twin-to-twin transfusion syndrome (TTTS), and to compare these with international best practice standards.

### Methods

The first ten consecutive pregnancies with severe second trimester TTTS treated by our team with selective fetoscopic laser coagulation of placental vascular anastomoses from 2006 to 2007 were included. Cases with a posterior placenta were performed at our unit at the Rotunda, while those with an anterior placenta were performed by the same fetal medicine specialist at a centre in London using a curved fetoscope. Consented patients were admitted to the prenatal ward either the day before, or on the morning of the procedure, depending on the geographic distance of referral of the patient to our Unit. All patients received preoperative and post-operative prophylactic antibiotics and tocolytics.

Fetoscopic laser ablation of placental vessels involves the sonographically-guided placement of a 2.8mm fetoscope with sheath into the amniotic cavity of the recipient fetus. A 2mm operating endoscope was then inserted into the fetoscopic sheath and was used to inspect the arterial and venous blood vessels on the surface of the placenta, at the vascular equator between both fetuses. A systematic examination of the chorionic plate alongside the insertion of the intertwin membrane was performed. Selective coagulation of the unpaired blood vessels that pass across the vascular equator from one fetal side to the other was done using a Neodymium:YAG laser fibre. At the completion of the procedure, amnioreduction was performed. Only lignocaine local analgesia in the skin over the fetoscope insertion site was used for the procedures. Data on obstetric and neonatal outcomes were collected (Table 1). All newborns were followed for at least 6 weeks postnatally (median 5 months), and a normal neurological outcome was defined as normal neurobehavioral examination with normal neonatal head imaging. Since some neurological abnormalities will not clearly manifest in the early neonatal period, our aim is to keep following up these children to at least 2 years of age.

### Results

Laser surgery was successfully accomplished by a single experienced operator (FDM) in all 10 cases. All cases were Quintero stage 2 or 3, and median gestational age at laser ablation was 19 4/7 weeks. Typically, between 2 and 8 anastomotic vessels were identified in each case of TTTS, with a mean of 6 unpaired vessels ablated in the 10 cases (SD 1.7). Complete pregnancy and neonatal outcomes were available in all cases. Median gestational age at delivery was 30 weeks. Two cases resulted in complete pregnancy loss at 22 weeks, following preterm premature rupture of the membranes (PPROM). In the remaining 8 cases, there were two donor fetus demises within 24 hours of the procedure, such that 14 of 20 fetuses survived the perioperative period (70% survival). One recipient fetus developed ventriculomegaly 8 days post-procedure, and the mother elected to undergo selective termination of this fetus, which was performed in the UK at 32 weeks. Overall, 7 fetuses did not survive and 13 are alive and well with no adverse neurological outcomes (65% overall intact neonatal survival). There were no maternal complications (such as placental abruption, chorioamnionitis or intraperitoneal bleeding) secondary to the procedures.

### Discussion

The first treatment for TTTS that attempted to treat and reverse the anatomic basis for the syndrome was reported by DeLia et al<sup>3,4</sup> who described fetoscopic laser photocoagulation of vessels crossing the intertwin membrane. In his first small series, DeLia reported perinatal survival of 53% in 26 patients<sup>4</sup>. While perinatal survival was very similar to that noted in previous reports using serial amnioreduction, the neurologic outcome of survivors appeared much better (96% of survivors were neurologically intact). Controversy continued regarding the relative efficacy of these two techniques until the first randomised trial of serial reduction amniocentesis versus fetoscopic laser surgery was completed in 2004.

This Eurofetus trial, conducted by Senat et al, randomly compared the efficacy and safety of treatment of severe TTTS with laser therapy versus serial amnioreduction<sup>2</sup>. The study was halted early after a planned interim analysis revealed a significantly higher likelihood of survival of at least one twin up to 6 months of age (76% Vs 51%, p=0.002) in the laser group compared to the amnioreduction group<sup>2</sup>. Additionally, neurological injury was significantly less amongst survivors of laser compared with serial amnioreduction (6% Vs 14%, p=0.02). The Eurofetus study has conclusively demonstrated that selective photocoagulation of placental vessels using fetoscopy is the optimal therapy for severe cases of TTTS in the second trimester.

Case	Parity	Quintero stage at diagnosis	GA at diagnosis (weeks)	GA at laser (weeks)	Post-operative course	GA at delivery (weeks)	Perinatal outcome
1	0+0	Stage II	23 0/7	23 4/7	Ventriculomegaly in recipient 8 days post laser. Selective termination at 32 wks	32 2/7 emergency CS for abruption	Normal donor 1.6kg
2	3+0	Stage II	21 3/7	21 6/7	Noted short cervix, PPRM 20 hrs post laser	22 0/7	Loss both fetuses
3	0+0	Stage II	20 4/7	21 0/7	Uncomplicated	34 0/7 elective CS	Both alive and well. Donor 2.14kg and recipient 2.16kg
4	0+1	Stage III	17 3/7	17 3/7	Demise of donor twin 24hrs post laser	37 0/7 elective CS	Normal recipient 3.3kg
5	0+1	Stage III	19 0/7	19 4/7	Demise of donor twin 3 hrs post laser	34 0/7 elective CS	Normal recipient 1.6kg
6	0+0	Stage III	19 0/7	19 6/7	PPROM at 29 0/7 wks	29 6/7 emergency CS for abnormal fetal testing	Both alive and well. Donor 980g and recipient 1.3kg
7	0+0	Stage III	17 1/7	18 5/7	Uncomplicated	30 0/7 elective CS for PPRM	Both alive and well. Donor 1.3kg and recipient 1.4kg
8	0+0	Stage III	19 3/7	19 3/7	Oligohydramnios in donor. Normal Doppler's in both	30 3/7 Emergency CS for abnormal fetal testing	Both alive and well. Donor 743g and recipient 1.6kg
9	1+0	Stage III	19 5/7	20 0/7	Normal growth, fluid and Dopplers both fetuses. PPRM and preterm labour at 22 0/7 wks	22 0/7	Loss both fetuses
10	2+4	Stage III	21 0/7	21 4/7	Donor remained IUGR with normal fluid and Dopplers	32 2/7 emergency CS for fetal testing	Both alive and well. Donor 840g and recipient 2.06kg

This audit of the first 10 cases of fetoscopic laser therapy for severe TTTS performed by our fetal surgery team has confirmed that our results are consistent with the international literature in this regard. Preterm premature rupture of the membranes (PPROM) remains the most important complication of invasive antenatal procedures and accounts for significant morbidity and mortality if the membranes rupture before viability. In the Eurofetus study, 9% of patients developed PPRM within 28 days of the procedure, in both the laser and amnioreduction groups<sup>2</sup>. The results of our audit are similar in this regard.

The results from our first 10 cases of fetoscopic laser surgery for TTTS are similar to those expected from the published literature. Fetoscopic laser ablation for severe cases of TTTS has now become an established therapeutic intervention available for patients in Ireland. Our goal over the next 12 months will be to build on the experience developed to date, and to expand the fetal surgical programme to include more complex cases, as well as other conditions that may benefit from fetal surgery such as acardiac twins and congenital diaphragmatic hernia.

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