

# Successful outcome after Nd : YAG laser separation of chorioangiopagus-twins under sonoendoscopic control

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## ABSTRACT

*Endoscopic laser coagulation of the chorioangiopagus was successfully performed at 25 weeks' gestation in a pregnancy presenting with acute polyhydramnios due to twin transfusion syndrome. Under local anesthesia, a rigid fetoscope housed in a 2.7 mm diameter cannula was introduced transabdominally into the amniotic cavity and the communicating vessels were coagulated by Nd : YAG laser through a fiber that was passed down the side-arm of the cannula. There was rapid normalization of urine output in both fetuses and resolution of the oligo- and polyhydramnios in the donor and recipient twins, respectively. Furthermore, there was normalization in both fetal circulations, as assessed by Doppler velocimetry, and there was gradual resolution of the hydrops in the recipient. Two healthy babies were born 9 weeks after the procedure.*

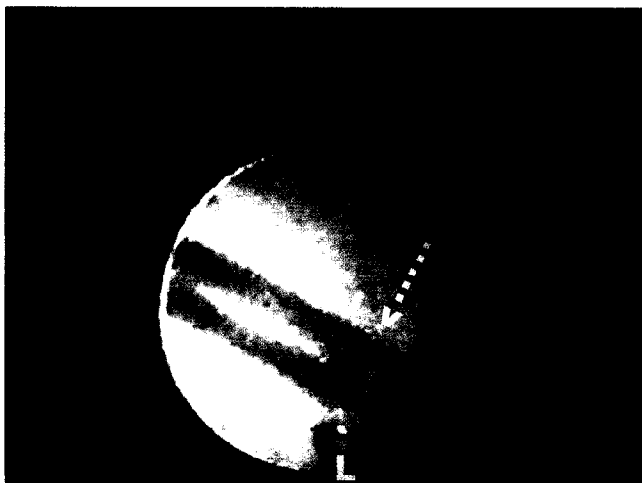
Twin–twin transfusion syndrome presenting in the second trimester of pregnancy with acute polyhydramnios is associated with a high perinatal mortality rate, either due to spontaneous abortion or very premature delivery of growth-retarded babies or babies with hydrops<sup>1</sup>. With expectant management, survival is less than 5%, while, with repeated amniocenteses and drainage of large volumes of amniotic fluid, 30–40% of the babies survive<sup>2</sup>. The most rational method of treatment would be interruption of the communicating placental vessels (chorioangiopagus). De Lia and colleagues<sup>3</sup> have achieved this by neodymium : YAG laser coagulation under endoscopic visualization; general or regional anesthesia was given and the endoscope was introduced into the uterus after laparotomy, hysterotomy and the insertion of a purse-string suture to control bleeding and amniotic fluid leakage. Despite the theoretical advantage of this approach, the technique has not gained acceptability, presumably because of its invasive nature.

This paper reports on the successful application of a new minimally invasive technique involving the percutaneous introduction of the laser fiber and separation of the chorioangiopagus under combined sonographic and endoscopic control.

## CASE REPORT

A 33-year-old woman with a twin pregnancy presented at 25 weeks' gestation with acute polyhydramnios. Ultrasonographic examination demonstrated that the fetuses were discordant in size and were separated by a thin membrane; there was a single anterior placenta. The larger twin, which was hydropic, was surrounded by polyhydramnios and appeared to have a distended bladder (Figure 1). The smaller fetus appeared fixed to the placenta because of oligohydramnios and no bladder could be demonstrated (Figure 1). Doppler studies of the descending thoracic aorta revealed high velocity, compatible with anemia in the donor and low velocity, compatible with polycythemia, in the recipient<sup>4</sup>. On the chorionic surface of the placenta there were large vessels, 3–4 mm in diameter, running from the donor to the recipient through the inter-twin membranes, and color Doppler studies demonstrated pulsatile flow within these vessels.

In view of the early gestation and the condition of the fetuses, it was felt that the chances for extrauterine survival were minimal and, therefore, the option of elective delivery was rejected. After counselling, the parents agreed to endoscopic laser coagulation of the chorioangiopagus. Under local anesthesia (lignocaine 2% infiltrated down to the myometrium) and continuous ultrasound visualization, a rigid 2 mm diameter fetoscope (field of vision 75°) housed in a 2.7 mm diameter cannula (KeyMed, Southend, UK) was introduced trans-



**Figure 1** Fetoscopic visualization of a communicating vessel crossing the inter-twin membrane (broken arrow), before (left) and after (right) coagulation (arrow-heads) by a Nd : YAG laser (L)



**Figure 2** Operative fetoscope: 20 cm length modified ureteroscope housed in a 2.7 mm diameter cannula carrying a 400  $\mu$ m Nd : YAG laser fiber

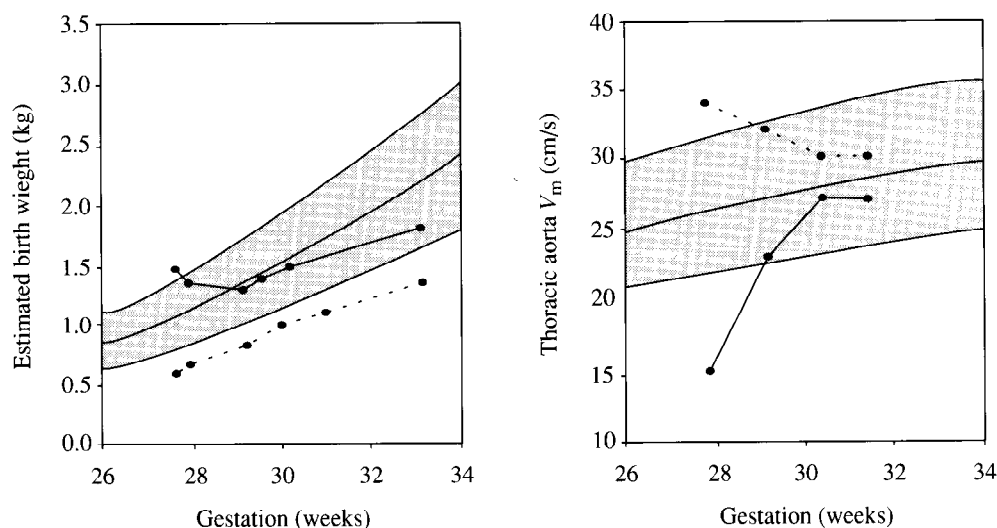
abdominally into the amniotic cavity of the recipient twin (Figure 2). The site of uterine entry was chosen by detailed ultrasound scanning to avoid injury to the placenta or fetuses and to allow access to the chorionic plate at the level of the inter-twin membrane. After visualization of the communicating vessels, a 400  $\mu$ m diameter Nd : YAG laser fiber (MBB, Munich, Germany) was passed down the side-arm of the cannula to 1 cm beyond the tip of the fetoscope. A combination of ultrasonographic and direct vision was used to examine systematically the chorionic plate along the whole length of the inter-twin membrane and identify the eight crossing vessels, which were coagulated by the administration of a total of 1342 joules in 20 shots of 3 s using an output of 30 watts at a distance of 1 cm (Figure 1). Direct contact with the vessels was avoided and there was no bleeding. At the end of the procedure, which lasted for 45 min, 3200 ml of clear amniotic fluid were drained. The patient, who had observed the whole procedure, was given prophylactic antibiotics and tocolysis and was discharged after 24 h.

Within 24 h of the procedure, there was normalization of urination in both fetuses, with the bladder of the recipient becoming smaller and the one of the donor becoming visible; by the end of the 1st week, the amniotic fluid volume was normal in both sacs and remained so until the end of pregnancy. During the next 8 weeks there was normalization in both fetal circulations, as assessed by Doppler velocimetry (Figure 3). In the recipient, there was resolution of the hydrops with disappearance of the edema within 1 week of the procedure and resorption of the ascites within 2 weeks; however, Doppler studies demonstrated regurgitation in both the mitral and tricuspid valves, which persisted until delivery. The growth velocity of both fetuses was normal, although the donor remained below the 5th centile (Figure 3).

At 34 weeks, there was spontaneous rupture of the membranes and lower segment Cesarean section for transverse presentation of twin 1 was performed uneventfully under epidural analgesia. The respective birth weight, Apgar score at 5 min and cord blood hemoglobin concentration were 1.6 kg, 9, and 20 g/dl in the donor twin and 2.2 kg, 9 and 15.6 g/dl in the recipient. The neonatal period was uneventful for both babies; although echocardiography confirmed the presence of mild mitral and tricuspid regurgitation in the recipient, there was no clinical evidence of heart failure and electrocardiography was normal. The placenta was monochorionic and perfusion experiments confirmed the absence of vascular communications.

## DISCUSSION

This study demonstrates the feasibility of a minimally invasive technique for coagulation of the communicating vessels in chorioangiopagus and interrupting twin transfusion. Furthermore, it documents the sequence of events in the recovery from the disease. The most likely explanation for the high hemoglobin concentration in the donor twin is increased erythropoiesis in response to hypovolemic tissue hypoxia<sup>5</sup> before coagulation of the com-



**Figure 3** Ultrasonographic estimation of fetal weight (left) and blood velocity ( $V_m$ ) in the fetal descending thoracic aorta (right), of the donor (broken line) and the recipient (solid line) twin plotted on the appropriate reference range for gestation (mean, 5th and 95th centile, shaded area)

municating vessels. Alternatively, in chorioangiopagus, reverse transfusion in the donor twin may occur at delivery<sup>1</sup>; however, in our case the recipient was not anemic and perfusion studies of the placenta did not demonstrate residual anastomoses.

The rapid normalization of urine output in both fetuses and resolution of the oligo- and polyhydramnios in the donor and recipient twins are the likely consequence of correction of the hypo- and hypervolemia, respectively. Subsequently, there was recovery of the heart function and gradual resolution of the hydrops in the recipient.

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