

# Prenatal Intervention for Complicated Multiple Gestations: Anesthetic Implications for Maternal and Fetal Outcome

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## ABSTRACT BODY:

**Introduction:** Monochorionic multiple gestations can share a single placenta and are at increased risk for asymmetrical distribution of blood flow among the fetuses. Additionally, if a monochorionic fetus with lethal anomalies dies in utero, the presence of shared circulation further places the remaining twin at increased risk for high output cardiac failure and death. These blood flow inequalities can result in twin-twin transfusion syndrome (TTTS) and reversed arterial perfusion sequence (TRAP). Selective laser ablation (SLAB) of placental vessels, bipolar cord cautery (BCC), or radiofrequency ablation (RFA) of umbilical cord vessels are all minimally invasive, percutaneous procedures that have been utilized to treat these conditions.<sup>1</sup> Many anesthetic techniques have been paired with these treatments, ranging from local anesthetic infiltration with sedation to full general anesthesia.<sup>2</sup> The anesthetic management of these patients was reviewed in this abstract, with the hypothesis that the chosen anesthetic technique influences both maternal and fetal outcome.

**Methods:** After IRB approval was obtained, retrospective data was collected in patients presenting with complicated monochorionic gestations. Three major anesthetic groups were studied, including patients that received general anesthesia (GETA), local anesthetic infiltration with sedation (MAC), and neuraxial blockade (Regional). Patients in the Regional group received either epidural, spinal, or combined spinal epidural (CSE) anesthesia. Fetal endpoints that were studied included: infant gestational age at birth, unexpected fetal loss after 7 days, and overall number of fetal live births. The maternal endpoints that were studied included: percent decrease in mean arterial pressure (MAP) during procedure, length of hospital stay and presence of pulmonary edema or excessive uterine activity.

**Results:** From July 1996 to December 2005, 117 procedures were performed in 116 patients (40 SLAB, 15 RFA, 56 BCC, and 6 other procedures). One patient had 2 BCC procedures on two separate occasions and was included in the analysis only once. During their procedures, 30 patients received GETA, 7 MAC, and 79 Regional (32 CSE, 46 epidural, 1 spinal) as their primary anesthetic. Sixty-five patients had the diagnosis of TTTS, 31 TRAP, and 20 had other diagnoses, including fetuses with multiple congenital anomalies (Table 1).

The data was analyzed with one-way ANOVA and chi square tests of variance. Maternal age and weight was similar among the anesthetic groups. However, gestational age was noted to be significantly lower in the MAC group (Table 1). Fetal outcomes, including gestational age at birth, fetal loss, and total number of fetal live births were similar among the three anesthetic groups. The presence of maternal pulmonary edema was also similar among the anesthetic groups. A trend toward decreased uterine irritability was seen in the MAC group while a trend toward larger falls in MAP was seen in the Regional group. The only maternal factor that was significantly lower in the MAC anesthetic group was maternal length of hospital stay (Table 2).

Table 1. Study patient characteristics

	Type of Anesthetic			
	GETA	Regional	MAC	
<b>Age (yr)</b>	27 ± 6	30 ± 6	31 ± 8	<i>P</i> = 0.13
<b>Weight (kg)</b>	71 ± 16	76 ± 16	80 ± 17	<i>P</i> = 0.24
<b>Gest. Age at procedure (wks)</b>	21 ± 3	21 ± 2	18 ± 2	<b><i>P</i> = 0.003</b>
<b>Procedure</b>				
SLAB ( <i>n</i> )	14	26	0	
BCC ( <i>n</i> )	13	42	0	
RFA ( <i>n</i> )	0	8	7	
Other ( <i>n</i> )	3	3	0	
<b>Diagnosis</b>				
TTTS ( <i>n</i> )	18	46	1	
TRAP ( <i>n</i> )	8	21	2	
Other ( <i>n</i> )	4	12	4	

Data are presented as count or Mean  $\pm$  SD

Abbreviations: BCC- Bipolar Umbilical Cord Caутery, GETA- General Endotracheal Anesthesia, MAC-Monitored Anesthesia Care, MAP- Mean arterial pressure, RFA- Radiofrequency Ablation of Umbilical Cord, SLAB- Selective Laser Ablation of Placental Vessels, TRAP- Twin reversed arterial perfusion sequence, TTTS- Twin-twin Transfusion Syndrome

Table 2. Fetal and maternal outcomes

	GETA	Regional	MAC	
<b>Fetal outcomes</b>				
Mean gestational age at birth (wks)	32.2 $\pm$ 5.4	33.6 $\pm$ 4.2	33.5 $\pm$ 7.9	<i>P</i> = 0.41
Unplanned fetal loss in 7 days	7 (23.3%)	13 (16.4%)	2 (28.5%)	<i>P</i> = 0.59
Expected # live births <	11 (36.6%)	20 (25.3%)	3 (42.8%)	<i>P</i> = 0.38
Actual # live births				
<b>Maternal outcomes</b>				
Maternal length of stay (days)	3.8 $\pm$ 0.45	2.8 $\pm$ 0.86	2.3 $\pm$ 0.26	<b><i>P</i> = 0.01</b>
Pulmonary edema	2 (6.6%)	1 (1.2%)	0 (0%)	<i>P</i> = 0.28
Uterine irritability	8 (26.6%)	9 (11.3%)	0 (0%)	<i>P</i> = 0.06
Decrease in MAP (%)	28 $\pm$ 12	34 $\pm$ 16	23 $\pm$ 10	<i>P</i> = 0.06

Data are presented as count or mean  $\pm$  SD

( ) = Percentage per anesthetic group

MAP = Mean arterial pressure

**Discussion:** The complications of monochorionic multiple gestations can be treated with several percutaneous procedures. A variety of anesthetic techniques have been coupled with these treatments, ranging from general anesthesia to local infiltration with sedation. In this study, maternal subjects had similar baseline characteristics, except for gestational age at time of procedure. This observation was likely the result of institutional procedural preference, where only RFA patients received MAC anesthetics. Thus, since RFA is commonly performed for TRAP, a diagnosis that is made earlier in gestation that does not require an observational period to monitor its evolution, subjects presented for treatment relatively earlier.

In this study, all fetal outcomes were unaffected by the chosen anesthetic technique. However, maternal length of stay was found to be significantly lower in the MAC group. A trend toward less uterine irritability was also noted in the MAC group. However, since all MAC patients received RFA, these observations were likely the result of procedural differences and not differences in anesthetic technique. Notably, the trocars used for RFA are smaller than those used for BCC and SLAB, thus causing less uterine insult and less uterine irritability. As such, though RFA patients did not receive routine postoperative magnesium tocolysis, they experienced less uterine irritability and had shorter lengths of hospital stay.

A trend toward larger decreases in MAP was also noted in the Regional group. These intraoperative decreases in MAP did not result in notably increased rates of maternal or fetal morbidity. However, due to the magnitude of the noted MAP decrease, close blood pressure monitoring is necessary when Regional anesthetic techniques are utilized in this patient population.