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Discordance of cord insertions as a predictor of discordant fetal growth in monochorionic twins☆

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ABSTRACT

Introduction: The type of cord insertion within monochorionic twin pairs could be different. The purpose of study is to evaluate the association of different combinations of placental umbilical cord insertions with birth weight discordance in a large cohort of monochorionic twins.
Methods: All consecutive monochorionic placentas from either uncomplicated twin pregnancies or with fetal weight discordance examined and injected with color dye at our centers were included in this study (n = 374). Marginal or velamentous cord insertions were defined as abnormal. Placentas were categorized as concordant when the cord insertions of both fetuses were either normal-normal or abnormal-abnormal, and as discordant when they were normal-abnormal. Birth weight discordance was defined as a difference in birth weight of each twin ≥25%. The association of different cord insertion combinations with birth weight discordance was analyzed.
Results: The rate of discordant cord insertions was 55% (204/374) in monochorionic twins. A highly significant association between discordant cord insertions and discordant birth weight was observed ($p < 0.01$). The odds ratios (OR) for birth weight discordance in the discordant cord insertion group compared with the concordant group were 2.3 (95% CI: 1.2–4.4) for the normal-marginal and 5.9 (95% CI: 3.8–10.4) for the normal-velamentous cord insertion subgroup. Discordant cord insertions are associated with the occurrence of unequal placental sharing (OR 4.3, 95%CI 2.7–6.9).
Discussion: Discordance of cord insertions is associated with discordance of birth weight and may therefore be an important indicator of adverse outcome in monochorionic twins.

1. Introduction

Growth discordance affects 11–36% of monochorionic (MC) twin pregnancies and is associated with high rates of perinatal mortality (10–20%) and morbidity (17–42% of neuromorbidity) [1–5]. The cause of birth weight discordance in MC twins is related to abnormal placentation reflected by unequal placental sharing and velamentous cord insertion [6–8]. The smaller twin usually has a smaller placental share and a velamentous or marginal cord insertion while the larger twin has a larger placental share and a central or paracentral cord insertion [8]. To date, most studies have focused on the presence of one anomalous cord insertion without taking into account the type of the other twin's cord insertion. Recent placental studies have suggested that the choriovascular distribution of a MC twin may correlate with the type of cord insertion of the opposite twin [9,10]. Some authors have speculated that prenatal assessment of the type and combination of cord insertions of both fetuses in MC twins may be a useful tool for predicting the risk of adverse outcomes [11,12]. However, the clinical significance of patterns of cord insertion pairs remains to be elucidated.

Our aim is to evaluate the association of different combinations of cord insertions with birth weight discordance in a large cohort of MC twin placentas.

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2. Materials and methods

All consecutive placentas of MC twin pregnancies examined at Leiden University Medical Center, Netherlands, between March 2002 and December 2014, and at Hospital Italiano de Buenos Aires, Argentina, between January 2010 and December 2014, were eligible for the study. MC placentas in both centers are routinely injected with colored dye and subsequently photographed and then stored for further analysis on computer using Image Tool for Windows version 3.0 (Image Tool, San Antonio, Texas, USA). Detailed injection protocol has been described previously [13]. Monochorionicity was diagnosed based on first-trimester sonographic features (T-sign, concordant gender and number of placental masses) and was confirmed after delivery by gross examination of the dividing membrane and/or histopathological examination of the placenta and the dividing membrane. Diagnosis of monochorionicity using ultrasound at first trimester were quite reliable with a sensitivity and specificity of 100% and 99.8%, respectively. Placentas of MC twins with twin-twin transfusion syndrome (TTTS), twin reversed arterial perfusion (TRAP) sequence, fetal demise, spontaneous twin anemia-polycythemia sequence (TAPS), higher order MC twins, contamination by formalin or severely damaged, were excluded. The majority of TTTS cases at our centers were managed with fetoscopic laser surgery. Previous studies shows that fetoscopic laser surgery for TTTS improves the fetal growth discordance [14]. To minimize the confounding from this treatment, TTTS cases were thus excluded. Part of placental data was reported in previous studies [15,16].

Cord insertions were recorded for each twin as normal, marginal or velamentous. Cord insertions into the placental disc and more than 1 cm away from the marginal border were defined as normal, within 1 cm of the disc edge as marginal and directly into the membranes as velamentous. Marginal or velamentous cord insertions were defined as abnormal. Placentas were categorized according to the combination of cord insertions as concordant when they were either normal-normal or abnormal-abnormal (Fig. 1) (marginal-marginal, velamentous-velamentous or marginal-velamentous), and as discordant when they were normal-abnormal (Fig. 2) (normal-marginal or normal-velamentous).

Small for gestational age (SGA) was defined as a birth weight lower than the 10th centile. Birth weight difference within each twin pair was calculated according to the following formula: (larger twin - smaller twin)/larger twin x 100. Birth weight discordance was defined as a difference ≥25%.

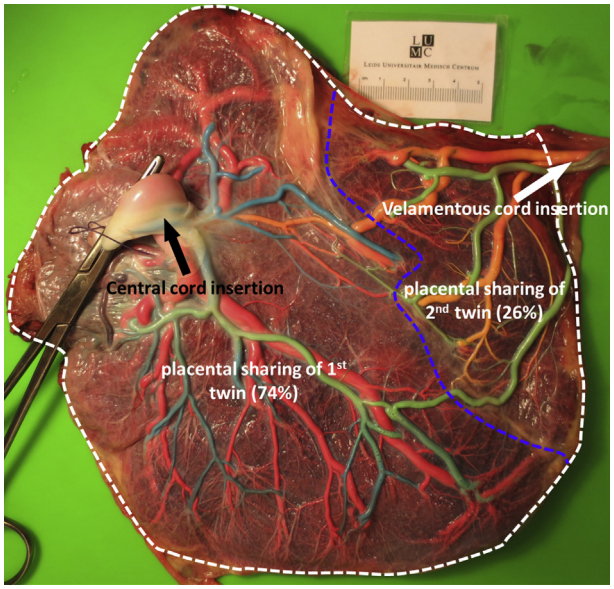

Fig. 2. Discordant cord insertions with unequal placenta sharing. Diamniotic twins delivered at 31^{+0} weeks, 1430 g and 1030 g (birth weight difference 28%), normal-velamentous cord insertions, placental territory discordance 69%.

Vascular equator was considered as the boundary of two placental territories and was delineated by connecting the spots of each arteriovenous anastomoses (Figs. 1 and 2). Placental territory of each fetus was measured by contouring the corresponding placental edge and vascular equator (Figs. 1 and 2) and was expressed as a percentage of the whole placental surface. The percentage of individual placental territory was calculated by dividing each individual placental territory by the sum of both territories. Placental territory discordance was determined by subtracting the percentage of individual placental territory from one fetus with the percentage of individual placental territory from the other fetus. Unequal placental sharing was defined as percentage of placental sharing discordance ≥25%.

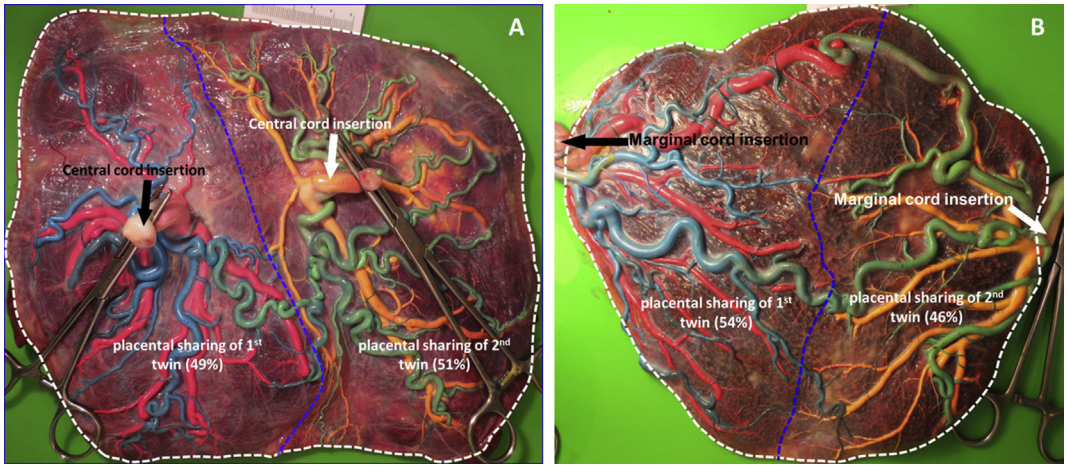

Fig. 1. Concordant cord insertions with balanced placenta sharing. The blue-dotted line indicates the vascular equator. A: diamniotic twins delivered at 31^{+6} weeks, 1517 g and 1548 g (birth weight difference 1%), normal-normal cord insertions, placental territory discordance 3%. B: diamniotic twins, delivered at 36^{+3} weeks, 3170 g and 2820 g (birth weight difference 6%), marginal-marginal cord insertions, placental territory discordance 15%.