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Research Article

Abnormal Placental Cord Insertion, No Association with Short Inter- Delivery Interval

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Abstract

Objectives: *This secondary data analysis aims to explore the relationship between a short inter- delivery interval and the prevalence of abnormal placental cord insertion.*

Study design: *The primary study was a prospective cohort study that investigated 1012 placentas of consecutively delivered singleton pregnancies between 24+0 and 42+2 weeks of gestation at a tertiary centre.*

For this secondary analysis, the data from multiparous women were re- examined. Viable pregnancies from 24 to 42 weeks were considered if their postpartum placental gross examination revealed abnormal cord insertion after birth. Medical records were examined and an inter-delivery interval (IDI) of 15 months was applied as cut off for short IDI or long IDI independent of the mode of delivery or pregnancy result.

Methods: *Digital measurements were taken to determine the distance between the placental cord insertion and the placental margin. Placental cord insertions were divided into three categories: central/eccentric, marginal and velamentous. For the purpose of this secondary study, the present as well as the previous delivery dates were logged, and the IPI calculated for each delivery.*

Results: *562 multiparous females were included, of them 35 pregnancies had an IDI of 15months or less (7.3 %). The mean IDI for the short ID group (</=15months) was 13.3 months while it was 39.7 months for the longer IDI (>/=16 months) . The overall median IDI for the marginal cord insertion group was 45.1 months, whereas it was 38.1 months for the velamentous cord insertion group.*

Overall 4/35 (11.4%) in the short IDI group and 60/527 (11.4%) in the long IDI group had an abnormal placental cord insertion. (Chi-sq 0.00, p=NS)

Conclusions: *In this study there was no evidence that a short IDI was related to the prevalence of abnormal placental cord insertion.*

Introduction

The placenta and umbilical cord play a significant role in intrauterine fetal development [1,2,3]. Any improper growth or function of the placenta or umbilical cord may result in a number of problems in pregnancy [2,4,5].

The umbilical cord exhibits variability in its implantation to the placenta [5,6,7]. This reflects the underlying changes of fetal circulation in the intrauterine period [7].

Knowledge of the umbilical cord insertion is vital for obstetricians and paediatricians' to anticipate any fetal developmental problems [5,8].

Normally, the umbilical cord is connected to the placental centre on the fetal side [1,5]. In addition, there are marginal, furcate, and velamentous cord insertions to the placenta [8].

The varieties of umbilical cord insertions can be classified relative to their distance from the placental edge. The placental cord insertion (PCI) is usually recorded as the distance in centimeters from the placental margin [1,5,8].

More than 90% of term placentas are implanted centrally or eccentrically with the cord being inserted between the centre and 2 cm or more away from the edge [3.8]. However, marginal cord insertion (MCI) (cord insertion less than 2 cm from the placental edge) and velamentous cord insertion (VCI) (cord entry into the fetal membranes before travelling to the placental edge) are classified as abnormal cord insertions [1,3,4].

The cord enters near the placental margin in MCI, on the periphery of the placental mass and is supported by very little placental tissue but it still emerges from the placental mass [1,3]. In the case of VC, the umbilical vessels penetrate into the amniotic membranes [6,7], therefore they are not protected by the placenta mass leaving umbilical vessels unprotected by Wharton's jelly. VCI occurs in around 1% of singleton Pregnancies [7,8], whereas MCI occurs in approximately 7% [3,4,7]. It is still unclear what causes abnormal placental cord insertion[1,3,4].

Abnormal cord insertion is not routinely screened for during pregnancy [9,10] but it can be detected sonographically and confirmed by physical examination of the placenta after delivery [22]. Recognizing the risk factors for abnormal cord insertion such as vasa previa, may aid in the prenatal identification and preconception counselling of individuals who more at risk of these abnormalities [11]. Several factors have

been reported to increase risks of abnormal placental cord with a greater frequency in multiple pregnancies and pregnancies conceived with the use of assisted reproduction **[**12**]** and abnormal cord insertion in previous pregnancies **[**6,13**]**.

The World Health Organization (WHO) recommend waiting 24 months between a live birth and the next conception 14. Short inter delivery interval (IDI) has been associated with a greater risk of several obstetric concerns both to the mother and the fetus, including premature pre-labour membrane rupture, preterm delivery small for gestational age (SGA), low birth weight, labour dystocia, placental abruption and third trimester vaginal bleeding **[**12,15**]**. Currently there is limited evidence linking IDI with abnormal placental cord insertion **[**15,16**]**. In a retrospective case-controlled study Whitney et al **[**16**]** found short pregnancy interval of 6 months or less has significantly increased the occurrence of VCI meanwhile no difference was found in MCI.

A secondary analysis of data from a prospective cohort of pregnant women with abnormal placental cord insertion diagnosed after birth, was performed to investigate IDI as a risk factor.

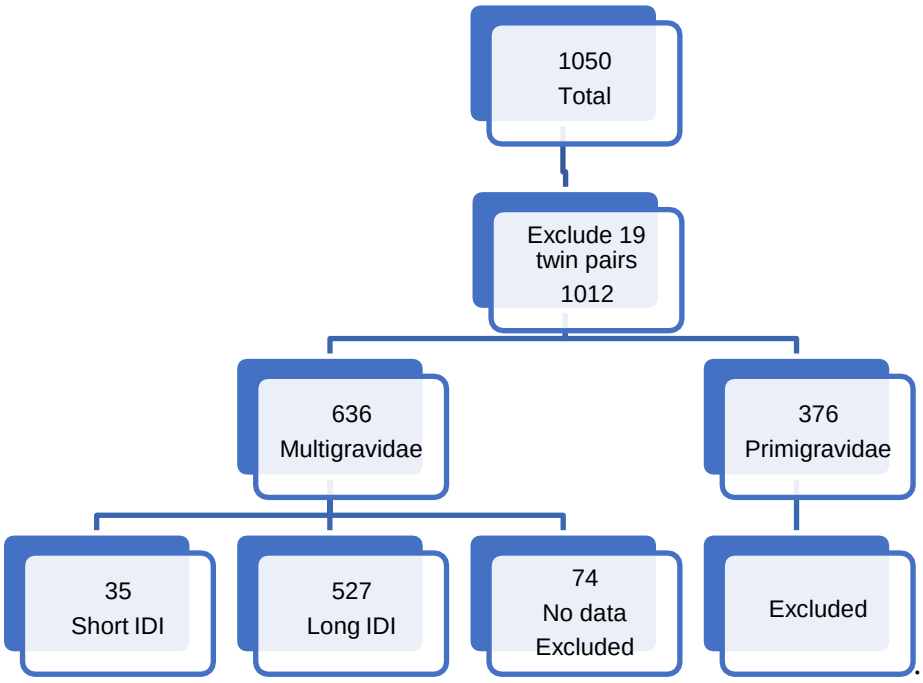

Fig 1: The selection of cases for the secondary analysis of Inter delivery interval (IDI).

Short IDI < /=15 months

Long IDI >/=16 months

Materials and Methods

Study design:

This study involved the analysis of data from participants recruited as part of observational cohort study **[**4,8**];** antenatal detection of abnormal placental cord insertion across different trimesters. The aim of the primary study was to investigate if abnormal placental cord insertion is associated with poor pregnancy outcomes in singleton pregnancies and to prospectively evaluate, using digital imaging, the distance from the cord insertion to the margin of the placenta. Cord insertion was classed as normal or central/eccentric (insertion >2cm from the placental edge), marginal (insertion <2cm from the placental edge) or velamentous (marginal insertion plus placental vessels penetrating into the amniotic membranes). The study's enrolment process and guidelines have been described previously **[**4**]**.

This secondary data analysis aims to explore the relationship between a short IDI and the probability of abnormal placental cord insertion by studying the data collected in the period between January 2016 to April 2016 of the primary study.

Approval for the study was obtained from the institutional review board, the Health Executive Research Ethics Committee (REC Ref 32/13). An information leaflet was given to all participants. Written informed consent was obtained during recruitment from each participant including consent for secondary studies.

Inclusion criteria for the secondary study included singleton pregnancies delivered at or after 24 weeks gestation in parous women.

Secondary study design and analysis:

For the secondary analysis we retrospectively looked at the data from the primary study in which their primary placental analysis confirmed abnormal cord insertion and included all gestations that considered viable pregnancies (24 weeks or more)

The IDI was defined as the period between the last live birth and the delivery date in the next pregnancy from the hospital maternal electronic records.

Using excel, birth interval data were gathered directly from the medical record. Women for whom the birth interval was unknown were excluded.

Placental cord insertion was compared between two groups of IDI intervals, </= 15 months and >/= 16 months. Statistical calculations were performed with icalcU.com.

Results and Discussion

The identification of the 562 cases studied is outlined in fig1.

Table 1 compares the distinctions of the secondary study population according to the IDI in the two groups, 35 subjects with 15 months or less intervals Vs 527 with 16 months or more, Those with IDI of 15 months or less had mean (SD) age of 39(4.8) year compared to 39.7(5.1) years respectively, the short IDI group had a slightly higher BMI of 27.0(7.7) in contrast to 25.7(5.1) for the 16 months or more IDI group , smokers were 6(17.1) and 92 (17.5%). In the short IDI (=>15 months) number of previous cesarean sections 27(77.1%), 20% had vaginal delivery in the previous pregnancy, meanwhile the =>16months IDI group had 395 (75.0%) Cesarean sections and 102 (19.4%) of vaginal deliveries. Of the whole group about 51.9% were in their second pregnancy.

	Interval <=15 months n=35	Interval >=16 months n=527	Significance
Mean (SD) IDI (m)	13.3 (1.4)	49.8 (34.9)	---
Mean (SD) age (y)	39 (4.8)	39.7 (5.1)	t=-0.78 p=NS
Mean (SD) BMI	27.0 (6.6)	25.7 (5.1)(n=526)	t=1.4 p=NS
Mean (SD) birthweight (g)	3615 (623)	3475 (559)	t=1.4 p=NS
Para 1 n(%)	18 (51.4%)	268 (50.9%)	chi-sq 0 p=NS
No previous VD n(%)	7 (20%)	102 (19.4%)	chi-sq 0 p=NS
No previous CS n (%)	27 (77.1%)	395 (75.0%)	chi-sq 0.08 p=NS
Smoker n(%)	6 (17.1%) (n=34)	92 (17.5%) (n=506)	Chi-sq 0 p=NS
Male baby n(%)	14 (40.0%)	262 (49.7%)	Chi-sq 1.2 P=NS

Table 1: The prevalence of velamentous and marginal cord insertions in placentae categorized by the inter delivery interval of >/=16 months or </=15 month

The prevalence of abnormal cord insertion was 4 (11.4%) in the IDI =< 15 months group and 60 (11.4%) in the =>16months group was not significant. (Chi-sq 0.00, p=NS).

	Interval <=15months n=35 (6.2%)	**Interval >=16 months n=527 (93.7%)**	**Significance**
Velamentous Cord Insertion	3 (8.5%)	18 (3.4%)	
Marginal Cord Insertion	1 (2.9%)	42(8.0%)	
Total abnormal cord insertions	4(11.4%)	60(11.4%)	Chi-sq 0 p=NS
Normal cord insertion	31(88.6%)	467(88.6%)	

Table 2: The prevalence of abnormal cord insertion according to IDI

Conclusion

The overall incidence of VCI in general population has been estimated rate was 1.6% of singleton pregnancies while MCI was 7% **[**2,4**]**. In the primary study abnormal cord insertion was confirmed in 11% of placentas after delivery **[**1,2**]**. This secondary study has examined the role of IDI in the development of abnormal cord insertion quoted in the primary data results in multiparous participants. By examining a cohort of pregnancies, the IDI was not associated with the prevalence of abnormal cord insertion. However, the association between short IDI and adverse pregnancy outcome has been described previously **[**17,18,19**]**.

The placenta and the umbilical cord both play a part in the pathophysiology of most adverse outcomes and the prediction of risk factors preconception as well as at early stages of pregnancy will help to recognize pregnancies at risk of adverse outcomes.

Although IDI has been associated with abnormal cord insertion and other adverse pregnancy outcomes, it is unclear if short IDIs are an independent risk factor or if the association is due to confounding by other variables **[**7,20,21**]** (such as maternal age, socioeconomic status, and reproductive history). In many western countries the average age of first-time mothers has increased **[**21**]** during the previous decades and older

women tend to have shorter IDIs. Women who wait until they are in their thirties to conceive their first baby are more likely to have shorter IDIs when compared to women who are between the ages of 20 and 29. When compared to younger women, older women's uterine vasculature is less capable of adequately adapting to the higher haemodynamic demands that occur during pregnancy leading in an increased likelihood of an unfavourable outcome for the pregnancy.**[**21,23**]**

Despite the fact that best practice regarding inter-pregnancy care require further investigation, It is evident that the use of long-acting reversible contraception methods may be one way to assist women in optimising birth spacing and subsequent pregnancy outcomes. It has been estimated that 70 percent of pregnancies that occur within one year after a prior delivery are unintended **[**17**]**. It has also been estimated that the use of long-acting reversible contraception methods increases the likelihood of achieving planned pregnancies and optimal birth intervals **[**17,18**]**.

Finally, In order to determine if the findings of this study were the consequence of a limited sample size or whether there is in fact no correlation between the two variables, we suggest conducting a second analytical study which involves cases and control group in order to reveal empirical evidence in the matter.

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