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Cord prolapse and the neonatal outcome

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Abstract: *Aims and Objectives*
The primary objective of this study was to determine the obstetric risk factors and the management protocol of cord prolapse in our unit through analysis of cases diagnosed over a period of 30 months. The secondary objective was to assess the neonatal outcomes that may be associated with cord prolapse.

Materials and Methods: A retrospective analysis for a period of 30 months was done during which there were 24 cases of cord prolapse (0.19% incidence) excluding cord presentations. The obstetric variables, parameters which determine the perinatal outcome were analysed. Statistical analyses were performed with the SPSS, Chi-Square test was used to test the statistical significance.

Results and Conclusion: The mean maternal age was 31.8±5.5 years. In 50% of the cases, labor was induced. The incidence of abnormal fetal presentation was 8%, and in two patients (8%) onset of labor was preterm. The mean diagnosis to delivery interval (DDI) was 15 minutes and 30 seconds; except for one vaginal delivery, all women underwent crash cesarean section delivery. There were no perinatal mortalities noted. It throws light onto whether DDI could be a critical determinant in deciding the neonatal outcome. Maneuvers to relieve pressure on the umbilical cord was followed but poorly documented (25%) as was the communication with the women and their partners. Various neonatal parameters such as the five-minute Apgar score, Cord pH, hypoxia ischemic encephalopathy (HIE), intubation during resuscitation and length of stay were assessed during the study which showed satisfactory neonatal outcomes.

Keywords: Cord prolapse, Diagnosis to delivery interval, Obstetric practice, Neonatal outcome.

Introduction

Cord prolapse is the descent of the umbilical cord through the cervix alongside or past the presenting part where the cord gets compressed between the fetus and the uterine wall in the presence of ruptured membranes. [1]Although this is a rare event resulting in less than 0.5% of the deliveries,[2] it may lead to significant adverse neonatal outcomes. Studies have shown that cord prolapse is associated to maternal risk factors, with approximately half of the cases reported being preceded by obstetric interventions.[3] This study aims to determine the incidence, the obstetric risk factors of cord prolapse and its neonatal outcomes.

Methods

A retrospective analysis of cases diagnosed as cord prolapse at the hospital was done for the period of 30 months (January 2018 to June 2020). The labor and delivery unit register and data from the Medical Records Division (MRD) were used to identify the cases of cord prolapse. In each case, the obstetric variables - maternal age, parity, gestational age at presentation, obstetric complications/interventions, the "diagnosis to delivery interval (DDI)", method of delivery and variables which determine the perinatal outcomes such as birth weight, Apgar score at one and five minutes of life, Cord pH, admission temperature, admission glucose, hypoxia ischemic encephalopathy (HIE), intubation during resuscitation, therapeutic cooling, cerebral function monitoring, admission and stay in the Neonatal Intensive Care Unit (NICU) until discharge or transfer were analyzed. Statistical analyses were performed with the SPSS package. To test the statistical significance of the categorical variables, the chi-square test was used. The criterion for selection was $P<0.05$.

Results

There were 12357 deliveries during the study period. Twenty-four of these cases were diagnosed with cord prolapse, giving an incidence of 0.19% (international comparison of 0.1% to 0.6%).[4] The mean maternal age was 31.8±5.5 years;(range 20 – 42 years) and the mean gestational age (GA) was 38±1.45 weeks. Eighty three percent of the patients were multiparous with G2P1 being the most frequently noted parity. Twelve (50%) cases of labor were induced, while the rest were spontaneous. Of the fetal presentation, a total of two (8.3%) cases were associated with mal presentation. Nevertheless, most cord prolapsed occur with vertex presentations because of the relatively low incidence of non-cephalic presentations similar to other studies.[5] In 21 (87.5%) cases, the deliveries were term pregnancies, and the rest late preterm deliveries at 35 and 36weeks.

Table 1: Obstetric risk factors for cord prolapsed

Obstetric risk factors	Frequency	Percent
Srom*	9	37.5
Polyhydramnios	7	29.1
High head	2	8.3
Breech	1	4.1
Grand multiparity	1	4.1
None	4	16.6
Total	24	100

*SROM= Spontaneous rupture of Membranes

The mode of delivery was by crash cesarean section in 23 cases (95%), one was an assisted breech delivery. The obstetric risk factors are as shown in Table 1. The interval from diagnosis of cord prolapse to delivery of the fetus were recorded in 17 cases (70%); the mean duration was 15.30 minutes while in two cases (8%) the DDI crossed 30 minutes- 34 minutes and 33 minutes, respectively. The management of cord prolapse was documented in only 25% of the cases. The neonatal outcomes are summarized in Table 2.The five-minute Apgar score less than seven and Cord pH <7.0 was observed in one of the 24 newborns (4.3%). Admission temperature, admission glucose, hypoxia ischemic encephalopathy (HIE) was analyzed. Correlation analysis between obstetric parameters (Obstetric risk factors &DDI), neonatal parameters (Perinatal asphyxia and length of stay at the NICU, five-minute Apgar & intubation during resuscitation) and obstetric factors effecting the neonatal outcomes (DDI and five minutes Apgar, Cord pH <7.2) were done.

Table 2: Neonatal outcomes of patients with Cord Prolapse

Neonatal outcomes	(n=24)
Gestational age (weeks)	38±1.45
Birth weight	3.12±0.44
Apgar score at one minute < seven	7.37±1.75
Apgar score at five minutes< seven	8.58±1.06
Cord pH	7.23±0.11
Caeserean section%	95
Hypoxia ischemic encephalopathy (HIE) %	16.6
Intubation during resuscitation %	33.3
Admission at NICU%	20
Perinatal mortality %	0

Table3: Correlation between Hypoxia ischemic encephalopathy and Resuscitation

		HIE - Hypoxia ischemic encephalopathy		Total	P value
		None	Stage I		
	None	16	0	16	
Resucsitation	BAG & MASK+PPV*	4	3	7	
	ETT†+PPV	0	1	1	
Total		20	4	24	0.03

*PPV= Positive pressure ventilation
† ETT= Endotracheal tube

Table 4: Correlation between intubation and length of stay

		Duration of NICU stay				Total	P value
		1 day	3 d/Transfer	4 days	Nil		
Intubation during resuscitation	ETT*+PPV†	0	1	0	0	1	
	None	1	0	0	15	16	0.012
	Bag & Mask+PPV	1	1	1	4	7	
Total		2	2	1	19	24	

*ETT= Endotracheal tube
†PPV= Positive pressure ventilation

Discussion

Cord prolapse an emergency obstetric complication is difficult to predict. In the present study the incidence of cord prolapse was 0.19% which agrees with similar published studies. Traditionally, factors such as prematurity (8%), SROM (45%) multiparty (83%), induction of labor (50%), have been implicated as predisposing factors. Although, factors, such as high head (12%), and polyhydramnios (29.1%) are recognized risk factors for cord prolapse, its sensitivity, in any single case is too low to be predictive for cord prolapse. Many of the studies draw attention to prematurity being a high-risk factor,[6,7] sincepremature babies are smaller, and their presenting

part is not well applied to the cervix, providing more space for the cord to prolapse, nonetheless, many of the cord prolapse in our study occurred in term pregnancy after 37 weeks (92%). Artificial rupture of membranes may lead to cord prolapse. In this study, cord prolapse occurred in equal numbers in those who had SROM (50%) and in whom amniotomy was used for augmenting spontaneous labor (50%) suggesting that artificial membrane rupture in this context carries a low risk of cord prolapse and is based on clinical judgement customized to individual women similar to other studies.[4] In clinical practice, the proposed crucial factor for successful rescue of fetuses with cord prolapse depends on the duration of the DDI. Indeed, one of the parameters for evaluating the standard of Obstetric practice is the time required to undertake an emergency cesarean which should not exceed 30 minutes.

In the present study, the mean interval from DDI was about 15.30 minutes, (Minimum being four minutes and Maximum being 34 minutes) which is well within the recommended range and is comparable with that reported in similar reviews on the management of cord prolapse. While shortening of the DDI is a crucial factor in determining the outcome of cord prolapse, every effort should be made to reduce cord compression and fetal hypoxia during those few minutes. For the cases were the DDI had exceeded 30 minutes, the neonatal outcomes were good with an Apgar score of nine at five minutes and Cord pH>7 indicating that the outcomes largely depend upon the prompt diagnosis, intrauterine resuscitation and immediate decompression procedures (IDP), rather than the "30 minute rule" as cited in other studies.[5] Maneuvers such as the Vagos method of rapid instillation of saline into the bladder, Trendelburg position, and manual elevation of the head has been described to relieve cord pressure during preparation for cesarean section by Caspi et al.[8]

It also described that there were no fetal deaths when these maneuvers are used despite long diagnosis to delivery intervals. In our unit these techniques were applied individually or in combination but with only 25% of the cases showing proper documentation. Hypoxia ischemic encephalopathy (HIE) followed similar trends as with Apgar scores, stage one HIE developed in two cases where the DDI was well below 30 minutes and the cases where the DDI crossed 30 minutes did not develop HIE. This implies that there may be other factors apart from DDI which may influence neonatal outcomes.Such factors include the occurrence of prolapse preceding diagnosis by a significant length of time, the degree of cord compression, and the presence of fetal compromise. Majority of the cases had good Apgar scores at five minutes and did not require any intubation except for one case where the neonate with an Apgar score of four, developed HIE and also required endotracheal intubation (ETT) ($p<0.03$) (Table 3). The intubation also influenced the length of stay amongst these neonates ($p<0.012$) (Table 4). In the present study, there were no perinatal deaths.

Limitations of the Study

The DDI was not documented (4.1%) in some cases which may influence the outcomes of the study. Long-term neurological outcome in the surviving infants were not available.

Conclusion

In the present study, the incidence of cord prolapse was 0.19% which agrees with similar published studies. SROM was the single most noted obstetric risk factor followed by polyhydramnios. The study shows a mean DDI of 15 minutes which is well within the acceptable limit and may have influenced a satisfactory neonatal outcome. There was no perinatal mortality. Although IDP maneuvers are a part of standard care, there still room for improvement in documenting them.

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