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Research Article

Gastroschisis: Impact of Delivery Planning on Patient Outcomes

Sathyaprasad Burjonrappa^{1,2*} and Amy Sullivan²

¹University of South Florida, Tampa, FL

²Newark Beth Israel Medical Center, Newark, New Jersey

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ABSTRACT

Introduction: Success rates of gastroschisis interventions on outcome have been increasingly examined. Much of the work has focused on post-delivery management and timing of the final closure. Little data is available regarding the impact of the timing of fetal delivery on outcomes. This study aims to examine the relationships between overall outcomes of patients diagnosed with gastroschisis and timing of delivery (planned versus non-planned) and mode of delivery (cesarean section versus vaginal delivery). The primary outcome evaluated was the length of hospitalization.

Methods: This work was performed as a ten-year retrospective chart analysis including patients from 2005 to 2013. Inclusion in the study required a pre-operative diagnosis and a surgical intervention for gastroschisis. We identified 29 patients of interest who were filtered based on availability of the specific timing of each intervention. Chi-square test was used to determine statistical differences amongst categorical variables and the student t-test was used to determine differences amongst continuous variables.

Results: The major factors influencing the Length of hospitalization were return of bowel function ($p = 0.0213$) and tolerance of full oral feeds ($p = 0.0116$). Further early extubation was also correlated to a shorter hospitalization ($p = 0.0003$). Analysis of mode of delivery, comparing vaginal delivery to Cesarean section, showed that patients delivered by Cesarean section had a reduced length of hospitalization as compared to those delivered vaginally ($p = 0.0080$). Mode of delivery did not significantly impact the other patient outcomes, but we did find that time to oral feeds was increased in those patients undergoing unplanned deliveries ($p = 0.0176$). No other outcomes were impacted by undergoing a planned versus unplanned gastroschisis delivery.

Conclusion: Our data suggests that patients delivered without prior planning will have an extended time to tolerance of oral feeds. In addition, we find that patients delivered by Cesarean section will have shorter lengths of hospitalizations in the setting of poor antenatal care. Factors influencing length of stay after gastroschisis, such as return of bowel function and time to tolerance of oral feeds may be related to mode and timing of delivery. We recommend that future analysis of larger databases should focus on peri-partum factors that may influence outcomes in gastroschisis. Further greater consideration should be given to the impact of lack of antenatal services in many parts of the world and its implications on maternal fetal wellbeing in congenital malformations such as gastroschisis.

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Introduction

Success rates of gastroschisis interventions have been increasingly examined over the past few years. With information being available from

large databases, it has become possible to draw significant conclusions with regards to the management of this condition from large sample sizes and extrapolate that information with a low probability of a Type I error [1]. The mode of delivery has similarly been studied and based on

*Correspondence to: Sathyaprasad Burjonrappa, MD, MS, FRCS, FACS, MBA, Associate Professor of Surgery and Pediatrics, University of South Florida, 1 Tampa General Circle, Suite G 441, Tampa FL 33606; Fax: 813 844 8045; Tel: 813 844 7354; E-mail: sburjonrappa@usf.edu

scientific evidence vaginal delivery is preferred to cesarean section in the absence of obstetric indications for a cesarean section [2]. Most outcome studies in gastroschisis have evaluated duration of parenteral nutrition, time to full oral intake, duration of mechanical ventilation, incidence of sepsis, length of stay, condition of bowel, and mortality amongst other factors [1, 3]. However, there are not many studies that have linked these gastroschisis outcome variables to mode and timing of delivery. In this study we examine the relationship between outcomes of patients diagnosed with gastroschisis and timing of delivery (planned versus non planned) and mode of delivery (cesarean section versus vaginal delivery).

Methods

This work was performed as a retrospective chart analysis of gastroschisis babies over an eight-year period from 2005 to 2013. Inclusion in the study required a diagnosis of gastroschisis and availability of maternal delivery data. While we identified 29 patients of interest, 23 patients were included for further analysis. Six patients were excluded due to non-availability of maternal data related to the prenatal and perinatal period. Maternal data obtained included mode of delivery (cesarean section versus vaginal delivery) and planned versus unplanned delivery. Neonatal data obtained included sex, gestational age, timing of repair, time to return of bowel function, time to full feeds, duration of intubation, and length of hospitalization. Statistical analysis was performed using the Fisher two tailed test to determine the significance of differences in categorical data and the student t-test was used to analyze continuous variables. Pearson correlation coefficient was used to determine the significance of linear association between two parameters. A probability value of 0.05 was considered significant.

Table 1: Comparison of outcomes for cesarean and vaginal delivery.

	C-Section	Vaginal Delivery	P-Value
Number	17	6	
Length of Stay(Days)	31 (10-61)	103 (27-243)	0.004
Oral Feeds (Days)	16 (11-32)	28 (10-60)	0.05
Gestational Age (weeks)	36 (31-39)	33 (32-35)	0.008
Birth Weight (Gram)	2606 (1230-3530)	2046 (1526-2610)	0.043

Results

There were 13 females and 10 males in the study group (See Table 1). Of the 23 patients, six were delivered by vaginal delivery and 17 after a cesarean section. Sixteen neonates (70%) were born prior to 37 weeks gestational age and classified as premature (Range: 31-36.3 weeks). Seven neonates were born full term. Average birth weight was 2460 grams (Range: 1230-3530g). Details of delivery process were available in 10 patients of whom 6 were planned deliveries and 4 unplanned. All unplanned deliveries and 5/6 planned deliveries were performed by Cesarean section. Four patients had Silos initially followed by definitive closure and 19 had primary closure. Return of bowel function, as evinced by some passage of meconium, was noted on average at 7.5 days after

the definitive closure (Range: 2-18 days). Average time to full oral feeds was 19.5 days (Range: 10-60 days). Average length of intubation of a gastroschisis baby was 9 days (Range: 0-129 days). Average length of hospitalization for the whole cohort was 51 days (Range: 10-243 days). A majority (14/23) of the study population (mothers) had inadequate or poor antenatal care with no documented detection of gastroschisis in the antenatal period.

There was a significant correlation between birth weight and gestational age ($p = 0.0164$). Length of hospitalization was significantly correlated to return of bowel function ($p = 0.0213$), duration of intubation ($n = 21$, $p = 0.0003$), and tolerance of oral feeds ($p = 0.0116$). Intervention strategy (immediate closure versus initial silo) was not significantly associated with duration of intubation, time to return of bowel function, and tolerance of oral feeds. Analysis of mode of delivery, comparing vaginal delivery to cesarean section, showed that patients delivered by cesarean section had a reduced length of hospitalization (Mean of 33; Range:10-61 days) as compared to those delivered vaginally (Mean of 103 days; Range: 27-243 days) ($p = 0.0080$). Mode of delivery did not significantly impact the other patient outcomes. The average birth weight of newborns with a planned delivery was 2661g (Range: 1526-3110) whereas it was 2161g (Range: 1730-2760) ($P < 0.05$). Time to oral feeds was increased in those patients undergoing unplanned deliveries ($n = 6$, $p = 0.0176$). No other outcomes were impacted by undergoing a planned versus unplanned gastroschisis delivery.

Discussion

The natural delivery process has been determined to be safe in babies with an antenatal diagnosis of gastroschisis [4]. In the USA, a large population-based analysis revealed an increased trend towards vaginal delivery of gastroschisis babies amongst pregnant mothers. The obstetric indications for cesarean section in this study included (i) non cephalic presentation, (ii) multiple gestation, (iii) prior cesarean delivery, and (iv) eclampsia. 63.5% of the cohort in this study had an attempted vaginal delivery while 36.5% underwent a planned cesarean section. The rates of vaginal delivery increased from 59% in 2005 to 69% in 2013 [2]. The authors concluded that while more work needs to be done to reduce the rate of cesarean section; there is a greater penetration of research findings into the practice setting. Our high cesarean rates are reflective of the community we serve in inner city with poor antenatal follow up, incomplete perinatal care, lower educational levels, and lower levels of affluence. Our outcomes with gastroschisis suggest that the higher cesarean rates may be protective in the setting of poor antenatal care. In the pediatric surgery literature, there is general consensus that vaginal delivery is better for the mother and does not adversely affect the newborn with gastroschisis. It has been suggested that the physiological stress of labor primes the cardiac and respiratory system for independent survival and is better for gastrointestinal function of the gastroschisis newborn [5]. Results from another medium sized study with 167 patients at a tertiary center showed that multidisciplinary prenatal care allowed for delivery at a later gestational age by vaginal delivery with better outcomes as compared to planned/unplanned cesarean section. [6]

However, we would like to caution that such exemplary results may not be possible without excellent prenatal care that all the participating centers in these studies offer. Higher incidence of chorioamnionitis,

undiagnosed fetal problems, and untreated maternal medical conditions may all affect the outcomes of both the mother and fetus in the setting of poor antenatal care. Having a lower threshold for cesarean section may actually be beneficial in this setting and this is borne out by our results where these infants had a better outcome than those delivered by vaginal delivery. Length of hospitalization in gastroschisis is affected by a number of factors such as prematurity and need for respiratory support, time to return of bowel function and tolerance of oral feeds, other comorbidities, and CLABSI (Central Line associated Blood Stream Infection) [7]. In our study the unplanned deliveries had a longer length of hospitalization likely linked to their significantly lower birth weights and associated issues. They also took a longer time to tolerate full oral feeds.

We conclude from this analysis that the mode of delivery and delivery planning does affect patient outcomes. We would suggest that vaginal delivery based on available scientific data is the optimal delivery modality for patients with adequate prenatal care. In the setting of insufficient prenatal care, cesarean section offers better outcomes in the form of shorter length of stay. The major limitation to this study is the small patient population utilized for analysis as this impacted our ability to identify statistical significance. Further detailed maternal records were not available to fully understand the exact breakdown in prenatal services. Future analysis should be performed utilizing an expanded database of patients in order to further examine how surgeons can alter timing of interventions to reduce patient complications and improve overall outcomes. Generalizability of outcomes to different healthcare delivery systems should be studied in greater detail.

Funding

No funding source was used to conduct this study.

Data Availability Statement

- 1) What the nature of the data: Retrospective data obtained by institutional review board clearance of Newark Beth Israel Medical center.
- 2) Where the data can be accessed: Not stored in data repository.
- 3) Why there are any restrictions on data access: Covered by Health Information and Patient Protection Act (HIPPA). De-identified data was obtained for conducting study.

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