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Prevalence and Risk Factors of Fetal Laceration Injury associated with Cesarean Delivery

Supatchara Taiwan, M.D.*,
Suphet Tuipae, M.D.*,**.

** Department of Obstetrics and Gynecology, Rajavithi Hospital, Bangkok 10400, Thailand*
*** College of Medicine, Rangsit University, Bangkok 12120, Thailand*

ABSTRACT

Objectives: To determine the prevalence and risk factors of fetal laceration injury during cesarean delivery.

Materials and Methods: Computer-based delivery records of Rajavithi Hospital were retrospective reviewed between January 2009 and December 2013. All data including maternal characteristics, neonatal outcomes, operative records and complications of cesarean delivery were collected. Prevalence of fetal laceration injury during cesarean delivery was calculated. Comparison was made between those with and without fetal laceration injury.

Results: During the study period, cesarean deliveris were performed in 10,540 of total 29,532 deliveries (35.7%). Five hundred and fifty cesarean deliveries were met the exclusion criteria. The remaining 9,970 deliveries were analyzed. Thirty-two newborns (0.3%) had observed laceration injury from cesarean delivery. Common sites of laceration injuries were on faces and most of injuries were mild lacerations. Membranes rupture before undergoing cesarean delivery (OR=2.04, 95%CI=1.02 – 4.08) and young maternal age group (OR=3.93, 95%CI=1.58-9.78) are significant risk factors for fetal laceration injury associated with cesarean delivery. Experience of operator, urgency of cesarean delivery and neonatal outcomes show no related association with the injury.

Conclusion: Fetal laceration injury associated with cesarean delivery is uncommon. Rupture of membranes before undergoing cesarean delivery and young maternal age group are major risk factors for the injury. Women with risk factors should be carefully operated during cesarean delivery.

Keywords: fetal laceration injury, cesarean delivery, risk factor

Correspondence to: *Supatchara Taiwan, M.D., Department of Obstetrics and Gynecology, Rajavithi Hospital, Bangkok 10400, Thailand Phone: 02-354-8108 ext. 3226 Email: sup.taiwan@gmail.com*

ความชุกและปัจจัยเสี่ยงต่อการเกิดบาดแผลฉีกขาดในทารกจากการผ่าท้องทำคลอด

ศุภัจฉรา ไต่วัลย์, สุเพ็ชร ทุ้ยแป

บทคัดย่อ

วัตถุประสงค์: *เพื่อศึกษาความชุกและปัจจัยเสี่ยงของการเกิดบาดแผลฉีกขาดในทารกจากการผ่าท้องทำคลอด*

วัสดุและวิธีการ: *ศึกษาบันทึกการคลอดของผู้ป่วยที่ได้รับการผ่าท้องทำคลอดย้อนหลัง 5 ปี คือระหว่าง พ.ศ.2552 ถึง พ.ศ. 2556 เพื่อหาความชุกของการเกิดบาดแผลฉีกขาดของทารกในการผ่าท้องทำคลอด และนอกจากนี้มีการแบ่งกลุ่มที่ทารกมีบาดแผลฉีกขาดและไม่มีบาดแผลฉีกขาด เพื่อเปรียบเทียบศึกษาปัจจัยเสี่ยงที่เพิ่มโอกาสในการเกิดบาดแผลฉีกขาดนี้ โดยปัจจัยที่นำมาศึกษา ได้แก่ อายุสตรีตั้งครรภ์ จำนวนบุตร การแตกของถุงน้ำก่อนการผ่าตัดคลอด ข้อบ่งชี้การผ่าตัด ประสบการณ์ของผู้ผ่าตัด เพศ น้ำหนัก และ Apgar score ของทารก เป็นต้น*

ผลการศึกษา: *จากการศึกษาพบอัตราการผ่าตัดคลอดอยู่ที่ร้อยละ 35.7 คือ มีการผ่าตัดคลอด 10,540 ราย จากจำนวนการคลอดทั้งหมด 29,532 ราย เมื่อศึกษาบันทึกการคลอดทั้งหมด พบว่า 570 รายที่ตรงกับเกณฑ์การคัดออก จึงเหลืออยู่ในการศึกษาทั้งสิ้น 9,970 ราย ในจำนวนนี้พบว่ามีทารกที่เกิดบาดแผลฉีกขาดในการผ่าท้องทำคลอด 32 ราย คิดเป็นร้อยละ 0.3 ด้านปัจจัยเสี่ยงของการเกิดบาดแผลฉีดขาดของทารกนั้น พบว่าการที่ถุงน้ำแตกก่อนการผ่าตัดคลอด และกลุ่มสตรีตั้งครรภ์ที่อายุน้อยเป็นปัจจัยเสี่ยงต่อการเกิดบาดแผลฉีกขาดของทารกในการผ่าท้องทำคลอด*

สรุป: *บาดแผลฉีกขาดของทารกในการผ่าท้องทำคลอดพบได้ไม่บ่อย และการที่ถุงน้ำแตกก่อนการผ่าตัดคลอดรวมถึงกลุ่มสตรีตั้งครรภ์ที่อายุน้อยเป็นปัจจัยเสี่ยงต่อการเกิดบาดแผลฉีกขาดของทารกในการผ่าท้องทำคลอด ดังนั้นบุคลากรทางการแพทย์ควรเพิ่มความระมัดระวังในการผ่าท้องทำคลอดสตรีตั้งครรภ์กลุ่มที่มีปัจจัยเสี่ยงต่อการเกิดบาดแผลนี้*

Introduction

Cesarean delivery has become a common method of delivery. World Health Organization suggested national cesarean delivery rate should be between 10-15%[1]. However, half of these countries had higher than 15% of cesarean section[2]. Accordingly in Rajavithi Hospital, cesarean delivery rate continuously increased from 24.4% in 2002 to 34.7% in 2011[3].

Fetal injury during delivery can occurred in normal delivery, operative vaginal delivery and cesarean delivery, of which increased neonatal morbidity rate, neonatal mortality rate, length of stay and stress for pregnant women and their families. Fetal laceration injury, the most common injury during cesarean delivery[4], has been reported between 0.4-3.1% of deliveries[4-10]. Once laceration injury occurred, women and families expressed their concerns about management, cosmetic recovery and functional results. Multidisciplinary team approach was also needed in management of injury, especially in severe laceration.

Several factors involved frequency of fetal laceration injury. Emergency cesarean delivery[6,7] and rupture of membranes[5-7] were demonstrated as the significant factors for the injury. Prevalence and risk factors of fetal laceration injury at cesarean delivery were not well defined in Rajavithi Hospital and the Asia-Pacific region.

The aim of this study was to determine the prevalence and risk factors of fetal laceration injury associated with cesarean delivery.

Material and methods

The present study was conducted after approval from the Research Ethical Committee of Rajavithi Hospital. All deliveries within 5-year period between January 2009 and December 2013 in Rajavithi Hospital, a tertiary center were recruited. Important delivery data were collected from computer-based delivery records included maternal age, number of children, gestational age, ruptured of membranes, indications for cesarean delivery, experience of the surgeons, fetal presentation, gender, birth weight, Apgar score, birth injury, site and severity of birth injury and management.

All pregnant women who undergone cesarean delivery during 5-year period were included in this study while exclusion criteria were multiple pregnancy, death fetus in utero and incomplete data.

The laceration is an injury that results in a break of skin. In this study defined fetal laceration injury as an iatrogenic cut to any part of fetus. After cesarean delivery, newborns were transferred to neonatal unit. Laceration injury could be recognized by surgeons, pediatricians or neonatal nurses and then confirmed by neonatologist. Laceration injury and management were recorded into delivery record. All delivery records were reviewed for documentation of fetal laceration injury during cesarean delivery and data was organized into groups with and without fetal laceration injury.

Severity of fetal laceration injury were defined as mild, moderate and severe lacerations[6]. Mild degree is a laceration limited at the level of skin, moderate degree is a laceration involved subcutaneous and muscle, severe degree is a laceration involved deeper structures such as bone, vessels and nerves.

Experience of the surgeon was defined as senior staff, junior staff and resident. Senior staff is an attending physician who obtained Diploma in Obstetrics and Gynecology for more than 5 years, junior staff is an attending physicians who obtained Diploma in Obstetrics and Gynecology within 5 years and resident is a physician who attended the residency training program in Obstetrics and Gynecology.

Urgency category of cesarean delivery was classified into 4 groups; Emergency, urgency, schedule and elective surgery[11]. Emergency cesarean delivery is performed immediately in life-threatening condition of woman or fetus, urgency cesarean delivery is performed when maternal or fetal compromise which is not immediately life-threatening, scheduled cesarean delivery is performed when a condition need early delivery but no maternal

or fetal compromise and elective cesarean delivery is performed at a time to suit woman and maternity team.

Prevalence of fetal laceration injury during cesarean delivery was calculated compared with total numbers of cesarean deliveries. Comparison was made between those with and without fetal injuries. Statistical analysis included Student T-test, Fisher's exact test and Chi-square test. $P < 0.05$ was considered statistical significant. Odds ratio was used to evaluate greater risk for significant factors. Statistical analyses were performed by software SPSS version 17.0. Chicago: SPSS Inc.

Results

Between January 2009 and December 2013, there were total 29,532 deliveries which 10,540 were cesarean delivery (35.7%). The study excluded 570 deliveries that 344 deliveries were multiple pregnancies, 29 deliveries were fetal death in utero and 197 deliveries had incomplete information. The remaining 9,970 deliveries were analyzed.

During the study period, 32 newborns were identified with laceration injury during cesarean delivery. The prevalence of fetal laceration injury during cesarean delivery was 0.30%. Fig. 1. demonstrates common sites of laceration injury, mostly were on the faces[16], others were on scalps[11], bodies[3] and extremities[2], respectively. Almost injuries were mild lacerations which were treated by skin adhesive tapes or left secondary healing. Two newborns had moderate lacerations involved subcutaneous layer and required surgical suturing. Severe laceration was not found in this study.

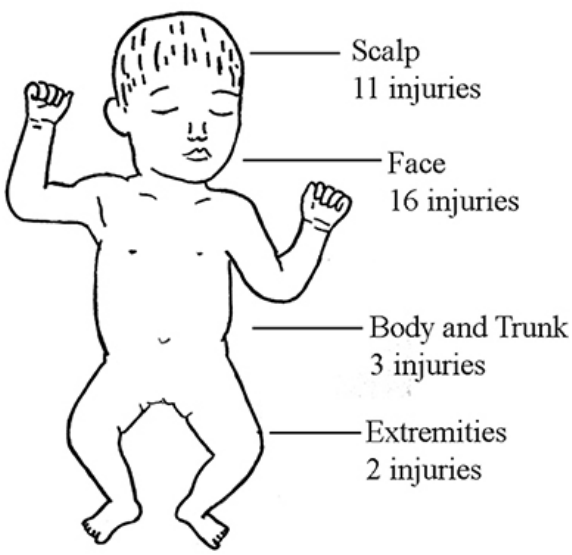

Fig. 1. Position and numbers of fetal laceration injury

Baseline characteristics, outcomes and details of operation from delivery records are demonstrated in Table 1. There were statistical significance in ruptured of membranes and young pregnant women. Mean maternal age in fetal laceration injury group was 26.50 years old, younger than group without the injury which mean maternal age was 29.51 years old. Ruptured of membranes were found in a half of group with fetal laceration injury during cesarean delivery.

Table 1. Baseline characteristics, neonatal outcomes, and operative records of women undergoing cesarean delivery.

Variable	Cesarean delivery				p value
	with fetal laceration injury (n = 32)		without fetal laceration injury (n = 9,938)		
	n	%	n	%	
Maternal age group					0.003*
Mean+SD	26.50±6.20		29.51±5.98		0.005†
< 20 years	6	18.8	527	5.3	
20-34 years	21	65.6	7,251	73.0	
≥ 35 years	5	15.6	2,160	21.7	
Parity					0.790*
Nulliparity	15	46.9	4,426	44.5	
Multiparity	17	53.1	5,512	55.5	
Gestational age group					0.346*
Mean+SD	38.25±1.88		38.11±2.37		0.737
< 37 weeks	4	12.5	1,409	14.2	
≥ 37 weeks	28	87.5	8,509	85.8	
Ruptured membranes					0.040*
Yes	16	50	3,273	32.9	
No	16	50	6,665	67.1	
Presentation					0.517*
Vertex	22	68.8	7,334	73.8	
Non-vertex	10	31.2	2,604	26.2	
Birth weight					
Mean±SD	3100.25±527.67		3055.33±607.35		0.676†
< 2,500 grams	4	12.5	1,321	13.3	
2,000 – 3,999 grams	28	87.5	8,248	83.0	
≥ 4,000 grams	0	0	369	3.7	
Fetal Gender					0.862‡
Male	16	50	5,190	52.2	
Female	16	50	4,748	47.8	
Apgar score at 5 min					0.28*
< 7	0	0	1,134	11.4	
≥ 7	32	100	8,836	88.6	
Mode (min-max)	10 (8-10)		10 (0-10)		
Experience of operator					0.647*
Resident	23	71.9	6,497	65.4	
Junior staff	0	0	125	1.3	
Senior staff	9	28.1	3,316	33.4	

* = p-value from Chi-square test, † = p-value from Independent t-test, ‡ = p-value from fisher's exact test, significant at the 0.05 level

The odds ratio of young pregnant women group of below 20 years old was 3.93 compared to age group of 21-34 years old ($p < 0.05$, 95% CI=1.58-9.78). Same as group of membranes ruptured before undergoing cesarean delivery, there was 2.04 times greater risk compared to group of intact membranes (OR = 2.04, 95%CI=1.02–4.08). This has just been discussed in Table 2. Otherwise, there was no statistical difference in maternal age, gestational age, parity, fetal presentation, fetal outcomes, fetal gender and experience of surgeon.

Table 2. Associated risk factors of fetal laceration injury during cesarean delivery..

Characteristics	OR	95% CI	p value
Maternal age (years)			
< 20	3.93	1.58-9.78	0.003
20-34	1		
≥ 35	0.80	0.30-2.12	0.653
Membranes rupture			
MR	2.04	1.02-4.08	0.045
MI	1		

p-value < 0.05 = statistical significant

The most common indications for cesarean delivery was cephalopelvic disproportion (31.0%), and previous cesarean delivery (27.5%) respectively. Table 3 shows fetal laceration injury associated with urgency category of cesarean delivery. Most of fetal laceration injuries occurred in scheduled group while there was no injury in emergency group. However there was no statistical significance in fetal laceration injury between groups of urgency category and indication for cesarean delivery.

Table 3. Fetal laceration injury during cesarean delivery per urgency category of cesarean delivery.

Urgency category of cesarean delivery	Cesarean delivery				p value
	with fetal laceration injury (n = 32)		without fetal laceration injury (n = 9,938)		
	n	%	n	%	
					0.177*
Emergency	0	0	346	3.5	
Urgent	4	12.5	835	8.4	
Scheduled	22	68.8	5,443	54.8	
Elective	6	18.8	3,314	33.3	

* p value from Chi-Square test

Discussion

There were 29,532 deliveries in Rajavithi Hospital during 2009 to 2013 and 10,540 were cesarean deliveries (35.7%). Five hundred and fifty cesarean deliveries were met exclusion criteria. The remaining 9,970 deliveries were analyzed. This study shows a higher cesarean section rate more than WHO suggestion[1], concordance to the worldwide study[2] and

the previous study in Rajavithi Hospital[2].

Fetal laceration injury during cesarean delivery identified in this study has lower comparing with previous studies[2-7]. Half of the injury significantly occurred when cesarean delivery performed after rupture of membranes which may relat to decrease in the distance between endometrium and fetal part. This observation correlated with previous study that rupture of membranes was concurred to be important risk factor[5-7].

It is interesting that lower maternal age was a risk factor for fetal laceration injury during cesarean delivery and previous studies had not mentioned maternal age was a risk factor. Further study may helpful for biological reason and more explanation.

Common sites of injury were scalp, face, extremities and body, respectively. These may correlate with higher ratio of vertex presentation. Almost of injuries were mild type and healed with sterile stripe or secondary healing. Two had moderate lacerations and were treated with surgical suture. Long term consequence and cosmetic satisfaction were not described in this study.

Surgical techniques were used to prevent of fetal laceration injury. Scalpel uterine entry with meticulous suction may reduce incidence of injury[6]. For extension of uterine incision, elevating uterine wall away from fetal parts by finger or Allis clamp before sharp uterine entry and finger blunt extension were described instead of direct scalpel incision or scissors[10].

This 5-year study provided a large population group with including several factors to investigate the potential risk of fetal laceration injury associated with cesarean delivery. On the other hand, the series had small number of injury group which could from under diagnosis and miscoding. Improvement of diagnosis and recording injury would increase number of injury group and provide more significant factor.

In summary, fetal laceration injury is the most common fetal injury associated with cesarean delivery. The risk factor for the injury is rupture of membranes before undergoing cesarean delivery and young maternal age group. Surgeon may reduce rate of laceration in high risk injury group by meticulous uterine wall incision and entry. Fetal laceration injury should be counselled together with other complications of operation in high risk patient group.

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Potential conflcts of interest

The authors declare no conflct of interest.

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