ORIGINAL ARTICLE

Evaluation of Lower Uterine Segment in Women with Previous Cesarean Section by Transabdominal Ultrasonography & its Relation to Feto-Maternal Outcome

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Abstract

The present study was conducted to assess the lower uterine segment with transabdominal sonography (TAS) in women with a previous cesarean section at 36-38 weeks gestation and to study the relationship between various LUS measurements and feto-maternal outcomes. Out of 110 patients enrolled, 10 (9%) with LUS thickness <2 mm were considered as poor healing group and were taken for elective LSCS. Remaining 100 were divided into two groups, 2-3.5 mm group and >3.5 mm group; 92% patients with LUS thickness >3.5 mm and 14% with LUS thickness between 2-3.5 mm delivered vaginally. The fetomaternal outcomes among patients with LUS thickness >3.5 mm were observed to be significant in the form of lower occurrence of puerperal pyrexia (4%), atonic PPH (4%), blood transfusion requirement (2%), less NICU admission (2%), less number of newborns with Apgar score <7 (2%), and with no cases of stillbirth, uterine rupture or uterine dehiscence when compared with LUS thickness 2-3.5 mm. Thus, patients with LUS thickness >3.5 mm had high rate of vaginal deliveries with favourable feto-maternal outcome, resulting in less maternal and perinatal morbidity and mortality. Thus, patients with ultrasonographic LUS thickness >3.5 mm at 36-38 weeks can be selected safely for vaginal birth after cesarean with favourable feto-maternal outcome.

Key Words

Lower Uterine Segment, Transabdominal Sonography, Cesarean Section

Introduction

Attempted vaginal birth after previous cesarean delivery (VBAC) remains controversial. The dictum "once a cesarean, always a cesarean", espoused by Cragin in 1916 was revised in many countries and a trial of labor in women with history of cesarean section was proposed as an attempt to reduce cesarean section rates.(1-4)

When VBAC is successful, it is associated with less morbidity than repeat cesarean delivery. The advantages include fewer blood transfusions, fewer postpartum infections and shorter hospital stays usually with no increased perinatal morbidity. (2,5) Those patients who fail a trial of labor are at increased risk for infection and morbidity. (6,7)

Delivery by elective LSCS carries long term risks of complications like placenta previa, placenta accrete adhesions, bladder injury, hysterectomy, etc. Also, the cost of this major operation is also another factor to make the obstetrician think about the TOL by the vaginal route in scarred uterus as an alternative of routine repeat cesarean. VBAC is associated with a risk of uterine rupture.(8) Rupture of the uterine scar can be life threatening for both mother and infant. (9,10)

Published reports on trial of labor (TOL) in a scarred uterus have shown both advantages and disadvantages of TOL. But the disadvantages like scar rupture, need for hysterectomy, etc. are the result of blindly selecting patients for trial of vaginal birth as there were no reliable methods to predict the risks of uterine rupture in these patients. With the availability of transabdominal ultrasonography, assessment of the integrity of the lower

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uterine segment has become possible even in a gravid uterus. Sonographically, the lower uterine segment appears as a two-layered structure that consists from the urinary bladder inward of the echogenic visceral-parietal reflection including the muscularis and mucosa of the urinary bladder (the outer layer), and the relatively hypoechoic myometrial layer.(11) Considering the importance of TAS in evaluating the integrity of LUS and ensuring the safety of VBAC, we conducted the present study to assess the LUS measurements (thickness, dehiscence, rupture) with TAS in women with a previous one CS at 36-38 weeks gestation and studied the relationship between various LUS measurements and feto-maternal outcome.

Material and Methods

This prospective study was conducted in the Department of Obstetrics and Gynaecology, SMGS Hospital, Government Medical College, Jammu. Patients with previous one cesarean section (CS) at 36-38 weeks gestation who attended OPD and were admitted in the labor ward for delivery w.e.f. December, 2008 to October, 2010 were inducted in the study group. Subjects who fulfilled the following criteria were included in the study group: patient not in labor, gestation 36-38 weeks, singleton pregnancy, normal amniotic fluid volume and placenta upper segment. A detailed history was enquired in each case and a thorough general physical, systematical and obstetrical examination was performed followed by transabdominal sonographic examination. On ultrasound, we examined LUS, longitudinally and transversally, and the measurement was taken with the cursors at the urinary bladder wall-myometrium interface and the myometrium/ chorioamniotic membrane-amniotic fluid interface. At least 2 measurements were taken and the lowest value was taken as the LUS thickness. A LUS thickness of >2 mm was categorized as good healing and selected as trial for vaginal delivery if no other obstetrical indication existed for a repeat C/S. A LUS thickness of <2 mm, abnormal thinning and defect was categorized as poor healing and considered for elective C/S. The patient's labor and delivery outcomes were reviewed. If any patient had repeat cesarean section, the obstetrician commented on appearance of lower uterine segment (LUS) under following categories: Class I - well developed lower segment; Class II - a thin lower segment but uterine contents not visible; Class III - translucent and uterine contents visible through the lower segment; and Class IV - a well circumscribed defect present in the lower segment.The relationship between various lower uterine segment measurements with respect to the delivery outcome and the intra-operative lower uterine segment appearance were reviewed. Finally, the relationship between the lower uterine segment thickness and feto-maternal outcome was found out. Feto-maternal outcome was analysed by taking into consideration the following: Apgar score at 5 minutes <7 or >7, requirement of NICU admission, occurrence of stillbirth, blood transfusion (at least one unit), atonic PPH, puerperal pyrexia, occurrence of uterine dehiscence and occurrence of uterine rupture.

Statistical Analysis

Data was presented as mean ± SD for quantitative variables and percentages for qualitative variables and analysed with the help of computer software MS Excel and SPSS for Windows. Relationship between LUS measurements and feto-maternal outcome was assessed by use of Odd's Ratio (OR) and corresponding 95% confidence interval (CI). Adjustment for confounding was undertaken by the use of multivariate methods involving logistic regression. A p-value < 0.05 was considered statistically significant.

Results

The sample size for the study comprised of 110 patients selected depending upon the eligibility criteria for inclusion. According to parity, 82% cases were para 1, 14.5% were para 2 and only 3.5% cases were para 3; 45.5% patients each had 2-3.5 mm or >3.5 mm LUS thickness, while

Table 1 . Distribution of Cases According to Mode of Delivery in Relation to lower Uterine Segment (LUS) Thickness

Lower uterine segment thickness	Vaginal deliveries No. (%)	Emergency LSCS No. (%)	Laparotomy for scar rupture No. (%)
2-3.5 mm (n = 50)	7 (14)	42 (84)	1 (2)
> 3.5 mm (n = 50)	46 (92)	4 (8)	–

Table 2. Distribution of Cases According to Intraoperative Assessment of Lower Uterine Segment (LUS) in Relation to LUS thickness (n = 47)

Lower uterine segment thickness	Class I No. (%)	Class II No. (%)	Class III No. (%)	Class IV No. (%)
2-3.5 mm	21 (49)	13 (30)	8 (19)	1 (2)
> 3.5 mm	4 (100)	–	–	–

Table 3. Apgar Score at 5 Minutes in Relation to LUS Thickness

LUS thickness	Apgar score <7 No. (%)	Apgar score >7 No. (%)	Odd's ratio	95% CI
2-3.5 mm (n = 50)	8 (16)	42 (84)	9.33	1.10-207.10
>3.5 mm (n = 50)	1 (2)	49 (98)		

Table 4. Number of NICU Admissions in Relation to Lower Uterine Segment (LUS) Thickness

Lower uterine segment thickness	NICU admissions	
	Required No. (%)	Not required No. (%)
2-3.5 mm (n = 50)	6 (12)	44 (88)
> 3.5 mm (n = 50)	1 (2)	49 (98)

Table 5. Relationship of Puerperal Pyrexia with LUS Thickness

LUS thickness	Puerperal pyrexia		Odd's ratio	95% CI
	Occurred No. (%)	Not occurred No. (%)		
2-3.5 mm	11 (22)	39 (78)	6.77	1.29-47.19
>3.5 mm	2 (4)	48 (96)		

Table 6 Relationship of atonic PPH with LUS thickness

LUS thickness	Atonic PPH		Odd's ratio	95% CI
	Occurred No. (%)	Not occurred No. (%)		
2-3.5 mm (n = 50)	9 (18)	41 (82)	5.27	0.97-37.59
>3.5 mm (n = 50)	2 (4)	48 (96)		

Table 7. Relationship of requirement of blood transfusion (1 unit) with LUS thickness

LUS thickness	Blood transfusion		Odd's ratio	95% CI
	Given No. (%)	Not given No. (%)		
2-3.5 mm (n = 50)	8 (16)	42 (84)	9.33	1.10-207.10
> 3.5 mm (n = 50)	1 (2)	49 (98)		

Table 8. Relationship of uterine dehiscence with LUS thickness

LUS thickness	Uterine dehiscence	
	Present No. (%)	Not present No. (%)
2-3.5 mm (n = 50)	8 (16)	42 (84)
> 3.5 mm (n = 50)	—	50 (100)

9% patients had <2 mm LUS thickness. The patients who had LUS thickness <2 mm on TAS underwent elective LSCS. These cases were excluded from the feto-maternal outcome assessment.

Rest 100 patients with LUS thickness >2 mm were divided into two groups - 2-3.5 mm and >3.5 mm and given trial of labor and relationship between the LUS measurement and fetomaternal outcome were measured. All the patients after undergoing TAS were observed for mode of delivery. Out of 50 patients with LUS thickness between 2 to 3.5 mm, 84% had emergency LSCS, 14% delivered vaginally and 2% had laparotomy for scar rupture. On the other hand, majority of patients (92%) with LUS thickness >3.5 mm delivered vaginally. Only

8% needed emergency LSCS (*Table 1*). Out of 43 patients with LUS thickness between 2 to 3.5 mm, 49% had class I (well developed lower segment), 30% had class II (thin lower segment), 19% had class III (translucent LUS and uterine contents visible through the lower segment) and 2% had class IV (rupture uterus) findings. On the other hand, all the patients with LUS thickness > 3.5 mm had class I intraoperative findings (*Table 2*).

One patient (2%) with LUS thickness >3.5 mm had new born with Apgar score <7 as compared to 8 (16%) patients with LUS thickness between 2 to 3.5 mm. The overall risk of Apgar score <7 with LUS thickness between 2 to 3.5 mm was 9.33 (1.10-207.10). The difference was statistically significant (p=.01, Fisher's exact test) (*Table 3*).

Six (12%) new borns in the LUS thickness group between 2 to 3.5 mm required NICU admission during the follow-up. On the other hand, only 2% new born in the LUS thickness group >3.5 mm required NICU admission. Overall risk of requirement of NICU admission with LUS thickness between 2 to 3.5 mm was 6.68 (0.74-153.14). The difference was statistically non-significant (p=.05, $\chi 2$=3.82) (*Table 4*). There was 4% stillbirth occurrence with LUS thickness group between 2 to 3.5 mm. On the other hand, there was no case of occurrence of stillbirth in the >3.5 mm LUS thickness group. The difference was found to be non-significant.

Eleven (22%) patients with LUS thickness between 2 to 3.5 mm developed puerperal pyrexia during the follow-up period of 10 days, excluding the first 24 hours. On the other hand, only 2% patients with LUS thickness >3.5 mm developed puerperal pyrexia. Overall risk of having puerperal pyrexia in patients with LUS thickness between 2 to 3.5 mm was 6.77 (1.29-47.19). The difference was found to be statistically highly significant (p=.007, $\chi 2$=7.16) (*Table 5*).

Nine (18%) patients with LUS thickness between 2 to 3.5 mm had atonic PPH, while 2 (4%) patients with LUS thickness >3.5 mm had atonic PPH. The overall risk of atonic PPH with LUS thickness is 5.27 (95% CI, 0.97-37.59). The difference was found to be statistically significant (p=.02, $\chi 2$=5.01) (*Table 6*).

Eight (16%) patients with LUS thickness between 2 to 3.5 mm were given blood transfusion, whereas 2% patients with LUS thickness >3.5 mm were given blood transfusion. The overall risk of blood transfusion with LUS thickness between 2 to 3.5 mm is 9.33 (1.10-207.10). The difference is significant (p=.01, Fisher's exact test) (*Table 7*). Eight (16%) patients with LUS thickness between 2 to 3.5 mm had uterine dehiscence. However, no patient showed uterine dehiscence with LUS thickness >3.5 mm. The difference was highly significant (p=.0005, Fisher's exact test) (*Table 8*). Only 1 (2%) with LUS thickness between 2 to 3.5 mm had uterine rupture, whereas no patient with LUS thickness >3.5 mm had uterine rupture. The difference was non-significant.

Discussion

Out of 110 patients studied, 45.5% cases had LUS thickness between 2 to 3.5 mm, 45.5% patients had LUS thickness >3.5 mm and 9% patients had LUS thickness <2 mm. All patients after undergoing TAS were observed for mode of delivery. All patients (9%) with LUS thickness <2 mm were considered as poor healing group and were taken for elective LSCS. Those with LUS thickness >2 mm were given trial of labor. These patients were divided into two groups - first 2 to 3.5 mm group and second >3.5 mm group. It was found that 92% patients with LUS thickness >3.5 mm delivered vaginally and only 8% had emergency LSCS. Those with LUS thickness between 2 to 3.5 mm, only 14% delivered vaginally, 84% had emergency LSCS and 2% had laparotomy for scar rupture. All the four emergency LSCS patients with LUS thickness >3.5 mm had class I intraoperative finding. Out of 42 emergency LSCS patients and 1 laparotomy patient with LUS thickness between 2 to 3.5 mm, 49% had class I, 30% class II, 19% class III and 2% class IV intraoperative findings. After statistical evaluation of relationship of puerperal pyrexia with LUS thickness, it was observed that out of 50 patients with LUS thickness between 2 to 3.5 mm, 22% have puerperal pyrexia as compared to only 4% patients with LUS thickness > 3.5 mm. The overall risk of having puerperal pyrexia was more in patients with LUS thickness between 2 to 3.5 mm and the difference was found to be statistically highly significant (p = 0.007).

After statistically evaluation of relationship of atonic PPH with LUS thickness, it was observed that atonic PPH occurred in 18% patients with LUS thickness between 2 to 3.5 mm as compared to only 4% patients with LUS thickness > 3.5 mm. The overall risk of atonic PPH was more in patients with LUS thickness between 2 to 3.5 mm and the difference was found to be statistically significant (p = 0.02). After statistical evaluation of relationship of one unit of blood transfusion with LUS thickness, it was observed that 16% patients with LUS thickness between 2 to 3.5 mm required 1 unit of blood transfusion as compared to only 2% patients with LUS thickness > 3.5 mm. The overall risk of blood transfusion requirement was more in patients with LUS thickness

between 2 to 3.5 mm and the difference was found to be statistically significant (p = 0.01).

After statistical evaluation of relationship of uterine dehiscence with LUS thickness, it was observed that 16% patients with LUS thickness between 2 to 3.5 mm had uterine dehiscence as compared to nil in case with LUS thickness > 3.5 mm. Highly significant (p = 0.0005) association was observed between utrine dehiscence and LUS thickness between 2 to 3.5 mm. Out of 100 patients with trial of labor, only 1 patient had ruptured uterus in the LUS thickness group of 2 to 3.5 mm. Therefore, there was statistically non-significant relationship between the ruptured uterus and LUS thickness.

After statistical evaluation of relationship of Apgar score new born at 5 minutes with the LUS thickness, it was observed that out of 50 patients with LUS thickness between 2 to 3.5 mm, 16% patients had newborns with Apgar score < 7 at 5 minutes as compared to only 2% patients with LUS thickness > 3.5 mm. The overall risk of having new born with Apgar score < 7 was more in patients with LUS thickness between 2 to 3.5 mm and the difference was found to be statistically significant (p = 0.01).

After statistical evaluation of relationship of NICU admissions with LUS thickness, it was observed that out of 50 patients with LUS thickness between 2 to 3.5 mm, 12% newborns required NICU admission as compared to only 2% newborns of patients with LUS thickness > 3.5 mm. The overall risk of requirement of NICU admission was more in patients with LUS thickness between 2 to 3.5 mm and the difference was found to be statistically significant (p = 0.05). Out of 100 patients with trial of labor, 2 cases of stillbirth were reported in the LUS thickness group of 2 to 3.5 mm. However, there was statistically non-significant relationship between the occurrence of stillbirths and LUS thickness.

Montanari *et al*.(12) studied 61 pregnant women between 37 and 40 weeks gestation with previous one cesarean section. On the basis of the surgical findings and outcome of trial of labor, scoring was done - score 1 to the women who had good healing or a favourable feto-maternal outcome, score 2 to poor healing or a unfavourable feto-maternal outcome. They found that those with LUS thickness > 3.5 mm had better feto-maternal outcome as compared to those with < 3.5 mm. Landon *et al*. (13) reported significant association between endometritis, blood transfusion and failure of trial of labor; 3.2% patients with failed trial of labor required blood transfusion as compared to 1.2% with successful trial of labor, 7.7% patients with failed trial of labor had endometritis as compared to 1.2% with successful trial of labor. Also, 1.7% patients with trial of labor required blood transfusion as compared to 1% with elective LSCS, 2.9% patients of trial of labor had endometritis as compared to 1.8% with elective LSCS.

Conclusion

TAS is a simple, safe, diagnostic tool in the evaluation of previous cesarean patients. Antenatal ultrasonographic measurement of LUS thickness at 36-38 weeks is an appropriate diagnostic procedure to decide the mode of delivery. In the present study, it was observed that patients with LUS thickness >3.5 mm had high rate of vaginal deliveries with favourable feto-maternal outcome, resulting in less maternal and perinatal morbidity and mortality. These patients can be selected safely for vaginal birth after cesarean with favourable feto-maternal outcome.

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