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CLINICAL ARTICLE

Obstetrics

Changes in lower uterine segment thickness during different gestational weeks in pregnant women qualified for trial of labor after cesarean section

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Abstract

Objective: To investigate the correlation between lower uterine segment thickness (LUST) and gestational weeks (GW) in women who attempted trial of labor after cesarean section (TOLAC) and to estimate the reference ranges of LUST.

Methods: A prospective cohort study was conducted between January 2019 and December 2020 at a tertiary-care center in Foshan, China. A total of 2588 women who attempted TOLAC were included. LUST was measured in different trimesters using transabdominal ultrasound. Histograms were used to review the mean and standard deviations (SD) of LUST at different GW.

Results: The mean LUST of the patients were 6.90 ± 2.86, 4.36 ± 1.87, 2.83 ± 0.65, and 2.57 ± 0.51 mm in the first (12.10 ± 1.28 weeks), second (21.79 ± 3.40 weeks), middle third (34.28 ± 2.64 weeks), and late third (38.20 ± 1.00 weeks) trimesters, respectively. An inverse correlation was noted between LUST and uterine rupture in women who underwent a planned ERCD ($P < 0.001$), but not in women who attempted TOLAC during the late third trimester ($P = 0.629$).

Conclusion: LUST is inversely correlated with GW and decreases faster in the first and second trimesters than in the middle and late third trimesters. TOLAC should be approached with caution for pregnant women with a thin myometrium in late third trimester.

KEYWORDS
cesarean section, lower uterine segment thickness, trial of labor, ultrasonography, uterine rupture

1 | INTRODUCTION

The global rate of cesarean delivery (CD) increased from 12.1% in 2000 to 21.1% in 2015.[1] China's CD rates decreased from 46.2% in 2010[2] to 36.7% in 2018, though the rate remains high and is accompanied by substantial maternal morbidity. Vaginal birth after cesarean (VBAC) rates have increased from 5% in 1985 to 28.3% in 1996, though they steadily declined to 8.5% in 2006 in the USA because of the fear

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of uterine rupture.[3] However, the rate of trial of labor after cesarean section (TOLAC) has been slowly increasing in both the USA and China[4] because of continual improvements in the TOLAC guidelines[3,5] and the increasing number of hospitals able to perform emergency CD.

Uterine rupture is a rare and poentially deadly complication of TOLAC. Elective repeat cesarean deliveries (ERCD) can result in surgical injury, incurable postnatal hemorrhage, unplanned hysterectomy, and complications in subsequent pregnancies.[6–8] The choice of mode of delivery after CD is controversial. A successful VBAC can effectively improve short-term and long-term complications[9,10] and is related to a reduction in CD rates at the population level.[11] A large sample study[11] showed a lower incidence of blood transfusions, uterine rupture, unplanned hysterectomy, and admission to intensive care units in patients who underwent VBAC than in those who underwent ERCD. Hence, TOLAC is an option for pregnant women with a history of cesarean section.[12]

Selecting pregnant women with high VBAC success potential and a low risk of uterine rupture is important. Screening candidates qualified for TOLAC is difficult in clinical obstetrics. Previous studies have used lower uterine segment thickness (LUST) to predict uterine rupture and success rate of TOLAC; however, reference values for LUST during pregnancy and the optimal cuff-off value for the prediction of uterine rupture in women attempting TOLAC have not been determined.

A large sample size and nonlinear locally estimated scatterplot smoothing (LOESS) regression fitting were used to determine the correlation between LUST and gestational week (GW) in pregnant patients without TOLAC contraindications in the present study to determine reference ranges of LUST at different GW.

2 | MATERIALS AND METHODS

2.1 | Study population

A prospective cohort study was conducted between January 2019 and December 2020 at the Affiliated Foshan Maternity & Child Healthcare Hospital, Southern Medical University (Foshan Maternity & Child Healthcare Hospital). This hospital is a tertiary, university-affiliated medical center with approximately 13 000 deliveries per year (accounting for approximately 10% of the city's deliveries) that provides care for the region's obstetrical population, especially those with complicated pregnancies. Women between 7^{+0} weeks and 41^{+3} weeks of pregnancy with a singleton pregnancy who had undergone one or two previous low transverse CD and with no TOLAC contraindications were included.

The inclusion criteria were as follows: (1) age 18–40 years with a desire to undergo TOLAC; (2) one or two previous CD with a transverse lower segment uterine incision, without other uterine surgical scars; (3) cephalic position of fetus and no previous indications of CD nor new indications for CD; (4) >18 months since last delivery. The exclusion criteria were as follows: (1) previous classical cesarean section with a T-shaped incision; (2) history of uterine scar pregnancy surgery, uterine rupture, or dehiscence; (3) multiple pregnancy, hip position, or threatening uterine rupture or dehiscence; (4) unsuitable for vaginal delivery because of internal and surgical complications.

This study was approved by the Human Subjects Committee of the Affiliated Foshan Maternity & Child Healthcare Hospital, Southern Medical University (approval number FSFY-MEC-2019-044). This study is registered in the Chinese Clinical Trial Registry (registration number: ChiCTR1800017801).

2.2 | Study procedures

At the time of admission, women with a combination of factors including not being suitable for CD, or reluctance by the pregnant woman to undergo TOLAC, requiring a planned CD, were classified as a planned ERCD group. These planned CD were usually performed after 38–39 weeks of pregnancy, and we made personalized decisions based on obstetrical factors. Pregnant women who had been assessed in the late stages of pregnancy to meet the TOLAC exclusion criteria and who were willing to give birth on a trial entered the delivery room. If the vaginal delivery was successful, it was classified as the VBAC group, and if the vaginal delivery failed, it was classified as the ERCD group. The indication for ERCD was determined by experienced obstetricians according to the comprehensive decision of fetal electrocardiogram, abnormal vaginal bleeding, blood urine, low blood volume shock, and abnormal fetal head position. We closely monitored the progress of the delivery process in pregnant women attempting TOLAC for slow progress. When the active period stagnates or rise and fall blocked, there should be vigilance for the occurrence of uterine rupture and appropriate plans for CD.

Thin LUST is a risk factor of uterine rupture. Therefore, we do not recommend TOLAC for pregnant women whose LUST is thin (e.g., less than a standard deviation, <2 mm). Although there is a relationship between LUST and risk of uterine rupture, the absolute cut-off between safe and unsafe trial of labor after CD were uncertain. In clinical practice, we would recommend that pregnant women with low LUST (e.g., less than a standard deviation, <2 mm) should have a planned elective CD. However, this recommendation is not mandatory, if the patient's other obstetric factors are suitable for TOLAC, and there is high wiliness for TOLAC, then pregnant women with thin LUST can also be given the opportunity to undergo a TOLAC.

All ultrasound examinations were performed using a GE Voluson V730 Expert ultrasound machine (GE Healthcare, Chicago, IL, USA; Zipf) equipped with a transabdominal transducer (RAB 4–8 L, 4.0–8.0 MHz), a GE Voluson S8/S6 ultrasound machine (GE Healthcare) equipped with a transabdominal transducer (C1-5-RS, 2–5 MHz), or a transvaginal transducer (RIC5-9-D, 3.0–9.0 MHz), or a Samsung (Samsung Electronics, Suwon-Si, South Korea) UGEO H60 ultrasound machine equipped with a transabdominal transducer (CA1-7AD, 1.0–7.0 MHz) or transvaginal transducer (EVN4-9, 4.0–9.0 MHz). The sonographic examination and measurements of LUST were performed by trained sonographers, and were usually performed transabdominally, though a few measurements were made transvaginally as the transabdominal image was not well visualized. Transabdominal assessments were conducted when the patient's bladder was full. The LUST was examined longitudinally

and transversely to identify the thinnest part of the myometrial layer and magnified so that movements of the calipers resulted in a 0.1-mm change. Measurements were obtained with the inner border of the horizontal line of the calipers placed on the inside edge of the white lines bordering the myometrium, perpendicular to the measured wall. At least three measurements were made, and the minimum value was retained as the dependent variable. In this study, the measured LUST represents the thinnest part of the

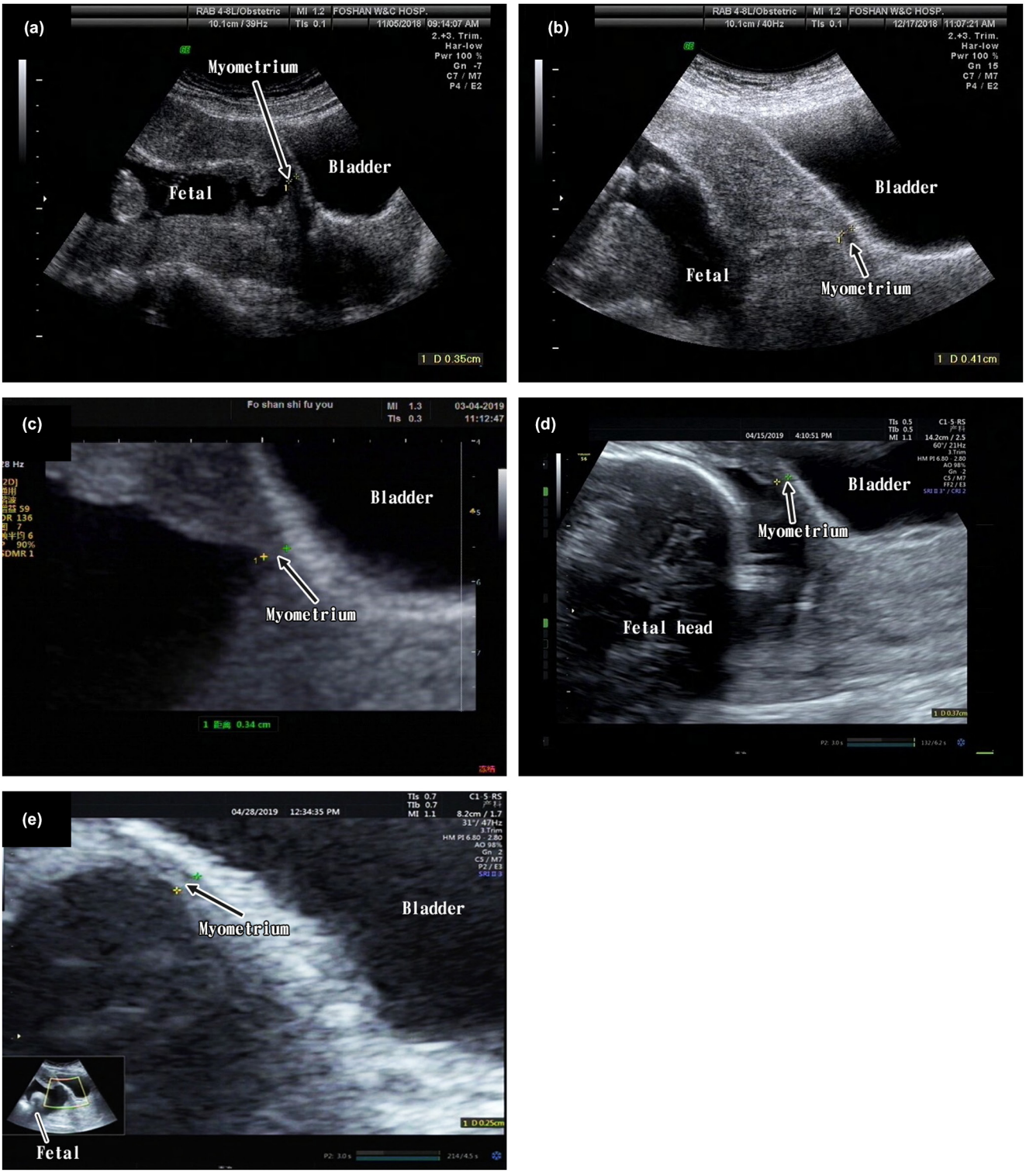

FIGURE 1 Lower uterine segment thickness (LUST) measured by a transabdominal scan in different trimesters of one woman. (a) Measured at 12^{+6} weeks, with a LUST (myometrial) of 3.5 mm; (b) measured at 18^{+6} weeks, with a LUST of 4.1 mm; (c) measured at 29^{+6} weeks, with a LUST of 3.4 mm; (d) measured at 35^{+6} weeks, with a LUST of 3.7 mm; (e) measured at 37^{+5} weeks, with a LUST of 2.5 mm

myometrium, a layer that is typically less echogenic and considered to represent the myometrium between the serous layer and the decidual layer of the uterus (Figure 1).

2.3 | Statistical analysis

Categorical data are reported as numbers and percentages, and continuous data are presented as the mean ± standard deviation (SD). Statistical significance was calculated using Pearson χ^2 tests or Fisher's exact tests for differences in qualitative variables and a Student *t* test or Kruskal-Wallis rank test for differences in continuous variables. LOESS regression was used to identify the nonlinear relationship between LUST and GW in all women and in women who underwent ERCD, TOLAC, or VBAC and those who failed TOLAC. Histograms were generated to describe the mean and SD of LUST in different trimesters. All statistical analyses were performed using SPSS software (version 24.0; IBM Corp., Armonk, NY, USA) and R software (version.3.6.0; The R Project for Statistical Computing, Vienna, Austria; http://www.r-project.org). A probability value of *P* less than 0.05 was considered significant.

3 | RESULTS

Of 5304 potentially eligible patients, 2716 (51.2%) did not meet the inclusion criteria, declined to participate, or did not undergo an ultrasound examination of the LUST (Figure 2). The final analysis included 2588 (48.8%) patients, of which 2245 (86.7%) underwent ERCD and 343 (13.3%) attempted TOLAC.

The mean maternal age was 32.39 ± 4.23 years, and the mean gestational age was 38.23 ± 1.22 weeks. The majority (88.5%) of patients had one prior CD, and 11.4% had two prior CDs. The majority (92.8%) of patients had no history of a vaginal delivery, and 7.2% of patients had a history of one vaginal delivery. Gravidity and maternal height were similar between the patients who underwent planned ERCD and the patients who attempted TOLAC ($P > 0.05$). Patients who underwent ERCD had a higher maternal age, GW, and maternal body mass index (calculated as weight in kg divided by the square of height in m) than those who attempted TOLAC (all $P < 0.001$). The ERCD group included significantly more patients with two previous CD and significantly fewer patients with a previous vaginal delivery than in the TOLAC group ($P < 0.001$). Demographic data and obstetric variables are shown in Table 1.

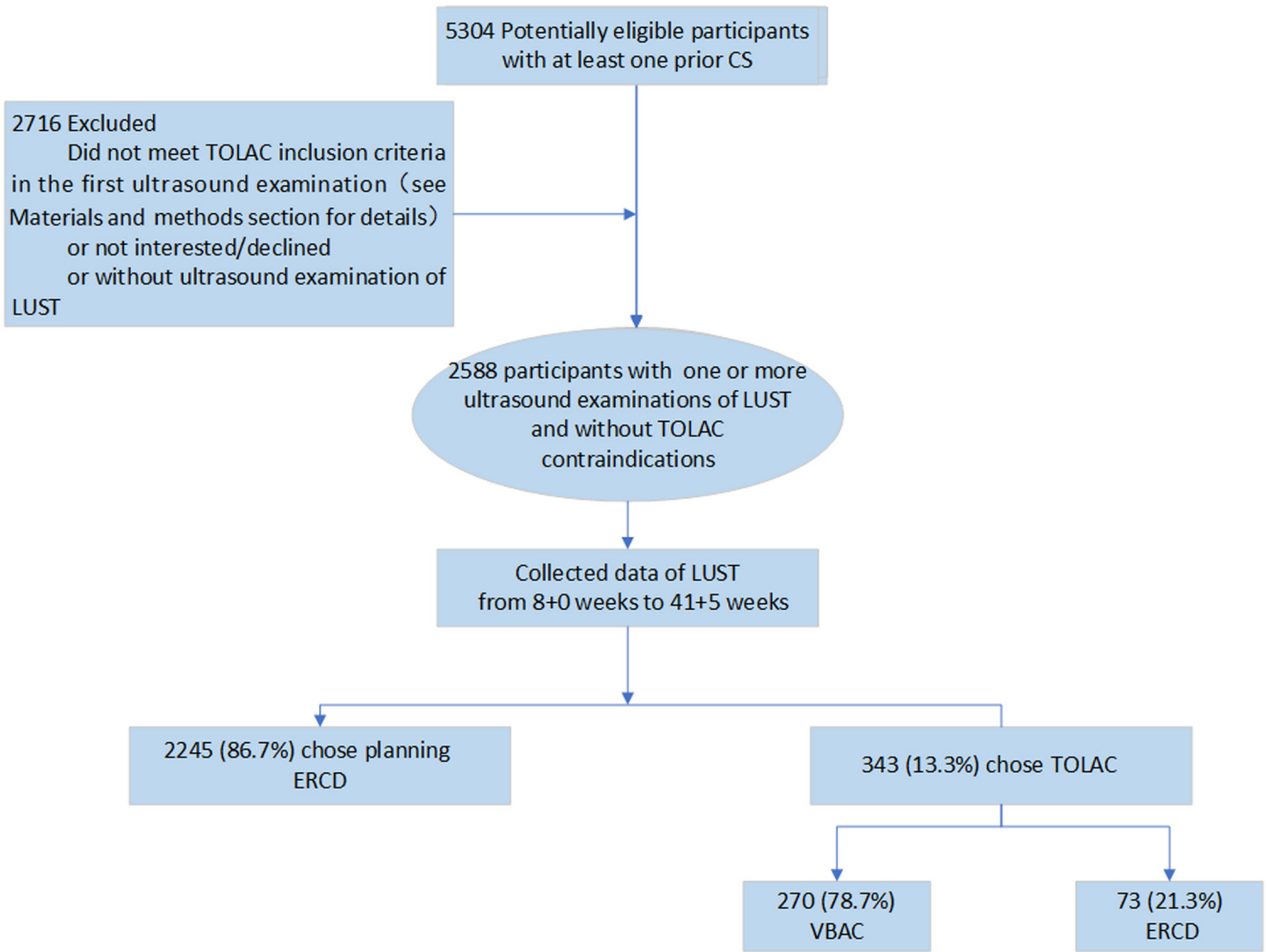

FIGURE 2 Flowchart of the study population

TABLE 1 Demographic data and obstetric variables of the study population[a]

Characteristic	All	TOLAC	Planning ERCD	*P* value
Maternal age, y	32.39 ± 4.23	31.65 ± 4.19	32.50 ± 4.22	0.001
Gestation, wk	38.23 ± 1.22	38.43 ± 2.17	38.63 ± 1.19	0.009
Gravidity				
2	974 (37.6)	123 (36.0)	851 (38.0)	0.208
3	896 (34.6)	111 (32.5)	785 (35.0)	
≥4	713 (27.6)	108 (31.6)	605 (27.0)	
Number of prior CS				
1	2291 (88.5)	341 (99.7)	1950 (86.9)	<0.001
2	294 (11.4)	1 (0.3)	293 (12.3)	
Prior vaginal birth				
0	2401 (92.8)	247 (72.0)	2154 (95.9)	<0.001
≥1	187 (7.2)	96 (28.0)	91 (4.1)	
Maternal weight at first trimester, kg	54.35 ± 8.28	53.52 ± 7.72	54.47 ± 8.36	0.047
Maternal weight at delivery, kg	67.17 ± 8.88	65.12 ± 8.39	67.48 ± 8.91	<0.001
Maternal BMI at delivery	27.31 ± 3.27	26.52 ± 3.18	27.43 ± 6.27	<0.001
Height, cm	156.76 ± 5.26	156.64 ± 5.24	156.78 ± 5.26	0.640
Birth weight, g	3181.39 ± 432.03	3046.53 ± 506.28	3202.00 ± 415.81	<0.001

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by the square of height in meters); CS, cesarean section; ERCD, elective repeat cesarean delivery; TOLAC, trial of labor afters cesarean section.

[a]Data are presented as mean ± standard deviation or as number (percentage).

Percentages do not total 100% owing to missing data.

Table 2 and Figure 3 show the LUST measurements obtained at different GW. Of all participants, the mean LUST was 6.90 ± 2.86, 4.36 ± 1.87, 2.83 ± 0.65, and 2.57 ± 0.51 mm in the first, second, middle third, and late third trimesters, respectively. Among the patients who attempted TOLAC, the mean LUST was 6.63 ± 1.71, 4.08 ± 1.83, 2.97 ± 0.61, and 2.63 ± 0.52 mm in the first, second, middle third, and late third trimesters. Among patients who underwent planning ERCD, the mean LUST was 6.91 ± 2.92, 4.39 ± 1.87, 2.82 ± 0.65, and 2.56 ± 0.51 in the first, second, middle third, and late third trimesters, The LUST decreased as the GW increased in both groups (both $P < 0.001$).

The LUST decreased faster during the progression of the first and second trimesters than during the third trimester (Figure 4). This trend was also observed in the patient subgroups (Figures S1, S2, and S3). The mean LUST among patients who underwent a VBAC was thicker in the first trimester and had less significant changes during late pregnancy than the mean LUST among patients who failed TOLAC (Figure S3).

Maternal and neonatal outcomes are reported according to the mode of delivery (Table 3). An inverse correlation between LUST and uterine rupture in women who underwent planned ERCD ($P < 0.001$) was observed, but this correlation was not associated with women who attempted TOLAC ($P = 0.629$). The rates of VBAC decreased as LUST increased, though this relationship was not significant ($P = 0.074$). We observed no cases of maternal death, hysterectomy, or perinatal or neonatal death.

We found no difference in late pregnancy LUST between pregnant women who had one CD and women who had two CD (Table S1). Besides, the trend between different LUST and uterine rupture, and TOLAC failure rates, was very similar between women with one prior CD and with two prior CD (Table S2).

4 | DISCUSSION

In this study, we found that LUST measured via ultrasound was inversely correlated with GW and decreased faster in the first and second trimesters than in the middle and late third trimesters. There was an inverse, nonlinear relationship between the LUST and GW in pregnant patients with no TOLAC contraindications. During the late third trimesters, LUST was associated with uterine rupture in women who underwent planned ERCD and but not in women who attempted TOLAC.

Most studies regarding LUST focused on the late stages of pregnancy[13–15] or on non-pregnant patients.[16,17] To overcome these limitations, this study used a large sample size and LOESS regression fitting to determine the correlation between LUST and GW in pregnant patients without TOLAC contraindications and to determine the reference ranges of LUST at different GW.

We discovered that the mean LUST decreased from 6.9 mm at 12 GW to 2.57 mm at 38 GW. The downward trend in our study was similar to that reported in other studies, though the LUST values are different. Berube et al.[18] reported that the median myometrial thickness was 1.5 mm (range 1.0–2.1 mm) between 35 and 38 GW in patients with a history of CD. Cheung[19] reported that the mean sonographic LUST was 1.8 ± 1.1 mm between 36 and 38 GW in patients with a history of at least one CD. In a prospective longitudinal study of 320 consecutive pregnant women with a history

TABLE 2 Comparison of the lower uterine segment thickness during pregnancy.[a]

		First trimester	Second trimester	Third trimester	One week before delivery
All	N	319	537	1454	1681
	Mean GW, wk	12.10 ± 1.28	21.79 ± 3.40	34.28 ± 2.64	38.20 ± 1.00
	LUS thickness, mm				
	−2 SD	1.18	0.62	1.53	1.55
	−1 SD	4.04	2.49	2.18	2.06
	Mean	6.9	4.36	2.83	2.57
	+1 SD	9.76	6.23	3.48	3.08
	+2 SD	12.62	8.1	4.13	3.59
TOLAC	N	19	42	123	283
	Mean GW, wk	11.99 ± 1.11	21.88 ± 3.07	34.11 ± 2.67	38.60 ± 1.09
	LUS thickness, mm				
	−2 SD	3.21	0.42	1.75	1.59
	−1 SD	4.92	2.25	2.36	2.11
	Mean	6.63	4.08	2.97	2.63
	+1 SD	8.34	5.91	3.58	3.15
	+2 SD	10.05	7.74	4.19	3.67
VBAC	N	15	36	100	209
	Mean GW, wk	12.07 ± 1.19	21.84 ± 3.21	34.22 ± 2.62	38.57 ± 1.05
	LUS thickness, mm	6.83 ± 1.74	4.27 ± 1.85	2.90 ± 0.6	2.64 ± 0.51
	−2 SD	3.35	0.57	1.70	1.62
	−1 SD	5.09	2.42	2.30	2.13
	Mean	6.83	4.27	2.90	2.64
	+1 SD	8.57	6.12	3.5	3.15
	+2 SD	10.31	7.97	4.1	3.66
Fail of TOLAC	N	4	6	23	74
	Mean GW, wk	11.68 ± 0.77	22.12 ± 2.24	33.65 ± 2.89	38.69 ± 1.20
	LUS thickness, mm	5.85 ± 1.56	2.93 ± 1.27	3.25 ± 0.74	2.59 ± 0.55
	−2 SD	2.73	0.39	1.77	3.69
	−1 SD	4.29	1.66	2.51	3.14
	Mean	5.85	2.93	3.25	2.59
	+1 SD	7.41	4.2	3.99	2.04
	+2 SD	8.97	5.47	4.73	1.49
Planning ERCD	N	300	495	1331	1398
	Mean GW, wk	12.11 ± 1.29	21.78 ± 3.43	34.30 ± 2.64	38.12 ± 0.96
	LUS thickness, mm				
	−2 SD	1.07	0.65	1.52	1.54
	−1 SD	3.99	2.52	2.17	2.05
	Mean	6.91	4.39	2.82	2.56
	+1 SD	9.83	6.26	3.47	3.07
	+2 SD	12.75	8.13	4.12	3.58

Abbreviations: ERCD, elective repeat cesarean delivery; GW, gestational week; LUS, lower uterine segment; N, number of cases for ultrasound measurement; TOLAC, trial of labor afters cesarean section; VBAC, vaginal birth after cesarean section.

[a]Data are presented as mean ±standard deviation unless otherwise stated.

of CD, Naji et al.[20] reported that myometrial LUST was decreased by an average of 1.1 mm per trimester, from 5.3 mm in the first trimester to 3.0 mm in the third trimester. Ginsberg et al.[21] also reported that LUST was inversely correlated with GW, from 9.4 mm at 15–23 GW to 4.0 mm at 39.1–42 GW. This study is the first to use nonlinear regression to determine that LUST rapidly decreases in the first and second trimesters and slowly decreases in the third trimester, reaching its lowest value 1 week before delivery.

We found that a LUST <1.55 mm was below the value defined as two SD below the mean. Therefore, these patients need to be monitored carefully for uterine rupture or dehiscence during ERCD and TOLAC. Bujold et al.[13] reported a cut-off value of 2.3 mm to identify

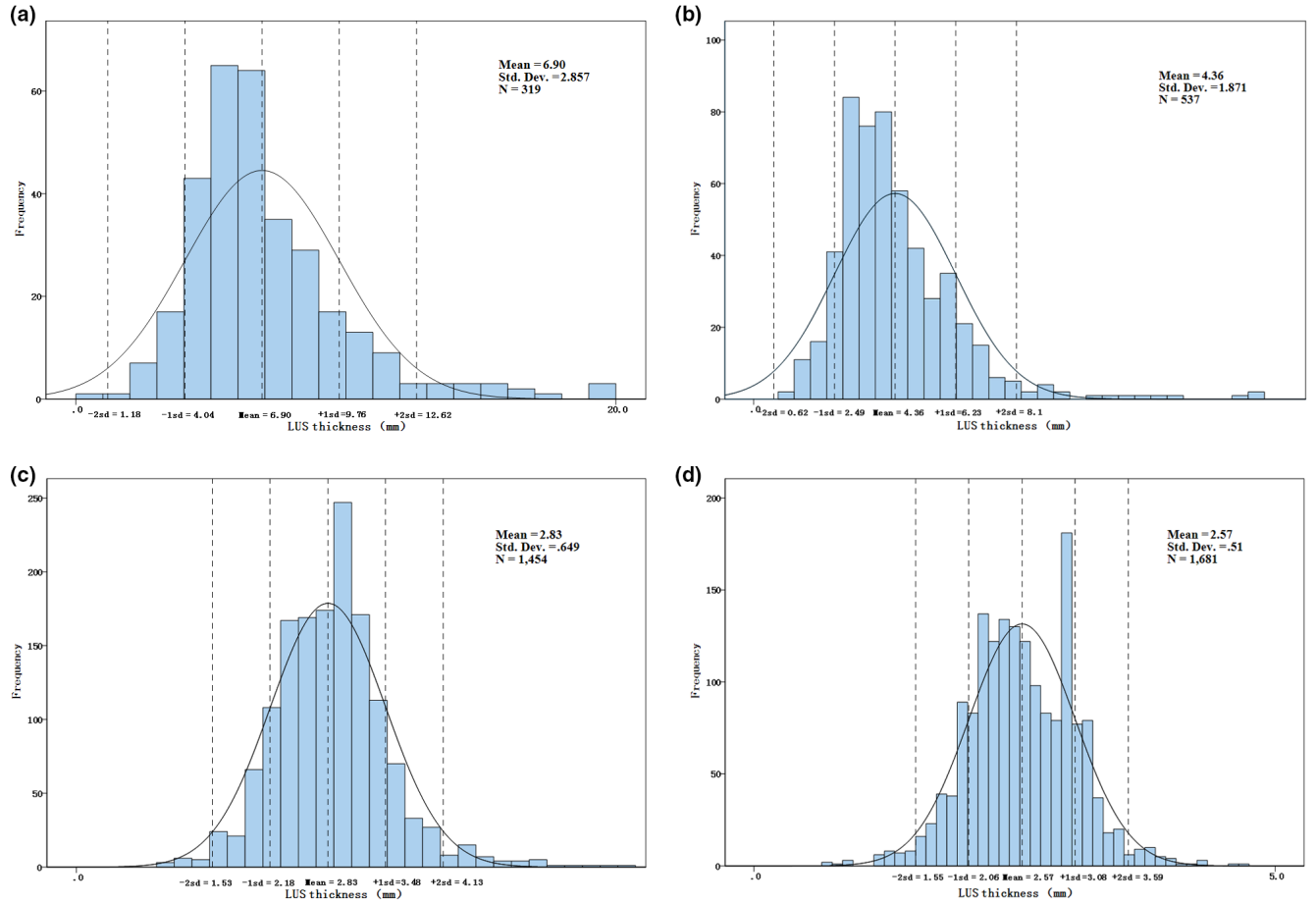

FIGURE 3 Distribution of lower uterine segment thickness (LUST) in different gestational weeks. Histograms were used to describe the mean and standard deviations of LUST at different gestational weeks. (a) First trimester; (b) second trimester; (c) middle third trimester; (d) late third trimester

patients at risk of uterine rupture during TOLAC. Uharček et al.[15] reported that LUST <2.5 mm was the only factor associated with translucent lower uterine segment and suggested a cut-off value of 2.5 mm. A systematic review reported the optimal cut-off value of LUST varied from 2.0 to 3.5 mm and from 1.4 to 2.0 mm for the myometrial layer alone; however, because of the heterogeneity of different studies, the review did not recommend an ideal cut-off value.[22] Kok et al.[23] reported the pooled sensitivity and specificity cut-offs of myometrial LUST to be between 0.6 and 2.0 mm as 0.76 and 0.92 mm, respectively. Their meta-analysis supported the use of antenatal LUST measurements for the prediction of a uterine defect during TOLAC. However, these previous studies included relatively small sample sizes and failed to draw effective conclusions, leading to controversies regarding the optimal cut-off value. In addition, the previous studies did not determine reference ranges of LUST for patients who had only one or two previous CDs and were without TOLAC contraindications.

4.1 | Clinical implications

Obstetric healthcare providers should note that LUST measured via ultrasound is inversely correlated with GW and decreases faster in the first and second trimesters than in the middle and late third trimesters. The average LUST thickness for women at 38.2 weeks of pregnancy was 2.57 ± 0.51 mm. The present study confirmed that LUST thinning in the late third trimester was associated with uterine rupture in women who underwent planned ERCD and was not associated with women who attempted TOLAC. This suggests that the risk of uterine rupture cannot be ignored in planned ERCDs. We did not observe an association between the risk of uterine rupture and LUST in late pregnancy of women who attempted TOLAC. Therefore, we believe that LUST should not be used as the single indicator for clinical decision-making in women attempting TOLAC with good inclusion criteria.

4.2 | Research implications

We visualized LUST at different GW and clearly identified the SD and LUST reference ranges for each trimester. However, we did not propose the ideal cut-off of LUST. We recommend enhanced monitoring of women with LUST below the two SD for potential uterine rupture or dehiscence during ERCD and TOLAC. Women with thinner LUST tend to have a ruptured uterus during a CD, and if these pregnant women undergo TOLAC, a uterine rupture is likely to occur. Allowing

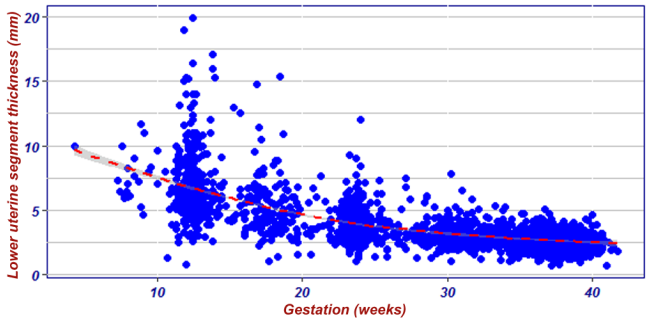

FIGURE 4 The correlation between gestational weeks and lower uterine segment thickness (LUST) of all pregnant women

them to opt for a CD is to avoid a rupture of the uterus in TOLAC. Uterine rupture is such a rare outcome that additional sample sizes are required for further observation.

4.3 | Strengths and limitations

We analyzed data from 2588 pregnant patients with a history of one or two CDs and no TOLAC contraindications. We also used a frequency histogram to visualize LUST at different GW and clearly identified the SDs and LUST reference ranges for each trimester. To the best of our knowledge, this is the first study using a large sample size and nonlinear LOESS regression fitting to determine the correlation between LUST and GW in patients without TOLAC contraindications, and to determine the reference ranges of LUST at different gestational weeks.

This study is not without limitations. First, the measurement of LUST has not been standardized. Both transabdominal and transvaginal ultrasound were used to measure LUST, as well as a combination of these methods. Previous studies[23] have reported a strong index of correlation between LUST measurements obtained via transabdominal and transvaginal ultrasound. However, LUST measurements are susceptible to contractions, abdominal adipose tissue, fetal position, GW, ultrasound operators, and other factors. Though a standardized measurement method was used in this study, we cannot rule out measurement errors. Based on our results, we believe that the use of transabdominal ultrasound in Chinese women is sufficient, because of the low body mass index and body weight of patients in southern China. Second, due to the small sample size of measurements obtained before 18 GW and the large variation of LUST measurements in these patients, the stability of the results in the early stages of pregnancy may be affected; data regarding the middle and late stages of pregnancy were not affected. Finally, women with thinner LUST were less likely to undergo a TOLAC because they were informed about the risk of uterine rupture. Women with thinner LUST tend to choose ERCD. A randomized controlled trial on this topic cannot be conducted ethically. All of these potential limitations should be considered when interpreting the results of this study.

TABLE 3 Lower uterine segment thickness and clinical outcomes of women qualified for trial of labor after cesarean section[a]

	Planning ERCD (%)						TOLAC (%)					
Clinical outcomes	All	<2 SD (<1.55 mm)	1–2 SD (1.55–2.06 mm)	1 SD–Mean (2.06–2.57 mm)	≥Mean (≥2.57 mm)	*P* value	All	<2 SD (<1.55 mm)	1–2 SD (1.55–2.06mm)	1 SD–Mean (2.06–2.57mm)	≥Mean (≥2.57 mm)	*P* value
Maternal outcomes												
Uterine rupture	6 (0.1)	1 (2.1)	3 (1.3)	2 (0.2)	0	<0.001	2 (0.7)	0	0	0	2 (1.3)	0.629
Hysterectomy	0	0	0	0	0	-	0	0	0	0	0	-
Maternal death	0	0	0	0	0	-	0	0	0	0	0	-
Failure of TOLAC	-	-	-	-	-	-	64 (22.6)	2 (50.0)	9 (28.1)	24 (25.3)	29 (19.1)	0.074[b]
Neonatal outcomes												
APGAR score <7 at 1 min	9 (0.4)	1 (2.1)	1 (0.4)	1 (0.1)	6 (0.6)	0.194	4 (1.4)	0	0	1 (1.1)	3 (2.0)	0.814
APGAR score <7 at 5 min	1 (0)	0 (0)	1 (0.4)	0 (0)	0 (0)	0.045	1 (0.4)	0	0	0	1 (0.7)	0.833
Perinatal or neonatal death	0	0	0	0	0	-	0	0	0	0	0	-

Abbreviations: ERCD, elective repeat cesarean delivery; SD, standard deviation; TOLAC, trial of labor after cesarean delivery.
LUST measures at the late third trimesters.
[a]Data are presented as n (%) unless otherwise stated.
[b]Linear-by-Linear Association.

In conclusion, the present study investigates the correlation between LUST and GW in pregnant women with no contraindications for TOLAC. LUST measured by ultrasound is inversely correlated with GW and decreases faster in the first and second trimesters than in the middle and late third trimesters. During the late third trimesters, LUST thinning was associated with uterine rupture in women who underwent planned ERCD and was not associated with women who attempted TOLAC. Given the overall risk of uterine rupture, use of TOLAC should be cautious for pregnant women with a thin myometrium in late third trimester.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest.

AUTHOR CONTRIBUTIONS

JR designed and implemented the study, conducted data analysis and wrote the manuscript; MH, LD, and ZM designed the statistical analysis and helped with data analysis; FD and CT helped with analysis plan and result interpretation; LY, GX, and LZ designed the study and developed the manuscript. All authors contributed to the final version.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of the article at the publisher's website.

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