

## To Study Association of Cervical Length in Full Term Pregnant Women and Delivery Interval

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### Abstract

*Introduction:* In the last few years ultrasonography has become an integral part of antenatal care, playing a central role in accurate pregnancy dating and screening for fetal abnormalities, placenta previa and multiple pregnancy. In the third trimester, ultrasound is used selectively in the diagnosis and management of problems suspected from clinical examination, such as fetal growth restriction, macrosomia, malpresentation and antepartum haemorrhage. In the present study we report the findings of cervical length at 37 to 41 weeks and the interval of delivery.

*Aims of the Study:* The aims of this study undertaken were as follows: To assess cervical length in the subjects attending antenatal OPD with a singleton gestation with vertex presentation between 37 to 41 weeks, To study the association of time interval of cervical length measurement and onset of labour. *Materials and Methodology:* The following inclusion criteria were used while selecting the subjects for the study: 1. Singleton pregnancy from 37 to 41 weeks of gestation, 2. Cephalic presentation, 3. Intact membranes, 4. Live fetus 5, Non labouring. *Conclusion:* CL by transvaginal ultrasound at term in singletons gestations, which is easily performed, could be used for prediction of spontaneous labour. It can be used to estimate the chance

that a woman has a spontaneous delivery within 1 week.

**Keywords:** CL-cervical length; TVS-transvaginal ultrasonography.

### Introduction

Traditionally, antenatal assessment is based on the clinical examination, which is carried out at 4 weekly intervals up to 28 weeks of gestation, at 2 weekly intervals to 36 weeks, every weekly up to delivery.

In the last few years ultrasonography has become an integral part of antenatal care, playing a central role in accurate pregnancy dating and screening for fetal abnormalities, placenta previa and multiple pregnancy [1]. Furthermore, several screening studies at mid-gestation suggest that Doppler ultrasound may be a useful predictor of pregnancies at high risk for preeclampsia and fetal growth restriction [2], and sonographic measurement of cervical length identifies pregnancies at high risk of spontaneous preterm delivery [3,4].

In the third trimester, ultrasound is used selectively in the diagnosis and management of problems suspected from clinical examination, such as fetal

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growth restriction, macrosomia, malpresentation and antepartum haemorrhage [5,6].

In our OPD, we come across many patients who frequently ask the questions when she will deliver, whether she will deliver normally or by caesarean section.

So far, data from the last menstrual period and the first accurate ultrasound examination are the two important methods for estimating the gestational age and due date [7-10].

Only 5% of patients deliver on their due date [11]. A clinician has currently little to predict when a woman at term, will deliver [8].

Transvaginal ultrasound (TVU) CL has been assessed in several populations (eg.-asymptomatic women as well as women with symptoms of preterm labour) to evaluate the risk of preterm birth, and in women before induction of labour to predict induction outcome [12-14].

Many observational studies have evaluated the association between TVU CL at term and the interval to delivery. Although TVU is reproducible and easy to learn, studies demonstrate conflicting results regarding its predictive accuracy in this clinical scenario.

#### *Aims of the Study*

The objectives of this study undertaken were as follows:

- To assess cervical length in the subjects attending antenatal OPD with a singleton gestation with vertex presentation between 37 to 41 weeks.
- To study the association of time interval of cervical length measurement and onset of labour.

#### **Materials and Methodology**

This observational prospective study was carried out during one year period from July 2017 to June 2018 at New Civil Hospital, Surat.

The study subjects were selected from the antenatal OPD, from the women seeking delivery services at the department of Obstetrics and Gynecology at New Civil Hospital, Surat. 100 consenting subjects who fulfilled the inclusion criteria attending the antenatal OPD were included in the study.

The eligible subjects were given participant information sheet and were enrolled in the study after obtaining written and informed consent to participate in the study.

The study subjects were explained about the procedure to be performed. While measuring the cervical length transvaginally privacy of the subject was maintained. Subjects were asked to empty the bladder before the procedure. The subjects lie in a dorsal lithotomy position.

Transvaginal cervical length was taken by a single observer. Three readings were taken. Average of these readings was taken.

The following *Inclusion Criteria* were used while selecting the subjects for the study:

1. Singleton pregnancy from 37 to 41 weeks of gestation
2. Cephalic presentation
3. Intact membranes
4. Live fetus
5. Non labouring

The following *Exclusion Criteria* were used for selecting the subjects for study:

1. Gestation age <37 weeks
2. Fetal malpresentation
3. Multifetal gestation
4. Premature rupture of membrane
5. Previous caesarean delivery
6. Congenital anomalies
7. IUFD
8. Painful regular uterine contractions
9. Antepartum haemorrhage
10. Pregnancy complications such as pre-eclampsia, intrauterine fetal growth restriction
11. History of cervical encirclage

The subjects were asked to follow up in OPD of Obstetrics and Gynecology after 7 days for routine examination or to come to labour room if they had any complain like lower abdominal pain, leaking per vaginum or bleeding per vaginum.

Subjects with complain of labour pain, leaking per vaginum or if they become sposteate were admitted in labour room of tertiary care centre. Routine investigations were sent. Complete history, general examination and systemic examination were done. Per vaginum examination was done and

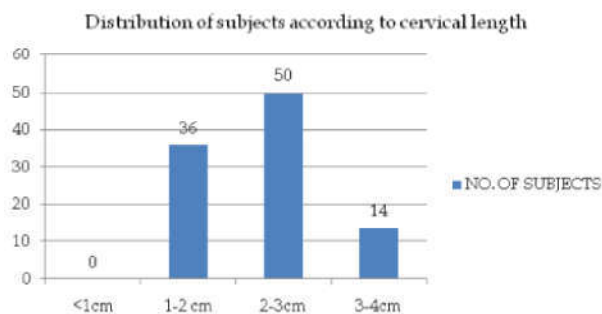
labour admission test was done. Labour monitoring and management were done as per protocol.

**Observation, Analysis and Discussion**

This was an observational prospective study. In this study, 100 consenting subjects satisfying the inclusion criteria were enrolled. CL by TVS was taken by a single observer. 3 readings were taken and average of these readings was taken. The observations of the study are discussed and analysed as follows.

**Table 1:** Distribution of Subjects According to Cervical Length

Cervical Length	No. of Subjects
<1 cm	00
1-2 cm	36
2-3 cm	50
3-4 cm	14



**Graph 1:** Distribution of Subjects According to Cervical Length

Table and Graph 1 shows distribution of subjects with cervical length. The data shows that maximum number of subjects (50) had cervical length between 2 and 3 cm. Whereas no subjects had cervical length below 1 cm. 36 subjects had cervical length between 1 and 2 cm and 14 subjects had cervical length between 3 and 4 cm.

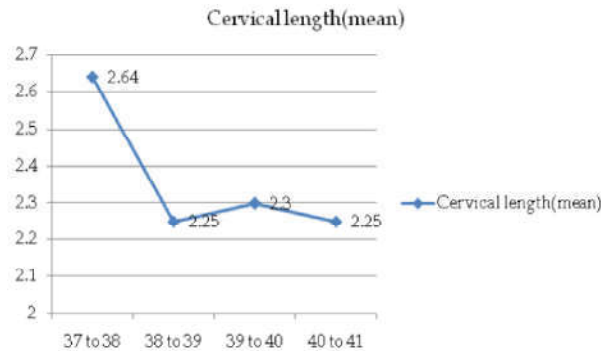
**Table 2:** Gestational Age and Cervical Length

Gestational age	Cervical length(mean)
37 to 38	2.64
38 to 39	2.25
39 to 40	2.30
40 to 41	2.25

Table and Graph 2 shows the relationship between gestational age and cervical length.

The average CL in 37 to 38 weeks was 2.64 cm.

The average CL in 38 to 39 weeks was 2.25 cm. The average CL in 39 to 40 weeks was 2.30 cm. The average CL in 40 to 41 weeks was 2.25 cm.

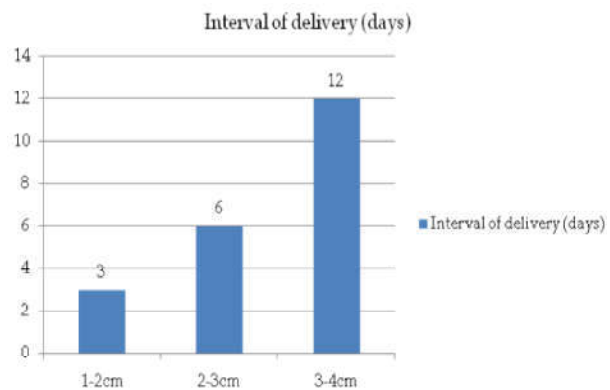


**Graph 2:** Gestational Age and Cervical Length

In Fatemeh Rahimi Sherbaf et al. [12] study the mean CL at 38<sup>th</sup> week was 25.2±1.9 mm, at 39<sup>th</sup> week was 25.4±5.6 mm, at 40<sup>th</sup> week was 27.1±4.5 mm.

**Table 3:** Cervical Length and Interval of Delivery

Cervical length	Interval of delivery (mean)
1-2 cm	03 days
2-3 cm	06 days
3-4 cm	12 days

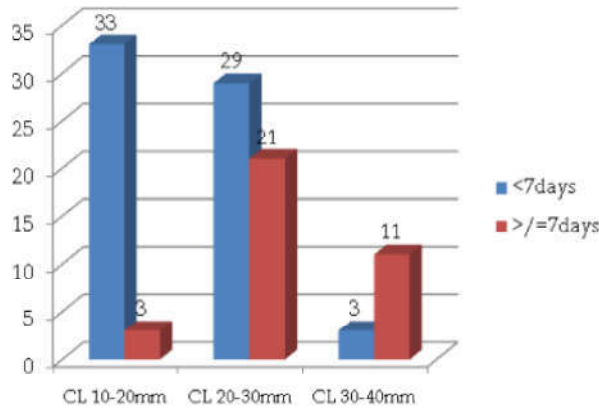


**Graph 3:** Cervical Length and Interval of Delivery

Table and Graph 3 shows the relationship between CL and interval of delivery. The data shows that when the CL was between 1 & 2 cm mean delivery interval was 3 days. In subjects with CL between 2 & 3 cm, average delivery interval was 6 days. When CL was between 3 & 4 cm, average delivery interval was 12 days. The table 3 show that when CL was between 1 and 2 cm, the delivery occurred earlier. Whereas, when CL was between 3 and 4 cm, the interval for delivery was longer.

**Table 4:** Cervical Length and Delivery Interval

Interval of delivery	CL 11-20 mm	CL 21-30 mm	CL 31-40 mm
<7 days	33	29	03
>/=7 days	03	21	11



**Graph 4:** Cervical Length and Delivery Interval

The data shows the interval of delivery in subjects with CL 10-20 mm, 21-30 mm and 31-40 mm respectively.

Our study shows that when CL 11-20 mm, 33 subjects delivered within 7 days and 3 subjects delivered after 7 days. When CL was 21-30 mm, 29 subjects delivered within 7 days and 21 subjects after 7 days. When CL was 31-40 mm, there were 3 subjects who delivered before 7 days and 11 subjects delivered after 7 days. We are able to construct a 3x2 table. The p value = 0.000006, which is statistically significant.

In G Saccone et al. [7] study, for the prediction of spontaneous labour within 7 days, sensitivity of CL <30 mm ranged from 46 to 89% and specificity from 40 to 84%. The pooled specificity was 64% (95% CI 58-69%) and pooled sensitivity was 60%

(95% CI 55-65%). The positive predictive value (PPV) and the negative predictive value (NPV) were 71 and 64%, respectively. A woman with TVU CL of 30 mm has a 50% chance of delivering within 7 days (PPV= 41.7%), whereas one with a TVU CL of 10 mm has an over 85% chance of delivery within 7 days (PPV= 85.7%). Higher the CL, better the sensitivity; lower the CL better the specificity. A woman with CL of 30 mm has a <50% chance of delivering within 7 days, whereas one with TVU CL of 10 mm has an over 85% chance of delivery within 7 days.

In the study Ramanathan et al. [1], 1571 women with singleton low risk pregnancies at gestational age 37 week were included. Spontaneous delivery before 40 week occurred in 100%, 94%, 61%, 10% and 0% for respective CL of <10, 11-20, 21-30, 31-40 mm and 41-50 mm. The incidence of those cases that had not delivered at or before 40 week and 10 days increased with cervical length at 37 week from 0% to 6%, 35% and 68% for respective CL of <20 mm, 21-30 mm, 31-40 mm and 41-50 mm.

**Table 5:** Cervical Length </> 2.5 cm and Delivery Interval

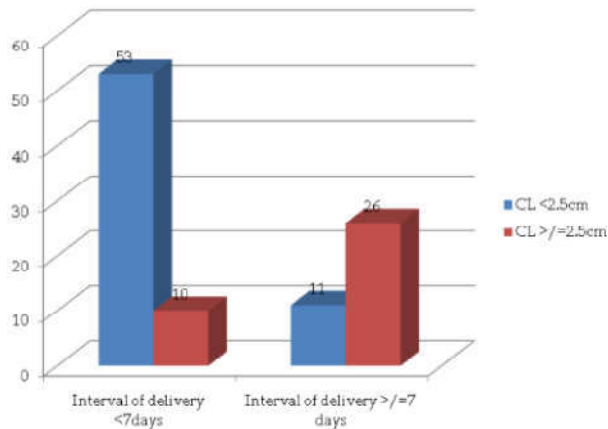
Cervical length	Interval of delivery <7 days	Interval of delivery >/=7 days
CL </=2.5 cm	53	11
CL >2.5 cm	10	26

The Table and Graph 5 shows the interval of delivery when CL is ≤ 2.5 cm and CL > 2.5 cm.

In our study, when the CL was ≤2.5 cm, 53 (82.8%) subjects delivered within 7 days. While 11 (17.18%) subjects delivered at or beyond 7 days. When CL was >2.5 cm, 10 (27.77%) subjects delivered within 7 days and 26 subjects (72.22%) delivered at or after 7 days. From the 2 x2 table, the p value < 0.01, which is statistically significant.

**Table 6:** Comparison with Various Studies

	Present study	Rozenberg et al. [39] study	Bayramoglu et al. [40] study	Tolaymat et al. [36] study	Miura et al [41] study
Study design	Prospective study	Prospective cohort	Prospective cohort	Prospective cohort	Prospective cohort
Inclusion criteria	Singletons with vertex presentation	Singletons with vertex presentation	Singletons with vertex presentation	Singletons with vertex presentation	Singletons with vertex presentation
Sample size	100	126	93	120	234
Range of gestational age	37-41	39-40	37-40	37-40	37-40
Nulliparous	34	62(49.2%)	44(47.3%)	66(55.0%)	138(58.9%)
Optimum cut off point of CL	25 mm	26 mm	25 mm	25.3 mm	25 mm
Primary outcome	Spontaneous delivery within 7 days	Spontaneous delivery within 7 days	Spontaneous delivery within 7 days	Spontaneous delivery within 7 days	Spontaneous delivery within 7 days



**Graph 5:** Cervical Length  $\leq$  2.5 cm and Delivery Interval

Our study shows that subject with CL  $\leq$  2.5 cm have 82.8% chances of being delivered within 7 days.

In the study, G Saccone et al. [7], a woman with TVU CL of 30 mm has 50% chance of delivering within 7 days, whereas one with TVU CL of 10 mm has an over 85% chance of delivering within 7 days.

In Gabriel et al. study (CL was taken upon arrival at the labour ward), in 63 cases CL was  $< 26$  mm and in 70 cases CL was  $\geq 26$  mm. Subjects with CL  $< 26$  mm had shorter delivery interval (ripening to delivery interval), being  $11.0 \pm 6.7$  h. While subjects with CL  $> 26$  mm had longer delivery interval, being  $18.6 \pm 7.1$  h. The difference was statistically highly significant ( $p < 0.01$ ).

This table compares our present study with other studies. This table show these studies are prospective study. These all study have included singletons with vertex presentation. All these studies included at term subjects. The primary outcome of these studies is spontaneous delivery within 7 days (Table 6).

### Summary

In this prospective observational study, the association of cervical length and the outcome of labour were studied in the subjects between 37 to 41 weeks of pregnancy. In this study we assessed the interval of delivery from the day of inclusion in the study and the outcome of labour.

In this study, 100 subjects fulfilling the inclusion criteria were taken. After taking informed consent, the TVS CL of these subjects was taken. These subjects were further followed up.

In our study when the CL was between 1 and 2 cm, the mean interval of delivery was 3 days, when the CL was between 2 and 3 cm mean interval

of delivery was 6 days and when CL was between 3 and 4 days, mean interval of delivery was 12 days. When CL was between 1 and 2 cm delivery occurred earlier. Whereas when CL was between 3 and 4 cm, interval of delivery was longer.

Our study shows that when CL 11-20 mm, 33 subjects delivered within 7 days and 3 subjects delivered after 7 days. When CL was 21-30 mm, 29 subjects delivered within 7 days and 21 subjects after 7 days. When CL was 31-40 mm, there were 3 subjects who delivered before 7 days and 11 subjects delivered after 7 days. The p value is  $< 0.01$ , which is statistically significant.

There were 64 subjects with CL  $\leq 2.50$  cm, and 36 subjects with CL  $> 25$  mm. When the CL was  $\leq 2.5$  cm, 53 (82.8%) subjects delivered within 7 days. While 11 (17.18%) subjects delivered after or at 7 days. When the CL was  $> 2.5$  cm, there were 10 (27.77%) subjects who delivered within 7 days, 26 (72.22%) subjects delivered at or after 7 days. Subjects with CL  $\leq 2.5$  cm had 82.8% chances of delivering within 7 days. This is statistically significant ( $p < 0.01$ ).

This study assessed whether TVU assessment of CL can be used as predictor for spontaneous labour within 7 days in singleton gestations at term. A woman with a TVU CL of  $< 25$  mm have 82.8% chance of delivering within 7 days, whereas one with CL  $> 25$  mm have 27.77% chance of delivering within 7 days.

This study has demonstrated an association between measurement of cervical length by transvaginal ultrasound and the likelihood of spontaneous onset of labour in the subsequent 7 days and outcome of labour.

### Conclusions

CL by transvaginal ultrasound at term in singletons gestations, which is easily performed, could be used for prediction of spontaneous labour. It can be used to estimate the chance that a woman has a spontaneous delivery within 1 week. Some consenting subjects who have completed 40 weeks were included in study only after assessment of modified biophysical profile was normal men and their providers may benefit from knowing term TVU CL to make more accurate plans for birth.

Obstetricians and midwives have always been puzzled by the patient's question: "When will I deliver?" Being able to predict the date of onset of spontaneous labour has several potential benefits.

Women with short TVU CL would be pushed to make last minute plans for welcoming the new born. Providers and birth locals may be able to

better plan staff and coverage.

For pregnant women, this information may help them to arrange their social activities and deal with their anxiety. TVU CL as a screening test at term for prediction of spontaneous labour may be best considered in women who will benefit most from this test.

#### *Strengths and Limitations of the Study*

*Strengths:* One of the strengths of our study is the inclusion of study data on CL in prediction of spontaneous onset of labour in a specific population, i.e. singleton at term. The overall risk of bias of the included studies was low.

*Limitations:* Limitations of our study are inherent to the limitations of the included study subjects. The number of included women is limited. Our study did not compare the CL with digital examination or with Bishop's score. This study did not include the women with previous CS willing for VBAC, women having intrauterine growth retardation, women having IUFD.

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