

## Ultrasonographic study of cervical parameters in primigravidas and its relation with pregnancy outcome

Meena Shantanu Gunjotikar<sup>1</sup>, Karande Suryaprakash J<sup>2\*</sup>

<sup>1</sup>Consultant, Gunjotikar Nursing Home, Solapur, Maharashtra, <sup>2</sup>Associate Professor, Dept. of Obstetrics & Gynecology, Ashwini Rural Medical College, Hospital & Research Centre, Solapur, Maharashtra

**\*Corresponding Author:**

Email: sjkarande2000@yahoo.co.in

### Abstract

**Introduction:** The diagnosis of cervical incompetence is often retrospective. It has become one of the obstetric challenges because of the lack of uniform prospective diagnostic criteria. Ultrasonography is an invaluable aid in the diagnosis of cervical incompetence as it is safe and noninvasive. The present study focused on changes in cervical parameters and relationship of cervical parameters with pregnancy outcome

**Materials and Method:** Total 160 cases - primigravidas were studied for the ultrasonographic parameters of cervix during the study period. Institutional Ethical committee approval was taken before beginning of the study. Patient were subjected to ultrasonographic study between 14 to 22 weeks for the first time, then serial ultrasonography was done monthly mainly for cervical parameters and if required, cervical encerclage was done.

**Result:** The incidence of cervical incompetence found in the present study was 1.25%. Mean cervical length was 3.49±0.53cm and mean diameter of internal os was 3.75 ±1.5mm. Shorter the cervical length, lesser is the gestational age at the time of delivery.

**Conclusion:** We conclude that, cervical length and diameter of internal OS are very important cervical parameters for the cervical incompetence.

**Keywords:** Ultrasonography, Pregnancy outcome, Cervical length, Internal OS

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### Introduction

Human cervix is the unique valve responsible for keeping foetus inside the uterus till the end of gestation and for its safe passage to the outside world.

Cervical incompetence can be defined as "Functional inability of cervix to retain the products of conception in utero till term," The reported incidence varies from 0.05 to 1% of all pregnancies reflecting the varying criteria employed for diagnosis. There are many causes of 2<sup>nd</sup> trimester pregnancy loss and cervical incompetence accounting for about 16-20% of 2<sup>nd</sup> trimester losses.

Cervical incompetence can be acquired or congenital. Whether an inherent weakness of the internal os may cause loss during first pregnancy remains controversial. If this congenital incompetence can be detected in first pregnancy, encerclage can be done and patient will be prevented from abortion. The diagnosis of cervical incompetence is often retrospective. It has become one of the obstetric challenges because of the lack of uniform prospective diagnostic criteria.

The diagnosis is often made after unfortunate incidence has occurred which inflicts a great mental trauma to the patient. The maternal risk scoring system fails to detect in various pregnancies related complication which ultimately leads to increase in risk for preterm birth.<sup>(1)</sup>

With the advent of ultrasonography, there has been a ray of hope. If we try to prevent the loss in the first pregnancy itself by regular ultrasonographical follow up of cervical parameters in 2<sup>nd</sup> trimester, it will be possible to prevent her from being the patient of Habitual Abortions. This is the main purpose of this study. At least we can try to prevent the first abortion by meticulous regular follow up of cervical parameters by ultrasonography and doing cervical encerclage if needed.

Ultrasonography allows detailed examination of entire cervix and thus provides an opportunity to improve accuracy of diagnosis of cervical incompetence. There are many studies indicating normative data for cervical length and diameter of internal OS. There is considerable variation in normal cervical parameters and also cut off limits, which predict risk of cervical incompetence. Various studies found that a short cervical length is related with a higher prevalence of preterm delivery.<sup>(2)</sup>

The study lays down normal values of cervical length and diameter of internal OS for Indian population.<sup>(3)</sup> According to this study normal length of cervix in Indian woman is 4.2 cm to 4.8 cm and diameter of int. OS (0.4 – 0.9 CM).

They suggested, if cervical length is less than 3 cm or internal OS more than 0.9 cm, these are potential cases for cervical incompetence. Based on this study,

we have started the follow up of the patients, starting from the first ultrasonography.

Randomly selected primigravidas who register in the 2<sup>nd</sup> trimester from 14 wks to 22 wks of gestation were selected for study.

Ultrasonography was done for the first time between 14 to 22 weeks of gestation for gestational age, congenital anomalies and cervical parameters, and if the cervical parameters were near the critical level for cervical incompetence, then those patients were followed further monthly and if there was any shortening of cervix or bulging of membranes, then encercilage was done. Ultrasonography is an invaluable aid in the diagnosis of cervical incompetence as it is safe and noninvasive.

### Objective

To determine the changes in cervical parameters and it's relationship with pregnancy outcome.

### Materials and Method

The present study was a prospective study conducted in Department of obstetrics and Gynecology. Total 160 cases - primigravidas were studied for the ultrasonographic parameters of cervix during the study period. Institutional Ethical committee approval was taken before beginning of the study. Patient were subjected to ultrasonographic study between 14 to 22 weeks for the first time, then serial ultrasonography was done monthly mainly for cervical parameters and if required, cervical encercilage was done. They were followed up till term for pregnancy outcome. The purpose of study was explained to each patient and informed consent was taken. After detail history taking and clinical examination, patients were randomly selected. The patients who fulfilled selection criteria were included in the study.

**Selection Criteria:** Randomly selected primigravidas in 2<sup>nd</sup> trimester from 14 weeks to 22wks of gestation, who came for ANC Registration, and those who were considered to be reliable for follow up.

In all patients were advised for the ultrasonography examination and routine investigations.

In 1<sup>st</sup> ultrasonography after registration i.e. preferably between 14 to 22 weeks, parameters were recorded Gestational age, Congenital anomalies, Cervical parameters like, Cervical length, Cervical width, Diameter of internal os, Thickness of lower uterine segment and condition of membranes.

Second ultrasonography was advised after 1 month, follow up of cervical parameters was done and third ultrasonography was advised after 1 month, follow up examination for-Gestational age follow up of cervical parameters was done.

Transabdominal sector scan was used in all patients to note the cervical parameters. Cervical canal was identified as the apex of membrane covering the cervix.

Cervical canal was identified as a hypoechoic line from the internal os to vaginal plate.

Patients were followed up for the changes in cervical parameters when the parameters were near the critical level of cervical incompetence and if there is any indication like shortening of cervix, or funneling / coning of membranes, then cervical encercilage was done to prevent from going in for abortion. All patients were followed up till pregnancy out come was studied in all cases.

**Statistical analysis:** Descriptive statistics such as mean, SD and percentage was used to present the data.

### Results

The incidence of cervical incompetence found in this study was 1.25% i.e. patients showed findings suggestive of cervical incompetence on USG.

**Table 1: Age Distribution**

Age in years	No. of Patients	Percentage
< 20	78	48.75
21 – 25	79	49.37
26 – 30	03	1.87

Majority of the patients belongs to age group 21 to 25 years (49.37%) followed by age group 26 to 30 years (48.75%).

**Table 2: Distribution of cervical length according to mean gestational age at delivery**

Cervical Length (in cm)	No. of Patients (%)	Mean gestational age at delivery (weeks)
1.5-2.0	2 (1.3)	35
2.1-2.5	2 (1.3)	34.5
2.6-3.0	31 (19.4)	36.07
3.1-3.5	46 (28.8)	34.52
3.6-4.0	57 (35.6)	35.56
4.1-4.5	18 (11.3)	38.4
4.6-5.0	4 (2.5)	38

Majority of patients belongs to whose cervical length was between 3.6-4 cm, gestational age at delivery was 35.5 weeks (35.6%) followed by cervical length between 3.1-3.5 cm, gestational age at delivery was 34.5 weeks (28.8%), cervical length between 2.6-3 cm, gestational age at delivery was 36.07 weeks (19.4%), cervical length between 4.1-4.5 cm, gestational age at delivery was 38.4 weeks (11.3%) and cervical length between 4.6-5 cm, mean gestational age at delivery was 38 weeks (2.5%). The present study suggests that smaller is the cervical length, earlier is the gestational age at the time of delivery.

**Table 3: Correlation between gestational age at delivery and mean cervical length**

Gestational age at delivery	Mean Cervical Length (cm)
More than 37 weeks	3.44 cm
Less than 37 weeks:	
1. 34-36 weeks	3.05 cm
2. 32-34 weeks	2.8 cm

For mean cervical length 3.44 cm, the corresponding gestational age at delivery was more than 37 weeks. Whereas for mean cervical length 2.8 cm, the corresponding gestational age at delivery was between 32-34 weeks and for mean cervical length 3.05 cm, the corresponding gestational age was 34-36 weeks. For mean cervical length is less than 3 cm, the corresponding mean gestational age at delivery was 37.07 weeks.

**Table 4: Correlation between Diameter of Internal OS and Pregnancy outcome**

Diameter of Internal OS in mm	No. of Patients	Mean gestational age at delivery(weeks)
Less than 5mm	140	38.2
5-10 mm	13	36.6

**Table 6: Correlation between cervical length, diameter of internal os and gestational age at the time of delivery**

No. of Patients	Cervical length In cm	Diameter of internal os in mm	Gestational age (in weeks) at the time of delivery
2	1-2	7 & 9	32-38
28	2.1-3	2 - 4	36-39
101	3.1-4	2 - 5	36-39
19	4.1-5	3 - 5	37-40

In the present study, as the cervical length increases and diameter of internal os goes on decreasing, pregnancy outcome gets improving. In one case though cervical length was less than 2 cm and diameter of internal os was 9 mm, gestational age at delivery was 38 wks. So there are other factors which might be good to pull on the pregnancy.

### Discussion

Previous studies of ultrasonographically measured cervical dimensions had differing results. Different studies lay down different - cut off limits for cervical length and internal os diameter.

The study conducted by Neerja Goel et al,<sup>(3)</sup> suggested that cervical length less than 3 cm or diameter of internal os more than 0.9cm has increased risk of cervical incompetence.

In a previous study, it was observed in between 15 and 24 weeks of gestation that a weekly shortening of

In patients with diameter of internal os less than 5mm, gestational age at delivery was 38.2 weeks and in patients with diameter of internal os between 5-10mm-gestational age delivery was 36.6 weeks. In these 13 patients diameter of internal os is between 5-10mm and their mean cervical length was 3.48cm.

This suggests that, smaller is the diameter of internal os, better is the pregnancy outcome.

In these 13 patients there might be other factors which were good enough to pull on the pregnancy near 37 weeks.

**Table 5: Correlation between gestational age at delivery and mean diameter of internal os**

Gestational age at delivery	Mean diameter of internal os in (mm)
More than 37 weeks	3.57
34-36 weeks	3.54
32-34 weeks	6.5

In patients whose mean diameter of internal os was 3.57 mm, gestational age at delivery was more than 37 weeks. In patients whose diameter of internal os was 3.54 mm, gestational age at delivery was between 34-36 weeks, whereas whose mean diameter of internal os was 6.5mm mean gestational age at delivery was between 32-34 weeks.

4.1 mm, in high-risk patients had a significant correlation with incompetent cervix.<sup>(4)</sup>

Routine ultrasound scan is normally done in all registered primigravidas between 14 to 22 weeks for exact gestational age and congenital anomalies. One more important thing that can be diagnosed at this gestational age is possibility of cervical incompetence in primigravidas and a timely encircled can be done if necessary and thus first pregnancy loss can be avoided if the cause for it is cervical incompetence. This is the main purpose of this study.

The present study showed incidence of cervical incompetence as 1.25% i.e. 2 patients showed findings suggestive cervical incompetence on USG.

In present study 49.37% i.e. 79 patients were between 21 to 25 years of age and 48.75% i.e. 78 patients were below 20 years of age.

**Cervical Length:** Different investigators give different criteria for cervical length in 160 primigravidas was  $3.49\text{cm} \pm 0.53\text{cm}$ .

The study conducted by Neerja Goel et al<sup>(3)</sup> studied prospectively 100 patients who were both primigravidas and multigravidas in concern with cervical parameters with total outcome, mainly to document parameter criteria for cervical incompetence. According to them - cervical length in pregnancy is between 4.8 to 4.2 cm. There is no statistically significant correlation between increasing gestational age. There is no statically significant correlation between increasing gestational age. Mean cervical length in primigravidas was 4.3 cm. Also, parity had no effect on cervical length.

T.R. Verma et al.<sup>(5)</sup> studied 170 cases which were at risk for cervical incompetence in ultrasonic dept. considered criteria for cervical incompetence as cervical length between 1.5 to 2cm and diameter of internal os more than 8mm.

The study conducted by Podobnik et al.<sup>(6)</sup> observed that a mean cervical length varied from 4.2cm to 4.9cm at 10 to 36 weeks. They also observed that the difference in length was significant in two groups, namely 10 to 24 weeks (4.9cm to 4.7cm) and 29 to 36 weeks (4.4cm).

The study conducted by Anderson<sup>(1)</sup> had shown normative data for cervical length by transabdominal and transvaginal sonography. Mean length at similar periods of gestation range from 3.9cm to 5.9cm by transabdominal method, transvaginal method showed variation from 3.2cm to 4.1cm. In another study conducted by Berghella V,<sup>(7)</sup> found mean cervical length was 3.13.

In another study conducted on 183 pregnant women, it was observed in patients between 16 and 23 weeks that weekly mean cervical shortening of 0.9 mm and spontaneous preterm delivery before 35 weeks, the mean cervical shortening was 2.5 mm per week.<sup>(8)</sup>

In our study, the mean cervical length is 3.49cm and showed variation between 1.9 to 5cm.

**Diameter of internal os:** In the present study of primigravidas, diameter of internal os was between 1mm to 5mm in 87.5% of the patients and the mean diameter of internal os was  $3.7\text{mm} + 1.5\text{mm}$ . As that of cervical length, diameter of internal os is also important in relation to cervical incompetence.

For this parameter, different investigators had laid down different cutoff limits.

According Neerja Goel et al,<sup>(3)</sup> the diameter of internal os ranged between 4mm to 9mm, mean diameter was 4.6 mm in primigravidas. Ultrasonographic evaluation of diameter of internal os did not show any variation with gestational age.

The study conducted by Brook et al,<sup>(9)</sup> say that the diameter of internal os 1.9cm or more was suggestive of cervical incompetence as all the women whose

measurements were below 1.9cm, proceeded to normal pregnancy till term.

B. Fiengold et al,<sup>(10)</sup> quote "evidence is offered that ultrasonic measurements of internal os can constitute a useful diagnostic parameter for cervical incompetence. It is measured with the aim of assessing an additional parameter on which the therapeutic approach can be based."

Varma T R et al,<sup>(5)</sup> found the diameter of cervical canal upto 8mm as normal.

Podobnik et al<sup>(6)</sup> had shown a mean width of internal os as 4.7 mm to 5.2mm with more statistical difference with advancing gestational age.

**Membrane status: Bulging of membranes:** In present study, 2 patients showed bulging of membranes in cervical canal along with cervical length 3.3 cm and 2cm and diameter of internal os 9mm in both.

According to Katherine Fong,<sup>(11)</sup> protrusion membranes through the internal os is the hallmark of the true incompetent cervix.

Varma et al<sup>(5)</sup> described 8 patients with normal; clinical examination but there was herniation of membranes into cervical canal on ultrasound. Thus clinically it is difficult to diagnose bulging of membranes if cervical length is normal.

Gestational age at first ultrasound scan:

In present study, 47.5% i.e. 76 of the patients had their gestational age at 1<sup>st</sup> USG between 16-18 weeks.

According to study by Neerja Goel et al,<sup>(3)</sup> the gestational age at 1st USG was in between 10-14 weeks of gestation.

This can be explained as our patients are less educated and they don't routinely come earlier for confirmation, later on they come very late for further follow up.

Gestational age at the time of delivery:

In present study, the majority of the patients 81.25% patients delivered between 36-40 weeks of gestation whose cervical length was between 3 to 5 cm.

According to the study by Neerja Goel et al,<sup>(3)</sup> the fetal outcome, in the form of gestational age at time of delivery was between 37-41 weeks.

But, this relation is not 100% applied as the foetal outcome is also affected by other like diameter of internal os, status of membranes, infections and other causes of preterm labour.

**Relation between gestational age at delivery and mean cervical length:** To find the baseline data for cervical parameters in our patients, we considered 37 weeks as age of maturity. So we calculated the mean cervical length in relation to 37 weeks and less that.

According to present study, shorter the cervical length is less than 3cm-is 37.07 weeks this can be explained as there may be other factors which are quite good to pull on the pregnancy near 37 weeks.

**Correlation between diameter of internal os and gestational age at the time of delivery:** In present study, when diameter of internal OS was less than 5mm, gestational age at delivery was 38 weeks, whereas for internal os between 5-10 mm, gestational age at the time of delivery was 36.6 weeks. So, according to our study-lesser is the diameter –better is the outcome i.e. more than is the gestational age at the time of delivery. The study done by Neerja Goel,<sup>(3)</sup> found that, when diameter of internal OS was less than 5mm, gestational age at delivery was between 37-41 weeks, whereas for internal os between 5-10 mm, gestational age at the time of delivery was 33-37 weeks.

In patients where gestational age is 36.6 weeks – with diameter of int. os between 5-10 mm- their cervical length where the gestation age at delivery was more than 37 weeks.

In these 13 patients, pregnancy could have been prolonged by 1 week or more if they had taken rest tocolysis.

**Relation between men diameter of os and gestational age above and below 37 weeks:** According to present study, more is the diameter of internal os more is the chances of preterm delivery or abortion.

14 patients lost to follow up at the time of delivery but those were regularly coming for routine ultrasonography with almost normal cervical parameters so probably they might gone to term.

Hence, ultrasonography when we routinely perform in every primigravidas we should look thoroughly for the cervical parameters.

### Conclusion

Normally, we do ultrasonography in all primigravidas in 2<sup>nd</sup> trimester, mainly for congenital anomalies and exact gestational age, so, if we scan for cervical parameters also, then it is possible to prevent from abortion, if the cause is cervical incompetence.

According to this study, we can say that while doing ultrasonographic study of primigravidas in second trimester, one should look for cervical parameters and if they are doubtful, patient should be called for further follow up so that we can try to pick up the cases of congenital cervical incompetence and we can prevent her from becoming a patient of habitual abortion/bad obstetric history.

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