

# Cervical assessment at the routine 23-week scan: standardizing techniques

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## ABSTRACT

**Objective** To examine the frequency of curvature of the cervix and to establish the degree of curvature with increasing cervical length. To assess the significance of this phenomenon in terms of the classification of patients as high risk for preterm delivery.

**Method** Cervical length was measured prospectively by transvaginal sonography in 301 women at 23 weeks of gestation. The distance between the internal and external os was measured both as a straight line and also as a curved line along the endocervical canal. In addition, a search of our database was made to identify all women who had undergone cervical assessment as part of a policy of routine screening. In those with cervical length of less than 26 mm the thermal images of the cervix were used to obtain straight and curved measurements. The frequency of curved cervix was calculated and the relationship between the ratio of straight to curved measurement to the curved one was determined.

**Results** In the prospective study curvature of the cervix was observed in 143 (48%) of the 301 women. Curvature was observed in 51% (135 of 267) with cervical length of 26–55 mm, 25% (8 of 32) with length of 16–25 mm, and none of the two with length of 1–15 mm. The ratio of the straight to the curved measurement decreased with increasing cervical length ( $r = -0.27$ ,  $P = 0.001$ ). In the retrospective study curvature of the cervix was found in 72 (15%) of 471 with length of 16–25 mm and in none of the 76 with length of 1–15 mm.

**Conclusion** Cervical length is influenced by the degree of cervical curvature. The disparity of measurements between the internal and external os taken as a straight line or along the cervical canal increases with cervical length. However, this disparity may not have any clinical implications because at short cervical length (less than 16 mm) the cervix appears to be always straight.

## INTRODUCTION

Prematurity remains the largest contributor to neonatal death and handicap. Ultrasonographic measurement of cervical length provides useful prediction of risk of spontaneous early preterm delivery and preliminary data suggest that in women with a short cervix the placement of a cervical suture can reduce this risk<sup>1–3</sup>. It is therefore vital that the technique of measuring cervical length is standardized. Previous studies have reported on the methodology of measurement of cervical length, including the need to define the internal and external os by the presence of the sonolucent endocervical mucosa along the length of the canal, the effect of transvaginal vs. transabdominal and transperineal routes of ultrasound scanning, the consequence of bladder filling, and the need to avoid exerting undue pressure on the cervix with the transducer<sup>4–10</sup>.

Another aspect in the methodology of measuring cervical length is the issue of the curved cervix. Previous studies have not reported whether in cases of a curved cervix the measurement of cervical length is made across a straight line joining the internal and external os or by tracing a line along the endocervical canal (Figure 1). The aim of this study was to examine the frequency of curvature of the cervix and to establish the degree of curvature with increasing cervical length.

## PATIENTS AND METHODS

Cervical length was measured prospectively by transvaginal sonography in 301 women at 23 weeks of gestation. The distance between the internal and external os was measured both as a straight line and also as a curved line along the endocervical canal. In addition, a search of our database was made to identify all women who had undergone cervical assessment as part of a policy of routine screening. In those with cervical length of less than 26 mm the thermal images of the cervix were used to obtain straight and curved measurements. The frequency of curved cervix was calculated and the relation

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between the ratio of straight to curved measurement to the curved one was determined.

At King's College Hospital, London, women attending for routine antenatal care are offered an ultrasound scan at 23 weeks which includes examination of the fetus and the option of having a transvaginal scan to measure cervical length as a screening test for spontaneous preterm delivery. Written informed consent is obtained for participating in the study which was approved by the hospital ethics committee.

The women are asked to empty their bladder and are placed in the dorsal lithotomy position. Transvaginal sonography with a 5-MHz transducer (Aloka 1700, Aloka Co., Ltd, Tokyo, Japan) is carried out by sonographers who had received The Fetal Medicine Foundation Certificate of Competence in Cervical Assessment (<http://www.fetalmedicine.com>). The probe is placed in the anterior fornix of the vagina and care is taken to avoid exerting undue pressure on the cervix, which may artificially lengthen the cervix. A sagittal view of the cervix is obtained and the sonolucent endocervical mucosa is used as a guide to the true position of the internal os, thereby avoiding confusion with the lower segment of the uterus<sup>4</sup>. The calipers are used to measure the linear distance between the triangular area of echodensity at the external os and the V-shaped notch at the internal os. Patient characteristics and ultrasound findings are recorded in the database at the time of the scan. Gestational age is determined from the menstrual history and confirmed from the measurement of fetal crown-rump length at the first trimester scan.

### Prospective study

In 301 consecutive women attending for the 23-week scan cervical length was measured both as a straight line between



**Figure 1** Ultrasound picture of the cervix illustrating the disparity in cervical length measured by a straight line between the internal and external os compared to a measurement taken along the endocervical canal.

the internal and external os and as the curved distance along the endocervical canal.

### Retrospective study

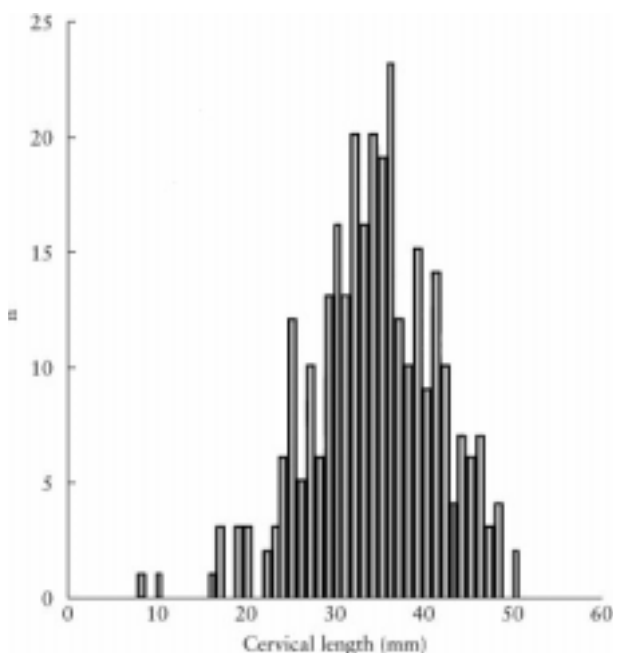
A computer search of our database was made to identify all women who had undergone routine cervical assessment at 23 weeks between January 1997 and April 1999, and had a cervical length of less than 26 mm. This cut-off was selected because in some of the previous studies it was reported to identify the high-risk group for preterm delivery<sup>1</sup>. The thermal images of the cervix were retrieved from the records of these patients, they were scanned into a computer and the straight and curved measurements between the internal and external os were made (Autosketch software, Autodesk Inc., London, UK).

### Statistical analysis

The frequency of curved cervix was calculated and in those cases where the straight line between the internal and external os did not overlie the endocervical canal the relationship between the ratio of the straight to curved measurement to the curved one was determined.

## RESULTS

In the prospective study of 301 singleton pregnancies, cervical length was normally distributed and the median was 34 mm (Figure 2). Curvature of the cervix was observed in 143 (48%) cases and increased with cervical length from 0% (0 of 2) at less than 16 mm to 25% (8 of 32) at 16–25 mm and 51% (135 of 267) at 26–55 mm. In the cases with a curved cervix the curved measurement was on average longer than the straight



**Figure 2** Cervical length distribution in 301 singleton pregnancies at 23 weeks of gestation.

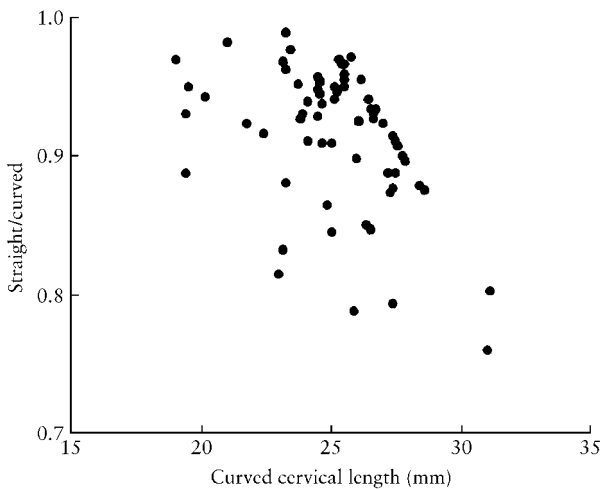
measurement with a mean difference of 1.2 mm (range 0.6–1.8 mm, SD 0.41) for the group at 16–25 mm and 2.9 mm (range 0.4–13.4, SD 2.07) at 26–55 mm. The ratio of the straight to the curved measurement decreased with increasing cervical length ( $r = -0.27$ ,  $P = 0.001$ ; Figure 3).

In the retrospective study there were 547 singleton pregnancies with cervical length less than 26 mm. Curvature of the cervix was found in 72 (15%) of 471 with length of 16–25 mm and in none of the 76 with length of less than 16 mm. In those with a curved cervix the mean difference between the straight and curved measurements was 2.23 mm (range 0.3–7.2, SD 1.39).

## DISCUSSION

The data from this study indicate that cervical curvature is a common finding. Furthermore, in cases with a curved cervix the measurement of cervical length taken as a straight line between the internal and external os is inevitably shorter than the measurement taken along the endocervical canal and the difference between the two increases with cervical length.

In a previous screening study at 23 weeks, involving 2567 singleton pregnancies, the risk of spontaneous delivery before 33 weeks increased exponentially with decreasing cervical length from about 0.2% at 60 mm, 0.8% at 30 mm, 4.0% at 15 mm and 78% at 5 mm<sup>2</sup>. The 1.5% of the population with cervical length less than 16 mm contained more than 50% of the spontaneous deliveries before 33 weeks. Furthermore, preliminary data suggest that in women with cervical length less than 16 mm the insertion of a Shirodkar suture may be associated with a 10-fold reduction in the overall risk for early delivery from about 50% to 5%<sup>3</sup>. If ongoing multicenter studies confirm these findings it is likely that cervical assessment will be incorporated into routine antenatal care and the cut-off cervical length for intervention would be 15 mm. In our present study all cases with cervical length less than 16 mm had a straight cervix and therefore cervical curvature does not pose any clinical problem in the classification of pregnancies at high risk of spontaneous preterm delivery.



**Figure 3** Ratio of the straight to the curved measurement with increasing cervical length (curved measurement).

In contrast to the study of Heath *et al.*<sup>2</sup> most other studies have used a cervical length of 25 mm in distinguishing between high- and low-risk pregnancies. In our retrospective study 15% of pregnant women with cervical length between 16 and 25 mm demonstrated cervical curvature and although the mean difference in measurements between the two techniques was only about 2 mm, in some cases a disparity of up to 7 mm was observed. Therefore, such a disparity would have important clinical implications especially if the intervention, such as cervical cerclage, is one with serious potential complications.

The risk of spontaneous preterm delivery before 33 weeks for women found by routine assessment at 23 weeks of gestation to have a cervical length of 20–25 mm is estimated to be about 1.5%<sup>1</sup>. It is therefore unlikely that sufficiently large non-intervention studies are ever to be carried out to determine whether the correct way of measuring cervical length in women with a curved cervix is across or along the endocervical canal. However, from the practical point of view it is reasonable to measure the linear distance between the internal and external os. Even if the current multicenter studies on the possible effectiveness of cervical cerclage prove that this treatment is beneficial, the selection of patients will be based on a measurement of less than 16 mm in which case the cervix is invariably straight.

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## REFERENCES

- 1 Iams JD, Goldenburg RL, Meis PJ, Mercer BM, Moawad A, Das A, Thom E, McNellis D, Copper RL, Johnson F, Roberts JM. The length of the cervix and the risk of spontaneous delivery. *N Engl J Med* 1996; 334: 567–72
- 2 Heath VCF, Southall TR, Souka AP, Elisseou A, Nicolaides KH. Cervical length at 23 weeks of gestation: prediction of spontaneous preterm delivery. *Ultrasound Obstet Gynecol* 1998; 12: 312–7
- 3 Heath VCF, Souka AP, Erasmus I, Gibb DMF, Nicolaides KH. Cervical length at 23 weeks of gestation: The value of Shirodkar suture for the short cervix. *Ultrasound Obstet Gynecol* 1998; 12: 318–22
- 4 Sonek J, Shellhaas C. Cervical sonography: a review. *Ultrasound Obstet Gynecol* 1998; 11: 71–8
- 5 Anderson HF. Transabdominal and transvaginal ultrasonography of the uterine cervix during pregnancy. *J Clin Ultrasound* 1991; 19: 77–83
- 6 Brown JE, Thieme GA, Shah DN, Fleischer AC, Boehm FH. Transabdominal and transvaginal endosonography: evaluation of the cervix and lower uterine segment in pregnancy. *Am J Obstet Gynecol* 1986; 155: 721–6
- 7 Karis JP, Hertzberg BS, Bowie JD. Sonographic diagnosis of premature cervical dilatation. *J Ultrasound Med* 1991; 10: 83–7
- 8 Confino E, Mayden KL, Giglia RV, Vermesh M, Gleischer N. Pitfalls in sonographic imaging of the incompetent uterine cervix. *Acta Obstet Gynecol Scand* 1986; 65: 593–7
- 9 Burger M, Weber-Rossler T, Willman M. Measurement of the pregnant cervix by transvaginal sonography: an interobserver study and new standards to improve the interobserver variability. *Ultrasound Obstet Gynecol* 1997; 9: 188–93
- 10 Yost NP, Bloom SL, Twickler DM, Leveno KJ. Pitfalls in ultrasonic cervical length measurement for predicting pre-term birth. *Obstet Gynecol* 1999; 93: 510–6