RESEARCH ARTICLE

The prognostic value of the nuchal cord prenatal diagnosis

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Objective. To verify whether postnatal results for newborns can be improved if the abdominal mode of delivery is used for all cases of umbilical cord loops diagnosed *ante partum*.

Method. We compared the obstetric results for two groups of births: 344 vaginal deliveries in which nuchal cord was diagnosed during the second stage of labour, and 48 cases in which the diagnosis was made with an ultrasound scan *ante partum* and delivery was by caesarean section (CS). All were singleton term pregnancies with a cephalic presentation, and with no other significant associated pathology.

Results. There were no significant obstetric differences between the group with a prenatal diagnosis of umbilical cord loop who delivered by CS and the group with a post partum diagnosis of umbilical cord loop who delivered vaginally.

Conclusion. We concluded that *ante partum* ultrasound diagnosis of nuchal cord is not in itself an indication for CS delivery.

Umbilical cord loops are not usually considered to worsen obstetric outcome and rarely cause serious problems. The umbilical cord has a mean length of 55 cm[1] and the presence of loops is determined by the quantity of amniotic fluid and the amount of fetal movement.

The prevalence of umbilical cord loops is 20 - 30% of all births for 1 loop and about 0.2% for 3 loops,[2] and increases with duration of pregnancy.[3] A nuchal cord usually appears when the umbilical cord is four-fifths as long as the fetus.[4] This condition usually does not influence the wellbeing of the newborn.[5] Transitory modifications of the fetal heart rate may be encountered, but the pH of the newborn's blood is not lowered.[6] Excessive uterine dynamics during birth, with continuous pressure on the umbilical cord, may be deleterious for the fetus.[7]

Since obstetric imaging has become more accessible, our service has had more cases of umbilical cord loops ultrasonically diagnosed before birth. Over a 1-year period, we asked all patients diagnosed with nuchal cord during a routine ultrasound scan at term and with no other associated pathology if they wanted to deliver by caesarean section (CS), with nuchal cord as the only indication. In this service, not all patients had ultrasound examinations immediately before birth.

This study investigated whether abdominal birth improves the outcome in patients with nuchal cord loops. We compared the results of vaginal deliveries during the course of which nuchal cord was diagnosed with those of caesarean sections after an *ante partum* ultrasound diagnosis of umbilical cord loop.

Patients and methods

We analysed the obstetric results for patients hospitalised in the Third Clinic of Obstetrics and Gynecology, University of Medicine and Pharmacy, Iasi, Romania, between May 2005 and May 2006. The inclusion criteria were singleton term pregnancies, cephalic presentation, the presence of nuchal cord, and no other significant associated pathology. Birth data were obtained from hospital files.

Ante partum diagnosis of umbilical cord loop was established by ultrasound examination (Philips ATL HDI 4000 (Eindhoven, The Netherlands), colour Doppler and power Doppler units included).

Institutional review board approval was obtained, and recruitment was by written informed consent. Patients discussed the risk factors associated with the two types of delivery with the gynaecologist, anaesthetist and cardiologist. No patients refused CS. We compared parameters for women who delivered by CS after an ultrasound diagnosis of nuchal cord (48 cases) with those

in whom nuchal cord was diagnosed in the course of a vaginal delivery (344 cases).

Differences were compared using paired and unpaired Student's *t*-tests, Fisher's exact test or the z-test, as appropriate. For all analyses, the level of significance was set at $p<0.05$.

Results

During the study period, a total of 1 800 births was recorded; the CS rate was 24%. The total number of nuchal cord loops recorded in partograms was 488 (27%), of which 83% were simple loops, 13.7% double loops, 0.018% triple loops and 0.006% quadruple loops; the balance were not recorded.

The ages of patients with nuchal cord loops ranged from 17 to 44 years; 88% were between 21 and 34 years old, and 78% were primiparas or secundiparas.

An umbilical cord loop was diagnosed before birth in 48 cases (12.2% of the study group). We compared the obstetric results of these patients, all of whom had CSs, with the natural birth (NB) group comprising all the other nuchal cords, diagnosed during the second stage of vaginal birth (344 cases).

The mean age in the CS group was 27.3 years and that in the NB group 25.5 years, a difference that is considered to be statistically significant (Student's *t*-test, two-tailed *p*-value=0.0135). The mean parity was 1.33 in the CS group and 2.1 in the NB group, which is also statistically significant (Student's *t*-test, two-tailed *p*-value = 0.0002). The mean gestational age was 38 weeks in both groups. There were no fetal deaths as a result of delivery in either group, and there were no significant differences in sex distribution of the newborns.

The mean weight in the CS group was 3 314 g, and that in the NB group 3 210 g (Student's *t*-test, $p=0.12$, no statistical significance). Eleven newborns in the NB group and 1 in the CS group weighed <2 500 g, which is of no statistical significance (Fisher's exact test, $p=1$), and a total of 11 newborns (2.8%) weighed >4 000 g – 9 in the NB group and 2 in the CS group (Fisher's exact test, $p=0.37$, no statistical significance).

The mean Apgar score for newborns at 1 minute was 8.027 for the CS group and 8.02 for the NB group. Applying the z-test to compare the Apgar scores obtained for the two groups, we found the following data: CS group mean – 8.270833, NB group mean – 8.017442, difference – 0.253391, var. A – 0.989149, var. B – 0.528766, statistical error difference – 0.14881, z calc. =1.702786. The 0 hypothesis is true at a confidence interval of 90.9%. As we set the criterion of significance at $p<0.05$, this difference is considered not to be statistically significant.

In relation to the number of nuchal cords, we found a mean Apgar score of 8.14 for 2 loops, 8.22 for 3 loops and 7.66 for 4 loops. It was not possible to draw statistical conclusions because of the low number of multiple loops.

Early postoperative complications were rare and not significant (data not presented).

Discussion

This was a retrospective cohort study that was population-based, and outcomes were identified from a database of past deliveries. This study design is a good way to estimate the incidence of a disease (fetal distress). To our knowledge, this is the first study which has tried to find a correlation between method of delivery and obstetric results in cases with only nuchal cord association. It is a non-randomised study with as few variables as possible.

The birth rate in our country (Romania) is declining, and more women have CS deliveries than in the past. This explains the subjects' ready acceptance of the opportunity for CS delivery.

The prevalence of nuchal cord in our study was similar to that cited in the literature. Patient age and parity do not seem to influence the prevalence. The mean age of women who had CS is significantly higher than that in the NB group, and women who had CS had lower parity. (We believe that the CS group felt more favoured to have an ultrasound scan (which diagnosed nuchal cord) immediately before birth.)

The z-test revealed no statistical significance between the mean Apgar score for babies born by CS compared with those in the NB group. When the same figures were analysed with Student's *t*-test, we could obtain statistical significance. The explanation seems to be linked to the number of items analysed. We recommend using the z-test instead of Student's *t*-test for groups of over 30.

Our findings indicate that the method of giving birth seems to have had little influence (if any) on the obstetric outcome, the mean weight of the babies and their clinical course being almost the same in the two groups. Our findings are similar to other published results.[8,9] Complications may become evident a longer time after birth in cases with very tight or multiple loops.[10] Some consider that umbilical cord nuchal loops are associated with induction of labour, slow progress of labour, and shoulder dystocia.[11] The pH of the newborn's blood may be lower than in babies with no cord loops.[12] No significant differences have been detected in vascular endothelial growth factor, placental growth factor and erythropoietin concentrations in the cord blood of babies born with nuchal and normal cords.[13]

A single nuchal cord loop does not appear to increase the risk of CS or of poor neonatal outcome.[14] Our data show that an increased number of loops did significantly influence the Apgar score. Others have found that multiple nuchal cord entanglements may be associated with a greater risk of meconium, abnormal fetal heart rate pattern during advanced labour, and mild umbilical artery acidosis at birth, and an increased need for operative delivery.[15]

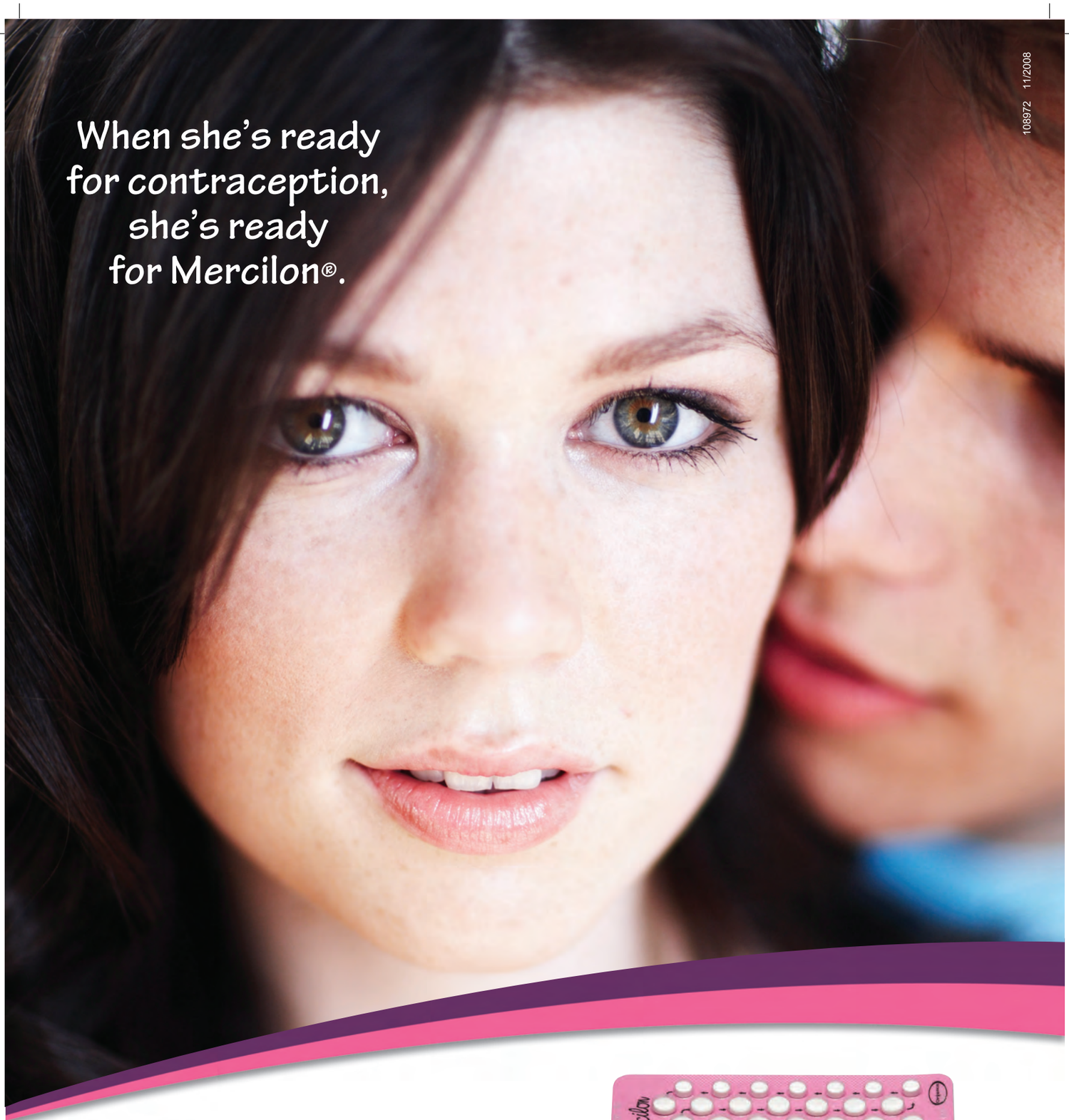
Our study has a number of limitations. We had insufficient fetal blood gas analyses to obtain meaningful statistical

results, and we were unable to determine whether the nuchal cord had a deleterious effect on the obstetric results because the figures obtained were too close to statistical significance.

Conclusion

Our study shows that CS with nuchal cord as the only indication seems to have only a slight influence on obstetric outcome. Ultrasound diagnosis of nuchal cord may therefore not be a valid reason to perform CS except when there are other associated indications. We agree with Stempel that '… the prenatal identification of a nuchal cord might cause unnecessary anxiety for the mother and the obstetrician, given the common occurrence of this condition and its very high association with a favorable outcome'.[16] Our study also points to the necessity of choosing the right statistical test when analysing data.

1. Rayburn WF, Beynen A, Brinkman DL. Umbilical cord length and intrapartum complications. *Obstet Gynecol* 1981; 57: 450.
2. Kan PS, Eastman NJ. Coiling of the umbilical cord around the foetal neck. *Br J Obstet Gynaecol* 1957; 64: 227-228.
3. Larson JD, Rayburn WF, Harlan VL. Nuchal cord entanglements and gestational age. *Am J Perinatol* 1997; 14(9): 555-557.
4. Colins JH, Collins CL, Weckwerth SR, De Angelis L. Nuchal cords: Timing of prenatal diagnosis and duration. *Am J Obstet Gynecol* 1995; 173: 768.
5. Clapp III JF, Stepanchak W, Hashimoto K, Ehrenberg H, Lopez B. The natural history of antenatal nuchal cords. *Am J Obstet Gynecol* 2003; 189: 488-493.
6. Hankins GDV, Snyder RR, Hauth JC, Gilstrap LC, Hammond T. Nuchal cords and neonatal outcome. *Obstet Gynecol* 1987; 70: 687.
7. Melchior J, Bernard N. Incidence and pattern of fetal heart rate alterations during labor. In: Kunzel W, ed. *Fetal Heart Rate Monitoring: Clinical Practice and Pathophysiology*. Berlin: Springer-Verlag, 1985: 73.
8. Mastrobattista JM, Hollier LM, Yeomans ER. Effects of nuchal cord on birthweight and immediate neonatal outcomes. *Am J Perinatol* 2005; 22(2): 83-85.
9. Gonzalez-Quintero VH, Tolaymat L, Muller AC. Outcomes of pregnancies with sonographically detected nuchal cords remote from delivery. *J Ultrasound Med* 2004; 23(1): 43-47.
10. Clapp JF 3rd, Lopez B, Simonean S. Nuchal cord and neurodevelopmental performance at 1 year. *J Soc Gynecol Investig* 1999; 6(5): 268-272.
11. Ogueh O, Al-Tarkait A, Vallerand D. Obstetrical factors related to nuchal cord. *Acta Obstet Gynecol Scand* 2006; 85(7): 810-814.
12. Martin GC, Green RS, Holzman IR. Acidosis in newborns with nuchal cords and normal Apgar scores. *J Perinatol* 2005; 25(3): 162-165.
13. Andres RL, Lewandowski MS, Peltier MR. Markers of chronic hypoxia in pregnancies complicated by nuchal cord. *Am J Obstet Gynecol* 2004; 191(6): S134.
14. Peregrine E, O'Brien P, Jauniaux E. Ultrasound detection of nuchal cord prior to labor induction and the risk of Cesarean section. *Ultrasound Obstet Gynecol* 2005; 25(2): 160-164.
15. Larson JD, Rayburn WF, Crosby S, Thurneau GR. Multiple nuchal cord entanglements and intrapartum complications. *Am J Obstet Gynecol* 1995; 173: 1228-1231.
16. Stempel LE. Beyond the pretty pictures: Giving obstetricians just enough (umbilical) cord to hang themselves. *Am J Obstet Gynecol* 2006; 195: 888-890.



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References: 1. Lammers P, Op Ten Berg M. Phase III clinical trial with a new oral contraceptive containing 150 µg desogestrel and 20 µg ethinylestradiol. Acta Obstet Gynecol Scand 1991;70:479-500. 2. Ernst U, Baumgarter U, Bauer U, Janssen G. Improvement of quality of life in women using a low-dose desogestrel-containing contraceptive: results of an observational clinical evaluation. Eur J Contraceptive Reproductive Health Care 2002;7:238-243. 3. Poindexter A. The emerging use of the 20-µoral contraceptive. Fertility and Sterility 2001;75(3)457-465. 4. Safarty D, Vree ML. A comparison of the cycle control and tolerability of two ultra low-dose oral contraceptives containing 20 µg ethinylestradiol and either 150 µg desogestrel or 75 µg gestodene. Eur J Contraceptive Reproductive Health Care 1998;3:179-189.

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