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Original article

Symphysis-fundal height predicts difficult evolution of induced labours

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Summary. *Background and aim:* Symphysis-fundal-height (SFH) could be prove useful for the management of labour. This study aims to assess the behaviour of induced labours in relationship with SFH values. *Methods:* Prospective observational study in a sample of 158 women underwent induction with intravaginal dinoprostone for different indications. SFH, SFH corrected for station, gestational age and parity were considered independent variables in multivariable models. Vaginal delivery, operative vaginal delivery, Cesarean section, Cesarean section for dystocia, Cesarean section for cardiotochographyc abnormalities, oxytocin infusion (for potentiating labour), need of Kristeller's maneuvre, epidural anesthesia (on demand), episiotomy, time from the first dose of dinoprostone to delivery, and time of active phase of labour were considered dependent variables in multivariable models. *Results:* SFH >34 cm (both uncorrected and corrected for station) independently associates with an increase of odds ratio for operative vaginal birth, Kristeller's maneuver, oxytocin use, episiotomy. Additionally, SFH >34 cm (corrected for station) seems to correlate with increasing time of active phase of labour. *Conclusions:* SFH >34 cm (both corrected and uncorrected for station) predicts difficult vaginal deliveries and operative vaginal deliveries in induced labours. (www.actabiomedica.it)

Key words: symphysis fundal height, labour outcome, labour induction

Introduction

Since 1954, Johnson et al (1) developed a rule to calculate fetal birth weight starting from symphysis-fundal height (SFH). Currently, SFH has been used for predicting fetal growth in pregnancy, and may be useful for screening low birth weight fetuses (2-4).

In full term pregnancies, SFH could be useful for predicting high-birth weight fetuses as well (5,6), but this information is not useful in clinical practice, as it does not change routine care. Preliminary observations in an Italian sample of full term healthy pregnancies (7) have suggested that SFH may predict difficult labors. Those findings agree with others already reported in literature from other countries (8,9). Therefore, to know the SFH at the beginning of a trial of labour could be prove useful for avoiding unnecessary interventions and time expense.

This study assesses the behaviour of labours after induction in relationship with SFH, aiming to highlight if SFH may be useful in predicting the outcome of induced birth.

Material and methods

A sample of pregnant women underwent labour induction with dinoprostone (intravaginal administra-

This study was carried on San Pietro Fatebenefratelli Hospital of Rome, Department of Obstetrics and Gynecology

tion) were enrolled at San Pietro Fatebenefratelli Hospital of Rome between March 2014 and September 2014, during the on-duty time of one of the Authors (LN). The indications for inductions and the clinical data of SFH, station, maternal characteristics and labour evolution were collected from medical charts. SFH measurements were collected by an inelastic tape graduated in centimeters from the upper edge of the pubic symphysis up to the higher part of the fundus of the uterus, with patients in gynecologic position, as already reported (5,7). The values were recorded in centimeters and approximated to 1 cm. At the same time, sonographic evaluation of amniotic fluid volume and station were assessed. Station is involved in the success of a trial of labour (10,11) and may affect the value of SFH in predicting the evolution of labour. This kind of behaviour was known by Johnson et al (1), who corrected their rule according with fetal head level within the pelvis. Therefore, we chose to correct SFH measurements by taking in account the fetal head levels within the maternal pelvis. SFH measures were reduced by 1 centimeter if station was -2 and was not changed if station was -3.

Two sets of binary logistic regression analyses and multilinear regression analyses were performed. In the first set, gestational age (>40 weeks), parity and SFH uncorrected for station level were considered independent variables. In the second step, gestational age (>40 weeks), parity and SFH corrected for station level were considered independent variables. The SFH variables were considered as dummies, with cut off >34 cm, because this value has been shown to best predict large (>4000g) birth weigh fetuses in an Italian sample of full term healthy pregnancies (5).

Vaginal delivery, operative vaginal delivery, Cesarean section, Cesarean section for dystocia, Cesarean section for cardiotocography (CTG) abnormalities, oxytocin infusion (for potentiating labour), need of Kristeller's maneuvre, epidural anesthesia (on demand), episiotomy, time from the first dose of dinoprostone to delivery (minutes), and time of active phase of labour (minutes) were considered dependent variables. SPSS 16.0 was used for calculations. Significance was set $p<0.05$.

Results

158 healthy term pregnant women were sampled. In Table 1 is reported the descriptive statistics of the dependent and independent variables of the sample, along with body mass index (BMI), maternal height, and indications for labour induction.

Table 2 summarizes results as adjusted odds ratios (OR) with 95% confidence intervals (CI) and adjusted standardized coefficients (Beta) too. SFH >34 cm, both uncorrected and corrected for station reduces the odds ratio of a Cesarean section for CTG abnormalities, but increases the odds ratio of an operative vaginal birth, of the need of Kristeller's maneuver, of episiotomy and of oxytocin use for potentiating labour.

Moreover, it seems that SFH >34cm uncorrected for station level increases the time of active phase of labour (Beta 0.142, p=0.092).

Discussion

This study has investigated the behaviour of induced labour in relationship with the clinical data of SFHs, both corrected and uncorrected for station. As already reported in literature in non-induced patients (7-9), SFH value is also strongly predictive of difficult labours in induced patients. This is proved by results of Table 2, where it is highlighted that SFHs do not increase the odds ratio of Cesarean sections overall, but increase the rate of operative vaginal births and associates with use of potentiative oxytocic infusion, Kristeller's maneuver, episiotomy, and, maybe, long lasting active phase of labours. As already reported by Authors (7), those associations are independent from fetal birth weight, meaning that SFH (both uncorrected and corrected for station) suggests labour difficulties in not too large fetuses.

Due to low number of cases, it is not proved that SFHs link with more Cesareans for dystocia. However, SFHs >34 cm lowers the odds ratio of Cesarean section for CTG abnormalities without affecting the odds ratio for the overall Cesareans. Therefore, it should be suspected that SFHs are able to predict Cesarean section for dystocia by repeating the analyses on more data. Assessing the odds ratios in Table 2, it

Table 1. Descriptive statistics (as rates and means with standard deviations).

Spontaneous vaginal delivery	105 (66.5%)
Cesarean section	40 (25.3%)
Cesarean section for dystocia	19 (12%)
Cesarean section for CTG abnormalities	18 (11.4%)
Operative vaginal delivery	13 (8.2%)
Oxytocin use	49 (31%)
Kristeller's maneuver	41 (25.9%)
Episiotomy	65 (41.3%)
Epidural anesthesia	113 (71.5%)
More than one dose of dinoprostone	61 (38.6%)
More than 2 mg of dinoprostone	54 (34.1%)
Fetal weight (g)	3362.3±465.73
Time from induction to delivery (min)§	769.84±347.66
Time of the active phase of labor (min)§	296.65±186.37
Station	
- 3	85 (53.8%)
- 2	73 (46.2%)
Gestational age at and over 41 weeks	88 (55.7%)
Multiparity	35 (22.2%)
Symphysis fundal height (uncorrected for station - cm)	32.8±2.07
Symphysis fundal height (corrected for station - cm)	33.3±2.11
Body mass index (BMI)	26.75±1.32
Maternal height (m)	1.65±0.04
Indications for induction*:	
- Intraepathic colestasis of pregnancy	6 (3.8%)
- Gestational diabetes mellitus	2 (1.3%)
- Premature rupture of membranes (PROM)	44 (27.8%)
- Oligohydramnios	38 (24.1%)
- Polyhydramnios	3 (1.9%)
- Intra-uterine growth restriction (IUGR)	18 (11.4%)
- CTG abnormalities	9 (5.7%)
- Pregnancy at 41 or more	88 (55.7%)
- Hypertensive disorders of pregnancy	3 (1.9%)
- Other indications	1 (0.6%)

*Some indications for induction are overlapped. Therefore, sum of rates does not correspond to 100%
§ Means and standard deviations on 118 cases who delivered vaginally

can be imagined that SFH corrected for station may be more able than SFH uncorrected for station to predict Cesarean sections for dystocia.

Reading carefully the descriptive statistics (Table 1), one could understand that some clinical conditions have affected the accuracy of SFH measurements. BMI, amniotic fluid volume, and sonographic diagnosis of IUGR produces both an increase and a decrease in SFH values. We judged that this heterogeneity in SFH values best depicts the common variability of the SFH measurements in clinical setting. A large observational study for assessing the goodness of SFH measurements should be drawn in selected cohorts of patients (PROM, oligohydramnios, polydramnios,

Table 2. Results of the two sets of multivariate logistic and regression analyses. The results are expressed as adjusted odds ratio with 95% CI and Beta. Results of univariate analyses are not shown. Significant results are highlighted in bold

	First set			Second set		
	SFH uncorrected for station >34 cm OR 95% CI p	Gestational age >40 weeks OR 95% CI p	Multiparity OR 95% CI p	SFH corrected for station >34 cm OR 95% CI p	Gestational age >40 weeks OR 95% CI p	Multiparity OR 95% CI p
Cesarean section	0.636 0.267-1.513 0.306	1.296 0.600-2.799 0.510	**0.063** **0.008-0.480** **0.008**	0.685 0.296-1.590 0.379	1.282 0.594-2.767 0.526	**0.063** **0.008-0.480** **0.008**
Cesarean section for dystocia	1.799 0.640-5.056 0.265	**3.341** **1.039-10.745** **0.043**	0 0-∞ 0.998	2.156 0.777-5.979 0.140	**3.341** **1.039-10.745** 0.043	0 0-∞ 0.998
Cesarean section for CTG abnormalities	**0.123** **0.016-0.961** **0.046**	0.669 0.241-1.860 0.441	0.190 0.024-1.502 0.116	**0.112** **0.014-0.871** **0.036**	0.676 0.242-1.885 0.454	0.201 0.025-1.593 0.129
Operative vaginal delivery	**10.637** **2.739-41.314** **0.001**	0.847 0.239-3.000 0.797	0.212 0.025-1.774 0.152	**9.549** **2.463-37.026** **0.001**	0.869 0.248-3.048 0.827	0.199 0.024-1.655 0.135
Oxytocin use	**2.095** **1.023-4.289** **0.043**	1.076 0.532-2.176 0.839	0.556 0.229-1.353 0.196	**2.248** **1.110-4.550** **0.024**	1.044 0.513-2.123 0.905	0.530 0.216-1.299 0.165
Kristeller's maneuver	**4.951** **2.309-10.617** **<0.001**	1.020 0.465-2.234 0.961	0.551 0.207-1.470 0.234	**4.706** **2.210-10.019** **<0.001**	0.998 0.455-2.190 0.997	0.515 0.193-1.374 0.185
Episiotomy	**3.841** **1.819-8.110** **<0.001**	1.578 0.789-3.155 0.197	**0.283** **0.113-0.710** **0.007**	**4.005** **1.909-8.399** **<0.001**	1.543 0.769-3.098 0.222	**0.263** **0.104-0.667** **0.005**
Epidural anesthesia	1.006 0.488-2.074 0.988	1.852 0.809-4.241 0.145	**0.366** **0.167-0.803** **0.012**	1.918 0.853-4.313 0.115	0.981 0.473-2.033 0.959	**0.366** **0.167-0.803** **0.012**
Increasing* time from induction to delivery§	0.038 0.663	0.171 0.052	**-0.312** **<0.001**	0.028 0.748	0.171 0.052	**-0.312** **<0.001**
Increasing* time of the active phase of labor§	0.105 0.213	-0.060 0.482	**-0.429** **<0.001**	0.142 0.092	-0.067 0.431	**-0.435** **<0.001**

* Results are expressed as standardized coefficients (Beta) and significance (p)

§ Calculations were made on 118 cases who delivered vaginally (operative or spontaneous birth)

IUGR, gestational diabetes, etc). Those informations could be useful for choosing to induce or not to induce the labour under special clinical circumstances.

In conclusion, SFH >34 cm predicts difficult vaginal labours and operative vaginal deliveries in induced labours.

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