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Occiput-spine relationship: shoulders are more important than head

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Abstract. – OBJECTIVES: To understand the role of fetal spine position in determining a fetal head position at the time of birth and modality of delivery.

PATIENTS AND METHODS: This was a multicenter prospective observational study. Fetal occiput and spine position were evaluated by intrapartum ultrasound. Eighty-six women were eligible for inclusion in the study. Occiput rotational movements and modality of delivery in relation to the fetal spine position were investigated.

RESULTS: At the beginning of labor, fetal occiput was in a posterior position in 52.3% of cases and, in 81.5% of cases the spine was in an anterior transverse position. At birth, occiput and spine were both in an anterior position in 90.4% of cases. The rate of cesarean sections in the SP group was significantly higher than the rate in the SAT group (50% *vs*. 8%, $p < 0.0007$). Instead, the rate of vaginal deliveries without intervention in the SP group was significantly lower than the rate in the SA group (14% *vs*. 71%, $p < 0.0001$).

CONCLUSIONS: Fetal spine position could have an important role in determining fetal occiput position at birth. Spine position might play a crucial role in the outcome of delivery.

Key Words:
Obstetric labor, Fetal spine, Intrapartum ultrasound, Occiput posterior, Occiput-Spine Relationship.

Introduction

Persistent occiput posterior (OP) position during labor represents the most common cephalic malposition at delivery[1-3]; 5% of fetuses present in an OP position, as a result of the failure of internal rotation, or because of malrotation during descent[4]. Several studies have tried to explain the mechanisms that lead to the OP position at delivery. However, literature on this topic is still inconsistent and provides conflicting results[5-10]. Some reports suggested that OP position at delivery originates from malposition of the fetal head before labor or during early labor[8,9], whereas other studies found that it is the result of malrotation during labor from an occiput anterior (OA) or occiput transverse (OT) position[5].

The persistent OP position is significantly associated with many abnormalities of labor and delivery, including greater use of oxytocin augmentation and epidural analgesia, prolonged labor, cesarean and instrumental vaginal delivery, and significant perineal trauma, third and fourth-degree laceration and anal sphincter injury[11]. Moreover, it seems to be related to an increased risk of chorioamnionitis, excessive peripartum blood loss, and postpartum infection[12]. Finally, neonates delivered in the persistent OP position, compared with occiput anterior position, and were associated with an increased risk for adverse short-term outcomes, such as significantly lower 1-minute and 5-minutes Apgar score, with possible admission to intensive care nursery[12,13].

An early diagnosis of fetal OP position during the active phase of labor indicates the need for more careful surveillance[14]. Traditionally, clinicians determine fetal head position by palpating the sutures and fontanels, although this clinical examination is highly subjective and inaccurate, with a defined rate of error ranging from 30% to 70%[9,15]. Sometimes, clinical evaluation is totally

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unable to locate fetal head position[8,15-20]. In the past few years, many studies have demonstrated that the intrapartum application of transabdominal or transperineal ultrasound may significantly enhance correct determination of fetal head position during active labor[16]. Today, there are good reasons to support the use of ultrasound in the assessment of fetal head position[21], particularly when the result of the clinical examination is uncertain, and possibly prior to any instrumental procedure[15,20,22].

The first aim of this study was to understand the role of fetal spine position in determining the fetal head position at the time of the birth. Secondary, we tried to define the role that this relationship could have regarding the modality of delivery.

Patients and Methods

This multicenter prospective observational study was carried out in the Labor and Delivery wards of two different Hospitals: "Paolo Giaccone" University Hospital, Palermo and "Villa Sofia-Cervello" General Hospital, Palermo, Italy. All eligible patients were adequately informed of the nature and objectives of the study, and written signed consent was obtained. After oral consultation with our local Ethics Committee, our study was defined exempted from IRB since the study was observational and not interventional (no randomization was made).

We recruited women with the following characteristics: age 18-40 years old, uneventful pregnancy, single fetus in cephalic presentation and normal fetal heart rate pattern status.

We excluded women with the following characteristics: women for whom the decision for a cesarean section had already been made before admission, history of uterine malformation, previous uterine surgery, pregnancies obtained by assisted reproductive techniques, suspicion of fetal malformation and intrauterine growth restriction.

The following data were collected: maternal age, gestational age, parity, type of labor (spontaneous or induced), maternal request of epidural analgesia, type of delivery (spontaneous, operative, or caesarean section), indications for caesarean section and neonatal weight (in grams). The clinical management of patients included in the study was the same as that routinely proposed in labor management and carried out according to internal protocols.

The ultrasound examination was performed by one of the researchers, who had previously trained for 9 months in the use of intrapartum ultrasound. Moreover, the clinical management of patients included in the study was modified by intrapartum ultrasound examination results. A portable Voluson i compact ultrasound system with a 4-8 MHz transabdominal curved array probe was used (GE Healthcare, Zipf, Austria).

As previously described[8,15], the ultrasound probe was placed horizontally on the maternal abdomen and a transverse view of the fetal trunk was obtained at the level of the fetal upper abdomen or the four-chamber view of the heart. The position of the fetal spine was thus determined. The ultrasound transducer was then moved downwards until the maternal supra-pubic region was reached, visualizing the fetal head. The landmarks depicting fetal occiput position were the midline cerebral echo, fetal thalami and cerebellum for occiput transverse and anterior position, and the fetal orbits for occiput posterior position.

The position of the occiput and spine was classified as anterior (OA and SA), transverse (OT and ST) or posterior (OP and SP). Fetal occiput and spine position were evaluated by intrapartum transabdominal ultrasound at the beginning of the first stage of labor and at the beginning of the second stage of labor. Clinical diagnosis of active labor was made when the uterine cervix was effaced, dilated at least 4 cm and in presence of efficient contractile activity; the second stage was defined as attaining full dilatation of the cervix.

Statistical Analysis

Statistical analysis was performed using cross-tabulations with Fisher's exact test. A *p-value* < 0.05 was considered as statistically significant. Statistical calculations were undertaken using STATA software (version 13.1, College Station, TX, USA).

Results

Between 1st September 2014 and 30th April 2015, 86 women were eligible for inclusion in the study. Data on maternal age, gestational age, parity, type of labor, a maternal request of epidural analgesia, type of delivery, neonatal birth weight and indications for caesarean section are reported in Table I.

Table I. General maternal and labor characteristics.

Variables	Mean (± SD)	Range
Maternal age	29.78 (6.18)	18-40
Gestational age	39.35 (0.70)	39-41
Neonatal birth weight (g)	3392.97 (447.39)	2470-4350
Variables	**Groups**	**Number (%)**
Parity	Nulliparous	58 (67.4)
	Multiparous	28 (32.6)
Type of labor	Spontaneous	61 (70.9)
	Induced	25 (29.1)
Epidural analgesia	Yes	27 (31.4)
	No	59 (68.6)
Indication for cesarean section	Dystocia	4 (30.7)
	Non reassuring fetal heart	6 (46.2)
	Failed vacuum extraction	3 (23.1)

At the first stage of labor, the OP fetal occiput position (52.3% of cases) and the SAT fetal spine position (81.4% of cases) were the most represented. Instead, at the beginning of the second stage of labor, the fetal occiput position was OA in 70.9% of cases and the fetal spine position was confirmed in SAT in 83.7% of cases.

We also evaluated the occiput position at birth, only considering vaginal deliveries (n = 73), and this was OA in 66 cases (90.4%) and OP in 7 cases (9.6%). Moreover, occiput rotational movements were investigated in the different stages of labor (Table II).

With regard to the occiput position at the beginning of labor, we noted that: none of the fetuses with OA and SAT was born in OP; all fetuses with OT and SAT were born in OA; all fetuses with OP and SAT were born in OA; all fetuses with SP, irrespective of the occiput position, were born in OP except for a minority (12.5%) born in OA (Table II).

We investigated the modality of delivery in relation to fetal occiput and spine position during the second stage of labor (Table II). The rate of vaginal deliveries without intervention was 71% (51/72 fetuses; 95% CI: 58.9-81) in the group of fetuses with SAT, independently of the occiput position, and 14% (2/14 fetuses; 95% CI: 1.8-42.8) in the group of fetuses with SP, irrespective of the occiput position ($p < 0.0001$). The rate of vaginal operative delivery was 21% (15/72 fetuses; 95% CI: 12.2-32) in the group of fetuses with

Table II. Occiput rotational movements in the different stages of labor.

	I stage of labor		II stage of labor		Birth
86 pts	OP 45 pts	OP/SP 14 pts	OP/SP 12 pts OA/SAT 2 pts	OP/SP 14 pts	2 PV in OP 5 VEX in OP 7 TC
		OP/SAT 31 pts	OP/SAT 6 pts OA/SAT 25 pts	OP/SAT 6 pts	4 PV in OA 1 VEX in OA 1 TC
	OA 22 pts	OA/SAT 22 pts	OA/SAT 22 pts	OA/SAT 61 pts	43 PV in OA 13 VEX in OA 5 TC
	OT 19 pts	OT/SP 2 pts	OT/SP 0 pts OP/SP 2 pts	OT/SP 0 pts	-
		OT/SAT 17 pts	OT/SAT 5 pts OA/SAT 12 pts	OT/SAT 5 pts	4 PV in OA 1 VEX in OA 0 TC

SAT, independently of the occiput position, and 36% (5/14 fetuses; 95% CI: 12.8-64.9) in the group of fetuses with SP, irrespective of the occiput position (p not significant). The rate of urgent cesarean sections was 8% (6/72 fetuses; 95% CI: 3.1-17.3) in the group of fetuses with SAT, independently of the occiput position, and 50% (7/14 fetuses; 95% CI: 23-77) in the group of fetuses with SP, irrespective of the occiput position ($p < 0.0007$). Table III reports the indications for cesarean sections.

Discussion

We observed that fetal spine position could have an important role in determining fetal occiput position at birth. At the beginning of labor, in 52.3% of cases, the fetal occiput was in a posterior position and, in 81.5% of cases, the spine was in anterior-transverse position. At birth, occiput and spine are both in the anterior position in 90.4% of cases (66/73 vaginal deliveries), and this phenomenon can be explained as the fetal occiput tends to rotate in the direction of the spine position.

Previously, Peregrine et al[23] found that the fetal occiput and spine sometimes do not share the same position, but they did not discuss this issue further. Blasi et al[14] claimed that the position of the spine during the second stage of labor can be considered a diagnostic sign in predicting the OP position at birth. Precisely, they focused on two main findings: firstly, when the occiput and spine were anterior at the ultrasound examination none of the infants was born in the OP position; secondly, when the occiput was posterior and the spine was anterior at the ultrasound examination none of the infants was born in the OP position; thirdly when occiput and spine were posterior at the ultrasound examination only 14% of cases rotated into an OA position at birth[14].

Recently, Gizzo et al[24] investigated the role of the spine position in determining the likelihood of persistent OP position at birth and possible associated implications in obstetrical management. They found that spine position had a high accuracy in predicting the position of the occiput at birth, especially if it was evaluated during the first stage of labor. Caesarean section and operative vaginal were more frequent during the second stage of labor in cases of persistent OP, especially if the spine was in a posterior position. Furthermore, in concordant posterior positions, labor length, analgesia request, operative delivery, and caesarean section rate were higher than in other combinations[24]. In accordance with previously cited studies[14,24], in our series, we did not find fetuses in OA and SP position, in any stage of labor: probably, this is impossible during human labor. All fetuses in an OP position at birth were in the same position also at the beginning of labor; in only two cases (2.3% of fetuses) did a malrotation occur (from an OT position to an OP position), probably because these two fetuses had an SP position.

Our results suggest that the persistent occiput posterior position is the consequence of an occiput posterior position per se, and not a consequence of a malrotation[4,8,25,26].

We observed that SAT positions were associated with vaginal deliveries in a higher percentage (71% of cases) compared to SP positions (14% of cases), independently of occiput positions ($p = 0.0001$). Conversely, SAT positions were associated with operative delivery in a lower percentage (29% of cases) compared to SP positions, independently of occiput positions (86%) ($p = 0.0001$). These facts suggest that spine position might play a crucial role in the outcome of delivery, but, in relation to the complexity and dynamism of human labor, it would not be right to say that the evaluation of spine position has a predictive value regarding the type of delivery. Indeed, also some fetuses in SAT positions were delivered by cesarean section (29%) and some fetuses in an SP position were delivered by vaginal delivery (14%).

Table III. Indication for cesarean sections.

	N	Dystocia	Non reassuring fetal heart	Failed vacuum extraction
OA/SAT	5	1 (20%)	4 (80%)	0 (0%)
OT/SAT	0	0 (0%)	0 (0%)	0 (0%)
OP/SAT	1	0 (0%)	1 (100%)	0 (0%)
OP/SP	7	3 (42.9%)	1 (14.2%)	3 (42.9
TOT	13	4 (30.7 %)	6 (46.2 %)	3 (23.1%)

Although not the topic of this study, we have found that vaginal operative deliveries were more difficult, in term of numbers of traction and detachments of a vacuum system, in cases of occiput posterior position with posterior spine compared to those with anterior spine. Indeed, three cesarean sections performed in this group were caused by a failed operative vaginal delivery. In particular, this observation could be important in the organizational set-up of smaller hospitals in which there is only one doctor with another on-call. In cases of necessity to perform an operative vaginal delivery in a fetus in an OP position with an SP position, in our opinion, it could be reasonable to call the second doctor and prepare for a potential cesarean section.

In consideration of the importance of the evidenced relationship between occiput and spine fetal position, the introduction of this evaluation as a routine protocol in labor should be considered. We might call this new ultrasound parameter "Occiput-Spine Relationship" (OSR).

The main limitations of our study were the relatively small number of enrolled patients and the absence of randomization; nevertheless, it might offer much food for thought, in the same way that the evaluation of "OSR" might have some implication in the management of dystocia. Indeed, if we look for a causal diagnosis regarding labor arrest, we should acknowledge that an incorrect position of the fetus might be the cause of dystocia in 60% of cases[28,29]. The therapeutic consequence of an abnormal fetal position and labor arrest might be to change the posture of the mother[30-32] or perform a manual rotation of the fetal occiput (before and not after breaking the membranes), allowing more favorable conditions to rotate the fetus into a typical position[21,33-38].

Conclusions

We suggest "OSR" evaluation during the different stages of labor in order to predict the occiput fetal position at birth, although not the type of delivery. This adjunctive information should be helpful in labor management. Further studies on this topic are needed, to obtain definitive consideration and universal protocol of action.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

References

1) Barth WH Jr. Persistent occiput posterior. Obstet Gynecol 2015; 125: 695-709.
2) Malvasi A, Tinelli A, Brizzi A, Guido M, Laterza F, De Nunzio G, Bochicchio M, Ghi T, Stark M, Benhamou D, Di Renzo GC. Intrapartum sonography head transverse and asynclitic diagnosis with and without epidural analgesia initiated early during the first stage of labor. Eur Rev Med Pharmacol Sci 2011; 15: 518-523.
3) Malvasi A, Tinelli A, Brizzi A, Guido M, Martino V, Casciaro S, Celleno D, Frigo MG, Stark M, Benhamou D. Intrapartum sonography for occiput posterior detection in early low dose combined spinal epidural analgesia by sufentanil and ropivacaine. Eur Rev Med Pharmacol Sci 2010; 14: 799-806.
4) Verhoeven CJ, Rückert ME, Opmeer BC, Pajkrt E, Mol BW. Ultrasonographic fetal head position to predict mode of delivery: a systematic review and bivariate meta-analysis. Ultrasound Obstet Gynecol 2012; 40: 9-13.
5) Gardberg M, Laakkonen E, Salevaara M. Intrapartum sonography and persistent occiput posterior position: a study of 408 deliveries. Obstet Gynecol 1998; 91: 746-749.
6) Caldwell WE, Moloy HC, D'Esopo DA. A roentgenologic study of the mecha-nism of engagement of the fetal head. Am J Obstet Gynecol 1934; 28: 824-841.
7) Calkins LA. The etiology of occiput presentations. Am J Obstet Gynecol 1939; 37: 618-623.
8) Akmal S, Tsoi E, Howard R, Osei E, Nicolaides KH. Investigation of occiput posterior delivery by intrapartum sonography. Ultrasound Obstet Gynecol 2004; 24: 425-428.
9) Souka AP, Haritos T, Basayiannis K, Noikokyri N, Antsaklis A. Intrapartum ul-trasound for examination of the fetal head position in normal and obstructed la-bor. J Matern Fetal Neonatal Med 2003; 13: 59-63.
10) Eggebo TM, Heien C, Okland I, Gjessing LK, Smedvig E, Romundstad P, Salvesen KA. Prediction of labour and delivery by ascertaining the fetal head position with transabdominal ultrasound in pregnancies with prelabour rupture of membranes after 37 weeks. Ultraschall Med 2008; 29: 179-183.
11) Fitzpatrick M, McQuillan K, O'Herlihy C. Influence of persistent occiput poste-rior position on delivery outcome. Obstet Gynecol 2001; 98: 1027-1031.
12) Ponkey SE, Cohen AP, Heffner LJ, Lieberman E. Persistent fetal occiput poste-rior position: obstetric outcomes. Obstet Gynecol 2003; 101: 915-920.
13) Cheng YW, Shaffer BL, Caughey AB. The association between persistent oc-ciput posterior position and neonatal outcomes. Obstet Gynecol 2006; 107: 837-844.
14) Blasi I, D'Amico R, Fenu V, Volpe A, Fuchs I, Henrich W, Mazza V. Sono-graphic assessment of fe-

tal spine and head position during the first and second stages of labor for the diagnosis of persistent occiput posterior position: a pilot study. Ultrasound Obstet Gynecol 2010; 35: 210-215.

15) Youssef A, Ghi T, Pilu G. How to perform ultrasound in labor: assessment of fe-tal occiput position. Ultrasound Obstet Gynecol 2013; 41: 476-478.

16) Dupuis O, Ruimark S, Corinne D, Simone T, André D, René-Charles R. Fetal head position during the second stage of labor: comparison of digital vaginal ex-amination and transabdominal ultrasonographic examination. Eur J Obstet Gy-necol Reprod Biol 2005; 123: 193-197.

17) Sherer DM, Miodovnik M, Bradley KS, Langer O. Intrapartum fetal head posi-tion I: comparison between transvaginal digital examination and transabdominal ultrasound assessment during the active stage of labor. Ultrasound Obstet Gyne-col 2002; 19: 258-262.

18) Sherer DM, Miodovnik M, Bradley KS, Langer O. Intrapartum fetal head posi-tion II: comparison between transvaginal digital examination and transabdomi-nal ultrasound assessment during the second stage of labor. Ultrasound Obstet Gynecol 2002; 19: 264-268.

19) Kreiser D, Schiff E, Lipitz S, Kayam Z, Avraham A, Achiron R. Determination of fetal occiput position by ultrasound during the second stage of labor. J Matern Fetal Med 2001; 10: 283-286.

20) Ramphul M, O'Brien Y, Murphy DJ. Strategies to enhance assessment of the fe-tal head position before instrumental delivery: a survey of obstetric practice in the United Kingdom and Ireland. Eur J Obstet Gynecol Reprod Biol 2012; 165: 181-188.

21) American College of Obstetricians and Gynecologists; Society for Maternal-Fetal Medicine. Obstetric care consensus no. 1: safe prevention of the primary cesarean delivery. Obstet Gynecol 2014; 123: 693-711.

22) Sherer DM. Can sonographic depiction of fetal head position prior to or at the onset of labor predict mode of delivery? Ultrasound Obstet Gynecol 2012; 40: 1-6.

23) Peregrine E, O'Brien P, Jauniaux E. Impact on delivery outcome of ultrasono-graphic fetal head position prior to induction of labor. Obstet Gynecol 2007; 109: 618-625.

24) Gizzo S, Andrisani A, Noventa M, Burul G, Di Gangi S, Anis O, Ancona E, D'Antona D, Nardelli GB, Ambrosini G. Intrapartum ultrasound assessment of fetal spine position. Biomed Res Int 2014; 2014: 783598.

25) Lieberman E, Davidson K, Lee-Parritz A, Shearer E. Changes in fetal position during labour and their association with epidural anesthesia. Obstet Gynecol 2005; 105: 974-982.

26) Adam G, Sirbu O, Voicu C, Dominic D, Tudorache S, Cernea N. Intrapartum ul-trasound assessment of fetal head position, tip the scale: natural or instrumental delivery? Curr Health Sci J 2014; 40: 18-22.

27) Alimondi P, Deiana SF, Santopietro X, Mastromatteo C, Villa PM, Giambattista E, Padoan A, Tampieri A, Perino A, Rinaldo D, Ragusa A. Dystocia in labour: maternal of fetal problem? [abstract]. Reprod Sci 2012; 3 Suppl. 1: (125A-).

28) Marpeau L, Sergent F, Manson F, Verspyck E, Eurin D. Mécanismes des stag-nations de la dilatation en phase active du travail [Mechanisms of the stagnation of dilatation in the active phase of labor]. Gynecol Obstet Fertil 2002; 30: 282-285.

29) Choi SK, Park YG, Lee DH, Ko HS, Park IY, Shin JC. Sonographic assessment of fetal occiput position during labor for the prediction of labor dystocia and perinatal outcomes. J Matern Fetal Neonatal Med 2016; 29: 3988-3992.

30) Hunter S, Hofmeyr GJ, Kulier R. Hands and knees posture in late pregnancy or labour for fetal malposition (lateral or posterior). Cochrane Database Syst Rev 2007; (4): CD001063.

31) de Gasquet B. [Trouver sa position d'accouchement]. Paris: Hachette Livre, 2009; p. 126.

32) Reitter A, Daviss BA, Bisits A, Schollenberger A, Vogl T, Herrmann E, Louwen F, Zangos S. Does pregnancy and/or shifting positions create more room in a woman's pelvis? Am J Obstet Gynecol 2014; 211: 662.e1-9.

33) Reichman O, Gdansky E, Latinsky B, Labi S, Samueloff A. Digital rotation from occipito-posterior to occipito-anterior decreases the need for cesarean sec-tion. Eur J Obstet Gynecol Reprod Biol 2008; 136: 25-28.

34) Ragusa A, Gizzo S, Noventa M, Ferrazzi E, Deiana S, Svelato A. Prevention of primary caesarean delivery: comprehensive management of dystocia in nullipa-rous patients at term. Arch Gynecol Obstet 2016; 294: 753-761.

35) Svelato A, Di Tommaso M, Spinoso R, Ragusa A. The reduction of first cesar-ean sections: a cultural issue. Acta Obstet Gynecol Scand 2016 Aug 12. [Epub ahead of print]

36) Svelato A, Meroni MG, Poli M, Perino A, Spinoso R, Ragusa A. How to reduce caesarean sections in first four Robson's classess. BJOG 2014; 121 (Supp. s2): 91.

37) Ragusa A, Svelato A, Costa D, Spinoso R, Perino A. Oxytocin augmentation in labouring patients: less is better. BJOG 2014; 121 (Supp. s2): 144.

38) Ragusa A, Svelato A. Oxytocin and customization of assistance in labor. JPNIM 2014; 3: e030123.