The use of intrapartum ultrasound to diagnose malpositions and cephalic malpresentations

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Fetal malpositions and cephalic malpresentations are well-recognized causes of failure to progress in labor. They frequently require operative delivery, and are associated with an increased probability of fetal and maternal complications. Traditional obstetrics emphasizes the role of digital examinations, but recent studies demonstrated that this approach is inaccurate and intrapartum ultrasound is far more precise. The objective of this review is to summarize the current body of literature and provide recommendations to identify malpositions and cephalic malpresentations with ultrasound. We propose a systematic approach consisting of a combination of transabdominal and transperineal scans and describe the findings that allow an accurate diagnosis of normal and abnormal position, flexion, and synclitism of the fetal head. The management of malpositions and cephalic malpresentation is currently a matter of debate, and individualized depending on the general clinical picture and expertise of the provider. Intrapartum sonography allows a precise diagnosis and therefore offers the best opportunity to design prospective studies with the aim of establishing evidence-based treatment. The article is accompanied by a video that demonstrates the sonographic technique and findings.

Key words: asynclitism, brow presentation, deep transverse arrest, dysfunctional labor, dystocia, face presentation, fetal attitude, fetal malpositions, fetal malpresentations, instrumental delivery, labor, obstructed labor, parturition, persistent occiput posterior, sinciput presentation

Introduction

Fetal malpositions and cephalic malpresentations are found in about 10% of all pregnancies and continue to present a challenge for obstetricians. They are well-recognized causes of failure to progress in labor, and usually result in protracted or arrested descent,[1-6] an increasingly important dilemma of contemporary obstetrics.[7-14] They frequently require operative delivery, and are associated with an increased probability of fetal and maternal complications.[3,4,6] Thus far, the diagnosis relied entirely on digital examination, which is notoriously subjective and imprecise.[15-21] Difficulties in the prospective identification contribute to creating uncertainties in the management of these conditions.

Intrapartum sonography was recently reported to be an objective and accurate diagnostic tool.[15-21] However, except for persistent posterior occiput, the subject of many studies, most available experience with other abnormalities of cephalic position and presentation is based on case reports and small series. The sonographic technique and findings are also demonstrated in a video accompanying the article. Furthermore, the approach to diagnosis is variable, as transabdominal, transperineal, and transvaginal sonography, or a combination of methods, were used.[16,17,20-23]

The objective of this review is to summarize the current body of literature and provide recommendations to identify malpositions and cephalic malpresentations with ultrasound. The review was performed according to the Meta-analysis of Observational Studies in Epidemiology guidelines.[24] We systematically searched PubMed for the following terms: "malpositions," "malpresentations," "occiput posterior," "deep transverse arrest," "deflexed presentation," "face," "brow," "sinciput," and "asynclitism" as related to "intrapartum sonography."

The initial yield included 172 articles; 23 of these provided details on the methodology and findings of intrapartum sonography.[5,17,21-23,25-42] We combined information from these articles with our own personal experience collected over a decade of intensive use of ultrasound in labor. The following discussion focuses on the second stage of labor, as this is the most optimal time for the diagnosis of malpositions and cephalic malpresentations.

Technique of intrapartum sonography and findings of vertex presentation with anterior occiput

Sonographic diagnosis of presentation and position in patients in labor with cephalic fetuses requires both a transabdominal and a transperineal[43] (also referred to as translabial)[44] approach (Figure 1).[17,28,44] Fetal position is best assessed by identifying the spine in the transabdominal scan and following its course to the conjunction with the occiput, which in anterior presentations is found between 10.30-1.30 hours. Vertex

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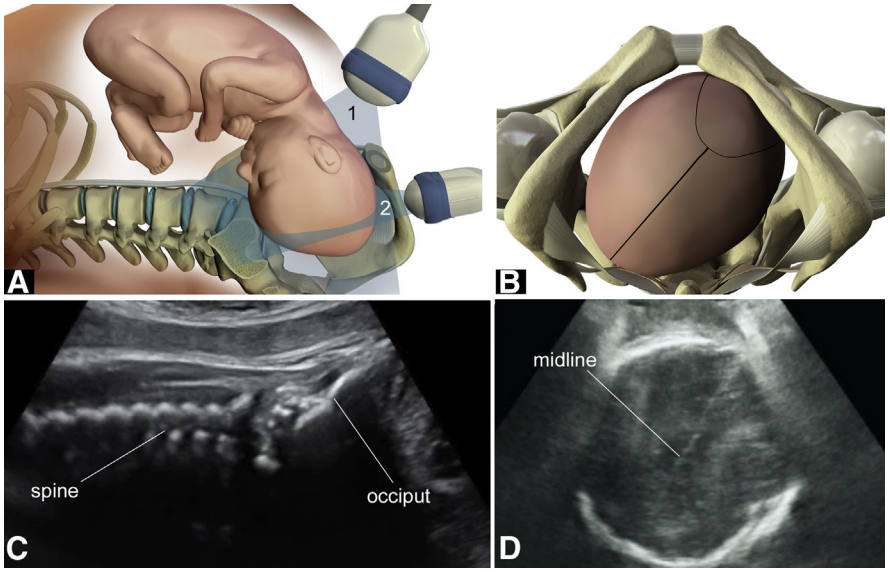
FIGURE 1
Sonography of vertex presentation with anterior occiput after engagement of fetal head



A, Schematic representation of ultrasound technique to identify fetal position and presentation: transabdominal scan is first obtained to demonstrate spine and occiput (1), and transperineal scan is then performed to identify cerebral midline echo (2). **B**, Schematic representation of direction of sagittal suture prior to internal rotation. **C**, Sonogram corresponding to section plane (1): wide angle between fetal spine and occiput indicates normal flexion. **D**, Sonogram corresponding to section plane (2): following engagement and prior to internal rotation cerebral midline echo has angle of about 45 degrees to anteroposterior axis of maternal pelvis.

Bellussi. Intrapartum ultrasound diagnosis of malpositions and cephalic malpresentations. Am J Obstet Gynecol 2017.

presentation is inferred by demonstrating a wide angle between the cervical spine and the occiput (occiput-spine angle) that reflects the flexion of the fetal head.[28] The angle typically increases as the head descends into the maternal pelvis (Table 1). It is on average 133 degrees when close to engagement, and it has been found that the larger the angle, the greater the probability of a spontaneous vaginal delivery.[28] Rotation is assessed clinically by palpating the sagittal suture. The midline of the fetal brain is easily demonstrated with sonography and is a convenient proxy of the sagittal suture. When the head is engaged, the midline echo is best seen in a transverse transperineal scan.[44] In normal labor, the angle formed between the midline of the fetal brain and the anteroposterior axis of the maternal pelvis is most frequently close to 45 degrees at the time of engagement. Internal rotation, inferred by an angle close to 0, usually occurs at a station of >3 cm.[44]

TABLE 1
Measurement of occiput-spinal angle according to fetal station

Station, cm	Occiput-spine angle, mean ± SD
−3	118.7 ± 11.0
−2	126.0 ± 8.76
−1	133.8 ± 8.3

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Cephalic malpositions

Cephalic malpositions include persistent vertex presentation with occiput posterior and transverse (Table 2). Diagnosis is made at the time of delivery because, in normal labor, the fetal occiput is frequently directed posteriorly or laterally in the first and even early second stage of labor and spontaneously rotates to an anterior position later. In the largest available sonographic studies, posterior and lateral occiput were found, respectively, in 33% and 37% of patients in the first stage; 19% and 28% at full dilatation; and 7% and 5% at delivery.[16,25,45]

Persistent malpositions are a major cause of prolonged or obstructed labor, and are associated with operative delivery and complications, including perineal lesions, febrile morbidities, and low 5-minute Apgar test scores.[2,6,42,46-50] Posterior occiput was also associated with a 4-fold increase in neonatal encephalopathy.[51]

Clinical diagnosis is inaccurate and there is little doubt that sonography is the method of choice.[15,18-21,52] Posterior occiput is easily diagnosed with a transabdominal scan oriented transversely above the pubic symphysis, demonstrating that the fetal eyes are oriented upwards (Figure 2).[41] The transperineal scan is usually less informative in these cases. Attention to the details of intracranial anatomy allow the inference of the posterior position of the occiput by demonstrating brain structures such as the atria of the lateral ventricles, but this requires specific knowledge of sonography of intracranial anatomy.[53] Demonstrating the fetal eyes, which remain visible above the pubic symphysis until late in the second stage, when the head is very close to be delivered, is far simpler. When the occiput is posterior, head deflexion is not infrequent and has a major influence on the progress of labor.[17] Deflexion can be ruled out by demonstrating in a longitudinal view of the fetal head that the chin is tucked on the chest (Figure 2).[17]

The transverse position of the occiput is best recognized by visualizing the horizontal direction of the midline of the fetal brain in a

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