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TESI DI SPECIALIZZAZIONE

The "Choroid Bar". An easy to seek marker of a normal posterior fossa at 12-14 gestational weeks.

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Abstract

Objective: Our objectives are: 1) to assess the visualization rate of the choroid bar in a consecutive series of 306 first trimester scans; 2) to verify – in this cohort of foetuses - the normalcy of the posterior fossa later in pregnancy; 3) to confirm the non-visualization of the choroid bar in a retrospective series of foetuses with posterior fossa malformations.

Methods: The study include a prospective and a retrospective series. The former includes 306 fetuses undergoing routine obstetric ultrasound at our Unit both in the first and the second trimester over the last 6 months, the latter includes 12 cases of posterior fossa malformations. In the prospective study, the choroid bar – defined as a visually continuous, homogeneously hyperechoic thick structure bridging the cisterna magna from side to side – was sought at the end of the 1st trimester Nuchal Translucency scan. In the retrospective study, previously acquired three-dimensional volume datasets were processed in order to assess whether the choroid bar could be visualized in case of open spinal dysraphisms and vermian cystic anomalies. In the prospective study patients, the confirmation of a normal posterior fossa was based on the sonographic aspect of this anatomic region at the time of the 2nd trimester anomaly scan at 19-21 gestational weeks, while in the retrospective study it was based on necropsy results, when available, or further direct imaging of the defect later in pregnancy.

Results: In the prospective study, the choroid bar could be visualized in all 306 fetuses: on transabdominal ultrasound in 287 (93.8%) cases, on transvaginal in 19

(6.2%). The choroid bar was displayed with a ventral/dorsal approach in 67 (21.9%) cases, with a lateral approach in 56 (18.3%) cases and with both in 183 (59.8%) cases. All 306 cases were confirmed to have a sonographically normal posterior fossa at 19-21 gestational weeks. On the contrary, in the retrospective study, it was never possible to reproduce the choroid bar.

Conclusions: We have described a new sign – the Choroid Bar – consistent with a normal posterior fossa at the end of the 1st trimester. The Choroid Bar represents an option to screen for major abnormalities of the posterior fossa, since it allows to suspect both open spinal dysraphisms and posterior fossa cystic malformations being at the same time very easy to visualize, for it can be displayed with all lines of insonation.

Chapter 1 – Introduction

In the fetus, the posterior cranial fossa has always drawn the attention of the researchers. In particular, the cerebellum with its vermis, the fourth ventricle, the cisterna magna and the brainstem have been studied for decades from the second trimester onwards[1–5]. More recently, the investigations have extended to the first trimester, thanks to the introduction of high frequency transducers – both transvaginal and transabdominal – which ensure a much higher resolution. This technological advance has led to the possibility to detect open dysraphisms at the end of the first trimester, owing to the identification of highly sensitive endocranial sonographic signs[6,7], some of which related to the early recognition of the Chiari II malformation[6,8]. Finally, over the last few years, the key role played by the position of the fourth ventricular choroid plexus (4V-CP) in the differential diagnosis of cystic vermian abnormalities has emerged not only in the second trimester[4,5], but also at 12-13 gestational weeks[9,10]. Hence, considering the above cited literature, it has become clear that the 4V-CP is indeed the pivotal anatomical structure to assess in order to characterize and differentiate major posterior fossa anomalies, because its position and aspect varies according to the different pathological entities.

1.1 Development and anatomy of the fourth ventricle and the 4V-CP

The plica choroidea, which represents the first evidence of the 4V-CP, becomes evident by the 7th gestational week (crown–rump length of 18–20mm)[11,12]. This structure is thought to be the divide between the area membranacea anterior (or anterior membranous area) and the area membranacea posterior (or posterior membranous area). The latter leads to the development of the transient Blake's pouch which seems to become fenestrated at about 12–13 gestational weeks to form the foramen of Magendie[13]. The anterior membranous area is eventually incorporated into the 4V-CP, probably leading to the development of the tenia choroidea which anchors the developing 4V-CP to the walls of the fourth ventricle. The fourth ventricle is a wide, tent-shaped midline cavity located between the cerebellum and the brainstem. It is connected rostrally with the third ventricle through the aqueduct, caudally with the cisterna magna through the foramen of Magendie and laterally with the cerebellopontine angles through the foramina of Luschka[14,15]. The timing of the appearance of the lateral foramina of Luschka is still in question, but the most supported theory is that it becomes evident only at about 26 gestational weeks[15]. The 4V-CP is described as a T-shaped structure with double vertical limbs and consists of two inverted L-shaped structures[14,16] (Figure 1a). The two paired longitudinal limbs are located on each side of the midline and extend to the foramen of Magendie and, in some cases (in the adult), protrude through it to the cisterna magna[16]. The two longitudinal limbs are juxtaposed and, in some cases, appear to merge at their end. The two transverse limbs extend laterally through the foramina of Luschka and reach the cerebellopontine fissures. The two terminal parts of the lateral segments, protruding through the foramina of Luschka, have been named Bochdalek's flower baskets (in German, Blumen korbchen) (Figure 1b)[17], because their appearance resembles a basket of flowers.

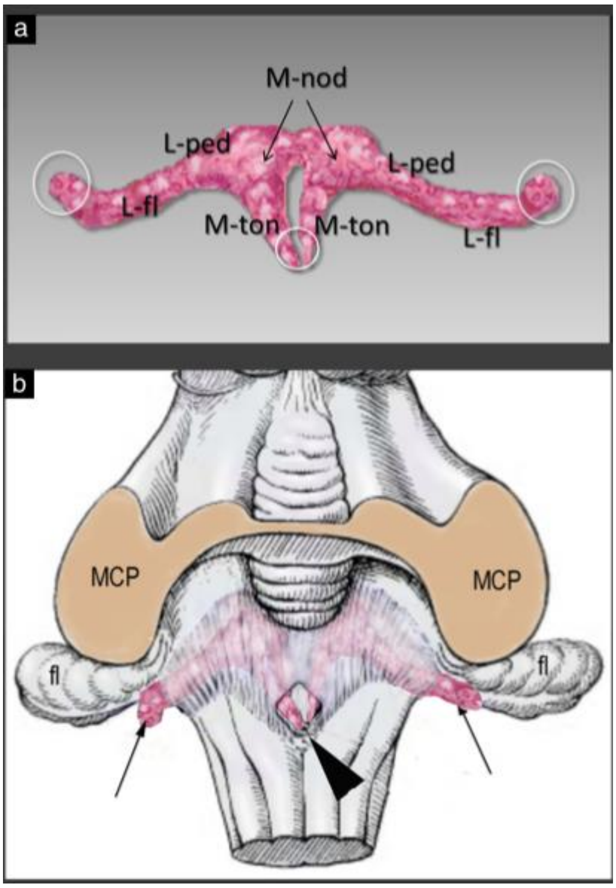

Figure 1 (a) Anatomy of the choroid plexus of the fourth ventricle (4V-CP). The 4V-CP is composed of two inverted L-shaped structures located on each side of the midline. The longitudinal limbs parallel to the midline represent the vertical medial segments (M). The transverse limbs that originate from the rostral ends of the medial segments are the lateral segments (L). According to their relationship with adjacent parts of the cerebellum, each lateral segment consists of a proximal peduncular part (L-ped; because it is where it connects with the vertical limb) and a lateral part named floccular (L-fl) because it is located beneath the flocculus. Similarly, each medial segment consists of a proximal nodular part (M-nod), positioned below the nodulus, and a distal tonsilar part (M-ton), located adjacent to the tonsils. The latter terminal parts of the two longitudinal limbs sometimes (in the

adult) protrude through the foramen of Magendie (small white circle), reaching the cisterna magna. The two terminal parts of the lateral segments, which have been named Bochdalek's flower baskets, protrude through the Luschka foramina (two larger white circles) into the cerebellopontine angles. (b) Bochdalek's flower baskets. The image demonstrates the 4V-CP (in pink), as seen from above, behind the transparent roof of the fourth ventricle. The arrowhead indicates the foramen of Magendie through which the terminal ends of the longitudinal limbs sometimes protrude. The two arrows indicate Bochdalek's flower baskets, i.e. the terminal parts of the two transverse limbs which protrude through the foramina of Luschka into the cerebellopontine angles. (Image modified from: https:// www.brainkart.com/article/Choroid-Plexus---Cerebrospinal-Fluid-Spaces_14902/.) MCP, middle cerebellar peduncles.

1. 2 Sonographic anatomy of the normal 4V-CP and Bochdalek's flower basket

The study of the 4V-CP is easier at 12 – 14 gestational weeks, because the calvarium is still widely unossified. By using a transvaginal approach with a high-frequency (6–12 MHz) ultrasound transducer, and acquiring a lateral volume of the posterior fossa, as recommended by the guidelines of the International Society of Ultrasound in Obstetrics and Gynecology (ISUOG)[18], it is possible to demonstrate the whole 4V-CP using multiplanar imaging. At 12–14weeks' gestation, the appearance of the 4V-CP is different from that described above, owing to the presence of the still imperforated Blake's pouch. Blake's pouch, which represents an outpouching of the roof of the fourth ventricle, mechanically bends and displaces laterally the two longitudinal limbs of the 4V-CP and, as a result, their appearance in the coronal plane resembles two brackets surrounding the round fourth ventricular outlet (Figure 2b). In a multiplanar image, it is possible to demonstrate simultaneously, in the midsagittal plane, the downward, oblique direction of the longitudinal limbs of the 4V-CP (Figure 2a), in the coronal plane, the diverging longitudinal limbs of the 4V-CP, embracing the superolateral part of Blake's pouch inlet, as well as the proximal part of the transverse limbs of the 4V-CP (Figure 2b) and, in the axial plane, the transverse limbs of the 4V-CP reaching laterally towards the lateral components of the rhombic lips (Figure 2c). Later in pregnancy, it becomes progressively more challenging to demonstrate the whole anatomy of the 4V-CP, in particular its transverse limbs, due to the fact that the cerebellopontine fissure, where Bochdalek's flower basket is located, is rather hidden by several anatomic structures, including the skull base. Nonetheless, the human sees only what he expects to see and not what is in front of his eyes and, as such, by becoming aware of the shape and position of the transverse limbs of the 4V-CP, it is possible to also demonstrate them in the second and early third trimesters of pregnancy (Figure 3).

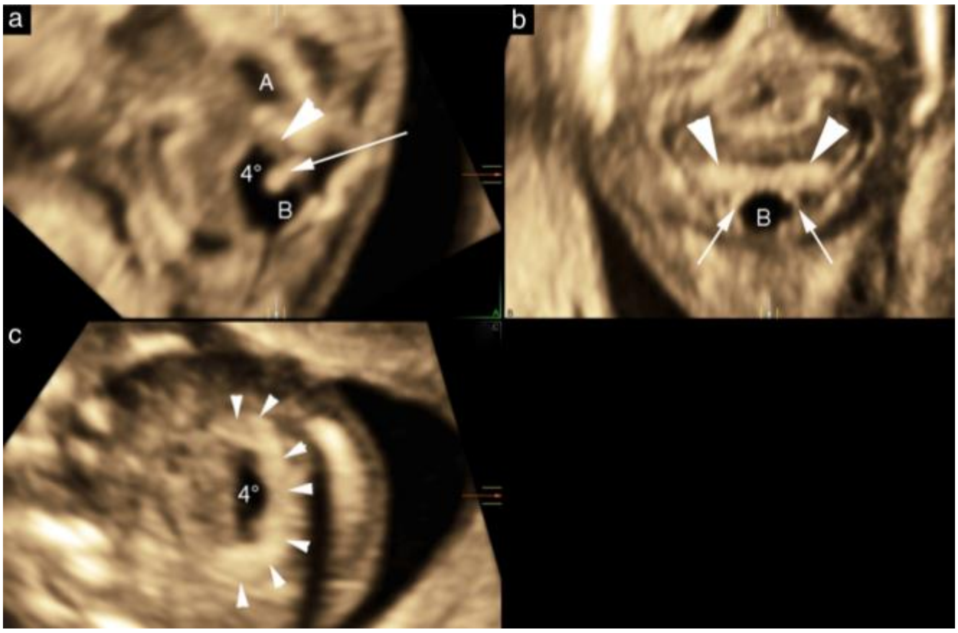

Figure 2 Multiplanar image demonstrating anatomy of the fourth ventricular choroid plexus (4V-CP) and related anatomical structures in a normal fetus at 13gestational weeks. The three-dimensional volume dataset was acquired laterally using a 6–12-MHz transvaginal transducer. (a) In the midsagittal plane, the downward, oblique direction of the longitudinal limbs (arrow) of the 4V-CP is visualized. The 4V-CP lies just caudal to the developing vermis (arrowhead) and cranial to Blake's pouch (B), at the level of the roof of the fourth ventricle (4°). Note also the prominent Sylvian aqueduct (A). (b) In the coronal plane, the diverging longitudinal limbs (arrows) of the 4V-CP embracing the superolateral part of Blake's pouch inlet (B) are seen; the proximal part of the transverse limbs (arrowheads) of the 4V-CP are also visible. (c) In the reconstructed axial plane, the transverse limbs of the 4V-CP (arrowheads) reaching laterally towards the lateral components of the rhombic lips are visualized.

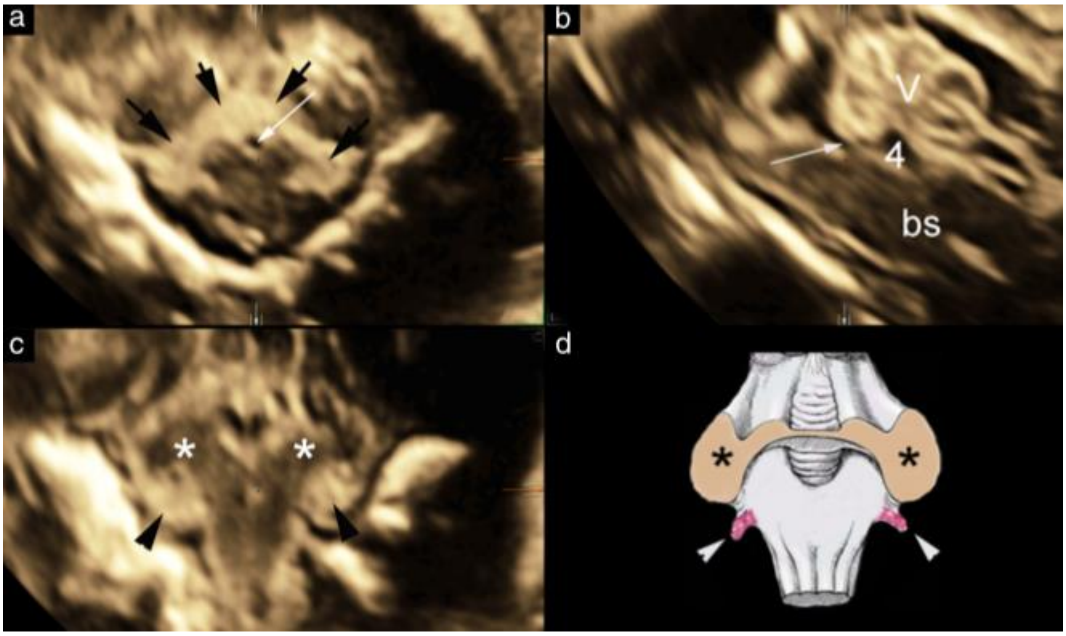

Figure 3 Multiplanar sonographic demonstration of Bochdalek's flower baskets in a normal fetus at 31 gestational weeks. The three-dimensional volume dataset was acquired in the axial oblique plane using a 5–9-MHz transvaginal transducer. (a) In the oblique axial plane, the whole course of the lateral segments (transverse limbs) of the fourth ventricular choroid plexus (black short arrows) is demonstrated. Note the foramen of Magendie in the middle (white arrow). (b) In the rotated midsagittal plane, it is possible to understand the actual level of the oblique plane shown in (a); the fourth ventricle (4), foramen of Magendie (arrow), brainstem and pons (bs), and cerebellar vermis (V) are shown. (c) In the corresponding coronal plane, it is possible to demonstrate the two Bochdalek's flower baskets (arrowheads), below the middle cerebellar peduncles (asterisks), protruding into the cerebellopontine angles.(d) Schematic representation of (c), showing Bochdalek's flower baskets (in pink, indicated by arrowheads) below the middle cerebellar peduncles (asterisks).

1. 3 Sonographic position of the 4V-CP in relation to cystic abnormalities of the posterior fossa

In the prenatal ultrasound community, the 4V-CP entered the diagnostic arena only after the description, by Tortori-Donati *et al.* in 1996[19], of Blake's pouch cyst (BPC) as a pathological entity distinct from mega cisterna magna in neonates. Subsequently, BPC was also demonstrated in the fetus[1,20,21] and it was established that one of the fundamental distinctive diagnostic criteria of BPC is a normal size of the vermis, unlike that which is observed in vermian hypoplasia (VH) and Dandy–Walker malformation (DWM)[1]. However, in a small number of cases, sonographic assessment of vermian biometry is not able to differentiate between BPC and VH. There are two likely reasons for this. The first is that, in a significant number of studies, sonographic assessment of the posterior fossa was carried out transabdominally which is a major limitation because, by definition, the lower part of the posterior fossa is shadowed by the skull base[3,22]. The second reason is that, in a few instances, there might be significant overlap in the values of the brainstem – vermis angle and vermian biometry between VH and BPC, due to possible mild compression of the vermis by the cyst, if very large, in BPC[3,4]. On the contrary, the assessment of the position of the 4V-CP has proved to be highly reliable in the differentiation of cystic abnormalities of the posterior fossa[4,9,10]. In a study published in this issue of the Journal, Volpe *et al.*[10] demonstrated that the 4V-CP is located outside the cyst, distant from the vermian margin and inferolaterally displaced by the cyst, in fetuses with DWM, whereas it is located within the cyst and just below the vermis in fetuses with BPC. These new data confirm and expand our previous finding that the 4V-CP is always superolateral (i.e. up) in relation to the cyst inlet in fetuses with BPC and inferolateral (i.e. down) in relation to the cyst inlet in fetuses with DWM and VH[4]. The findings of Volpe *et al.* concord with the hypothesized differential pathogenesis of the two conditions. Therefore, it is now highly recommended to check the position of the 4V-CP both at 12 – 13 gestational weeks and in the second trimester, in order to carry out an accurate differential diagnosis between cystic abnormalities of the posterior fossa. An important technical note should be mentioned here. In both our study[4] and that of Volpe *et al.*[10], the data on the differential position of the 4V-CP in cystic vermian abnormalities were obtained using high-resolution three-dimensional transvaginal ultra- sound. As also underlined in the recent ISUOG guidelines on fetal neurosonography[18], it is crucial to use all these three tools, i.e. a high-frequency transducer, transvaginal approach and three-dimensional multiplanar imaging, in order to visualize adequately the 4V-CP and distinguish it from the lower part of the vermis (i.e. the uvula). In fact, it is all but impossible to distinguish the two struc- tures on transabdominal ultrasound[10,22]. This leads to the conclusion that most charts for vermian biometry based on transabdominal ultrasound have very likely overestimated the true size of the vermis, because the 4V-CP was often inadvertently included in the measurements. Hence, there is a strong need to reassess vermian biometry in pregnancy using transvaginal ultrasound and build new biometric charts that do not include the 4V-CP in the measurements.

In this study we test the hypothesis that the demonstration of a normal appearance of the two horizontal limbs of the 4VCP – which we refer to as the "choroid bar" – might represent an easy marker to seek in order to confirm the normalcy of the posterior fossa anatomy at 12-13 gestational weeks, on screening ultrasound. Hence, our objectives are: 1) to assess the visualization rate of the choroid bar in a consecutive series of 306 first trimester scans; 2) to verify – in this cohort of foetuses - the normalcy of the posterior fossa later in pregnancy; 3) to confirm the non-visualization of the choroid bar in a retrospective series of foetuses with posterior fossa malformations.

Chapter 2 – Methods

2.1 Study design and population

The prospective study includes 306 consecutive fetuses undergoing routine obstetric ultrasound at our Unit both in the first and the second trimester over the last 6 months (November 2022 – May 2023), while the retrospective study includes 12 cases of posterior fossa malformations [Chiari II in open spina bifida: 3 cases; Dandy-Walker Malformation (DWM): 4 cases; Blake's pouch cyst (BPC): 5 cases]. Singleton pregnancies only were included in the study. Entry criterion for the retrospective study was the availability of one or more high-quality transvaginally acquired volume datasets of the posterior fossa, allowing multiplanar image correlation. In the prospective study, the confirmation of a normal posterior fossa was based on the sonographic aspect of this anatomic region at the time of the 2nd trimester anomaly scan at 19-21 gestational weeks. In the retrospective study, it was based on necropsy results, when available, or further direct imaging of the defect later in pregnancy.

2.2 Ultrasound technique

In the prospective study, all patients underwent the routine first trimester scan, performed according to Italian[23] and international[24] guidelines. The sonographic assessment of the fetal head included the evaluation of the intra-cranial translucency[6]. All scans were performed by medical trainees supervised by a senior expert in fetal medicine (DP). For the purpose of this study, once the anatomic evaluation had been completed, the choroid bar was sought by the operator on an axial plane of the fetal head, displayed either with a ventral and/or lateral approach. The "choroid bar" is constituted by the horizontal limbs of the 4VCP which visually join on the midline and can be defined as a "visually continuous, homogeneously hyperechoic, thick structure bridging the cisterna magna from side to side" (**Figures 4, 5**). To consider it as normal, cerebrospinal fluid should be present on both sides of the choroid bar, ie in the 4th ventricle anteriorly and the Blake's pouch posteriorly, the latter being a physiologic entity at this gestational age[4]. The presence of cerebrospinal fluid both ventrally and dorsally to the choroid bar excludes both an abnormal IT (Chiari II malformation) and cystic vermian anomalies (BPC and DWM), in which the 4VCP is displaced[9,10]. The choroid bar can be visualized with a lateral (**Figure 4A**), dorsal (**Figure 4B**), and ventral (**Figure 4C**) approach to the fetal head. As for the retrospective study, the posterior fossa was assessed on three-dimensional multiplanar imaging of volume datasets stored in the Unit archive at the time of the diagnosis, which included in all cases a transvaginal early neurosonography. The volume datasets were processed and navigated on the three orthogonal planes in order to check whether the choroid bar could be reproduced or not. Descriptive statistics only were performed on the study population.

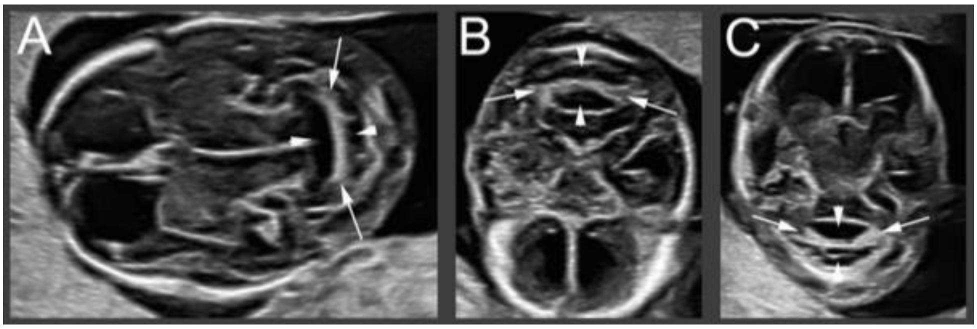

Figure 4. The Choroid Bar is defined as a "visually continuous, homogeneously hyperechoic, thick structure bridging the cisterna magna from side to side (arrows)" and consists of the two horizontal limbs of the 4th ventricular choroid plexus (see text). To be considered normal, cerebrospinal fluid should be seen both ventrally and dorsally to the choroid bar (arrowhead), the two areas corresponding to the 4th ventricle and the physiologic Blake's pouch, respectively. In this figure, we demonstrate that it can be adequately visualized with all lines of insonation: A) lateral; B) dorsal; C) ventral. Gestational age of the three foetuses was 13+0, 13+1 and 13+0 weeks+days, respectively.

Figure 5. In this image, three-dimensional multiplanar imaging is used to demonstrate how significantly the aspect of the posterior fossa changes according to the acquisition plane [note the reference marker positioned on the choroid plexus in (A) and (B)]. A) lateral, axial acquisition, as per ISUOG early neurosonography guidelines13. The two orthogonal panels demonstrate the Choroid Bar on the axial acquisition plane (rotated 90; left panel) and the typical position of the choroid plexus on the reconstructed midsagittal plane (right panel); B) ventral, axial acquisition. In this case, the reconstructed plane is the midsagittal one (right panel), on which the aspect of the choroid plexus is similar to that of the classical IT plane; C) demonstration of the cranial posterior fossa on a 13 weeks specimen. Midsagittal plane (compare to the right panel of A). (Large arrowheads: choroid bar; small arrowhead: choroid plexus; arrow: physiological Blake's pouch; asterisk: 4th ventricle).

Chapter 3 – Results

Median maternal age was 34 years (SD: 5.59; range: 18 - 50) and median gestational age at ultrasound was 13 weeks (SD 3 days; range: 12+1 – 13+6) (CRL: 52.3 – 84.0). In the prospective study, the choroid bar could be visualized in all 306 fetuses: on transabdominal ultrasound in 287 (93.8%) cases, on transvaginal in 19 (6.2%). Of the latter, a direct transvaginal approach was chosen in 8 women with a BMI > 35 kg/m^2, whereas in 11 cases this approach was adopted because the anatomic evaluation, including the visualization of the choroid bar, could not be completed transabdominally, owing to acoustic shadowing from bowel gas with an empty bladder, extensive abdominal scars, or diffuse myomas/adenomyosis of the anterior uterine wall. The choroid bar was displayed with a lateral approach (**Figure 4A**) in 56 (18.3%) cases, with a ventral/dorsal approach (**Figure 4B, C**) in 67 (21.9%) cases, and with both in 183 (59.8%) cases. All 306 cases were confirmed to have a sonographically normal posterior fossa at 19-21 gestational weeks, when the anomaly scan was performed (always in our Unit).

As for the retrospective study, the choroid bar could never be displayed, regardless of the sonographic approach to the posterior fossa. In **Figure 6**, the aspect of the choroid bar plane is shown in a normal fetus (**Figure 6A**), and three fetuses with open spina bifida (**Figure 6B**), Blake's pouch cyst (**Figure 6C- D**) and Dandy-Walker Malformation (**Figure 6E-F**). The differential aspects of the posterior fossa and choroid plexus position and aspect according to the type of anomaly are summarized in **Table 1**.

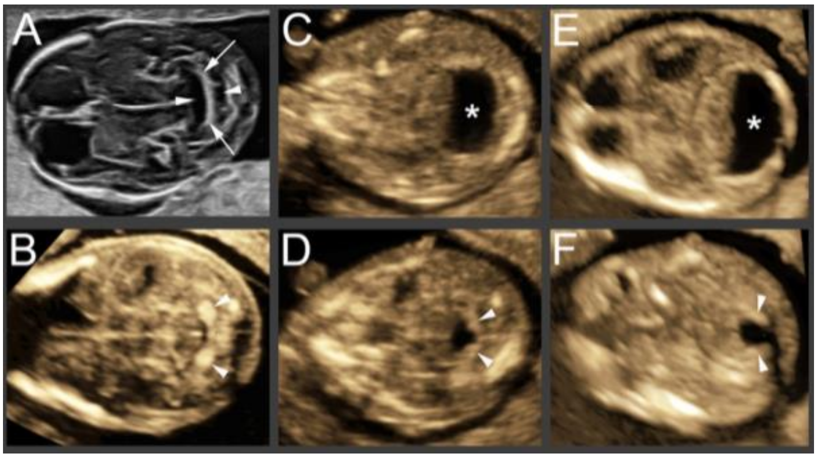

Figure 6. Comparison of the Choroid Bar plane in normal and abnormal foetuses. A) normal fetus, 13+0 weeks+days. Normal aspect of the Choroid Bar, with cerebrospinal fluid ventrally and dorsally (arrowheads) to the actual Choroid Bar (arrows); B) Open spina bifida (13+6 weeks+days). The Choroid Bar plane cannot be demonstrated. Caudally, the two lateral ends of the horizontal choroid plexus limbs (arrowheads) are shown. Note the complete absence of cerebrospinal fluid, consistent with the Chiari II malformation; C) Blake's pouch cyst (13 weeks). Choroidal bar plane. Note the non-visualization of the choroid bar. The whole posterior fossa is cystic (asterisk); D) in the same case, just caudal to the former plane, the two horizontal limbs of the choroid plexus (arrowheads) can be seen displaced laterally; E) Dandy-Walker Malformation (13 weeks). The aspect of the choroidal bar plane is almost identical to that of the Blake's pouch cyst shown in C, with a large fluid collection only (asterisk); F) however, in Dandy-Walker Malformation, the choroid plexus (arrowheads) is outside the cyst and displaced inferolaterally, as evident in this plane, which is the lowermost level of the posterior fossa.

Anomaly	Choroid Bar Plane	4VCP Position	4VCP Shape
DWM	Only CSF collection	Displaced inferolaterally	Two AP bars
BPC	Only CSF collection	Displaced downward*	V-shaped
OSD	No CSF	Displaced downward	Only lateral ends visible

Table 1. Differential aspects of the posterior fossa and choroid plexus position and aspect by type of anomaly. 4VCP: choroid plexus of the 4th ventricle; AP: antero-posterior; BPC: Blake's Pouch Cyst; CSF: cerebrospinal fluid; DWM: Dandy-Walker Malformation; OSD: open spinal dysraphism. *: superolaterally to the cyst inlet

Chapter 4 – Discussion

The early assessment of the posterior fossa may become a key component of the Nuchal Translucency scan, due to the possibility to suspect and/or diagnose both Chiari II malformation[6], which is associated with open spinal dysraphisms, and cystic posterior fossa malformations, such as DWM and BPC[9,10]. However, the visualization of the Intracranial Translucency may offer some difficulty and is not readily displayed in all cases. At the same time, there is no official criterion set for the assessment of the posterior fossa during the Nuchal Translucency scan other than the optional assessment of the Intracranial Translucency on the midsagittal plane of the fetal head[24], despite the fact that current technological capabilities have led to a significant increase in the image resolution. It should also be considered that several articles have been published over the last few years on the recognition of posterior fossa malformations at the end of the 1st trimester[9,10]. Therefore, a significant discrepancy has arisen between the complete lack of recommendations for an early assessment of the posterior fossa on one side (other than the above mentioned IT) and the possibility to suspect/diagnose posterior fossa cystic malformations on the other. In this context, the Choroid Bar represents an option that has two major advantages: 1) it allows to suspect on the same plane both open spinal dysraphisms and posterior fossa cystic malformations (**Table 1**, **Figure 6**); 2) it is very easy to visualize, regardless of the line of insonation (**Figure 3**). Infact, it could be obtained in all cases undergoing first trimester screening ultrasound examination performed by residents in training.

In addition, we were able to confirm that the Choroid Bar can never be reproduced in abnormal cases (**Figure 6**). This is due to the fact that in DWM and BPC the 4VCP is displaced downwardly, acquiring a V-shape aspect in BPC; in DWM, it has been demonstrated by us and other researchers that the 4VCP lies outside the cyst associated with this anomaly, being displaced infero-laterally[9,10]. In Chiari II malformation, which is always associated with open spinal dysraphisms, the whole cerebellum, including the 4VCP, is displaced downward, due to the continuous leakage of cerebro-spinal fluid through the spinal defect. This leads with time to prolapse or herniation of the cerebellar tonsils and/or the whole cerebellum across the foramen magnum; as a consequence, the 4VCP is dragged downward, too (**Figure 6B**).

A main limitation of this study is represented by the fact that the retrospective series only included cases of DWM, BPC and Chiari II malformation. However, it is highly likely that also vermian hypoplasia may be associated with failure to visualize the Choroid Bar, considering that an abnormal position of the 4VCP is present also in this condition, at least in the 2nd trimester[9]. Another limitation is represented by the fact that no abnormality of the posterior fossa was diagnosed prospectively, being all the abnormal cases retrospectively evaluated on stored volume datasets. However, this represents a preliminary study addressing the feasibility and reproducibility of the technique. Assessment of the Choroid Bar is being used since the end of the enrolment in this study and the next step will be to demonstrate the role of this sonographic sign in the identification of posterior fossa abnormalities in a prospective study.

In conclusion, we have described a new sign – the Choroid Bar – consistent with a normal posterior fossa at the end of the 1st trimester. We have demonstrated that it can be achieved in all patients undergoing early anatomy assessment either transabdominally and/or transvaginally and with all insonation lines. Finally, we have demonstrated in a small retrospective series that the Choroid Bar can be visualized neither in Chiari II malformation nor in cystic vermian anomalies (BPC, DWM). Hence, the Choroid Bar can be effectively employed in the early anomaly scan in order to achieve a fast and consistent demonstration of a normal posterior fossa. As mentioned above, the second, ongoing part of this study will focus on the prospective assessment of the role of the Choroid Bar in the identification of posterior fossa malformations.

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