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Fetal ventriculomegalies during pregnancy course, outcome, and psychomotor development of born children

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Summary

Purpose: The objectives of this study were as follows: to present the course and outcome of pregnancies complicated with fetal ventriculomegaly, determine the association between prenatal ultrasound diagnoses and definitive postnatal diagnosis or diagnoses after autopsy and additional analysis, and to monitor the psychomotor development of children born with ventriculomegaly. *Materials and Methods:* The survey was designed as retrospective study and included 62 pregnant women who were attending a regular ultrasound examinations at the Department of Gynecology and Obstetrics, Clinical Center of Serbia, or patients who were referred from other institutions in Serbia. *Results:* Ventriculomegalies were divided into three groups: mild, moderate, and severe or hydrocephalus. The most common were severe ventriculomegalies, with 34 cases (55%). Of all pregnancies complicated with ventriculomegalies, 61% were terminated. Among those continued, 88% had normal psychomotor development. In 97% ultrasonographic diagnosis was confirmed. *Conclusion:* Majority of pregnancies complicated with ventriculomegaly were continued and most of the children born with anomalies had normal psychomotor development.

Key words: Ventriculomegaly; Fetus; Psychomotor development; Outcome.

Intorduction

Malformations of the central nervous system are the most complicated and the most common congenital disorder with a prevalence of one in 100 to one in 500 newborns. Regular ultrasound examinations are the most important aspect of detecting these anomalies [1]. The etiology of the disease is variable and can be genetic (chromosomal abnormalities), secondary (as a consequence of intracranial hemorrhage, hypoxic-ischemic lesions, transplacental infection, obstruction of the flow of cerebrospinal fluid) or multifactorial [2, 3].

Ventriculomegaly is defined as an ventricular increase regardless of the degree and etiology of enlargement. Hydrocephalus refers to a heavier degree of ventriculomegaly. Transverse diameter (width) of atrium measurement is the most widely accepted method for ultrasound evaluation of the size of the lateral ventricles of the brain. It is measured at the level of choroid plexus glomus. Ventriculomegaly is divided according to the degree of enlargement in mild (10-12 mm), moderate (13-15 mm), and severe (> 15 mm). The term 'borderline' includes mild and moderate ventriculomegaly and represent 'gray zone', because the authors do not agree that it is real ventriculomegaly or just a phase in the normal development of the cerebral ventricles [4-6]. In the case of diagnosis of borderline ventriculomegaly, sometimes it is difficult to make a final decision on the further course of pregnancy and advise parents. Mild ventriculomegaly frequently affects both lateral ventricles, and it can also be unilateral or asymmetric [7]. Isolated ventriculomegaly is defined as a ventricular enlargement with normal intraventricular pressure, which is not associated with other sonoFigureic abnormalities of the central nervous system and accounts for 20% of sonoFigureically detected fetal ventriculomegaly. It is considered a dynamic process, so that from the moment of diagnosis until the end of pregnancy may cause spontaneous regression, but also can progress to a severe form [8, 9].

The objectives of this study were as follows: to present the course and outcome of pregnancies complicated with fetal ventriculomegaly, determine the association between prenatal ultrasound diagnoses and definitive postnatal diagnosis or diagnoses after autopsy and additional analysis, and to monitor the psychomotor development of children born with ventriculomegaly.

Materials and Methods

Time and place of study implementation

The research was conducted at the Department of Gynecology and Obstetrics, Clinical center of Serbia in the period from January 2002 until December 2012.

Respondents - monitoring units

The study included 62 pregnant women who were attending a regular ultrasound examinations at the Department of Gynecology and Obstetrics, Clinical Center of Serbia, or patients who were re-

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ferred from other institutions in Serbia. The criteria for inclusion in this study were visualized ventriculomegaly by ultrasound, insight into the histopathological diagnosis if the pregnancy was terminated, and telephone contact with parents in order to assess the psychomotor development of children. Criteria for exclusion from the study were the inability to establish phone contact with parents and non-disclosure in the histopathologic diagnosis. Five patients were excluded from the study, whereas the present authors were not able to perform phone contact with four respondents, and in one of the interviewees did not have access to histopathologic diagnosis.

Clinical methodology

If during a routine ultrasound examination there was suspected ventriculomegaly, it was advisable to review patient by a multidisciplinary Consilium for fetal anomalies consisted of the perinatologist, child neurologist, neurosurgeon, and geneticist who followed the further course of pregnancy. In addition to the ultrasound examination, some examinees were advised additional diagnostic methods and analysis to determine the precise diagnosis and etiology of diseases, such as screening for infections toxoplasmosis, rubella, cytomegalovirus, herpes simplex virus (TORCH), karyotyping, and magnetic resonance imaging (MRI).

Statistical methodology

The survey was designed as a retrospective study. Information during pregnancy and their outcomes were collected from Consilium for fetal anomalies reports, fetal autopsy reports, and by telephone contact to obtain information on postnatal psychomotor development of children. Observation characteristics that the present authors followed were: maternal age, parity history, history of similar or other congenital anomalies in a family or in previous pregnancies, weeks of gestation in which women were first shown Consilium for fetal anomalies, the total number of consultative examination, karyotype, MRI findings, mothers' comorbidities, prenatal sonoFigureic diagnosis of abnormalities, the diagnosis at autopsy or postnatal diagnosis after birth, institution where birth took place, way of delivery (vaginal delivery or cesarean section), child's sex, and psychomotor development.

In order to determine the correlation between prenatal and final diagnosis, the authors divided them into three groups. In group 1 were pregnancies where the prenatal diagnosis and the final diagnosis after birth or autopsy fully matched, regardless of whether they were isolated or associated anomalies. Group 2 included pregnancies in which diagnosis at birth or after an autopsy confirmed prenatal diagnosis, but cerebral and extracerebral anomalies were discovered that were not seen by ultrasound. Group 3 classified anomalies that prenatally could not be diagnosed, so the diagnosis was made after the birth or autopsy or wrongly diagnosed malformations.

Statistical analysis included descriptive statistics (integers, percentages of proportion, and mean, standard deviation). The results are presented Figureically and in tabular form.

Results

Ventriculomegalies were divided into three groups: mild, moderate, and severe or hydrocephalus. Total number of all ventriculomegalies in the present study were 62. The most common were severe ventriculomegalies, with 34 cases (55%), as shown in Figure 1.

More than half of women whose pregnancies were complicated with ventriculomegaly were nulliparous (Table 1).

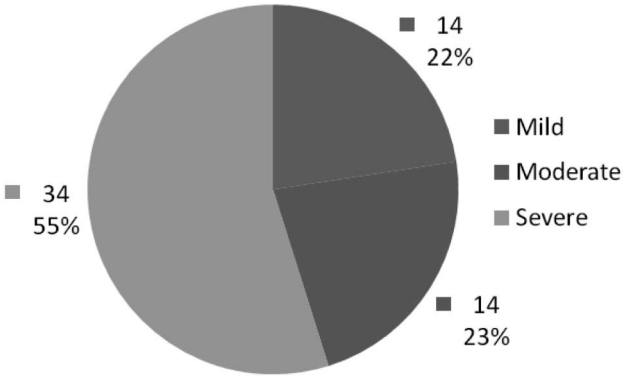

Figure 1. — Ventriculomegaly classification according to severity of ventricle dilatation.

Table 1. — *Women parity whose pregnancies were complicated with ventriculomegaly.*

Anomaly	One child	Two children	More children
Mild ventriculomegaly	9	4	1
Moderate ventriculomegaly	7	7	0
Severe ventriculomegaly	16	14	4
Total	32 (52%)	25 (40%)	5 (8%)

Table 2. — *Number of consulting examinations.*

Anomaly	One consultation	Two consultation	More then two consultations
Mild ventriculomegaly	9	2	3
Moderate ventriculomegaly	7	6	1
Severe ventriculomegaly	32	1	1
Total	48 (77%)	9 (15%)	5 (8%)

Table 3. — *Anomalies associated with ventriculomegalies.*

Anomaly	No.
Hepatomegaly	2
Facial dysmorphia	1
Splenomegaly	1
Cystic renal tumor	1
Ventricular septal defect	1
Total	6

Almost 80% of the examinees had one medical consultations, while only five of them had more than two serial consultative examinations (Table 2).

All of the diagnosed mild ventriculomegalies were isolated (Table 3). Mean gestational week when the patient first presented to Consilium for fetal anomalies was 32 (ranging from 28th to 37th week). The average age of mothers whose pregnancies complicated with mild ventriculomegaly was 30.6 years (range 20 - 39). None of the multiparous, previous pregnancies were complicated with central nervous sys-

tem anomalies. All pregnancies complicated with mild ventriculomegaly were monofetal. In four (29%) fetuses, karyotyping was done and all of them were normal and in three (21%) of respondents underwent TORCH infection screening and in all it was negative. Of additional diagnostic methods in order to confirm the diagnosis, MRI was performed in six (36%), in three of them MRI coincided with the sonoFigureic findings, and for two patients data was not available. As for the outcome of pregnancy, all the children were live births and all were born in the Department of Obstetrics and Gynecology, through vaginal delivery. Only one baby was born before the expected delivery date, which was immediately after birth transferred to the University Children 's Hospital where he was hospitalized for seven days. During hospitalization, the child was on antibiotic treatment for septicemia. After one month, there was a spontaneous regression of ventriculomegaly. Psychomotor development of at the time of the study was completely normal, and then the child was 20 months old. The remaining 13 (93%) infants were born at term, sonoFigureic findings at birth in 12 (86%) were normal, there was a spontaneous regression of ventriculomegaly, and psychomotor development was assessed throughout the study period (Table 4). In one infant (7%) in the sixth month and at the age of two years, reported two febrile seizures, psychomotor development was normal, with a follow-up period of 42 months. The average follow-up of children with mild isolated ventriculomegaly was 32 months (range from 7 to 42). Only one child after birth was confirmed with ventriculomegaly and the present authors aligned it to Group 1 (Figure 2).

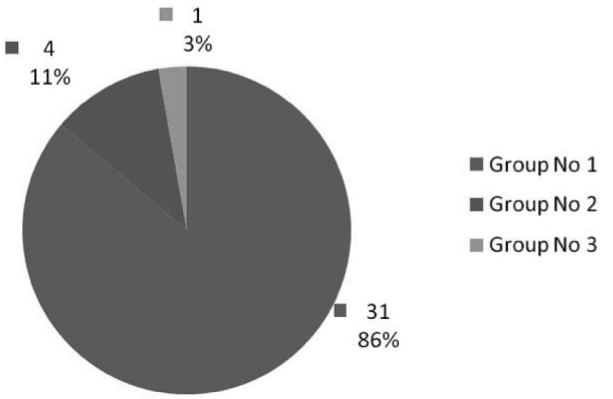

Figure 2. — Matching prenatal and definitive diagnosis. Group No. 1: pregnancy in which the prenatal diagnosis and the final diagnosis after birth or autopsy fully matched. Group No. 2: pregnancy in which the birth or after autopsy confirmed prenatal diagnosis but were diagnosed with associated cerebral and extracerebral anomalies which were not seen by ultrasound. Group No. 3: pregnancies with anomalies either could neither be diagnosed prenatally nor only after birth or autopsy diagnosis or wrongly diagnosed.

The average age of women whose pregnancies were complicated with moderate ventriculomegaly was 30.1 years (range 18-39). The patient was first examined by Consilium for fetal anomalies average at 30th gestational week (range from 26th to 37th). No multiparous during previous pregnancy had central nervous system anomalies. In two patients (14.3%), pregnancy was terminated. One pregnancy was terminated at 36th week. During pregnancy MRI was performed, which showed that in addition to ventriculomegaly there was also porencephalic cyst of severe degree. Screening for TORCH infections was negative. Karyotyping was also performed, but the authors had no information on the results. An autopsy revealed ventriculomegaly of severe degree, so that it was placed into Group 2 (Figure 2). The second pregnancy was terminated at 30th gestational week, the karyotype was normal, and MRI findings was unknown; TORCH infections screening was negative. An autopsy confirmed moderate ventriculomegaly, which placed it in Group 1 (Figure 2).

Of the 12 (85.7%) women who continued the pregnancy, two of them (16.7%) gave birth in secondary level institutions, and the remaining ten (88.3%) in the Department of Obstetrics and Gynecology, Clinical centre of Serbia. Four (33%) pregnancies were ended by cesarean section, and the remaining eight (67%) delivered by the vaginal route. All pregnancies were completed at term, and all children were eutrophic. In one infant mild ventriculomegaly by the end of the first year of life progressed to hydrocephalus, and set a new diagnosis: cerebral gigantism, in which a child has epilepsy by type of grand mal. At the time the present study was conducted, the child was less than three-years-old (follow-up period 35 months). Karyotype of this child showed inversion of fifth chromosome that occurred de novo. In the remaining 11 (92%), postnatal sonoFigureic findings and psychomotor development were normal (Table 4). The average follow up of psychomotor development of children was 30 months (range six to 50). One was a twin pregnancy as a result of in vitro fertilization, in which only one fetus was diagnosed with moderate ventriculomegaly, while the other fetus was without any abnormality. Other pregnancies were monofetal. One pregnancy was complicated by mother's gestational diabetes. In four (33%) fetal karyotype was made, which was normal in three, and in one the result was unknown. In seven (58%) of them MRI was performed and were matched with the sonoFigureic findings. During one pregnancy screening was made for TORCH infections, which was negative. The largest number of moderate ventriculomegaly was isolated, with as many as 13 fetuses (92.8%). In only one fetus (7.2%), ventriculomegaly was associated with ascites (Table 3).

The average age of women whose pregnancies were complicated with hydrocephalus was 29.7 years (range 19-42). The fetuses were first shown to the Consilium for fetal anomalies at an average at 30th gestational week (range of 17th to 37th), with four (11.8%) first presented before the

Table 4. — *Outcomes of pregnancies complicated with ventriculomegaly.*

	Number (%)	Pregnancy termination		Confirmed anomaly		Psychomotor development	
		yes	no	yes	no	+	-
Ventriculomegaly	62 (43,3)	29 (47)	33 (53)	38 (61)	24 (39)	29(88)	3 (12)
- Mild	14	0	14	1 (7)	13 (93)	14	0
- Moderate	14	2 (14%)	12 (86%)	3 (21%)	11 (79%)	11 (92%)	1 (8%)
- Severe	34	27 (79%)	7 (21%)	34 (100%)	0	4 (57%)	2 (43%)

'+' Indicates normal psychomotor development. '-' in the case of moderate VM refers to seizures by type of grand mal, one '-' in case of severe VM, epilepsy, and spastic hemiparesis, the other '-' in case of severe VM: do not walk, blind, and speaking issues.

Table 5. — *Pregnancies complicated with severe ventriculomegaly and continued.*

	Karyotype	Prenatal sonographic findings	Postnatal findings	Delivery	Gestational week	No. of operations	Psychomotor development	Follow-up period (months)
1.	Not done	Severe ventriculomegaly	Hydrocephalus	vag	33	2	Problems with speaking, walking, blind	36
2.	Not done	Ventriculomegaly (width 40 mm)	Obstructive hydrocephalus	vag	37	5	Epilepsy, spastic hemiparesis	58
3.	Not done	Anechogenous formation of posterior fossa	Sylvian aqueduct atresia, hydrocephalus	vag	37		Died after 7 days	
4.	Normal	Enlargement of the third ventricle	Hydrocephalus	vag	37	1	Normal	38
5.	Normal	Ventriculomegaly (width 20 mm)	Hydrocephalus	vag	38	2	Normal	33
6	Not done	Ventriculomegaly (width 24 mm)	Hydrocephalus	sc	39	1	Normal	37
7.	Normal	Progressive	Hydrocephalus	vag	38	1	Normal	36

[a] vag-vaginal delivery; [b] sc-cesarean section.

24th week of gestation, and all of the pregnancies were terminated. In three patients (11%) in which the current pregnancies were complicated by fetal hydrocephalus and terminated, the previous pregnancies were also diagnosed with fetal hydrocephalus; a karyotype was performed in only one of them, where the authors had no information on the outcome. In two patients (7%), whose current pregnancy was terminated, outcome of previous pregnancies was infant death in the first seven days of life, the causes unknown. The largest number of pregnancies complicated by severe ventriculomegaly fetuses (79% or 27 pregnancies) were terminated (Table 4).

The patients whose pregnancies were complicated by severe ventriculomegaly of fetus and continued are shown in Table 5. The average age of mothers who continued pregnancy was 31 years (range 19-38); in only one patient the previous pregnancy was also complicated by hydrocephalus. In these patients karyotyping was not performed although it was suggested. All other respondents, six of them were nulliparous. Mean gestational weeks in which these respondents were shown to Consilium staff team was 33.4 weeks (range 31 to 37). All the patients had one council. Karyotype was performed in three fetuses (43%) and each of them was normal. Two patients (29%) underwent MRI, which coincided with the ultrasound findings. None of the patients during pregnancy had undergone TORCH screening. All pregnancies were monofetal.

According Table 5 we can see that the prenatal and postnatal findings are fully matched in almost all cases examined (6-86%). In one case, No. 3 in Table 5, prenatal ultrasound diagnosed anechogenous formation of posterior fossa diameter 70 x 40 mm, with next consultative examinations showed progressive growth, but it was not possible to set a definitive diagnosis. Postnatally, it was found that it was the hydrocephalus caused by artesian of Sylvian aqueduct, so the authors placed it in Group 3. In two cases, numbering 2 and 3 the cause was known, while in others the cause remains unknown. All severe ventriculomegaly were isolated, without associated cerebral or extracerebral anomalies (Table 3). One of the fetuses (14%) was delivered by cesarean section; the other six (86%) vaginally. Only one patient was delivered at the secondary level institution, while all the others were delivered at the Department of Gynecology and Obstetrics. One infant was born prematurely at 33rd gestational week, three at the 37th week, two at 38th, and one in 39th week of gestation. The average psychomotor development follow-up of children born alive was more then three years, more precisely 39.7 months (range 33-58). Only one child died in the neonatal period after seven days (number 3). Three children had a neurosurgical operation (ventriculo-peritoneal shunt application) and all at the time of the study had normal psychomotor development. Two children had two operations, where one had normal psychomotor development, while the second, which was prematurely born, had problems with talking, does not walk, and has trouble seeing. One child in whom the diagnosis was obstructive hydrocephalus, had five surgeries, had epilepsy, and spastic hemiparesis.

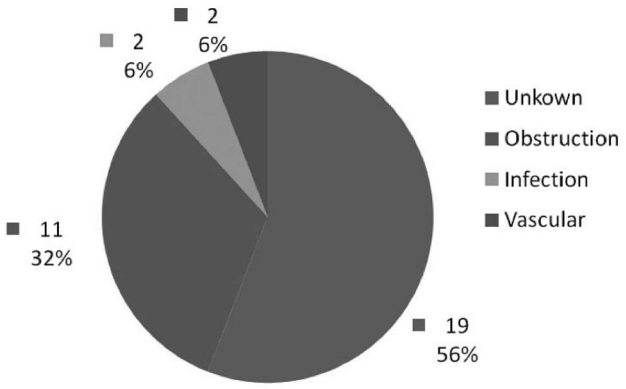

Figure 3. — Etiology of severe ventriculomegaly.

The average age of women who terminated their pregnancies complicated with severe ventriculomegaly of fetus was 39.7 years (range 21-42). They were first presented to the Consilium at an average of 29th week (range from 17th to 37th). Most of the patients, 21 (78%) were presented only once, after which the final decision on the further course of pregnancy was made, while four of them (15%) were at two consultings and one women (7%) had four consulting examinations. Mean gestational weeks in which the abortion was performed was at 30th weeks (range from 17th to 38th). Karyotyping was performed in seven (26%) women who terminated their pregnancies and for all it was normal. MRI was performed in 11 (41%) and findings coincided with the sonoFigureic findings. In two patients (7%) histopathologic analysis of the placenta revealed the presence of chronic transplacental infection. One of these histological images was compatible with toxoplasmosis, a screening for TORCH infections was positive (IgM and IgG antibodies to toxplasmosis were increased), while the others beside the placental infection, was present also infections of the brain, lungs, and kidneys, with unknown infectious agent, TORCH screening was not done, and hydrocephalus was a combination of internal and external. In two patients (7%) in the histology, brain tissue revealed the presence of reactive gliosis and existence siderophages indicating possible vascular etiology of severe ventriculomegaly. Based on the autopsy and histopathological analysis, nine fetuses (26%) were diagnosed with internal hydrocephalus, suggesting obstructive etiology at level of interventricular openings or Sylvian aqueduct, as shown in Figure 3.

Three women (11%) had comorbidities that also complicated pregnancy: one patient had hypertension, the second one systemic lupus erythematosus, and the third one myxoma of cardiac chambers, deep vein thrombosis, and aneurysm of interatrial septum. Three pregnancies were twin pregnancies (11%), with the finding of the central nervous system, with the other fetuses were normal. In 24 examinees (89%), fetal prenatal and postnatal diagnoses were completely matched, while the three fetuses (11%), postnatally at autopsy revealed additional extracerebral anomalies (Table 3). In two fetuses there was hepatomegaly, and in one facial dysmorphia with splenomegaly and ascites in whom the known causative infectious agent was toxoplasmosis. In two more fetuses there was the existence of associated extracerebral anomalies diagnosed prenatally and postnatally confirmed: in one, cystic kidney tumor, and in the second ventricular septal defect. As for fetal sex, the authors had data for only ten of the fetuses, in which six were female and were four males.

Overall, if we exclude all pregnancies complicated with mild and moderate ventriculomegalies which were not terminated, the largest number, 31 of the 36 fetuses (86%) with ventriculomegalies are classified in Group 1. In Group 2 there were four of them (11%), while in Group 3 there was only one fetus (3%), as shown in Figure 3.

In Table 4 we can see that more than half of pregnancies complicated with ventriculomegaly, 53%, were terminated. In 61% of examinees confirmed the presence of anomalies, with the largest number of confirmed anomalies was among severe ventriculomegaly. In 88% of cases where the pregnancy continued, psychomotor development was normal.

Discussion

The incidence of chromosomal abnormalities present in fetuses diagnosed with initially mild ventriculomegaly according to literature is about 4% [10-12]. According to published studies, the majority of fetuses with mild ventriculomegaly and abnormal karyotype have associated anomalies. In case of anomalies associated with mild ventriculomegaly, the incidence of aneuploidy (usually trisomy of chromosome 21st and 18th) was 2-3%, 14.2% with moderate ventriculomegaly, and 17.4% with severe ventriculomegaly [13, 14]. In the present study, pathological karyogram showed only one fetus (8%) with moderate ventriculomegaly which was isolated. The present study showed in one fetal karyotype (5%) with severe ventriculomegaly that there was hereditary pericentric inversion of chromosome, which probably does not have clinical significance.

Gaglioti *et al.* followed children with prenatally diagnosed ventriculomegaly during a period of two years and demonstrated that 97.7% of children with mild ventriculomegaly survive, 80% with moderate, and 33.3% with severe ventriculomegaly. Of those who survive, normal psychomotor development is present in 93% of cases with mild, 75% with moderate, and 62.5% with severe ventriculomegaly [15]. An incidence of delayed psychomotor development in the case of isolated mild ventriculomegaly in the literature ranges between 0% and 36%, with approximately 90% of all investigated cases that have normal psychomotor development [9]. Sherif *et al.* have shown that the risk of delayed psychomotor development is significantly higher if the width of ven-

tricular atrium is more than 12 mm [5]. According to a British author, the average incidence of abnormal psychomotor development in the literature ranges between 7% and 46%. British researchers also examined perinatal outcome in fetuses with severe ventriculomegaly where this anomaly was diagnosed if the width of the atrium was larger than 15 mm. Half of the pregnancies were terminated, and the other half were live-born children. Of all live births 20% died within four months, and of the remaining cases only 13% had normal psychomotor development. As for pregnancies that are continued, only 10% of respondents at the time of research, at the age of one year of life had normal psychomotor development. The average follow up was 15 months. Twenty percent died in the neonatal period, and 20% underwent neurosurgical intervention (ventriculo-peritoneal shunt), and both children had cerebral palsy [8]. In the present study, all 14 fetuses with prenatally diagnosed mild ventriculomegaly after birth had normal findings of central nervous system at the time of the research normal psychomotor development, with average follow-up period 32 months (range 7-42). As for moderate ventriculomegaly, 12 pregnancies out of 14 (86%) continued. As the present authors have already mentioned in one case (8%), moderate ventriculomegaly progressed to severe ventriculomegaly, while in the remaining 11 (92%) postnatal sonoFigureic findings and psychomotor development were normal. The average follow up of psychomotor development was 30 months (range 6-50). The present study included 34 pregnancies complicated with severe ventriculomegaly, of which only seven continued (20.5%). In the present research, six children were alive (85.7%), of whom four had normal psychomotor development (66.7%), vision, walking and talking issues, and another has epilepsy and spastic hemiparesis. One child died after seven days of life (14.3%). Pier *et al.* concluded that in approximately 29% of cases of sonoFigureically diagnosed isolated ventriculomegaly leads to spontaneous regression, in 57% of cases it remains constant, and in 14% of cases ventriculomegaly progresses [16]. Goldstein *et al.* performed a systematic review of the literature which covered 577 patients with moderate ventriculomegaly. Normal psychomotor development was seen in 85.2% of cases, slightly marred by 7.8%, while severe mental retardation was present in 7%. Given the fact that these authors followed psychomotor development in two time periods, they concluded that the percentage of those who had normal psychomotor development was lower after a longer follow-up period, which shows the importance of studies of children with anomalies of the central nervous system, accompanied by longer period of time are required in order to obtain more precise information on the prognosis of the disease [17]. Ouahba *et al.* conducted a prospective study, involving 101 newborns with isolated mild and moderate ventriculomegaly (ventricle width to 15 mm). The mean length of follow-up was 43.81 months (range 2-127). Normal psychomotor development was registered in 88% of patients, while the remaining 12% had neurological disease or some degree of psychomotor retardation. There was no difference in the outcome between unilateral and bilateral ventriculomegaly [12].

In a study of French researchers in a group of severe ventriculomegaly, 90% of pregnancies were terminated, and 10% of pregnancies were continued, as was the case with only one patient whose child had normal psychomotor development. In the group of mild to moderate ventriculomegaly, 32% of pregnancies were terminated. Of pregnancies that are continued, 91% of infants had normal psychomotor development, and the remaining 9% had a handicap (hemiplegia and epilepsy) [15]. In the present study, all women with mild ventriculomegaly of fetus continued pregnancy, two (14.3%) with moderate ventriculomegaly had terminated their pregnancy, while the group of severe ventriculomegaly had the highest percentage of abortions amounting to 79.4%. In the group of isolated ventriculomegaly in an Irish study, only one pregnancy (5%) was terminated, 26.3% were stillborn, 10.5% died in the neonatal period, while more than half (52.6%) were liveborn. Among live births, only one child (10%) had normal psychomotor development at the time of the survey with four years of age, 40% mildly retarded psychomotor development, while 50% were profoundly disabled, including one child with agenesis of corpus callosum body with vision issues [13].

The present authors can conclude since the ventriculomegaly is the most common central nervous system anomaly, therefore particular attention must be paid when diagnosing dilated ventricles atria, which should include a thoroughly review of the anatomy of the fetus. Given the fact that Group 3 was 3% of the cases, the authors conclude that ultrasound is a reliable diagnostic tool in the diagnosis of central nervous system anomalies. It is necessary to conduct more follow-up studies with longer research periods, in order to make conclusions on psychomotor development of children with brain abnormalities.

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