Bratisl Lek Listy 2008; 109 (9)
405–411

CLINICAL STUDY

Real-time ultrasound in the detection of intrauterine growth retardation in preeclampsia

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Abstract: *Objective:* An early identification of eventual intrauterine growth retardation (IUGR) and fetus development using an ultrasound method.
Background: Preeclampsia (PIH) complicates from 5 to 10 % of pregnancies and it is a leading cause of maternal and fetal mortality and morbidity.
Methods: The study was conducted during a 2 year period based on patients between 15 and 41 years, divided in two groups: group A based on 67 preeclamptic patients, and group B based on 129 normotensive pregnancises.
Results and conclusion: The fetuses from group A were suspected from IUGR ($p<0.05$). Based on our study it can be concluded that IUGR is the main complication of the fetus in the hypertensive pregnancy. The most common type of restriction in PIH was the asymmetric type of IUGR. In PIH pregnancies, there could be a faster aging of the placenta and oligohydramnion *(Tab. 9, Fig. 7, Ref. 20).* Full Text (Free, PDF) *www.bmj.sk.*
Key words: preeclampsia, intrauterine growth retardation, ultrasound.

Worldwide, pre-eclampsia and eclampsia contribute to the death of a pregnant woman every 3 min. The management of pregnancies complicated by hypertension has not significantly altered for many years, possibly as results of little progress being made in our understanding of the condition (1).

Preeclampsia or Pregnancy Induced Hypertension (PIH), a serious pregnancy-specific multisystem disorder characterized by proteinuria and hypertension after the 20th week of gestation, is still a leading cause of maternal and neonatal morbidity and mortality (2, 3, 4, 5, 6).

PIH complicates 5 to 10 % of pregnancies and is a leading cause of maternal and fetal mortality and morbidity. Although the cause is unknown, an inadequate invasion and remodeling of maternal uterine arteries by the extravillous trophoblasts in the first trimester is a common feature. The impairment of placental development and trophoblast invasion is thought to be causally associated with PIH (7, 8). Thus, the trophoblast invasion into the maternal compartment is impaired, and the pregnant uterus is not transformed into a low-resistance bed. Precisely, this pathology is thought to be a pathogenetic feature of pregnancy complications such as preeclampsia or intrauterine growth retardation (IUGR). An abnormal uterine perfusion characterizes pregnancies at risk and precedes their clinical manifestation. However, only some pregnant women with an abnormal uterine perfusion develop this complication, and about two thirds have a normal course of pregnancy despite the high uteroplacental resistance (9). Uterine artery Doppler examination at the 11–14 weeks scan can identify a high risk population in which preventive or therapeutic interventions might be effective (10, 11).

The intrauterine growth retardation (IUGR) infants are those in the lower 10 % of weight for age (12). In 50–70 % of fetuses with IUGR, an increased maternal blood pressure is present. It has been proven that the incidence of IUGR is increasing with gaining weight and hypertension duration. When hypertension is followed by proteinuria, IUGR possibilities are few times higher (13). The ueroplacental hypoperfusion could be a starting point of etiopathogenesis to IUGR and maternal symptoms.

Ultrasonography (US) is allowing a relatively close fetal weight measurement, proper fetal growth in particular time intervals, also determining symmetric fetal growth, state of the placenta and the assessment of amniotic fluid volume (14).

The fetal biometry means verifying the following parameters: biparietal diameter (BPD), occipitofrontal diameter (OFD), head circumference (HC), abdominal circumference (AC), femur length (FL) (15).

In PIH, oligohydramnion is a side effect of hypoxia, and at the same time a reduced plasma volume and haemoconcentration. Although estimation of the amount is very important for the fetal monitoring, a prospective research showed that this method is much more sensitive in IUGR prediction, and also that there is no connection with the fetal distress (15).

Numerous of researches showed that PIH and IUGR are accompanied with a premature aging placenta. A small placenta which is thinner than normal characteristics for the associated

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gestational age is characteristic of the uteroplacental insufficiency (16, 17).

The main reason for this study was based on the conclusion that PIH is not rear in our obstetric population. The basic idea of our study: early identification of eventual intrauterine growth retardation and fetus development using an ultrasound method; verifying the PIH's influence on the fetus weight and length; developin the approach and conditions for an adequate delivery and optimal pregnancy outcome.

Methods

The study was conducted in the medical centre "Borka Taleski" in Prilep, during a 2 year period in patients between 15 and 41 years (average age 25.73±5.77 years).

The patients were divided in two groups:

1. Group A: based on 67 preeclamptic patients, (study group).

2. Group B: based on 129 normotensive pregnancies, (control group).

Including criteria:

1. An exact information on the pregnancy stage (means that the information of the last period corresponds with the results from the obstetrical examination and the ultrasound scan).

2. The patients included in this study had the first obstetrical examination and ultrasound in period of 6 to 12 weeks.

3. All patients started the pregnancy with normal blood pressure (≤120/80 mmHg).

4. All patients were healthy in past (without any chronic disease).

5. Only single pregnancies were included.

The real-time scanning was performed using the ultrasound unit *Simens* with a convex array of 3.5 MHz.

In the second and third trimester, the fetal growth was monitored using the following parameters: BPD, HC, TCD, BOD, AC, FL and HL, HC/AC ratio. At the same time the placenta was examined and the amount of amniotic fluid volume was determined.

The above mentioned ultrasound parameters were identified and measured with a standard method, by showing the referential structure, examining the echo structure of the studied tissue of the placenta following the standard methods and proximity to determine the size of the amniotic fluid pocket.

Statistical tests used: Student t-test, chí^2-test, Kolmogorov-Smirnov test and Mann-Whitney U test. The chosen level of significance was $p<0.05$.

Results

Using the US method, the abovementioned parameters were monitored in every patient; also examination of the placenta and approximate determination of the amount of amniotic fluid. A statistic calculation of the biometric parameters obtained from ultrasound (US) in the 20 g.a., showed that there wasn't an obvious difference between group A and B ($p>0.05$) regarding the growth and development of the fetus.

Tab. 1. The results from the US measurements in 26 g.a.

Parameter	Group	N	$\bar{x}$	Sd	df	t-values	p
BPD	A B	67 129	6.55 6.62	0.19 0.24	194	2.19	0.29
HC	A B	67 129	23.81 24.27	0.98 0.92	194	3.24	0.001
TCD	A B	67 129	2.77 2.8	0.11 0.12	194	1.23	0.21
BOD	A B	67 129	4.04 4.06	0.18 0.15	194	0.93	0.35
FL	A B	67 129	4.76 4.85	0.19 0.2	194	3.11	0.002
HL	A B	67 129	4.34 4.4	0.13 0.17	194	2.44	0.02
AC	A B	67 129	21.14 21.7	0.98 1.04	194	3.64	0.0004
HC/AC	A B	67 129	1.12 1.11	0.04 0.03	194	2.08	0.04

BPD – biparietal diameter, HC – head circumference, TCD – transcerbellar diameter, BOD – binocular diameter, FL – femur length, HL – humerus length, AC – abdominal circumference, HC/AC – head circumference/abdominal circumference ratio

Tab. 2. The results from the US measurements in 32 g.a.

Parameter	Group	N	$\bar{x}$	sd	df	t-values	P
BPD	A B	66 128	8.07 8.18	0.24 0.18	192	3.11	≤0.01
HC	A B	66 128	28.91 29.57	3.32 1.11	192	2.05	<0.05
TCD	A B	66 128	3.37 3.42	0.1 0.08	192	3.39	≤0.01
BOD	A B	66 128	5 5.01	0.21 0.20	192	0.54	>0.05
FL	A B	66 128	6.02 6.24	0.29 0.21	192	5.91	≤0.01
HL	A B	66 128	5.55 5.66	0.27 0.13	192	3.81	≤0.01
AC	A B	66 128	26.76 27.91	1.44 1.05	192	6.30	≤0.01
HC/AC	A B	66 128	1.09 1.06	0.04 0.04	192	5.36	≤0.01

BPD – biparietal diameter, HC – head circumference, TCD – transcerbellar diameter, BOD – binocular diameter, FL – femur length, HL – humerus length, AC – abdominal circumference, HC/AC – head circumference/abdominal circumference ratio

The above results showed that in the 26 n.g. there were evident differences in the growth and development of the fetuses in normotensive and hypertensive pregnancies, although, to make a note, that was still in a period in which hypertension is not manifested. The statistic calculation showed that there was an obvious difference ($p<0.01$) in HC, FL and AC. Statistically, there was also a difference in ($p<0.05$), while the difference between the mean values of the HC/AC ratio was on the age.

Calculation of the HC/AC relation in the group A resulted in 7.46 % of fetuses with a suspected IUGR, compared to the 92.54 % with proper US results. In the group B there was only 1.55 % of fetuses with a suspected IUGR, compared to 98.45 % with proper US results ($p>0.05$) (Tab. 1).

In 32 g.a., our results showed a high statistically significant difference between the group A and B. Especially regarding BPD, FL and AC. Also, evident differences between fetuses from hypertensive and normal pregnancies existed when calculating the mean value of the HC/AC ration. Calculating the HC/AC ratio in this period in the group A in 66 US examined fetuses resulted

Tab. 3. The results from the US measurements in 36 g.a.

Parameter	Group	N	$\bar{x}$	sd	df	t-values	P
BPD	A B	61 129	8.86 9.02	0.26 0.19	188	4.98	<0.01
HC	A B	61 129	32.02 32.71	1.11 0.63	188	5.42	<0.01
TCD	A B	61 129	3.46 3.48	0.065 0.06	188	2.87	<0.01
BOD	A B	61 129	5.64 5.80	0.22 0.18	188	5.41	>0.01
FL	A B	61 129	6.7 7.02	0.35 0.21	188	7.91	<0.01
HL	A B	61 129	6.09 6.24	0.27 0.19	188	4.44	<0.01
AC	A B	61 129	30.24 32.24	1.97 0.97	188	9.33	<0.01
HC/AC	A B	61 129	1.061 1.013	0.05 0.022	188	9.33	<0.01

BPD – biparietal diameter, HC – head circumference, TCD – transcerbellar diameter, BOD – binocular diameter, FL – femur length, HL – humerus length, AC – abdominal circumference, HC/AC – head circumference/abdominal circumference ratio

Tab. 4. The results from the US measurements in 38 n.g.

Parameter	Group	n	$\bar{x}$	Sd	df	t-values	P
BPD	A B	51 129	9.21 9.38	0.19 0.13	178	6.586	<0.01
HC	A B	51 129	33.32 34.1	0.89 0.71	178	6.191	<0.05
TCD	A B	51 129	3.48 3.49	0.06 0.05	178	1.697	>0.05
BOD	A B	51 129	6.03 6.25	0.23 0.19	178	6.129	<0.01
FL	A B	51 129	7.1 7.5	0.33 0.25	178	8.518	<0.01
HL	A B	51 129	6.45 6.72	0.27 0.21	178	7.031	<0.01
AC	A B	51 129	32.28 34.3	1.83 1.28	178	8.37	<0.01
HC/AC	A B	51 129	1.03 0.99	0.04 0.03	178	7.174	<0.01

BPD – biparietal diameter, HC – head circumference, TCD – transcerbellar diameter, BOD – binocular diameter, FL – femur length, HL – humerus length, AC – abdominal circumference, HC/AC – head circumference/abdominal circumference ratio

in 13.64 % suspected with IUGR, compared to 86.36 % with proper US result. In the group B there was 3.1 % suspected with IUGR, compared to 96.9 % with proper US examination in 128 examined pregnancies (p<0.01) (Tab. 2).

In 36 g.a., using an US measurement, we found similar differences between groups as in 32 g.a. The most obvious differences were regarding the following parameters: BPD, HC, FL and HC. The US results measured in 36 g.a. are showed in the Table 3.

Based on HC/AC, a suspected IUGR in the group A was found in 21.31 % fetuses, while proper US results were found in 78.69 % of 61 US examined fetuses in total. In the group B, a suspected IUGR was found in 0.78 % fetuses, while 99.22 % of 129 US examined fetuses had normal relation (p<0.01). Results are shown on the Figure 1 and Table 3.

The analyzed US results in 38 g.a. also showed a high difference regarding all parameters except TCD. The values of TCD were not statistically different between the fetuses from normotensive and hypertensive pregnancies. Again in 38 g.a. we were

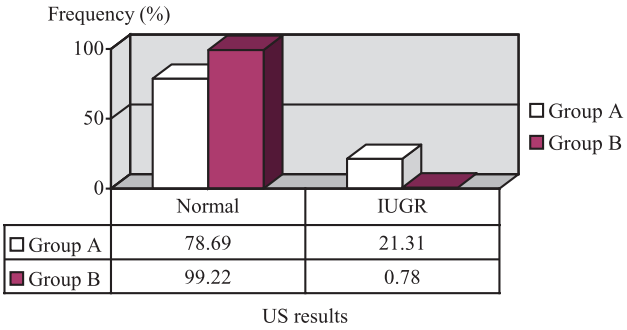

Fig. 1. Results of HC/AC relation in 36 n.g.

calculating HC/AC ratio, when the mean value for the group A was 1.032±0.044, while for group B it was 0.992±0.028. Based on this relation and compared with referred values, in the group A 25.29 % had results and values suggestive of IUGR, while 74.71 % had proper US results, from the total number of examined pregnancies in 38 g.a. In the group B, 129 pregnancies were examined, and based on HC/AC relation in 43.1 % the IUGR was suspected (p<0.01) (Tab. 4).

The last US examination was performed in the 40 g.a., in pregnancies which came as scheduled, where the pregnancy age was at least 39+1 g.a. Also in 40 g.a. were measured the same parameters like in the previous US examinations. This examination also concluded an obvious difference between the groups regarding the fetus growth. The biggest differences in the mean values were in AC and FL, although other parameters were different, too, except TCD, which had almost the same values in group A and group B during US examination; without a statistical difference (p>0.05). The results of the fetal biometry in 40 g.a. are showed in Table 5.

The mean value of the HC/AC ratio in 40 g.a. for the group A was 1.01±0.024, while for the group B was 0.98±0.013, which was statistically signifiacant different (p<0.01). Calculating this

Tab. 5. The results from the US measurements in 40 n.g.

Parameter	group	n	$\bar{x}$	sd	df	t-values	P
BPD	A B	22 96	9.43 9.53	0.11 0.11	116	3.78	<0.01
HC	A B	22 96	34.23 34.97	0.69 0.79	116	4.03	<0.01
TCD	A B	22 96	3.49 3.61	0.05 0.04	116	1.66	>0.05
BOD	A B	22 96	6.32 6.51	0.14 0.11	116	7.04	<0.01
FL	A B	22 96	7.43 7.79	0.28 0.17	116	7.53	<0.01
HL	A B	22 96	6.80 9.96	0.15 0.15	116	4.23	<0.01
AC	A B	22 96	33.69 35.48	1.33 0.86	116	7.83	<0.01
HC/AC	A B	22 96	1.01 0.98	0.024 0.013	116	8.19	<0.01

BPD – biparietal diameter, HC – head circumference, TCD – transcerbellar diameter, BOD – binocular diameter, FL – femur length, HL – humerus length, AC – abdominal circumference, HC/AC – head circumference/abdominal circumference ratio

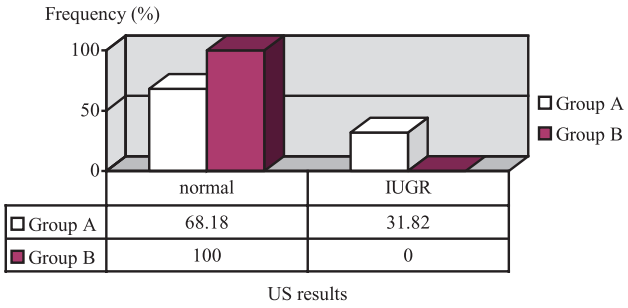

Fig. 2. Results of HC/AC relation in 40 g.a.

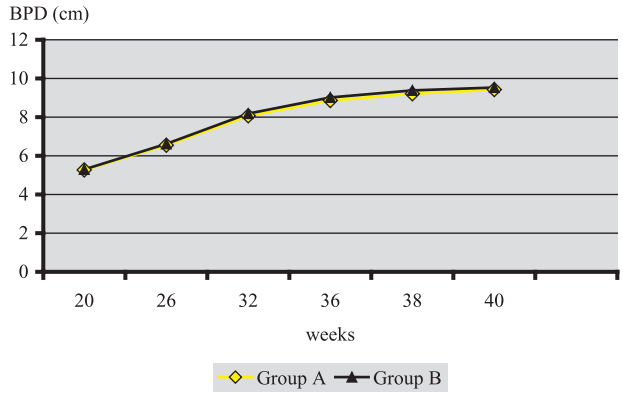

Fig. 3. BPD growth.

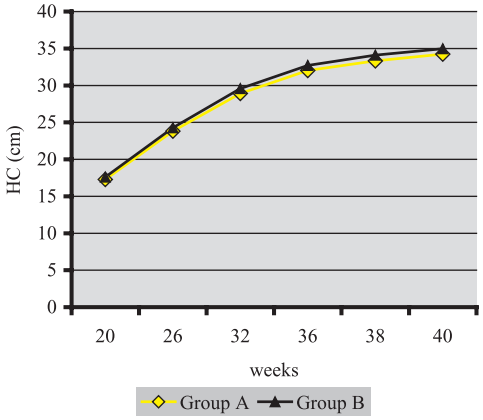

Fig. 4. HC growth.

ratio, values suggestive of IUGR were found in 31.82 % fetuses from 22 patients in the group A, while in group B there wasn't not even one fetus with suspected IUGR values from 96 US examined fetuses ($p<0.01$). The results of the HC/AC ratio in 40 g.a. are showed in the Figure 2.

Based on the study results it can be concluded that fetus's growth and development in hypertensive pregnancies is lower, comparing to fetuses from normal pregnancies. The most obvious difference is in values of AC and FL parameters. The growth and development measured by associated parameters during the pregnancies can be graphically presented, comparing the fetus development in normotensive and hypertensive pregnancies at the same time. Figures 3 and 4 displays the values of BPD and HC from 20 to 40 g.a. in the group A and group B.

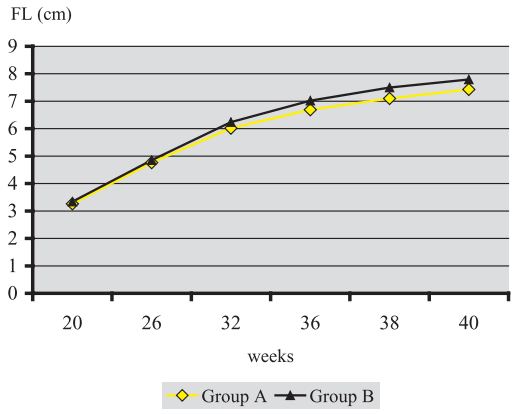

Fig. 5. FL growth.

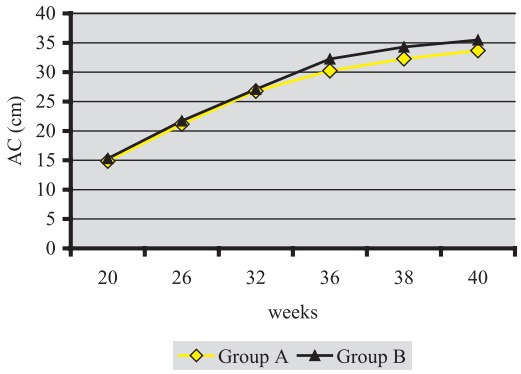

Fig. 6. AC growth.

The differences in the growth of AC and FL between the fetuses from normotensive and hypertensive pregnancies during the second and third trimester are presented in the Figures 5 and 6.

During the pregnancy, placenta and the amniotic fluid was evaluated by US. The results in the 20 g.a. showed that there was no differences between the groups, considering the fact that in all pregnancies (group A and group B) the degree of placental maturity was 0, and the amount of amniotic fluid in all cases was (Tab. 6).

Tab. 6. Degrees of placental maturation in 26 g.a.

Degree of placental maturity	Group A		Group B	
	N	%	n	%
0	11	16.42	118	91.47
I	55	82.08	11	8.53
II	1	1.50	0	0.00
III	0	0.00	0	0.00
Total	67	100	129	100

Tab. 7. Degrees of placental maturation in 32 g.a.

Degree of placental maturity	Group A		Group B	
	N	%	n	%
0	0	0.00	0	0.00
I	4	6.06	118	92.19
II	57	86.36	10	7.81
III	5	7.58	0	0.00
Total	66	100	128	100

Tab. 8. The amount of amniotic in 38 g.a.

Volume of amniotic fluid	Group A		Group B	
	N	%	n	%
Normal	14	28	114	88.37
Reduced	35	70	13	10.08
Increased	1	2	2	1.55
Total	50	100	129	100

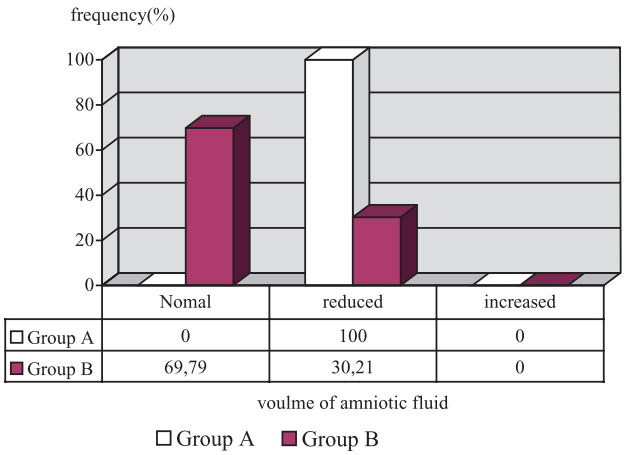

Fig. 7. The amount of amniotic fluid.

By calculating the above parameters we found a statistically highly significant difference between the groups ($p<0.01$). For the same period of gestation, US examination for the amount of amniotic fluid didn't showed any difference considering that in the 26 g.a. all pregnancies from both groups had an adequate amount of amniotic fluid.

The parameter analysis showed a high statistical difference ($p<0.01$) (Tab. 7).

In 36 g.a. in the group A wasn't mentioned the presence of degree 0 and I maturity. In this group of 61 patients, 11 (18.03 %) had II, and 50 (81.97 %) III degree of placental maturity. In the group B of 129 patients in 36 g.a. 6 (4.65 %) had I, 120 (93.02 %) II, and 3 (2.33 %) III degree of placental maturity. In this group, 0 degree wasn't found, too. Calculation of the parameters showed a statistically highly significant difference between the group A and B, and in this period using an US method a faster aging of placenta in hypertensive pregnancies was detected.

By examining the placenta in 38 g.a. we found that in 50 patients from the group B all 50 had III degree of placental maturity. In 129 patients from the group B 46 (35.66 %) had II, while 83 (64.34 %) had III degree of placental maturity. 0 and I degree of maturity in this week of gestation wasn't found in any group ($p<0.01$) (Tab. 8).

The US examination of placental maturity in 40 g.a. showed that in the group A as well as in the group B only III degree placenta was present. In the group A 22 patients and in the group B 96 patients were examined ($p>0.05$).

US examination of the amniotic fluid in 32 g.a. showed that in the group A 56 (84.85 %) of 66 patients had normal amount of amniotic fluid and 10 (15.15 %) had a reduced amount of amniotic fluid. In the group A wasn't present an increased amount of amniotic fluid. In the group B, 125 (97.66 %) of 128 patients had an adequate amount of amniotic fluid, 1 (0.78 %) had reduced, and 2 (1.56 %) patients had an increased amount of amniotic fluid ($p>0.05$).

With US method in 36 g.a. we found that 41 (67.21 %) of 61 patients from the group A had an adequate, 19 (31.15 %) reduced, and 1 (1.64 %) an increased amount of amniotic fluid. In the group B of 129 patients, 125 (96.9 %) had an adequate and 4 (3.1 %) patients had an increased amount of amniotic fluid. In this group wasn't present a reduced amount of amniotic fluid ($p<0.01$).

In the amount of amniotic fluid in 38 g.a., a significant difference was found. The results from the US examinations of the amniotic fluid in 38 g.a. are shown in the table 8 ($p<0.01$).

In 40 g.a. we found a difference in the amount of amniotic fluid. In the group A of 22 patients, all had a reduced amount of amniotic fluid. In the group B of 96 US examined patients 69.79 % had an adequate, while 30.21 % a reduced amount of amniotic fluid. An increased amount of amniotic fluid wasn't present in any group ($p<0.01$). The results are shown in the Figure 7.

The approximate birth weight of the newborns from the group A was 2807.6±574.28 g, while in the group B 3497.9±321.73 g.; newborns from the hypertensive pregnancies had a lower birth weight comparing to the newborns from the normotensive pregnancies ($p<0.01$). The approximate head perimeter of a newborn in the group A was 33.4±1.7 cm, while in the group B 34.97±1.11 cm. The statistical calculation showed a highly significant difference ($p<0.01$). The newborn length in the group A was 47.86±2.52, while in the group B 51.06±1.18 cm ($p<0.01$) (Tab. 9).

Tab. 9. Neonatal weight birth.

Weight birth (g)	Group A		Group B	
	N	%	n	%
1000–2500	17	25.37	0	0.00
2501–3500	43	64.18	72	55.81
3501–4000	7	10.45	51	39.54
4001--4500	0	0.00	6	4.65
Total	67	100	129	100

Discussion

PIH complicated pregnancies have a potentially negative influence on the fetal growth and increase the perinatal morbidity and mortality. The US made an obstetrician's dream come

true, opening a window in the uterus cavity and allowing observation of fetus growth and development, as well as examining the placenta and determining the amount of amniotic fluid; and it is safe, direct, intentional and repeatable.

With the gestation advance, the individual growth variability is also increased. It is considered that all fetuses until 20 g.a. have the same growth formula. The importance of knowing the technological parameters of the US device, which is used in the practice, is emphasized in order to get an adequate information regarding the state and fetus development. *Boog* recommends the first assignment to be a good population research, in the associated study area.

By measuring the BPD, HC and TCD we can indirectly follow the growth of the fetal brain. Cambell and Gillieson (1975.) were narrowing the US measurement to BPD, HC and AC with intention to create a difference between symmetrical and asymmetrical IUGR. Based on Cambell's study from 568 normal pregnancies from 17 to 41 g.a., the mean HC/AC ratio was: in 17 g.a. 1.18; in 29 g.a. 1.11; in 36 g.a. 1.01; for later this ratio to be changed due to accelerating growth of the fetal abdomen which was bellow 1 in the eutrophycal fetuses. In contrary, in the asymmetric fetuses the HC/AC ratio pertained bigger than 1 after 36 g.a., resulting from the weak deposit or used deposit in hepar and subcutaneus lipid tissue. Similar results showed other authors (18).

Measuring of FL can help to edit the US growth profile, even though the same as BPD, this parameter could also show an undetected IUGR. The Japanese authors (19) found that lower values of FL and HL in the first 20 g.a. show an increased risk of structural malformation (especially cardiovascular and genetical anomalies) more than a declined growth or slower fetus growth. A similar significance of lower FL values found the Canadian authors, too (20).

In the hypertensive pregnancy accompanied with IUGR, oligohydramnion is often detected. In some cases the amount of amniotic fluid could be reduced to only a few drops (14, 15). But, it has been proven that determining the amount of AT with US is not a reliable method for the detection of the actual polihydramnion or oligohydramnion (Shuker et al, 1996). determined a connection between oligohydramnion and IUGR in PIH pregnancies. The study showed that the reduced amount of AF is poorly sensitive in the IUGR prediction (21).

The placental characteristic of a hypertensive pregnancy is small placenta which ages quickly. The III degree of placental maturity determined with US method gives a good prediction of the fetal lung maturity (16).

In our study to 20 g.a. we found that the US results between hypertensive and normotensive group weren't different. But already in the 26 g.a. we found a significant difference in the statistical processing ($p<0.05$). By calculating the HC/AC ratio in the group of hypertensive pregnancies, IUGR was concluded in 7.46 % ($p>0.05$).

US examination of the placenta in the 26 g.a. regarding the degree of maturity showed that in 62.08 % patients, which later developed PIH, the degree of maturity was I, in 16.42 % it was 0, while degree II of maturity was present only in 1.5 % of patients ($p<0.01$). Regarding the amniotic fluid in 26 g.a., there wer no differences between the groups ($p>0.05$).

US exam in 32 g.a. showed the most obvious differences between the group A and B when compared to 26 g.a. But the US results showed that not all organs and body parts were equally affected. The results calculation showed that the most obvious differences were in AC ($p<0.001$), which means that in hypertensive pregnancies the most affected are the parenchymal organs (liver). Cephalometry didn't showed the obvious differences between the groups ($p>0.05$). Our results are identical as from the available literature; in PIH, most often an asymmetrical type of IUGR id developed predominantely in the third quarter of the pregnancy. In conditions of UPC the circulation is redistributed, where the brain tissue and the top body parts (HL and torax) get enough amount of blood. In this conditions the most affected is the bottom part of the body (abdomen and FL).

By calculating the HC/AC ratio in 32 g.a. we concluded that IUGR is present in 13.64 % of fetuses in the group of hypertensive pregnancies ($p<0.01$).

In 36 g.a. we found that in the group of hypertensive pregnancies, 21.31 % had values that are referring to the asymmetric IUGR. Assessment of placenta in 36 g.a. showed that in the group A, 18.03 % had II and 81.97 % III degree of placental maturity, while in the controlled group most of them (93.02 %) had II degree of placental maturity ($p<0.01$). Olighydramnion in 36 g.a. was concluded only in hypertensive pregnancies (31.15 %).

In 38 g.a. we found that in the group of the hypertensive pregnancies the asymmetric type IUGR was present in 25.29 % cases, while in the group of the normotensive in 3.1 % of cases ($p<0.01$). US assessment of the placenta showed that in the group A III degree of placental maturity was present in all 50 examined patients (100 %). In the group B, II degree of maturity was present in 35.66 %, and III degree in 64.34 % of patients from 129 examined ($p<0.01$). Oligohydramnion was diagnosed in 70 % of pregnancies from the group A compared to the only 1.55 % of patients in the group B ($p<0.01$).

In 40 g.a., the asymmetric type of IUGR was diagnosed in 31.82 % of pregnancies from the group A ($p<0.01$). All patients in 40 g.a. had the III degree of placental maturity and all had oligohydramnion, while in the group of normotensive the amniotic fluid was reduced only in 30.21 %.

The only parameter that wasn't different during the pregnancy between normotensive and hypertensive pregnancies was TCD.

The newborns from the hypertensive pregnancies had a lower birth weight (approximate birth weight 2807.76±574.28 g). Head perimeter and body length were also different between the groups. The newborn's birth measurements from the hypertensive pregnancies were 33.4±1.7 cm for the head perimeter and 47.86±2.52 cm for the body length. Also these results are the same as from the associated literature (6, 16, 18, 19, 21).

Based on our research it can be concluded that IUGR is the main complication in the fetus of a hypertensive pregnancy. Using the ultrasound scan, the changes in the fetus development

can be detected, and also fast aging of placenta, even before an increased artery blood pressure is detected, what makes US diagnostically the best option of the antenatal detection of a retarded fetal development and growth. Early detection allows a timely and adequate treatment, which would help to reduce postnatal distress and weak condition of the newborn on delivery. The most often type of restriction in PIH is the asymmetric type of IUGR. Using US it is often associated with oligohydramnion, which can have a predictive value comparing to IUGR.

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Received July 15, 2007.
Accepted June 20, 2008.