

Doppler ultrasound assessment in third trimester in women with gestational hypertension

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Abstract

Background: Gestational hypertension is a form of high blood pressure in pregnancy. It occurs in about 6 % of all pregnancies. Impaired placental perfusion due to vascular abnormalities is clinically evident and can be diagnosed with Doppler ultrasound. **Purpose:** The aim of this study is to evaluate hemodynamic changes using Doppler ultrasound of the abdomen and central artery in pregnant women with and without hypertension. **Materials and Methods:** For data analysis, 179 pregnant women aged between 19-40 were selected from private clinics and 47 of them were diagnosed with gestational hypertension. They compared Doppler ultrasound hemodynamic assessment of the middle cerebral and umbilical arteries in late pregnancy with 132 control pregnant women without hypertension. **Results:** The mean±SD of RI, DS and PS/ED parameters of the umbilical artery showed a significantly different ($P < 0.05$). However, the Doppler contrast of the MCA artery showed a slight difference between the study groups, so they were not associated with gestational hypertension ($P > 0.05$). Binomial regression analysis was done, Increase UA RI and UA PSED associated with increased risk of hypertension more than double when compared to control group (odds ratio = 2.638, 2.610) respectively while Increase UA DS associated with decreased risk of hypertension when compared to control group (odds ratio = 0.725). **Conclusion:** Doppler ultrasound examination of maternal abdominal arteries can be used to determine hemodynamic dysfunction due to gestational hypertension.

Keywords: gestational hypertension, Doppler ultrasound, third trimester, placental perfusion, maternal abdominal arteries

Introduction

One of conditions of high blood pressure in pregnancy is Gestational hypertension. The prevalence of PIH about 6 % of all pregnancies [1]. It is diagnosed when blood pressure is above 140/90 mm Hg and is first diagnosed at or after the 20th week of pregnancy. [2]. Gestational hypertension should improve within 42 days post-delivery and may be persist after puerperium however, if persist after puerperium after this period called chronic hypertension [3].

In patients with hypertension in pregnancy , we should exclude the secondary cause which can affect on rate of morbidity and mortality of both mother and baby. The cause might a chance to be identified with an instrument of decreased placental perfusion prompting systemic vascular endothelial dysfunction[4].

The resultant placental hypoxia prompts a course of incendiary occasions, disturbing the equilibrium of angiogenic factors, and instigating platelet accumulation, all of which bring about endothelial brokenness showed clinically as the pregnancy initiated hypertension[5]. An analysis of hypertension in pregnancy warrants nearer observing, in light of the fact that it influence both mother and child.

One of the noninvasive strategies for assessment of fetal intrauterine wellbeing before conveyance is Doppler stream speed waveform investigation. The accompanying xamination with Doppler ultrasound: umbilical vein, central nervous system, maternal abdominal duct waveform, fetal aorta, fetal venous velocity and fetal ductus venosus. [6] Hemodynamic changes in uteroplacental and fetoplacental spread can be determined before obstetric complications occur. [7]

Methods

about 47 pregnant women, with gynecologist's attested assurance of gestational hypertension and with gestational age some place in the scope of

They were recruited between 28 and 36 weeks for data collection at a gynecology clinic in Babil, Iraq. The findings of Doppler ultrasound in this case are different from those in 132 pregnant women with a gestational age of 28 to 37 weeks who did not have hypertension browsed a comparative private office. Pregnant women with kidney brokenness, twin pregnancies, essential abnormalities, intrauterine mortality, or inability to bear the Doppler ultrasound evaluation were stayed away from the assessment.

The patients' enlistment and Doppler ultrasound evaluation were coordinated between February 2020 to April 2021.

Doppler ultrasound evaluations, It is performed by Doppler sonographers. All patients underwent transabdominal Doppler ultrasound examination using Samsung HS50 model 2020 4D test (CV1 8AD) 1-8 MHz. The umbilical cord and focal nerve were examined for each sense (peak systolic velocity (PSV), end-diastolic velocity (EDV), resistance index (RI), pulsatility index (PI), and systolic-diastolic degree (S/D.) [8]).

The accumulated data was taken apart by (SPSS) transformation 23 for the relationship and binomial backslide between different limits was done. P regard <0.05 was considered quantifiably colossal. T test was used for tenacious data.

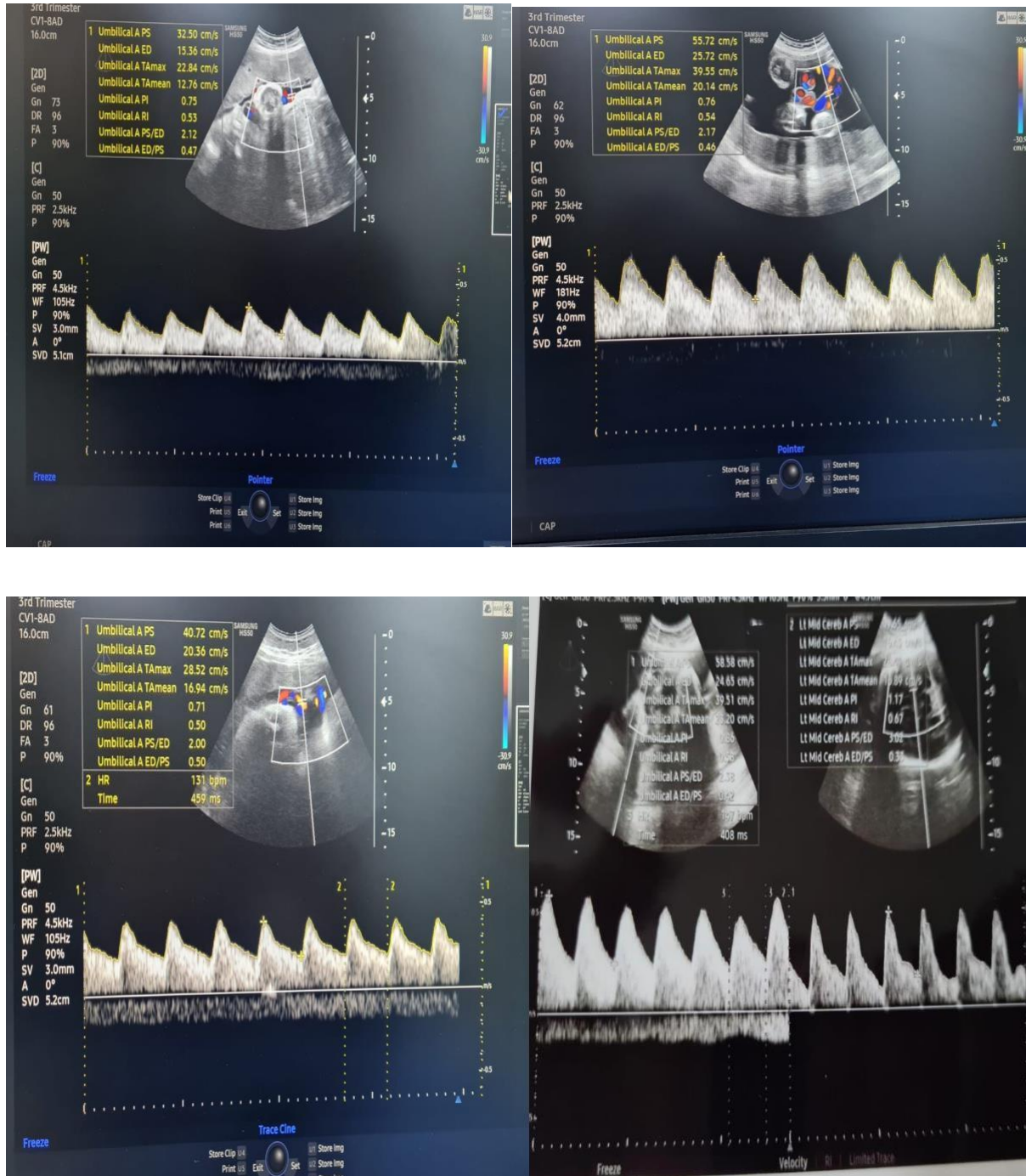


Figure (1):Some doppler ultrasound of studied group

Results

A total of 179 pregnant women were recruited and sub-divided in two groups: 47 Patients with hypertension and 132 pregnant women with normal blood pressure.

The median of GW was 35 for both patients and controls. Maternal age, there was no statistical difference among studied groups($p>0.05$). The median of Number of pregnancies was 2 and 1 for patients and controls respectively , there was statistical difference among studied groups($p<0.05$) ,Table1.

Table 1: The characteristics of study groups

Characteristics		Patient	Control	P value
Maternal age (years)		28.67±6.48	26.72±6.31	0.07
Gestational age	Mean±SD	35.04±3.02	35.10±2.81	0.93
median (range)		35(28-40)	35(28-41)	
Number of pregnancies, median (range)		2(0-10)	1(0-9)	0.048

*P <0.05 was significant

Table 2 shows the Doppler ultrasound images obtained from the arteries in the study group. Mean ± SD of umbilical artery RI, DS and PS/ED showed no significant difference between study groups ($P<0.05$). However, the Doppler contrast of the MCA artery showed a slight difference between the study groups, so they were not associated with gestational hypertension ($P>0.05$).

Table 2: Classification of Doppler US findings by artery in the study groups

Doppler findings		Patient	Control	P value
UA	PS	41.08±9.78	43.59±10.25	0.15
	ED	16.88±5.21	18.78±5.16	0.033*
	RI	0.60±0.09	0.56±0.06	0.021*
	PI	0.91±0.21	0.86±0.15	0.143
	PS/ED	2.53±0.53	2.35±0.39	0.013*
MCA	PS	47.43±13.37	50.02±13.94	0.271
	PD	10.78±4.33	10.96±4.98	0.82
	RI	0.77±0.060	0.78±0.098	0.40
	PI	1.60±0.29	1.66±0.35	0.35
	PS/ED	4.76±1.30	5.23±3.53	0.37

*P <0.05 was significant

The peak systolic velocity (PSV), end-diastolic velocity (EDV), Resistivity Index (RI), Pulsatility Index (PI) and the systolic-diastolic ratio (S/D)

Table 3 shows the correlation between doppler findings and general characteristics of study groups. Regarding age, there was negative correlation with UA DS , MCA PS , MCA RI and MCA PI (P<0.05) .

Gestational age there was negative correlation with UA RI ,UA PI ,UA PS/ED, MCA PS , MCA PD (P<0.05). Gestational age, while had positive correlation between gestational age and UA DS , MCA PS (P<0.05).

Regarding parity, there was positive correlation with UA RI ($P < 0.05$).

Table 3: Correlation between Doppler findings and general characteristics in the studied groups

Doppler findings			Age	Gestational age	Parity	
UA	PS	r	-.142	0.218*	-.059	
		P	.057	0.003	.434	
	DS	r	-.161*	0.351*	-.071	
		P	.032	0.001	.342	
	RI	r	.112	-0.335*	.148*	
		P	.136	0.001	.048	
	PI	r	.043	-.282*	.004	
		P	.564	0.001	.958	
	PS/ED	r	.111	-.285*	.063	
		P	.140	0.001	.401	
	MCA	PS	r	-.148*	.311*	-.042
			P	.048	0.001	.576
PD		r	-.161*	.398*	-.042	
		P	.032	0.001	.578	
RI		r	.029	-.312*	-.022	
		P	.695	0.001	.770	
PI		r	.053	-.262*	.011	
		P	.477	0.001	.883	
PS/ED		r	.112	-0.065	.139	
		P	.137	0.386	.063	

* $P < 0.05$ was significant

r Correlation coefficient

Table 4 shows the Correlation between Doppler findings of umbilical and Middle cerebral artery in the studied groups , there was negative correlation between UA RI and MCA PS , UA RI and MCA PD (P<0.05) while there was positive correlation between UA RI and MCA RI , UA PI and MCA RI , UA RI and MCA PI , UA PI and MCA PI (P<0.05).

Table 4 : The Correlation between Doppler findings of umbilical and Middlecerebral artery in the studied groups

UA		MCA				
		PS	PD	RI	PI	PS/ED
PS	r	.098	-.010	.038	.024	.066
	P	.192	.889	.609	.747	.379
DS	r	.136	.098	-.079	-.086	.067
	P	.070	.190	.296	.254	.373
RI	r	-.151*	-.223*	.194*	.193*	.001
	P	.044	.003	.009	.010	.989
PI	r	-.026	-.135	.168*	.173*	-.004
	P	.733	.071	.024	.021	.956
PS/ED	r	-.094	-.179*	-.066	.241*	-.002
	P	.209	.017	.378	.001	.979

*P <0.05 was significant

r Correlation coefficient

Binomial regression analysis was done, for Doppler us in patients with hypertension versus normal control, Increase UA RI and UA PSED associated with increased risk of hypertension more than double when compared to control group (odds ratio =2.638 , 2.610) respectively while Increase UA DS associated with decreased risk of hypertension when compared to control group (odds ratio =0.725)

Table 5: Binomial regression analysis for Doppler us in patients with hypertension versus normal control

Patients	P value	Odds ratio	Confidence interval	
			Lower limit	Upper limit
UAPS	0.147	0.974	.940	1.009
DS	0.035*	0.725	.661	.994
RI	0.024*	2.638	0.079	2.600
PI	0.144	1.252	0.609	4.701
PSED	0.015*	2.610	1.207	5.644
MCAPS	0.270	0.986	.962	1.011
PD	0.820	0.992	.925	1.064
RI_A	0.404	0.161	.002	11.689
PI_A	0.357	0.630	.236	1.682
PSED_A	0.367	0.902	.720	1.129

*P <0.05 was significant

Discussion

In the fetal situation, the umbilical vein is always linked to the outcome of pregnancy and is considered an important non-invasive method document in terms of the central nervous system, fetal blood flow markers and the risk of fetal frailty [9].

The mean \pm SD of RI , DS and PS/ED boundaries of the umbilical conduit showed a critical contrast between the investigation gatherings ($P < 0.05$). While the doppler boundaries of the MCA supply route showed a nearby hole between the investigation gatherings and along these lines they were not related to gestational hypertension ($P > 0.05$).

In our investigation, as individual estimations, strange RI ,DS and PS/ED from umbilical vein recommending, however not the overall Doppler US for these courses, could be considered as markers to assess the particular vascular modifications. This outcomes concurred with results got by Lopez-Mendez et al.

A description of findings similar to this analysis can be found in Mallikarjunappa et al. Made by. It is used to examine Doppler velocity waveforms of umbilical arteries, uterine arteries, and central cerebral arteries [10]. According to this study, some researchers found a greater difference in the umbilical cord RI and PI margin in women with PE compared to women without PE [11-13].

Mallikarjunappa *et al.* [14] Umbilical canal Doppler studies have shown that there is an increase in the S/D ratio, RI and PI limits in pregnant women with hypertension in the second and third trimesters.

Binomial regression examination was done, for Doppler us in patients with hypertension versus typical control, Increase UA RI and UA PSED related with

expanded danger of hypertension more than twofold when contrasted with control bunch (chances proportion =2.638 , 2.610) individually while Increase UA DS related with diminished danger of hypertension when contrasted with control bunch (chances proportion =0.725).

A report by Li et al. [15] also supports this. Interestingly, Lopez-Mendez et al. [10] noted no significant difference in the PI and RI of the uterus, but reported a significant difference in the PI and RI of the umbilical cord between women with HRP with and without PE, which were the same. In this research, we found it in the umbilical cord process. The difference between the current study and the above evaluation may be a direct result of the difference in population and disparity in the distance of the obstetric Doppler limit, which may vary from population to population. [10]

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