ORIGINAL ARTICLE

Maternal blood pressure before the onset of eclampsia and stroke during labor at term

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Aim: We examined women complicated by stroke or eclampsia occurring in our institute during labor at term, with particular attention to changes in their blood pressure.

Methods: We identified all pregnant women who were hospitalized for labor and delivery between April 1, 2002, and November 30, 2015.

Results: During this period, there were 14 cases of eclampsia and 3 cases of stroke associated with hypertensive disorders of pregnancy. In 16 (94%) of these cases, systolic blood pressure was normal (< 140 mmHg) at 3–7 days before admission for delivery at term. In 6 of these cases (35%), systolic blood pressure was normal (< 140 mmHg) at admission. Severe hypertension (systolic blood pressure ≥ 160 mmHg) was observed immediately after the onset of eclampsia or stroke in all cases.

Conclusions: Regular measurement of blood pressure in all women during labor is important.

Introduction

In order to promote fetal growth, significant maternal circulatory and metabolic changes occur during pregnancy. Problems with these physiological changes may cause the development of hypertensive disorders of pregnancy and lead to eclampsia and stroke during pregnancy, labor, or the puerperium, which are associated with increased adverse acute and long-term maternal and perinatal outcomes.^{1,2)}

It is difficult to distinguish between eclampsia and stroke during labor. In women complicated by eclampsia, appropriate treatments with antihypertensives and/or anticonvulsants are required.³⁾ If a stroke is detected, treatments in cooperation with neurosurgical specialists are required as soon as possible.³⁾

Therefore, prediction of the onset of eclampsia and stroke is very important for the safety of mothers and their infants. Against this backdrop, we examined women complicated by stroke or eclampsia occurring in our institute during labor at term, with particular attention to changes in their blood pressure.

Methods

The protocol for this study was approved by the Ethics Committee of the Japanese Red Cross Katsushika Maternity Hospital. In addition, informed consent for retrospective analyses was obtained from each subject before delivery.

We conducted a retrospective examination using patient data in our hospital. We identified all pregnant women who were hospitalized for labor and delivery between April 1, 2002, and November 30, 2015. During this period, there were 15 cases of eclampsia, 1 case of cerebral infarction, 2 cases of cerebral hemorrhage, and 1 case of subarachnoid hemorrhage. Diagnoses were confirmed by imaging findings (e.g., CT and MRI). We excluded 1 case of eclampsia that occurred before labor at 28 weeks of gestation and 1 case of subarachnoid hemorrhage due to cerebral arteriovenous malformation. Thus, in this study, we assessed the remaining 17 cases with serious complications of hypertensive disorders of pregnancy. We examined the following parameters: maternal age, parity, proteinuria, edema, and systemic and diastolic blood pressures at 3–7 days before

Table 1. Clinical characteristics and changes in systolic/diastolic blood pressure in 17 cases complicated by eclampsia or stroke during labor at term

Stage of delivery	Diagnosis	Maternal age (y)	Parity	Urine protein	Edema	Systolic/diastolic blood pressure (mmHg)		
						At 3–7 days before admission	At admission for delivery	At 0.1–2 h before eclampsia/stroke
First stage	Eclampsia	37	0	Yes	No	125/70	137/ 80	145/ 85
	Eclampsia	25	0	Yes	No	139/92	140/ 90	144/ 95
	Eclampsia	23	0	Yes	No	135/89	152/106	179/121
	Eclampsia	31	0	No	No	129/80	145/103	160/100
	Eclampsia	43	0	No	No	122/78	135/ 88	145/100
	Cerebral infarction	34	1	No	Severe	155/90	150/ 80	150/ 77
Second stage	Eclampsia	37	0	No	No	116/65	114/ 61	125/ 80
	Eclampsia	34	0	No	No	109/71	125/ 68	133/ 86
	Eclampsia	31	0	Yes	Mild	135/93	158/101	168/ 98
	Eclampsia	38	0	No	No	125/80	146/ 93	160/110
	Eclampsia	38	2	Yes	No	118/80	147/ 87	160/ 80
	Eclampsia	32	0	No	No	139/83	130/ 80	150/ 80
Within 2 h after delivery	Eclampsia	42	0	Yes	Severe	133/82	142/ 96	176/118
	Eclampsia	20	0	Yes	No	138/83	148/ 78	181/ 94
	Eclampsia	27	0	No	No	130/82	144/102	201/138
	Cerebral hemorrhage	36	0	Yes	Mild	139/87	170/110*	150/100
	Cerebral hemorrhage	32	0	Yes	Severe	119/80	134/ 86	158/100

* HELLP (Hemolysis, Elevated Liver enzymes, Low Platelet count) syndrome

admission for delivery at term, at admission, and at 0.1–2 h before eclampsia or stroke.

Results

Table 1 shows the clinical characteristics and changes in systolic/diastolic blood pressure in 17 cases complicated by eclampsia or stroke during labor at term. The ages of 7 cases (41%) were ≥ 35 years. Nine cases (53%) were also complicated by proteinuria, while 3 cases (18%) were complicated by severe systemic edema. In 16 cases (94%), systolic blood pressure was normal (<140 mmHg) at 3–7 days before admission for delivery at term. In 6 of these cases (35%), systolic blood pressure was normal (<140 mmHg) at admission. At 0.1–2 h before the onset of eclampsia or stroke, systolic pressures of 2 and 7 cases (12 and 41%, respectively) were normal and revealed mild hypertension (140–159 mmHg), respectively. Severe hypertension (systolic blood pressure ≥ 160 mmHg) was observed immediately after the onset of eclampsia or stroke in all cases.

Discussion

In this study, 94% of women who developed eclampsia or stroke at term did not exhibit hypertension before labor. Thus, the acute increase in blood pressure was likely involved in the development of eclampsia and stroke

during labor at term.

In a recent prospective study in Japan,⁴⁾ 24% of pregnant women who remained normotensive throughout pregnancy developed hypertension during labor. In that study, one of the 19 patients complicated by emergent hypertension (maximum systolic blood pressure during labor ≥ 180 mmHg) developed eclampsia. The authors of that study emphasized the importance of repeatedly measuring maternal blood pressure during delivery to help detect critical hypertension early in high-risk cases, such as those with a maternal age of ≥ 35 years, body mass index at delivery of >30 , systolic blood pressure at 36 weeks of gestation of 130–134 mmHg, systolic blood pressure at admission of 130–139 mmHg, proteinuria (a score of 2+ on the dipstick test), and severe edema.⁴⁾ There have also been reports on the association between ‘labor-onset hypertension’ and eclampsia and cerebrovascular disease in pregnancy.^{5–10)} Our current findings may support these previous observations^{4–10)} indicating the importance of managing acute hypertension during labor. In addition, we confirmed that eclampsia can occur even in cases without severe hypertension.

In an earlier study of cerebral perfusion pressure changes in laboring normotensive women by ultrasonography,¹¹⁾ at the peak of a contraction and during pushing, cerebrovascular resistance was found to rise significantly, although cerebral blood flow did not change. In addition, preeclamptic patients in one study showed a global

elevation of cerebral perfusion pressure and lower resistance in cerebral circulation than normotensive pregnant women.¹²⁾ It is thus possible that significant changes in maternal cerebral circulation during and after delivery are associated with the development of eclampsia and/or stroke, even if severe hypertension is not observed.

Finally, in order to prevent eclampsia, the guidelines for obstetrical practice in Japan¹³⁾ require the measurement of blood pressure and protein levels in the urine of all women who are admitted for delivery. The guidelines also recommend that blood pressure be measured regularly at appropriate intervals in parturient women diagnosed with hypertensive disorders of pregnancy, those with a positive urine protein result at admission, and those who are hypertensive at admission. Regular assessments of blood pressure and pulse rate at an interval of 2 h or less are also recommended when administering uterotonics. While these recommendations are very important, our current findings suggest that management based on these recommendations may be insufficient to prevent eclampsia or stroke during labor at term, because blood pressure was normal at admission in 35% of cases complicated by eclampsia or stroke. Thus, regular measurements of blood pressure in all women during labor may be required at the same intervals.

Conflict of interest

None.

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