

PREDICTION OF PREGNANCY INDUCED HYPERTENSION : EVALUATION OF ROLL OVER TEST AND ISOMETRIC EXERCISE TEST

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SUMMARY

Roll-over test (ROT) and isometric exercise test were performed prospectively on 75 primigravid normotensive women between 28 and 32 weeks to predict the development of pregnancy induced hypertension. ROT was found to have high false negativity and low sensitivity. The isometric test was highly sensitive with low false negativity and high specificity. Hence, the isometric test is superior to ROT and can be used to screen high risk patients.

INTRODUCTION

Pregnancy-induced hypertension (PIH) is one of the common maternal disorders in developing as well as developed countries. It is responsible for high maternal and perinatal morbidity and mortality which are due to the severity of hypertension and its complications. Hence, there is a need for identifying those pregnant women who are prone to develop hypertension. Once they are identified the development of hypertension could be prevented or atleast

early detection and treatment will decrease its complications and associated risks to the mother and fetus.

The roll-over test (ROT) was reported to be highly reliable in predicting the ultimate development of PIH (Gant et al 1974 and Marshal and Newman, 1977). But, subsequently this could not be substantiated by others (Didolkar et al, 1979 and Kassir et al, 1980). Degani et al (1985) reported that the isometric handgrip exercise test was superior to ROT. In this prospective study, the efficacy of these two tests in predicting PIH was studied.

PATIENTS AND METHODS

Seventy five primigravid women in the age groups of 18 to 30 years and between 28 to 32 weeks of gestation attending the antenatal clinic of JIPMER hospital, Pondicherry, from August 1987 to September 1988 were chosen at random. They were advised regular follow up and delivery in this institution. Those with essential hypertension, renal disease, diabetes mellitus and cardiac disease were excluded from the study.

The method and importance of testing were explained to the patients and a detailed general and obstetric examination was performed. The period of gestation was established from the last menstrual period, by clinical examination and by ultrasound whenever necessary.

The blood pressure (BP) was recorded by sphygmomanometric method in all patients by a single obstetrician. The systolic pressure (SBP) was noted at the point where first clear tapping sound was heard. The diastolic pressure (DBP) was noted at the point of fifth Korotkoff sound.

The baseline BP was taken in left lateral position (at 30° tilt) after 2-3 min of rest. Four readings were taken in this position every 5 min. and the average was taken to represent baseline BP. For performing the ROT, the patient from lateral position was turned supine and BP recorded in the same arm at 1 and 5 min. The average of the two readings was taken. An increase in the DBP of 20 mm Hg or more was taken as positive ROT.

Again, the patient was turned to left lateral position and 20 to 30 min. rest was given. Then isometric handgrip exercise test was performed in this position as

follows (Degani et al 1985). The patient was instructed to press an inflated cuff of a calibrated sphygmomanometer to maximal voluntary contraction (MVC) for 30 sec. for a 3 min. period of sustained isometric handgrip exercise. The patient then compressed the inflated sphygmomanometer at a tension level of 50% of the subject's previously determined maximal contraction. The patient was instructed to avoid Valsalva maneuver during the test. An increase in the DBP of 20 mm Hg or more was considered a positive isometric exercise pressor response.

PIH was diagnosed when a patient normotensive prior to third trimester developed persistently elevated BP of 140/90 mm Hg or more (when two consecutive measurements were made 6 h apart), or if DBP was 20 mm Hg or more above the previous level. The criteria for transient hypertension were as per Davy (1985). All patients were followed upto term and BP recording was done at each antenatal visit, during labour and upto 72 h postpartum.

RESULTS

Results of ROT (Table I)

Out of 75 primigravidas, the ROT was positive in one patient, who subsequently developed PIH. Seventy four patients showed negative test, 68 of these remained normotensive and 6 developed PIH.

The predictive value of positive ROT was 100% and that of negative test was 91.9%. The sensitivity was poor (14.3%) i.e. the test failed to identify 85.7% of individuals who subsequently developed PIH as shown by high false negativity.

Results of isometric tests (Table II)

The isometric test was positive in 6 patients and all of them developed PIH. The predictive value of positive test was 100%. Out of 69 patients who showed negative test, 68 remained normotensive and one developed PIH, which was mild and transient. The predictive value of negative test was 98.5%. The sensitivity was high (85.7%) i.e. it detects higher proportion of individuals who subsequently developed PIH (Table III).

None of the 7 patients who developed PIH had proteinurea though 5 of them had edema. One patient had transient hypertension. In 6 patients, PIH was detected when it was mild. All were hospitalised. Two of them progressed to severe PIH, (one to imminent eclampsia at 34 weeks of gestation). The ages of patients who developed PIH ranged from 18 to 25. There was no maternal or perinatal death in this study.

Table I

Roll-Over Test

Result	Developed PIH (n = 7)	Remained Normotensive (n = 68)
Positive (n = 1)	True positive - 1	False positive - Nil
Negative (n = 74)	False negative - 6	True negative - 68

Table II

Isometric exercise test

Result	Developed PIH (n = 7)	Remained Normotensive (n = 68)
Positive (n = 6)	True positive - 6	False positive - Nil
Negative (n = 69)	False negative - 1	True negative - 68

Table III

Evaluation of ROT and IET

Test	Sensitivity	Specificity	Predictive value of		False positive	False negative
			Positive test	Negative test		
ROT	14.3	100	100	91.8	1.4	85.7
IET	85.7	100	100	98.5	1.4	14.3

DISCUSSION

The basic mechanism involved in PIH is the development of vasospasm, the etiopathogenesis of which is still obscure. To detect this vascular reactivity early many tests were developed, viz. pressor response to various substances like angiotensin II, metabolic clearance of dehydro-isoandrosterone sulfate, etc. Gant et al (1973) found that the pressor response to angiotensin II was accurate in predicting PIH in 90% of patients. The limitation of this is that a clinical setting with an experienced laboratory technician is required. Subsequent studies showed less reliability of this test (Morris et al, 1978).

During the conduct of angiotensin II test it was noted that a patient who moved from left lateral to supine position developed a sudden rise in BP. This observation led to the development of ROT (Gant et al, 1974). The efficacy of ROT was studied by various authors but remains controversial (Didolkar et al, 1979 and Kassir et al 1980).

The mechanism which mediates the hypertensive vascular response in ROT is unknown. It could be as a result of increased vascular reactivity (Degani et al, 1985). In normal pregnancy there is an increased resistance to infused angiotensin II and increased production of prostaglandin E. In pregnancies complicated by PIH, there is loss of resistance to angiotensin II with development of enhanced vascular sensitivity and a decrease in prostaglandin E production (Gant et al, 1973 and 1974). Whether the defect is in the prostaglandin production, loss of response to prostaglandin,

renin-angiotensin changes, or a combination of events has not been proved (Marshall and Newman, 1977).

Isometric exercise tends to produce less increase in heart rate and cardiac output, but marked increase in both SBP and DBP usually without changing the systemic vascular resistance. The increase in BP is considered to result from a reflex from the contracting muscle where blood flow is markedly impeded by the sustained muscle contraction and also may be due to moderate increase in cardiac output (Lind and Mc Nicol, 1967 and Grossman et al 1973). At 50% maximal voluntary contraction or more there is a mild but widespread peripheral vasoconstriction in isometric work so that the increased cardiac output results in increased BP (Lind 1970).

In the present study, the ROT had a positive predictive value (PPV) of 100% and negative predictive value (NPV) of 91.9%. The findings were comparable to those of Gant et al (1974) and Marshall and Newman (1977). But other authors reported poor predictability (Thomson and Mueller-Heubach, 1978 and Didolkar et al 1979). Though some workers (Karbhari et al 1977) showed high sensitivity of this test, the present study as well as Didolkar et al's (1979) showed poor sensitivity. The PPV and NPV of isometric test were high in this study as in other studies (Degani et al, 1985). The sensitivity and specificity were also high.

In conclusion, it may be said that the isometric exercise test has high predictive value compared to ROT. It has high sensitivity and specificity. As

it is time consuming it may not be recommended in busy antenatal clinics but can be used to detect patients at risk of PIH in high risk clinics.

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