

## EVALUATION OF PROVOCATIVE TESTS IN PREDICTING PRE-ECLAMPSIA

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### SUMMARY

Despite the on-going efforts, prediction of pre-eclampsia is yet not possible. The present study was conducted to evaluate the efficacy of Roll Over Test (R.O.T.), Isometric Handgrip Exercise Test (IHG Ex test) and Cold Pressor Test (CPT) as an aid in predicting pre-eclampsia. Fifty primigravid normotensive women were studied; all the patients were subjected to the three tests. These tests were then evaluated singly and in combination. It was concluded that not only a positive test is helpful, but a negative test too is significant in ruling out cases not destined to develop pre-eclampsia, and that combination of the tests increases the predictive accuracy.

### INTRODUCTION

Pre-eclampsia is a leading cause of maternal and foetal morbidity and mortality in various parts of the world. Therefore, its early diagnosis and intensive management is of utmost necessity. But the diagnosis depends on hypertension, proteinuria and oedema, features which appear when the disease has already established. However, if we are able to select the high risk population and keep them under intensive antenatal care, we

would be able to improve the maternal and foetal prospects.

Recently some valuable tests have been applied to detect women at increased risk of developing pre-eclampsia. In the present study, an effort is therefore made to evaluate the efficacy of these tests regarding prediction of pre-eclampsia in primigravidae.

### MATERIAL AND METHODS

Fifty primigravid women attending the antenatal clinic of Department of Obstetrics & Gynaecology, J.L.N. Medical College & Hospital, Ajmer were selected for the study.

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Multigravid patients already showing signs of PIH and those with a history of essential hypertension, and chronic renal disease were excluded.

Gestational age of the patients was between 16 and 30 weeks. A detailed history with special reference to family history of hypertension, past history of diabetes and renal disease, history of pre-eclampsia in mother, mother-in-law and sister of the patient were taken.

General physical examination and obstetric examination were carried out with special reference to presence of anaemia and oedema; BP measurement and recording of weight. Haemoglobin estimation and urine examination for albumin were done. The three provocative tests were then carried out after recording the basal sitting and supine pressures. Fifteen minutes of rest was allowed between each test for the haemodynamics to return to baseline.

*ROLL OVER TEST* was performed as originally described by Gant et al (1974). However, the BP measurements were made on the right arm. A rise in diastolic pressure of > 20 mm of Hg on rolling over from the left lateral to the supine position was considered as a positive test.

*COLD PRESSOR TEST:* The left and of the patient was immersed upto the wrist in cold water ( 6°C). The BP was measured on the right arm considering unbearable discomfort as the endpoint. A positive test was considered as a rise in diastolic pressure of > 20 mm Hg over basal level. During the test, the patient was asked to avoid valsalva manoeuvre and breath holding. The test was performed with the subject in the sitting position and her right upper limb extended forwards at an angle of 45. to keep the cuff at heart level with the forearm parallel to the ground (Mittal et al, 1988).

#### ISOMETRIC HAND GRIP EXERCISE TEST

The subject was asked to lift a standard weight 7 Kg with the left hand, BP being measured on the right arm and considering unbearable discomfort as end-point. A positive test being considered as a rise in the diastolic pressure of > 20 mm Hg above basal level (Mittal et al, 1988).

All the cases were followed and those developing a BP of 140/90 and above with albuminuria or oedema were considered as pre-eclampsia cases. The sensitivity, specificity and predictive accuracy of the positive and negative tests were thereby determined by following formulae -

$$\text{Sensitivity} = \frac{\text{No. of PE cases showing the criteria}}{\text{Total No. of PE Cases}} \times 100$$

$$\text{Specificity} = \frac{\text{Total No. of normotensives not showing the criteria}}{\text{Total No. of normotensives}} \times 100$$

$$\text{Predictive accuracy of positive test} = \frac{\text{No. of PE cases showing positive test}}{\text{Total No. of cases showing negative test}} \times 100$$

$$\text{Predictive accuracy of negative test} = \frac{\text{No. of normotensives showing negative test}}{\text{Total No. of cases showing negative test}} \times 100$$

### OBSERVATIONS

Out of the total 50 cases studied; 15 developed pre-eclampsia.

**ROLL OVER TEST:** 28 cases showed a positive test - 13 true positive and 15 false positive with a sensitivity, specificity and predictive accuracy of 86.6%, 57.1% and 46.4% respectively. Negative test showed a sensitivity, specificity and predictive accuracy of 13.3%, 42.8% and 90.9% respectively (Table Graph No. 1).

**COLD PRESSOR TEST:** was true positive in 13 and false positive in 27 with a sensitivity of 86.6%, specificity of 22.8% and predictive accuracy of 32.5%. The negative test recorded the above values as 13.3%, 77.1% and 80% respectively.

**ISOMETRIC HANDGRIP EXERCISE TEST:** The positive test showed a sensitivity of 80% specificity of 22.8% and predictive accuracy of 30.76%. The negative test gave the above values as 20%, 77.1% and 72.7% respectively.

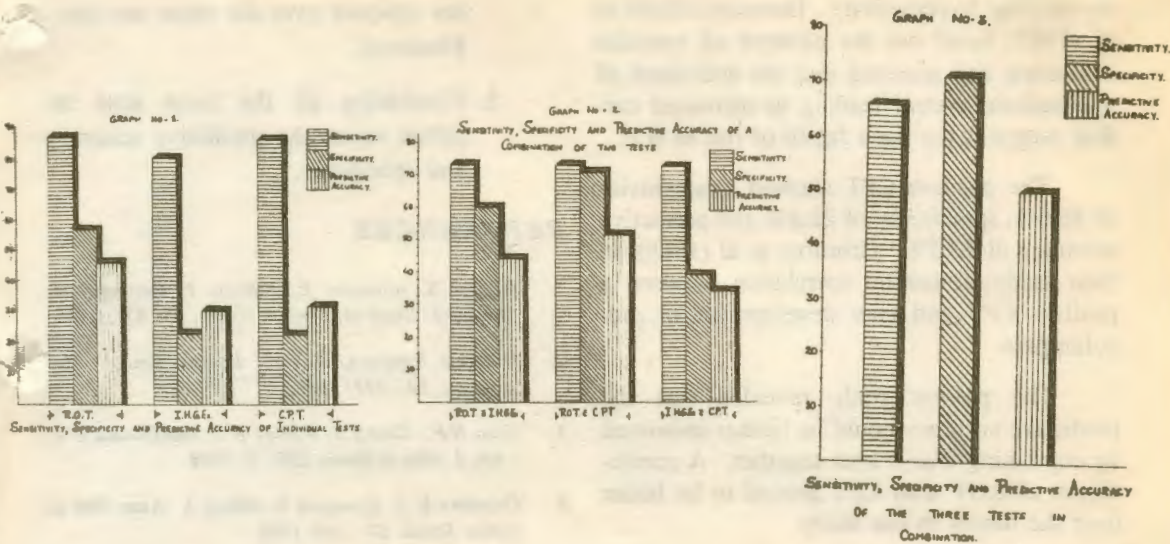
On taking the combination of the tests into consideration a positive ROT with a positive IHG Ex test gave a sensitivity of 73.3%, specificity of 60% and predictive accuracy of 44%. When ROT and CPT were considered together, the values were 73.3%, 71.4% and 52.8% respectively. However, a combination of IHG Ex test with CPT recorded a sensitivity of 73.3%, specificity of 40% and predictive accuracy of 34.3% (Table, Graph No. 2).

When all the three tests were considered together, the respective values were 66.6%, 71.4% and 50% (Graph No. 3).

TABLE

Comparison of provocative tests alone and in combination

Provocative tests	Sensitive	Specificity	Predictive accuracy
ROT	86.6	57.1	46.4
IHG Ex test	80.0	22.8	30.7
CPT	86.6	22.8	32.5
ROT with IHG	73.3	60.0	44.0
ROT with CPT	73.3	71.4	52.8
IHG with CPT	73.3	40.0	34.3
ROT with IHG with CPT	66.6	71.4	50.0



**DISCUSSION**

Pre-eclampsia has constantly challenged the obstetrician, as it still cannot be prevented, and when it emerges, causes considerable maternal and foetal morbidity and mortality.

Over the years efforts have been made to select cae destined to develop pre-eclampsia by various methods.

Gant et al, in 1974, first described the ROT and recorded on 88% sensitivity of the same in predicting pre-eclampsia. However, the arm used was not specified in this study. Regarding the mechanism underlying the vascular response in ROT, they observed tat in patients prone to develop the disorder, a decrease in the metabolic clearance of DHEAS together with an increase in te vascular sensitivity to infused Angiotensin II occurred. They suggested that the immediate hypertensive response shown in the ROT could better be explained by baro-receptors rater than the activation of Renin-Angiotensin system which would require a longer time interval to act.

A positive ROT showed a sensitivity, specificity and predictive accuracy of 86.6%,

57.1% & 46.4% in the present study. A high predictive accuracy has also been reproted by Gant et al (1974), Kharbhari et al (1977, Majumdar and Deshmukh (1979) and Karna (1979), while a low value of the same has been reported by Kassari et al (1980). Didolkar et al (1979) did not find any significant correlation between a positive ROT and subsequent development of pre-eclampsia. The findings of Gusdon et al (1977) are similar to our study.

The negative ROT showed a predictive accuracy of 90.9% in the present study. Similar results have been reported by Gant et al (1974), Gusdon et al (1977), Kharbhari et al (1977), Karna (1979), Majumdar & Deshmukh (1979), Kassari et al (1980), Mukherjee & Ghosh (1984) and Grimfor et al (1988).

The isometric handgrip exercise test showed a sensitivity of 80%, specificity of 22.8% and predictive accuracy of 32.76% of the positive test. The negative test, however, had a predictive accuracy of 72.72%, the findings being similar to those of Degani et al (1985).

The mechanism underlying IHG Ex test according to Savin et al (1980) was explained

by vascular hyperactivity. However, Nisell et al (1987) ruled out the element of vascular resistance and suggested that the activation of sympathetic system leading to increased cardiac output is the main factor of rise in B.P.

The positive CPT showed a sensitivity of 86.6%, specificity of 22.8% and predictive accuracy of 32.5%. Grimfors et al (1988), in their study, found no correlation between a positive CPT and later development of pre-eclampsia.

The present study revealed that the predictive accuracy could be further improved by combining 2 or 3 tests together. A combination of ROT with CPT proved to be better over the others in our study.

When all the 3 tests are combined, not only the predictive accuracy, but the specificity also rises. Contrary to this, Grimfors et al (1988) did not find any of the 3 tests useful as a screening method for predicting pre-eclampsia.

However, Degani et al (1985) have reported a better predictive accuracy of IHG Ex test over ROT.

## CONCLUSION

1. The ROT is more specific and carries a higher predictive accuracy when compared with the CPT and IHG Ex tests.
2. Considering a combination of 2 tests - a positive ROT with a positive CPT

are superior over the other two combinations.

3. Combining all the three tests together raises the predictive accuracy and specificity.

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