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Roll-over test in primigravidae attending a public primary care service

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Objective: To determine the roll-over test (ROT) performance in predicting pregnancy-induced hypertension (PIH) in primigravidae aged 15-29 years in a public primary care service. **Method**: Prospective cohort study enrolling 369 consecutive and initially normotensive primigravidae. The ROT was applied within 28-32 weeks of pregnancy. PIH was defined as diastolic blood pressure (DBP) 90 mm Hg or systolic blood pressure (SBP) 140 mm Hg, or a rise in DBP 15 mm Hg or a rise in SBP 30 mm Hg. The ROT prognostic properties were calculated, and a receiver operating characteristic (ROC) curve was constructed. **Results**: For the 20 mm Hg cutoff point, sensitivity was 20% and specificity was 93%. Positive and negative predictive values were, respectively, 23% and 92%, for a PIH cumulative incidence of 9.5%. With other cutoff points, the ROC curve showed a poor discriminatory value of the test. **Conclusion**: The ROT was not useful for predicting PIH in a primary prenatal care setting.

Uniterms: Pregnancy. Pregnancy-induced hypertension. Toxemia. Pre-eclampsia. Roll-Over Test.

INTRODUCTION

Hypertension which complicates pregnancy is a major cause of prematurity and perinatal mortality.[1] Any large unselected group of pregnant women with raised blood pressure will contain individuals whose hypertension antedates the pregnancy, those whose blood pressure began to rise after the end of the second trimester (pregnancy-induced hypertension - PIH), and a few with pre-existing hypertension exacerbated by the pregnancy. It is recognized that primigravidae are at highest risk of PIH.[2]

In most parts of the world, prenatal care services, when accessible, have the most profound effect on the consequences of hypertension in pregnancy, but not in its prevention. If the roll-over test (ROT), published by Gant et al.[3] in 1974 and still taught in medical schools, is in fact accurate, it could be useful for identifying higher risk groups of primigravidae, who would deserve special attention.

This prospective study was therefore aimed at determining the value of the ROT in predicting PIH development in primigravidae aged 15-29 years living in the eastern region of Greater Sao Paulo, Brazil, a low-income urban area, who attended a primary prenatal care public service (Leonor Mendes de Barros Maternity Hospital).

PARTICIPANTS AND METHODS

The inclusion criteria were as follows: a) spontaneous demand for routine prenatal assistance in the service where the study was based; b) reporting being primigravida at the

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time of registration; c) 15-29 years old; and d) normotensive (blood pressure lower than 140/90 mm Hg before the 24th week of pregnancy) without the use of anti-hypertensive drugs.

The exclusion criteria (and the respective numbers excluded by each criterion) were as follows: a) in the first contact, expectation of moving to an unknown address (7); b) continued inability to give a precise home address at the second contact (10); c) miscarriage before the 24th week of pregnancy (5); d) determination, through further contact, that the woman was either not a primigravida (4) or not pregnant (3); e) suffered congenital vascular disease (1); or f) made regular use of aspirin or drugs known as vasoactives (zero). Out of 422 primigravidae considered eligible, 394 were submitted to ROT.

Loss during follow-up was minimized by special efforts aimed at those (68%) who missed at least one appointment: 46 telephone calls were made, 731 letters were sent (maximum of three per woman)[4], and 151 home visits were performed (in the case of non-response to the third letter). These efforts resulted in follow-up losses of only 6.3% (25 participants). Also, 34 hospitals had to be visited in order to get the medical records of those (more than 50%) who gave birth in hospitals other than that where the study was based. All the remaining 369 were followed up from 24 weeks of pregnancy until one month after delivery.

The ROT consisted of the same procedure performed by Gant et al.[3], except that the participants' responses to angiotensin II after the test were not evaluated. At the time of study, each participant was placed in the left lateral recumbent position, and blood pressure measurements in the right upper arm were repeated at five minutes intervals, until a constant baseline diastolic blood pressure had been established. When the diastolic blood pressure had become constant, the subject was turned to the supine position and the blood pressure was measured immediately and again five minutes later while the participant was still supine.

The ROT was conducted by the same observer every time, who was trained to measure blood pressure with the London School of Hygiene and Tropical Medicine sound tape[5]. All the participants were invited to urinate before the test. The Korotkoff first phase was taken as the systolic blood pressure. The diastolic was recorded as the Korotkoff fifth phase - or the fourth, if the fifth phase was not detected before the value reached zero.

An increase in diastolic blood pressure of at least 20 mm Hg, from the left lateral to the supine position, was taken as a positive test, but other cutoff points were considered in the analysis. Sensitivity and specificity were calculated with such different cutoff points, in order to generate a receiver operating characteristic (ROC) curve[6].

PIH was defined as[7] a diastolic blood pressure (DBP) of at least 90 mm Hg or a systolic blood pressure (SBP) of at least 140 mm Hg, or a rise in DBP of at least 15 mm Hg or a rise in SBP of at least 30 mm Hg. The diagnosis of PIH was confirmed when such blood pressure readings were obtained on at least two occasions, six hours or more apart. Regarding the review of medical records from around the time of delivery, the same blood pressure criteria were applied, and the medical record review was done by the same observer, blind to the previous blood pressure levels of the participants.

RESULTS

Some characteristics of the 369 primigravidae analyzed are shown in Table 1. In these women, the overall risk of PIH development was 9.5% (35/369), with the 95% confidence interval between 6.5% and 12.5%.

Table 2 shows the test results for the cutoff point of $\Delta DBP \geq 20$ mm Hg. Sensivity (7/35) was 20%, and specificity (311/334), 93%. Predictive values (for a PIH cumulative incidence of 9.5%) were: positive (7/30), 23%, and negative (311/339), 92%. These predictive values, particularly the negative, proved to be quite close to those which would have been expected if the tests had not been performed.

Table 3 shows the ROT sensitivities and specificities for different ΔDBP cutoff points. Those numbers were used to construct the ROC curve exhibited in the Figure, which shows the poor ROT prognostic value for PIH in the studied primigravidae.

DISCUSSION

Gant et al.[3] observed 88% sensitivity (15/17) and 95% specificity (20/21) for the ROT, in a sample with PIH occurrence of almost 45% (17/38), a figure far different from that observed in unselected pregnant women. This may suggest problems of participants' selection or unblinded assessment and PIH diagnosis criteria.

In the same work, Gant et al.[3] also evaluated the response to angiotensin II administration (with an infusion

Table 1
Some characteristics of the 369 analyzed primigravidae.

Characteristics	Number	(%)
AGE (years)		
15-19	161	43.6
20-24	152	41.2
25-29	56	15.2
ETHNIC GROUP		
White	206	55.8
African	159	43.1
Asian	4	1.1
EDUCATION (highest school grade completed)		
0 - 3	47	12.7
4 - 7	232	62.9
8 or more	90	24.4

Table 2
Roll-over test results for the cutoff point of ΔDBP ≥ 20 mm Hg.

		PIH* development		
		Yes	No	Total
Roll-over	Positive	7	23	30
test	Negative	28	311	339
Total		35	334	369

* Pregnancy-induced hypertension

Table 3
Roll over test sensitivities and specificities for pregnancy-induced hypertension, according to different cutoff points.

Cutoff point (ΔDBP mm Hg)*	Sensitivity (%)	Specificity (%)
20 or more	(7/35) = 20.0	(311/334) = 93.1
14 or more	(17/35) = 48.6	(191/334) = 57.2
8 or more	(25/35) = 65.7	(120/334) = 35.9
2 or more	(29/35) = 82.9	(35/334) = 10.5
-4 or more	(34/35) = 97.1	(5/334) = 1.5

* Difference from supine to left lateral diastolic blood pressure, in mm Hg.
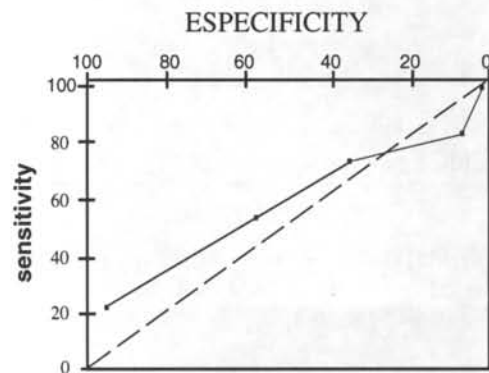
Figure - Receiver operating characteristic curve (solid line) of the roll-over test performance in the prognosis of pregnancy-induced hypertension.

pump) after the ROT, and observed a high correlation with the ROT results. This procedure, however, was not tested in the present study, as it would not have been feasible in a public prenatal care service as crowded as the one where this study was based.

This time-consuming (almost thirty minutes) test would certainly be considered for preventive purposes, if it presented an attractive performance in defining a high risk group of primigravidae for developing PIH. However, as has been shown, that was not the case.

Many investigators have studied the ROT performance in several parts of the world: some[8-12] have recommended its use, and others[13-18] have not. Methodological discrepancies may account for such a division of opinions: in two of these studies[10,17], the cutoff point of a positive ROT was different to ΔDBP ≥ 20 mm Hg; in two[12,16], diagnosis of PIH included criteria other than blood pressure only; in at least three[8,14,18] it was not stated whether the medical record reviewer for PIH diagnosis was blind to the ROT results. The remaining[13,15] still showed conflicting results on the ROT performance, possibly because of differing PIH diagnosis criteria, in spite of being based on blood pressure only. None of these studies was carried out in a primary care setting.

CONCLUSION

The poor performance of the ROT in predicting further PIH does not recommend its use in primigravidae in a primary prenatal care setting.

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RESUMO

Objetivo: Determinar o desempenho do teste da posição supina, ou "roll-over test" (ROT), na predição da doença hipertensiva específica da gravidez, ou "pregnancy-induced hypertension" (PIH), em primigestas de 15-29 anos de idade num serviço público de atendimento primário. *Método*: Estudo prospectivo arrolando 369 consecutivas primigestas, inicialmente normotensas. O ROT foi aplicado entre as 28a. e 32a. semanas de gravidez. Definiu-se PIH como desenvolvimento de pressão arterial diastólica (DBP) ³ 90 mm Hg ou pressão arterial sistólica (SBP) 140 mm Hg, ou elevação 15 mm Hg na DBP ou elevação 30 mm Hg na SBP. As propriedades prognósticas do ROT foram calculadas e construiu-se uma curva de desempenho do teste (ou "receiver operating characteristic curve" - curva ROC). *Resultados*: Com o ponto de corte de 20 mm Hg a sensibilidade foi de 20% e a especificidade 93%. Os valores preditivos positivo e negativo foram, respectivamente, 23% e 92%, para a incidência cumulativa de PIH de 9,5%. Com outros pontos de corte, a curva ROC desenhou o fraco valor descriminatório do teste. *Conclusão*: O ROT não se mostrou útil na predição de PIH num serviço pré-natal de atendimento primário.

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