

Uterine contraction regularity during labour in White and Black patients

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Summary

Irregularity of uterine contractions during labour was compared in 50 White and 50 Black patients. The standard deviation of distances between contractions as seen on cardiotocography and of maximal pressures was used to compare contraction regularity in the two groups of patients. A small standard deviation (SD) indicated regular contractions; a larger SD signified irregular contractions. Mean SDs of peak-to-peak and of base-to-base measurements were both 6,3 mm for White patients and both 7,6 mm for Black patients. The mean SD for maximal uterine pressures was 9,5 mmHg for White patients but 12,7 mmHg for Black patients. All these differences were statistically highly significant, and this implies that uterine contractions are more irregular in Black patients.

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Little is known about the clinical importance of irregular uterine contractions. Although extensive research has been done on partograms¹ and the quantification of uterine cavity,² the relationship between irregular contractions and the outcome of labour is still uncertain. Much work on the fetal heart rate had been completed since the introduction of cardiotocography, but uterine contraction patterns³ have been neglected to a great extent.

Since the introduction of fetal heart rate monitoring to the Bloemfontein academic hospitals we have noticed an irregularity in the distance between successive contractions as seen on cardiotocography. It also appeared that the maximal pressure (intensity + tone^{4,5}) of uterine contractions is more variable in Black than in White patients (Fig. 1). A study was therefore undertaken in order to quantify possible differences.

Patients and methods

Cardiotocographic recordings of 50 White and 50 Black patients were studied. Patients had to have been in established labour for at least 2½ hours, and received only pethidine with or without promethazine during labour. All patients who received oxytocic or tocolytic drugs at any stage during labour were excluded from the study. In all patients labour started spontaneously, and all had vaginal deliveries.

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Uterine contractions during labour were measured with a fluid-filled intra-uterine catheter connected to a pressure transducer positioned at the level of the maternal xyphoid. Special care was taken to flush the intra-uterine catheter regularly during labour, and to ensure that the pressure transducer was always correctly calibrated and zeroed to air before use.^{6,7} Corometrics III (Bio-engineering Services, Bloemfontein) and Berkeley series 200* (F. C. Marcus, Bloemfontein) cardiotocographs were used, both monitors using recording paper of the same scale.

Three different periods of 30 minutes each were selected from each patient's recording. Period 1 immediately preceded delivery, period 2 started 1½ hours before delivery, and period 3 started 2½ hours before delivery. During each of these periods the number of contractions was first counted. Then the distances between successive contractions were measured from base to base (B-B) and from peak to peak (P-P). Lastly, the maximal pressure of each contraction was measured (Fig. 2).

All the data (frequency, B-B and P-P distance and maximal pressure) for each corresponding period in Black and White patients were compared statistically. The standard deviation (SD) for the B-B distances, P-P distances and maximal pressure was determined for each patient and was then compared in the two groups of patients by means of Hotelling's T²-test.⁸⁻¹⁰ Subsequently the different measurements for the different periods were compared within each patient group.

Results

The mean contraction frequency over 30 minutes in the White patients was 13,3 and in the Black patients 12,0. This difference was not statistically significant ($P = 0,463$).

For period 1 there was a significant difference between White and Black patients regarding the mean SDs of the B-B measurements ($P = 0,012$), P-P measurements ($P = 0,005$) and the maximal pressures ($P = 0,016$) (Table I).

TABLE I. DIFFERENCES BETWEEN MEAN SDs FOR PERIOD 1

	Group	Mean (mm)	P value
B-B	Whites	5,3	0,012
	Blacks	6,9	
P-P	Whites	5,1	0,005
	Blacks	6,9	
Maximal pressure measurement	Whites	4,3 (11 mmHg)	0,016
	Blacks	5,4 (13,8 mmHg)	

For period 2 the mean SD difference was significant for the maximal pressures (Whites 3,6 mm (9 mmHg), Blacks 4,7 mm (11,8 mmHg); $P = 0,003$), but this was not so for the differences between the B-B and P-P measurements.

For period 3 the maximal pressures differed significantly ($P = 0,003$). In this period the B-B ($P = 0,056$) and P-P ($P = 0,058$) measurements also differed significantly at the 10% level (Table II).

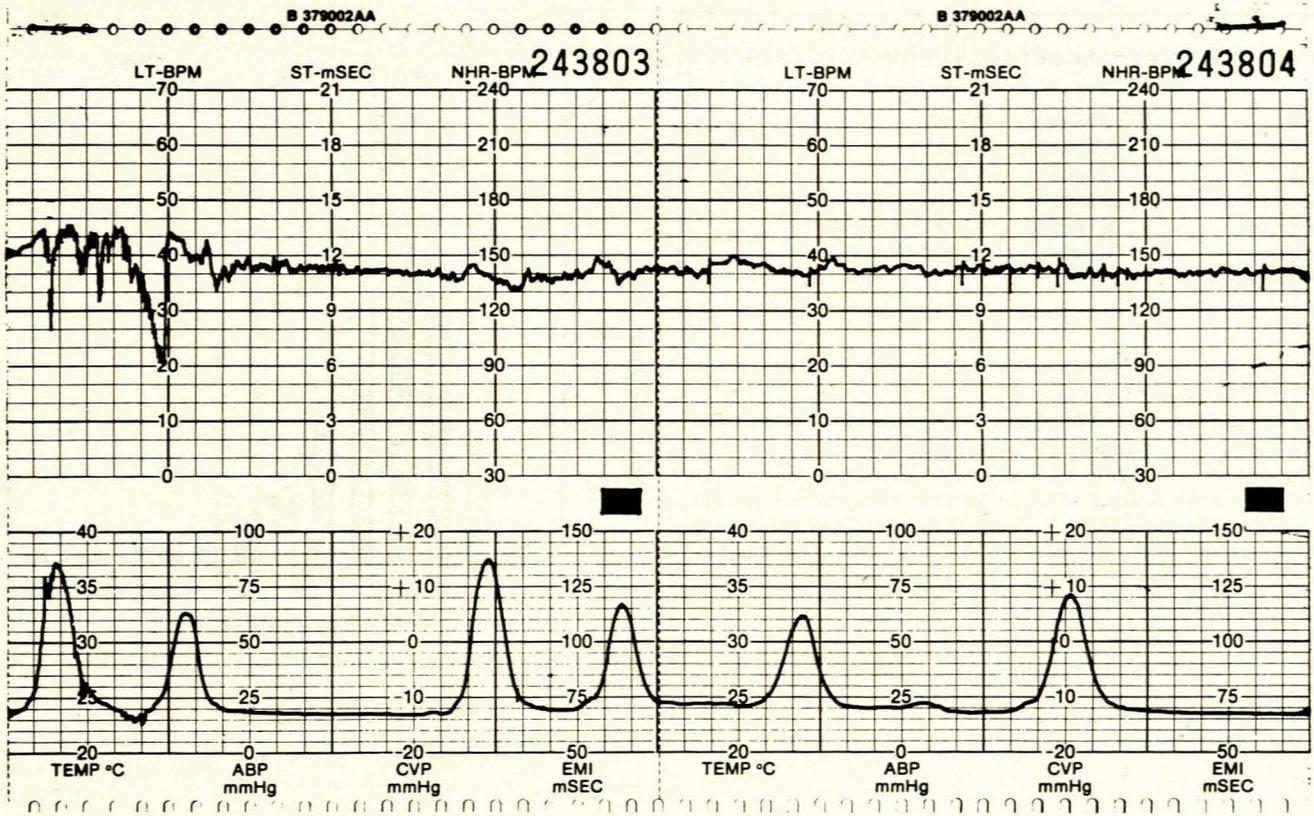


Fig. 1. The irregular onset and maximal pressures of contractions.

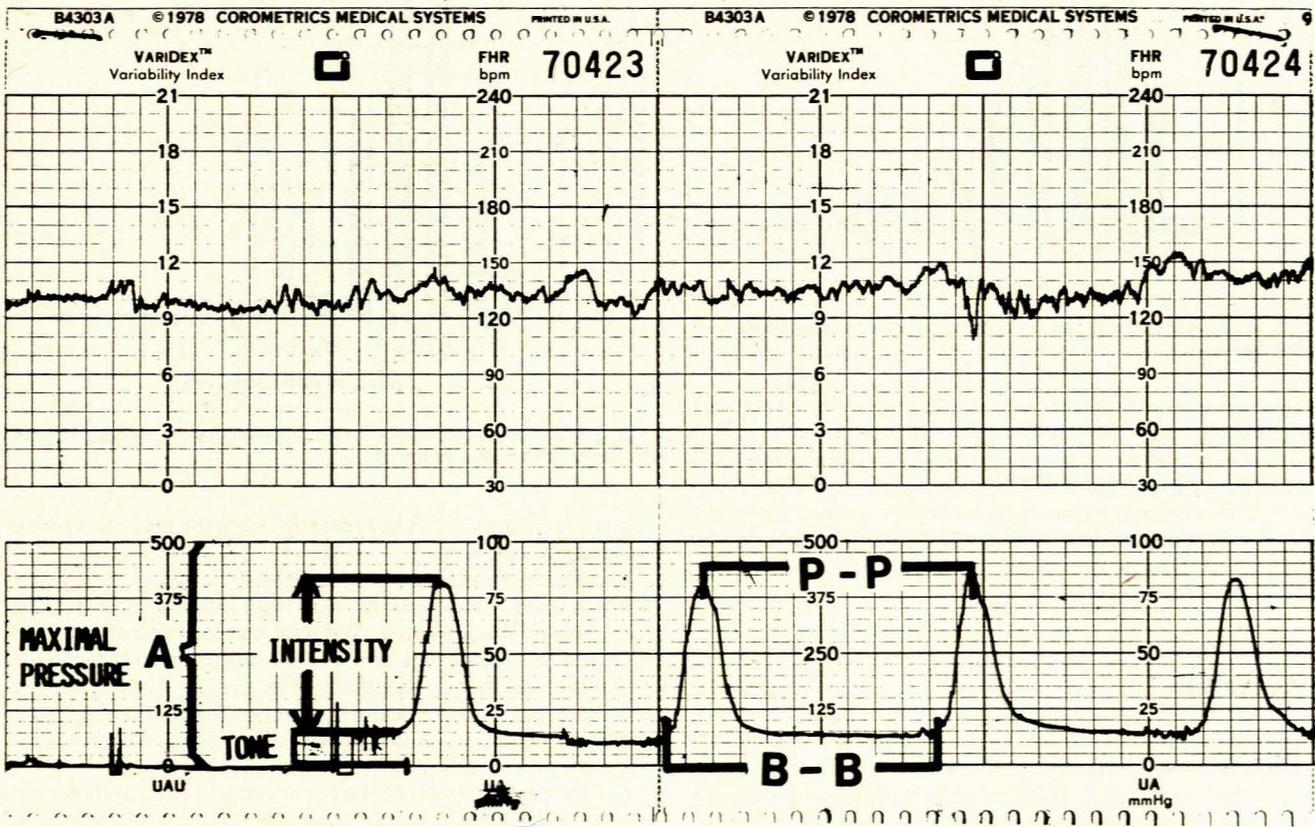


Fig. 2. Regular uterine contractions. Different measurements used are illustrated (A = maximal pressure measurements).

TABLE II. DIFFERENCES BETWEEN MEAN SDs FOR PERIOD 3

	Group	Mean (mm)	P value
B-B	Whites	6,8	0,056
	Blacks	8,3	
P-P	Whites	6,8	0,058
	Blacks	8,3	
Maximal pressure measurement	Whites	3,5 (8,8 mmHg)	0,003
	Blacks	5,2 (13,0 mmHg)	

In all three periods the mean SD for each variable was smaller in the White patient group.

The results for the three different periods were then pooled. The mean SD for the B-B distance in White patients was 6,3 mm, but was 7,6 mm in Black patients. The mean SDs for the P-P distance in White and Black patients were also 6,3 mm and 7,6 mm respectively. The mean SD for maximal pressure in White patients was 3,8 mm (9,5 mmHg), but 5,1 mm (12,7 mmHg) in Black patients. All these differences are statistically highly significant ($P = 0,001$) (Figs 3-5).

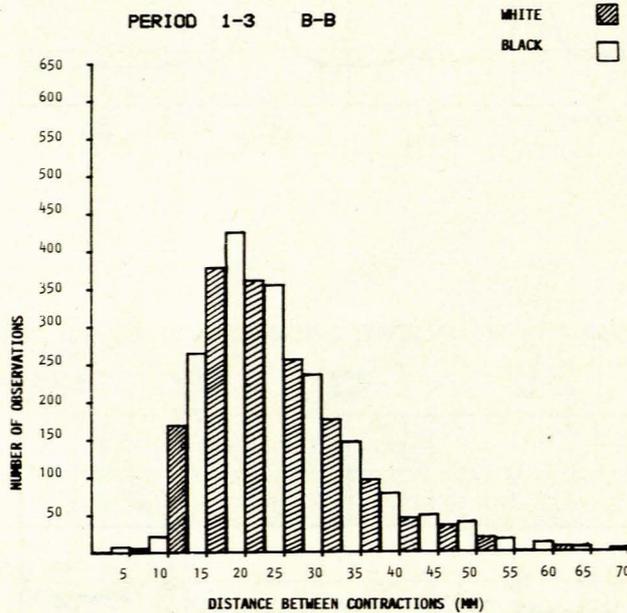


Fig. 3. Mean SD differences for B-B measurements in White and Black patients.

Measurements in the three different periods within each patient group were then analysed. For White patients the B-B measurements differed between periods 1 and 2 and 1 and 3, but not between periods 2 and 3. The same applies to P-P measurements. The maximal pressure differences were not significant between the three periods (Table III). For Black patients no significant difference was found for any of the variables in the three periods (Table IV).

Discussion

In comparing the data for the two patient groups, the SD for each variable was measured and these were then compared by using Hotteling's T^2 -test. If the mean SDs differed significantly in the two groups it was concluded that the regularity of contractions differed significantly. Furthermore, it was concluded that the group with the smallest mean SD had the most regular

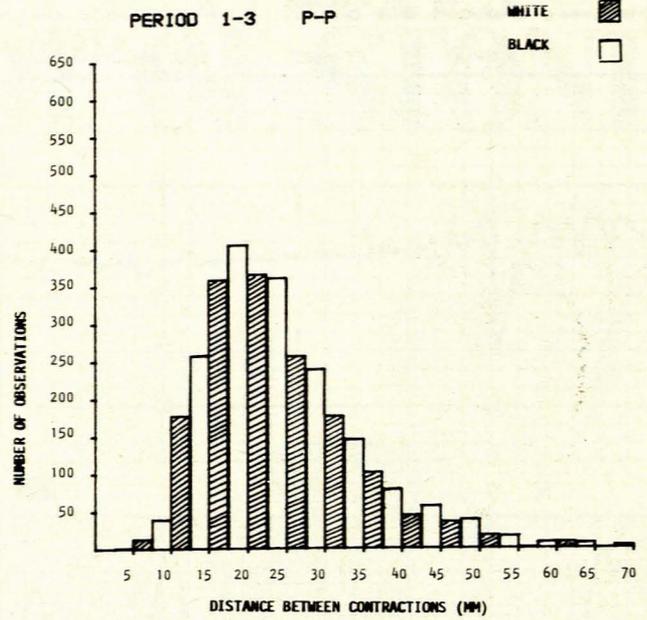


Fig. 4. Mean SD differences for P-P measurements in White and Black patients.

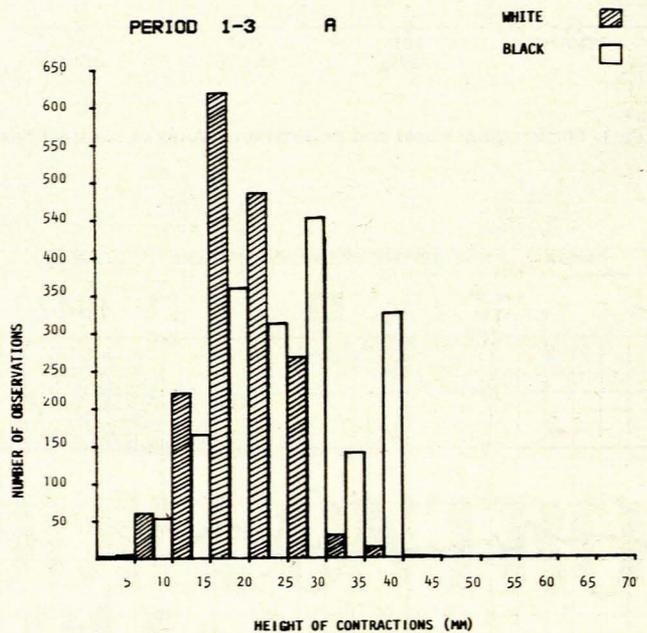


Fig. 5. Mean SD differences for maximal pressure measurements in White and Black patients.

contraction pattern.⁸⁻¹⁰ The same applied to the maximal uterine contraction pressures.

The results in period 1 showed that directly before delivery White women's contractions were significantly more regular than those of Black women. Maximal uterine contraction pressures were also more regular in the White group. In period 3 the difference was not so significant. In period 2, although the difference was not statistically significant, the contractions were still more regular in White patients. However, maximal pressures differed significantly.

For the pooled results of the three periods, the differences in the two groups were highly significant. These differences in contraction regularity as well as in the maximal pressure are clearly demonstrated by Figs 3-5. It is also apparent from Fig. 5

TABLE III. COMPARISON OF THE THREE PERIODS IN THE WHITE PATIENTS

	Period	Mean (mm)	P value
B-B	1	5,3	0,005
	2	6,7	
	1	5,3	0,008
	3	6,8	
	2	6,7	0,869
	3	6,8	
P-P	1	5,1	0,001
	2	6,8	
	1	5,1	0,003
	3	6,8	
	2	6,8	0,943
	3	6,8	
Maximal pressure measurement	1	4,3 (11,0 mmHg)	0,058
	2	3,6 (9,0 mmHg)	
	1	4,3 (11,0 mmHg)	0,065
	3	3,5 (8,8 mmHg)	
	2	3,6 (9,0 mmHg)	0,785
	3	3,5 (8,8 mmHg)	

TABLE IV. COMPARISON OF THE THREE PERIODS IN THE BLACK PATIENTS

	Period	Mean (mm)	P value
B-B	1	6,9	0,413
	2	7,5	
	1	6,9	0,090
	3	8,3	
	2	7,5	0,329
	3	8,3	
P-P	1	6,9	0,470
	2	7,5	
	1	6,9	0,110
	3	8,3	
	2	7,5	0,320
	3	8,3	
Maximal pressure measurement	1	5,4 (13,8 mmHg)	0,067
	2	4,7 (11,8 mmHg)	
	1	5,4 (13,8 mmHg)	0,631
	3	5,2 (13,0 mmHg)	
	2	4,7 (11,8 mmHg)	0,344
	3	5,2 (13,0 mmHg)	

that more Black women had stronger contractions than White women; the majority of White patients had values to the left and the majority of Black patients values to the right of the graph. It is therefore apparent that the uterine contractions of White women are statistically significantly more regular than those of Black women.

When different periods were studied within each group, it became apparent that there was no difference in the regularity of contractions from early to late labour in the Black patient group. In the White patient group contractions tended to be more regular just before delivery. In both groups the regularity in normal uterine pressure remained the same throughout labour.

We undertook this study to prove our hypothesis that contractions are less regular in Black patients than in White patients. The question now arises as to what the influence of these findings on the progress and outcome of labour would be. It is also uncertain whether these irregular uterine contractions have any effect on fetal oxygenation during labour. The irregular strength of uterine contractions may be due to greater fluctuations in response to indigenous prostaglandins or oxytocin or to fluctuations in levels of these hormones in Black patients.

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