be identified.[11] Such a toxin may also explain the multisystem involvement in LD.

Although clinical and radiological features may suggest LD, a definitive diagnosis can only be made by laboratory examination. In the laboratory diagnosis the indirect fluorescent antibody test of patient sera against fixed smears of cultures of the organism has proved to be the most practical. *L. pneumophila* has a number of serogroups, and serological testing must be done against all groups. Ideally at least two blood specimens, one collected in the acute phase and the other 3 weeks thereafter, are needed to show a rise in titre. A fourfold or greater rise in titre with a minimum dilution of 1:128 (seroconversion) or a positive titre of 1 : 256 (seropositive) is taken as a positive result. The disadvantage of the indirect fluorescent antibody test is that it becomes positive late in the course of illness and is therefore used mainly to make a retrospective diagnosis. There are also reports of false-positive serological tests in patients with *Haemophilus influenzae* and other bacterial pneumonias owing to the sharing of antigens by these bacteria. Other methods of diagnosing LD include culturing the causative organism from blood, sputum, pleural effusions and lung tissue, the direct fluorescent antibody test, and the modified Dieterle silver impregnation staining technique to demonstrate the bacillus in biopsy and autopsy tissue specimens.

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Variable decelerations of the fetal heart rate during antenatal monitoring

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Summary

Variable decelerations were observed in only 52 (0,75%) of 4 509 patients in whom the fetal heart rate was monitored antenatally. In 14 patients fetal monitoring was performed less than 1 week before the test with variable decelerations. The results of 9 of these tests were normal. Tests were repeated within 1 week in 16 patients; normal results were seen in 11 of these. Fetal movements and acceleration patterns of the fetal heart rate occurred in 54% and 23% of patients respectively. The interval between testing and delivery ranged from 0 to 98 days, with a mean of 14 days, and there were no intra-uterine deaths. Fetal distress during labour was rare. Fetal outcome was favourable in only 4 of the 7 cases in which variable decelerations were complicated by reduced beat-to-beat variability. Variable decelerations during the antepartum period therefore do not necessarily indicate a complicated labour.

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The significance of variable decelerations of the fetal heart during antenatal monitoring is uncertain. Variable decelerations are usually associated with cord compression during labour, but similar fetal heart rate (FHR) patterns have also been reported during labour when the neonate has been found to be small for gestational age.[1] Freeman and James[2] reported repeated variable decelerations with loss of baseline variability during antenatal monitoring in 3 hypertensive patients with severe intra-uterine growth retardation. Two of the infants died *in utero* and the third shortly after delivery. Similar FHR patterns were reported by Baskett and Sandy[3] in 4 patients; marked growth retardation was present and only 1 infant survived. In these cases variable decelerations were complicated by reduced variability. The question was then raised whether variable decelerations *per se* during antenatal monitoring have any prognostic significance.

Patients and methods

A total of 6 899 antenatal FHR recordings from 4 509 patients was examined for variable decelerations. To be included in the study decelerations had to be repetitive and variable in both shape and amplitude, with the latter at least 20 beats/min (Fig. 1). The presence of other FHR patterns such as reduced variability (less than 5 beats/min) and accelerations (more than 20 beats above baseline) was also noted.

Antenatal FHR recordings taken within 1 week of the test with variable decelerations were also examined. Fetal outcome was measured by FHR monitoring during labour, 5-minute Apgar scores and the presence of growth retardation. Tygerberg Hospital growth charts were used to assess mass for gestational age. When the birth weight was below the 10th percentile for the

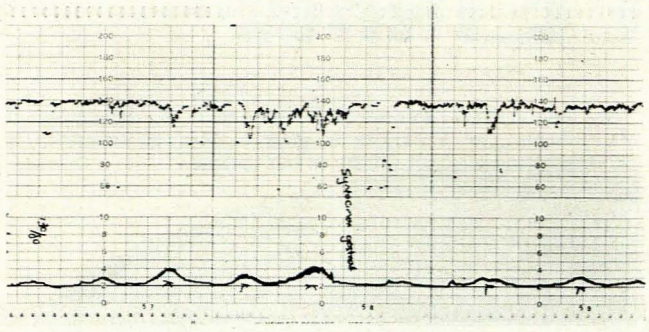

Fig. 1. Variable decelerations during uterine contractions.

specific duration of pregnancy, the neonate was regarded as being small for gestational age. Hewlett-Packard cardiotocographs with the array ultrasound transducer were used for all antenatal monitoring. Uterine contractions were always recorded by the external method. A paper speed of 2 cm/min was used throughout.[4]

Results

There were 52 (0,75%) recordings which demonstrated variable decelerations of the FHR. Indications for the tests were suspected intra-uterine growth retardation (23 patients), postdatism (8), pre-eclampsia (6), antepartum haemorrhage (3), diabetes (2) and miscellaneous (10). The duration of the pregnancies ranged from 27 to 45 weeks (mean 37,2 ± 3,0). Oxytocin was administered to 35 patients, and adequate uterine contractions were seen in 37. Duration of the monitoring ranged from 13 to 90 minutes, with a mean of 44 minutes (SD 15,3). Fetal movements were present in 28 patients, and the number of fetal movements during the recordings ranged from 1 to 15. Accelerations of the FHR were noted in 12 patients and reduced variability in 7 patients. Basal tachycardia was observed in 1 patient.

In 14 patients antenatal monitoring had also been performed less than a week before the test which demonstrated the variable decelerations. Nine of these recordings were normal and 2 possibly abnormal; 2 demonstrated variable decelerations and 1 hyperstimulation of the uterus. In 16 patients antenatal monitoring was repeated within a week of the test that had demonstrated variable decelerations. Eleven recordings were normal, 3 suspicious and 1 uncertain. The remaining patient had hyperstimulation of the uterus. In only 1 patient were results suggestive of abnormality encountered both before and after the test which demonstrated variable decelerations. This patient eventually delivered a normal infant 17 days after the test revealing variable decelerations. Of the remaining 2 patients with a suspicious test result after variable decelerations, 1 had a normal delivery and the other had pre-eclampsia and was delivered of a 1 605 g fetus 4 days after the test (Table I; patient 5). This was one of the infants with growth retardation. FHR variability became less in 7 patients with variable decelerations. Two of these were delivered of infants weighing 784 g and 960 g 4 and 11 days respectively after the test. The first one was delivered by caesarean section for severe abruptio placentae (patient 10). This was the only patient in whom variable decelerations had occurred at frequent intervals. The second fetus was delivered at 27 weeks because of fulminating pre-eclampsia (patient 14). Neither of these infants was retarded in growth. The third one was growth-retarded and was delivered at 39 weeks, 1 day after the test (patient 8). The remaining 4 infants were normal at delivery, which took place 1, 2, 24 and 25 days after the test.

The interval between testing and delivery ranged from 0 to 98 days, with a mean of 14 days (SD 9,3).The FHR during labour

TABLE I. POOR FETAL OUTCOME

Patient	Antenatal fetal monitoring			Indications for monitoring	TDI (days)	Apgar score	Birth weight (g)	SGA	Other
	Week before	Variable deceleration	Week after						
1	—	Yes	Normal	? Growth retardation	36	10	2 332	Yes	
2	—	Yes	—	Diabetes	20	9	2 010	No	
3	—	Yes	Normal	Pre-eclampsia	12	10	2 324	No	
4	—	Yes	—	Post-term	6	1	3 186	No	
5	—	Yes	Suspicious (twice)	Pre-eclampsia	4	5	1 605	Yes	
6	—	And accelerations	—	? Growth retardation	2	6	3 650	No	
7	—	Yes	—	APH	1	3	1 280	No	
8	—	Also tachycardia and reduced variability	—	? Growth retardation	1	5	2 670	Yes	Variable decelerations during labour
9	—	Yes	—	? Growth retardation	3	6	3 030	No	Variable decelerations during labour
10	Variable deceleration	And reduced variability	Reduced variability	? Growth retardation	4	9	784	No	Abruptio placentae
11	—	Yes	Normal	? Growth retardation	5	10	2 390	Yes	
12	—	Yes	—	Post-term	2	9	2 308	Yes	
13	—	Yes	Normal	Post-term	10	2	3 000	No	Bradycardia during labour
14	Uncertain	And reduced variability	—	Pre-eclampsia	11	3	960	No	
15	Overstimulation	Yes	Overstimulation	Pyelonephritis	5	8	1 918	?	
16	—	Yes	—	Pre-eclampsia	4	6	1 110	Yes	Tachycardia and variable decelerations during labour

TDI = test-to-delivery interval; SGA = small for gestational age; APH = antepartum haemorrhage.

was recorded in 19 patients, none of whom demonstrated late decelerations. Variable decelerations were noted in 8 patients. Birth weights ranged from 784 g to 4 360 g, with a mean of 2 849 g (SD 293 g). Ten infants weighed less than 2 500 g and 6 were small for gestational age. Only 1 infant could not be assessed for growth retardation because the duration of pregnancy was uncertain. The 5-minute Apgar scores ranged from 1 to 10, with a mean of 8,6 (SD 0,5). Nine infants (17,3%) had low 5-minute Apgar scores. There were no intra-uterine deaths.

Discussion

During labour the incidence of variable decelerations varies from 19,5% to 50%,[5-9] but they seldom occur during antenatal fetal monitoring.[10,11] In this study only 0,75% of patients demonstrated variable decelerations. The criteria to be included in this study were strict, however, as the minimum amplitude of the decelerations had to be 20 beats/min.

In the large majority of cases variable decelerations seemed to be a temporary phenomenon, as the result of monitoring in the preceding week had been normal in 76% of patients and was normal in 69% in the following week. Only 1 patient demonstrated repeated variable decelerations. The fact that 54% of patients had fetal movements and 23% had acceleration patterns of the fetal heart further indicates that variable decelerations do not suggest fetal compromise in the large majority of patients. Patients also tolerated labour well, with no late decelerations seen. Variable decelerations did not occur more frequently during labour, being seen in 42% of patients. This incidence is within the normal limits reported in the literature.[5-9] Variable decelerations during the antepartum period therefore do not necessarily complicate labour.

Four of the 7 patients in whom variable decelerations were complicated by reduced variability eventually had uncomplicated deliveries and normal infants. Two infants weighed less than 1 000 g (patients 10 and 14), however, and in 1 (patient 8) the newborn was small for gestational age. It therefore seems that repeated variable decelerations with loss of baseline variability could be associated with fetal compromise. One of the 3 patients in whom a suspicious result had followed the test with variable decelerations produced a growth-retarded infant. Since all the patients subjected to stress testing fell in the high-risk category, it is difficult to decide whether these findings occurred by chance or were associated with complicated variable decelerations.

The aetiology of variable decelerations before labour is still uncertain. Although growth-retarded fetuses are more prone to variable decelerations,[1] only 12% of these infants were retarded in growth. This figure is not higher than the general incidence of growth retardation at this institution. In patients with oligohydramnios, which is frequently seen in growth retardation, the umbilical cord is more vulnerable to compression and therefore also to variable decelerations. Temporary cord compression could probably also occur in the normal patient during uterine contractions, depending on the positions of the fetus and the cord. Variable decelerations may also occur with fetal movements, and in fact the latter were observed in more than half of the patients in this study, with as many as 15 per test. These movements may have temporarily compressed the cord and caused variable decelerations.

Variable decelerations therefore represent a wide spectrum of clinical conditions. In the large majority of patients they appear to be a temporary phenomenon which is not associated with danger to the fetus, but when they are complicated by other abnormal FHR patterns or appear repeatedly the test should be interpreted with the greatest care.

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A South African-made copper intra-uterine contraceptive device

A preliminary report

B. KARSTADT

Summary

A series of 375 patients in whom Cuprocept intra-uterine contraceptive devices (manufactured by Cuprocept SA) have been inserted over a period of 12 months by non-White nursing staff is presented. The trial is continuing. Results so far are very encouraging; the continuation rate is 91,5% and there was only 1 unplanned pregnancy.

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The intra-uterine contraceptive device (IUCD) is a crucial method of birth control in an unreliable or non-compliant population group. An IUCD should be easy to insert or remove