

# Effects of Rupture of Membrane on Fetal Heart Rate Pattern

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THE ARTIFICIAL rupture of membranes (ARM) performed during labor facilitates the production of Type I dips by uterine contractions. Figure 1 illustrates an example of such an effect. While the membranes are intact, uterine contractions produce no visible effect on fetal heart rate (FHR). After ARM each uterine contraction produces a Type I dip in the FHR tracing (the only exception is the uterine contraction recorded at hour 9:05).

dips are very variable. For example, the duration of the dip recorded at hour 9:03 is shorter than 15 sec. whereas that of the dip recorded at hour 9:11 is about 60 sec. This variability of the dips is characteristic of cases with nuchal cord in which the dips are considered by Hon and Quilligan<sup>3</sup> to result from the compression of the cord by uterine contractions. The compression of a nuchal cord is facilitated by ARM. Type I dips are usually recorded after

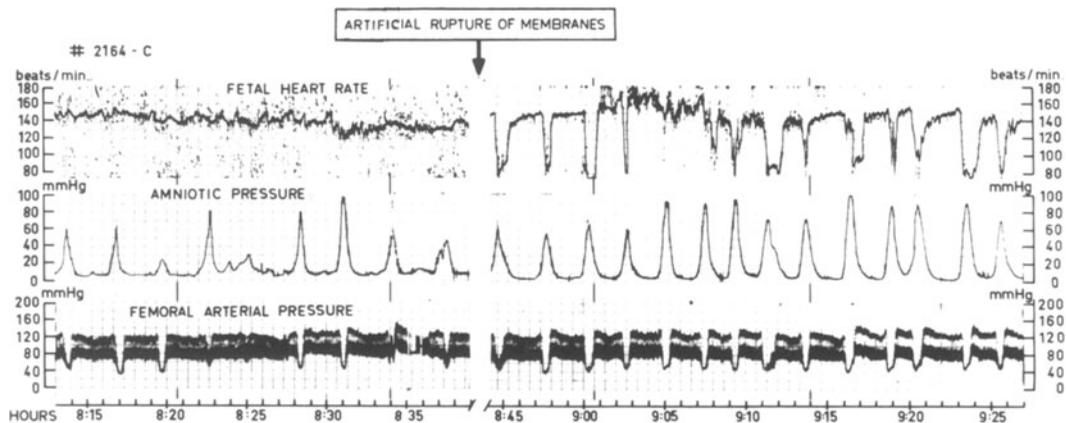


FIG. 1. Cervical dilatation stationary at 6 cm. Head in -2 station. After ARM, uterine contractions produced Type I dips with great variability in their duration and amplitude. At birth a tight nuchal cord was observed. Apgar score 6, 7, and 7 at 1, 5, and 10 min.

Dips are Type I because the descending limb of the dip is recorded at the time of the ascending limb of the uterine contractions. The amplitude and duration of the

ARM also in the absence of nuchal cord (Fig. 2); in these cases Type I dips are of smaller amplitude and less variability (in duration and amplitude) than when nuchal cord is present. In the absence of nuchal cord Type I dips are attributed to the compression and deformation of the fetal head by uterine contractions; this effect is also facilitated by ARM according to Schwarcz *et al.*<sup>4</sup>

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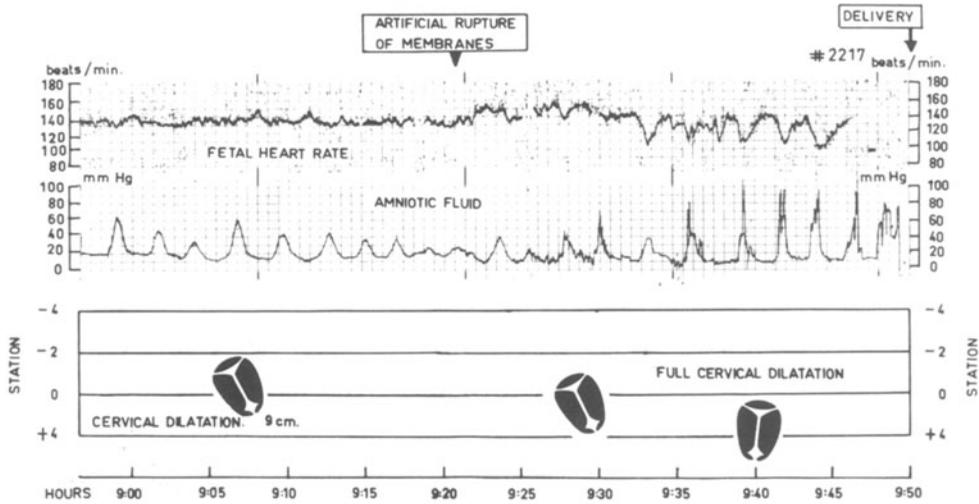


Fig. 2. Record obtained during the last part of the first stage and throughout the second stage of labor. After ARM, uterine contractions produced Type I dips, with little variability in their amplitude and duration. No nuchal cord was observed at birth. Apgar score 8, 9, and 10 at 1, 5, and 10 min.

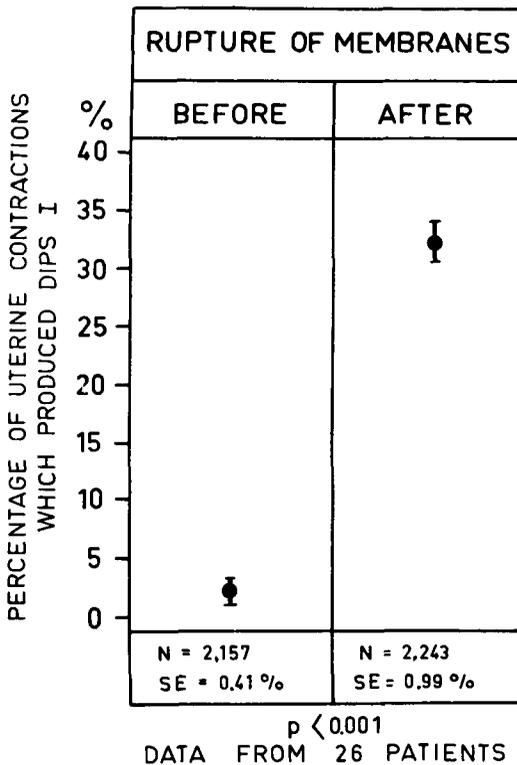


FIG. 3. After ARM, the incidence of Type I dips is significantly higher than before ARM. (After Althabe *et al.*<sup>1</sup>)

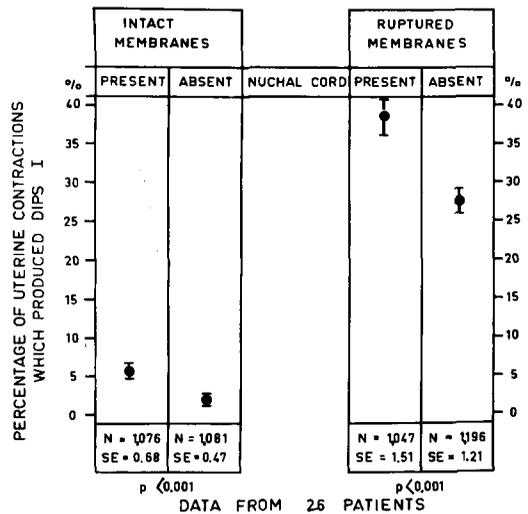


FIG. 4. The incidence of Type I dips is significantly higher when nuchal cord is present than when it is absent, both before and after ARM. (After Althabe *et al.*<sup>1</sup>)

Althabe *et al.*<sup>1</sup> have shown that the incidence of Type I dips (measured by the percentage of uterine contractions causing dips) increases markedly after ARM. Figure 3 shows data corresponding to 26 labors monitored from the beginning through delivery. ARM was performed

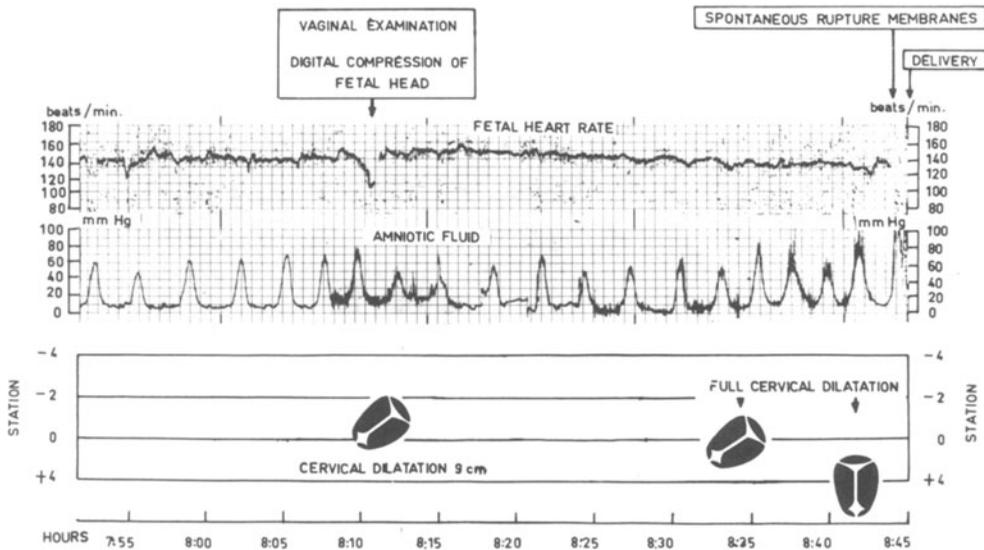


FIG. 5. Record obtained during the last part of the first stage and during the second stage of labor. Membranes remained intact until 2 min. before delivery. No dips are seen in the FHR tracing. During vaginal examination at hour 8:12 the manual compression of fetal head caused a transient fall of FHR. At birth no nuchal cord was found. Apgar score 8, 9, and 10 at 1, 5, and 10 min. (After Schwarcz *et al.*<sup>5</sup>).

when cervical dilatation was between 4 and 6 cm. Before ARM only 2% of 2157 contractions produced dips. After ARM 32% of 2243 contractions produced Type I dips. The difference is highly significant ( $P < 0.001$ ).

Figure 4 corresponds to the same series of 26 labors, in which the cases with nuchal cord and without nuchal cord are analyzed separately. In the group of 13 cases with nuchal cord the incidence of Type I dips is 5% before ARM and increases to 40% after ARM. In the group of 13 labors without nuchal cord the incidence of Type I dips is 2% before ARM and increases to 28% after ARM. In both groups ARM caused a highly significant increase in the incidence of Type I dips.

Before the rupture of membranes the incidence of Type I dips is significantly greater ( $P < 0.001$ ) in the group with nuchal cord (5%) than in the group without nuchal cord (2%). Also after ARM the incidence of Type I dips is significantly higher ( $P < 0.001$ ) in the group with nuchal cord (40%) than in the group without nuchal cord (28%).

In all of the 26 cases reported in this study, Type I dips were present after ARM, at least during advanced labor. If membranes are not ruptured artificially they usually remain intact until cervical dilatation is almost complete or until the second stage of labor. As long as the membranes remain intact Type I dips are usually absent, even in advanced stages of labor (Fig. 5). Their incidence is much lower than in cases in which ARM has been performed at 4–6 cm. of cervical dilatation. The molding of the fetal head seems to be less marked when the interval between rupture of membranes and delivery is short.<sup>5</sup>

According to Friedman and Sachtleben,<sup>3</sup> the progress of labor is not significantly influenced by the timing of ARM during labor.

These observations question the benefits which may result from the routine performance of ARM in early or midlabor. The data available are insufficient to answer such a question. However, it should be emphasized that ARM causes striking changes in the FHR patterns dur-

ing labor; this fact should be borne in mind when interpreting FHR tracings for the evaluation of fetal conditions.

### RESUME

La rupture artificielle des membranes facilite l'apparition des Dips I.

Un exemple d'une telle éventualité est montré. Avant la rupture il n'y a aucun effet des contractions, après, des Dips I apparaissent régulièrement. Leur amplitude et leur durée sont variables, ce qui caractérise les circulaires.

Les Dips I sont aussi enregistrés après rupture des membranes en l'absence de circulaire. Ils sont alors attribués à la compression céphalique.

Sur 26 cas enregistrés pendant tout le travail, on a noté qu'avant la rupture des membranes 2% des contractions produisaient des Dips, contre 32% après.

Si l'on distingue les cas suivant l'existence ou l'absence de circulaire, la proportion de contractions produisant des Dips I passe de 5 à 40% après la rupture, et en l'absence de circulaire de 2 à 28%.

D'une manière générale, tant que les mem-

branes restent intactes les Dips I sont absents même en fin de travail.

Ainsi se trouve posée la question de l'indication de la rupture artificielle des membranes.—C. SUREAU

### REFERENCES

1. Althabe, O., Aramburu, G., Schwarcz, R. L., and Caldeyro-Barcia, R. Influence of the rupture of membranes on compression of the fetal head during labor. *In* Caldeyro-Barcia, R.: *Perinatal Factors Affecting Human Development*. Pan American Health Organization, Washington, D.C., 1969, p. 143.
2. Friedman, E. A., and Sachtleben, M. R. Amniotomy and the course of labor. *Obstet. Gynec.*, 22: 755, 1963.
3. Hon, E. H., and Quilligan, E. J. The classification of fetal heart rate. II. A revised working classification. *Conn. Med.*, 31: 779, 1967.
4. Schwarcz, R. L., Strada-Sáenz, G., Althabe, O., Fernández-Funes, J., and Caldeyro-Barcia, R. Pressure exerted by uterine contractions on the head of the human fetus during labor. *In* Caldeyro-Barcia, R.: *Perinatal Factors Affecting Human Development*. Pan American Health Organization, Washington D. C., 1969, p. 115.
5. Schwarcz, R. L., *et al.*, preliminary unpublished data.