

Leukocytic Infiltration of the Umbilical Cord in Twins

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Leukocytic infiltration of the umbilical cord, particularly of the umbilical vein, is common both after normal and abnormal delivery (Tab. I).

The significance and the cause(s) of this phenomenon, however, are still highly controverted subjects (Tab. II). According to some authors (Benirschke, 1960; Benirschke and Clifford 1959; Blanc 1961; and Kelsall et al, 1967), cord infiltration may be an indication of *intrauterine fetal infection*. As a consequence, the terms vascu-

Tab. I. Reported incidence of cord infiltration (consecutive singleton deliveries)

Author	N. of cords	Cord infiltration (%)
Benirschke & Clifford (1959-60)	1536	11.0
Blanc (1961)	?	11.0
Thiery & Yo (1969)	1213	17.8
Beckmann & Zimmer (1931)	420	18.3
Kelsall & Barter (1967)	198	19.2
Dominguez et al (1960)	1000	24.8

Tab. II. Significance of cord infiltration

Mechanical factors	Beckmann & Zimmer (1931)
Intrauterine fetal <i>infection</i>	Benirschke & Clifford (1959); Benirschke (1960); Blanc (1961); Kelsall & Barter (1967)
Fetal <i>hypoxia</i>	Dominguez et al (1960)
Infection and/or hypoxia	Barter (1962)

litis, umbilical phlebitis and funiculitis have been introduced. Other authors (Barter, 1962, and Dominguez et al, 1960), mostly impressed by the discrepancy between the incidence of clinically evident neonatal infection and funiculitis, as well as by the significant association of cord infiltration with prolonged labor and clinical signs of fetal distress, have come to the conclusion that leukocytic infiltration of the umbilical cord must predominantly be the effect of *fetal hypoxia*. Dominguez et al (1960) go

even further and postulate " that the examination of the umbilical cord for leukocytic infiltration affords a means for a long term study of children to determine the effect of intrauterine hypoxia on their ultimate growth and development ".

One way to check the validity of the latter hypothesis, is to investigate the umbilical cords of twins. Since our group has proven that, compared to the first-born twin, the second-born infant is as a rule significantly more hypoxic at birth (Derom and Thiery, 1969), one may expect that intragroup comparison of the incidence of leukocytic infiltration of twin cords should at least permit to disprove the validity of Dominguez assumptions.

This investigation is based on the microscopic examination of the umbilical cords of 530 consecutively delivered sets of twins (1 060 cords) and of 1 213 consecutively delivered singletons. Of each cord the mid-portion was studied in paraffin sections stained with H & E.

The expression " leukocytic infiltration of the umbilical cord " refers to the presence of white blood cells within the wall of the umbilical vein. Although invasion of the vein alone is the rule, simultaneous infiltration of the umbilical vein and of one or both arteries is not at all exceptional. Invasion of the arteries without concomitant infiltration of the umbilical vein, on the other hand, is extremely rare and not even reported by several authors. For that matter, these cases have not been considered for statistical evaluation.

The degree of infiltration of the cord is graded as follows (Fig. 1): Grade 1: the leukocytic infiltration is limited to the tunica intima of the umbilical vein; Grade 2: the infiltration

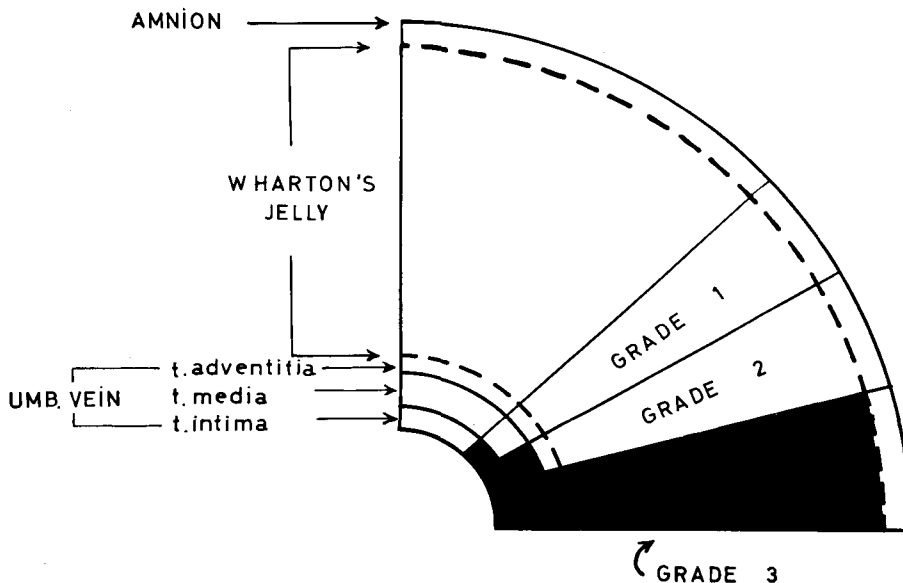


Fig. 1. Diagrammatic representation of the grading of leukocytic infiltration of the umbilical cord.

reaches the tunica media of the vein wall; and Grade 3: leukocytes are no longer confined to the vessels; they have migrated through the adventitia and may have reached the bulk of the cord substance.

Tab. III records the incidence of cord infiltration in singletons. The overall incidence of leukocytic infiltration is 18%, whereas the distribution according to the degree of infiltration of the cord reads approximately as 1 : 1 : 2.

In Tab. IV we have tabulated the incidence of leukocytic infiltration of the umbilical cords of twins. Leukocytic infiltrations are found in 5.3% of the cords of the

Tab. III. Incidence of cord infiltration in 1213 singletons

	N. of cases	Umbilical vessels involved (N. of cases)		
		V	V + A	A*
Grade 1	54	48	6	0
Grade 2	47	46	1	3
Grade 3	115	60	55	2
Total	216 (17.8%)	154	62	5

* Not included in study.

first-born twin and in 6.0% of those of the second-born infants. The distribution according to the degree of infiltration is, with the possible exception of Grade 1, pretty much the same in first- and second-born twins. Computed for sets of twins, the overall incidence of leukocytic infiltration amounts to 5.7%, whereas the proportion of the various grades of infiltration is 1 : 1.4 : 3.5 (Tab. V).

Tab. IV. Incidence of cord infiltration in 1060 twins

	Twin A	Twin B
Grade 1	3	7
Grade 2	7	7
Grade 3	18	18
Total	28 (5.28%)	32 (6.04%)

Tab. V. Incidence of cord infiltration in singletons (N. = 1213) and twin sets (N. = 530)

	N. of cases			Total	
	Grade 1	Grade 2	Grade 3	N.	%
Singletons	54	47	115	216	17.81
Twin sets	10	14	36	60	5.66

From these data we draw the following conclusions: (1) the incidence of leukocytic infiltration of the umbilical cord is exactly three times lower in twins than in singletons; (2) first- and second-born twins are not significantly different as far as the incidence of leukocytic infiltration of their cords is concerned; and (3) the same can be said of the distribution according to the degree of cord infiltration.

The purpose of this investigation is not to solve the controversy of the significance of cord infiltration. Notwithstanding this, our data refute the assumption that *fetal hypoxia* may be considered an important link in the genesis of cord infiltration, unless one is prepared to assume that the appearance of the oxygen debt contracted by the second twin is so acute that the leukotactic stimulus which would cause the white blood cells to invade the cord gets no chance to become morphologically perceptible. At any rate, we feel obliged to conclude that cord infiltration is *not* a sensitive indicator of hypoxia and that microscopic examination of the cord is not an accurate test for screening infants for this condition.

From our twin study, at least two pieces of evidence can be derived which cast some doubt upon the validity of the *inflammation theory* as well. That the cords of second-born twins are found to be as frequently invaded by leukocytes as those of first-born twins, makes it feel uneasy to accept the preponderant role played by ascending bacteriologic contamination of the amniotic sac in the genesis of cord infiltration. A second point seems to plead against this theory. According to Blanc (1961), the so-called "amniotic infection syndrome" is three times as commonly found in premature fetuses than in term babies. As any twin series includes a relatively high proportion of infants with low birth weight, one expects the incidence of cord infiltration, for this reason alone, to be significantly higher in (first-born) twins than in singletons, a fact which is not at all confirmed by our data.

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