



The Northwestern University Multihospital Twin Study

II. Mortality of First Versus Second Twins *

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The results of a multihospital study involving a total of 588 twin pairs born in Chicago in 1970–1975 are reported, with special respect to differences in mortality between first and second twins by time as well as by cause of death. Mortality was higher in second than in first twins and most commonly occurred after delivery and was the result of immaturity and of respiratory distress syndrome.

Key words: Twin pregnancy, Perinatal mortality, First vs second twin, Birth weight

INTRODUCTION

The Northwestern University Multihospital Twin Study has developed a data base of 588 mothers and their 1126 twin concepti from a group of 13 hospitals in the Chicago metropolitan area. The deliveries under study took place between 1970 and 1975. During this time, certain maternity hospitals were being prepared to become state designated referral centers for high-risk obstetric cases. The compilation of the data was done in such a way as to provide a reference base for comparison at regular intervals. The methods of data collection and preparation have already been described [1, 2, 5].

The preliminary reports [1, 2] from the study characterized the maternal patient population, and the first major data analysis documented infant characteristics and pregnancy loss as well [5]. This report describes differences in mortality between first and second twins in this series, by time of death (ante-, intra-, or postpartum) and by specific cause of death, as recorded on the death certificate.

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RESULTS

Table 1 shows the twin-specific mortality rates by birth weight. The second twin had a higher crude mortality than did the first twin (8.5% vs 6.1%) and had higher weight-specific mortality rate in almost all weight categories. As birth weight increased, mortality rates declined for both first and second twins. This decline was less dramatic for second twins in the weight categories of 750–999 g, 1000–1249 g, and 1250–1499 g than for first twins. For infants weighing 1500 g or more, mortality rates were similar for twin I and twin II.

Table 2 classifies the 88 deaths by the time of their occurrence (ante-, intra-, or post-partum). Because of the small numbers in each category, it is not possible to make valid statistical comparisons on a line-by-line basis. When all weight categories are combined, however, there is no significant difference in the distribution of time of death for first or second twins. For both first and second twins, the majority of deaths occurred after delivery, and the fewest deaths occurred intrapartum.

Table 3 lists the reported primary and secondary causes of death for first and second twins. By far, immaturity was the most common diagnosis of primary cause of death, and respiratory distress syndrome (RDS) accounted for the preponderance of secondary diagnoses. The distributions of the reported cause of death for twin II were similar. Thus, as in singleton births, delivery prior to full maturation and development represents the most common threat to the twin neonate's survival. Since twin infants tend to be smaller and to deliver earlier in gestation than singleton infants [4], the increased mortality risk associated with twin pregnancy can be easily understood.

Table 4 lists the causes of death among infants weighing more than 2000 g. With the exception of cases numbered 1 through 3, the deaths of all other infants possibly might have been avoided given optimal circumstances at the time of delivery. A similar assessment may be made for those infants who succumbed from RDS after having attained a birth weight of ≥ 1500 g (Class III, Table 5). It is unlikely, however, that the deaths that occurred in Class II of Table 5 (51 infants) could have been avoided regardless of the sophistication of medical care provided.

TABLE 1. Twin-Specific Mortality by Birth Weight

Weight (g)	First twin		Second twin	
	Total infants	Death rate (%)	Total infants	Death rate (%)
500	6	83.3 ^a	11	100.0
500–749	9	100.0	9	88.0
750–999	15	60.0	13	69.2
1000–1249	12	25.0	9	55.6
1250–1499	20	10.0	14	21.4
1500–1999	72	4.2	91	6.6
2000–2499	154	1.3	162	1.9
2500–2999	180	1.1	169	0.4
3000–3499	90	...	82	...
3500+	24	...	17	...
Not stated	6	...	11	...
Total	588	6.1	588	8.5

^aIn the single case where survival was stated, the hospital records were discrepant. The operative note described delivery of twin stillborns; the order sheet stated that one infant was transferred to a high-risk center alive. Follow-up was unavailable.

TABLE 2. Mortality Versus Birth Weight and Time of Death

Weight (g)	First twin			Second twin		
	Antepartum	Intrapartum	Postpartum	Antepartum	Intrapartum	Postpartum
≤499	3	2	0	4	3	4
500-749	0	1	8	2	0	6
750-999	1	0	8	2	0	7
1000-1249	1	0	2	1	0	4
1250-1499	0	0	2	1	0	2
1500-1999	2	0	1	1	1	4
2000-2499	1	1	0	0	1	2
2500-2999	1	1	0	1	0	0
3000-3499	0	0	0	0	0	0
3500+	0	0	0	0	0	0
Not stated	0	0	1	3	1	0
Total deaths	9	5	22	15	6	29
Percentage per category	25	14	61	30	12	58

TABLE 3. Birth Weight Versus Cause of Death

Weight (g)	≤ 499		500-749		750-999		1000-1249		1250-1499		1500-1999		2000-2499		2500-2999		3000-3499		3500- +		Un-known		Total					
	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II				
Primary causes																												
1. Abortion	1	1																							1	1		
2. Abruptio placentae			1	1			1																			1	3	
3. Anomalies incompatible with life					1																				0	2		
4. Immaturity	4	9	9	7	9	8	2	1	1	1	1	1	3												1	27	29	
5. Interlocking heads														1	1											1	1	
6. Prolapsed umbilical cord														1	1											1	1	
7. Respiratory distress syndrome																										0	3	
8. Velamentous cord																										1	0	
9. Unknown	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1										4	4	10	
Secondary causes																												
1. Abruptio placentae	1	3	1	1	1																						3	4
2. Anomalies incompatible with life																											0	1
3. Asphyxia of newborn	2	3	3	2	1	1	1																				6	7
4. Immaturity					1																						0	1
5. Maceration	1				1	1	1	1	1	1	1	1	1												2	3	7	
6. Respiratory distress syndrome																											10	10
7. Vasa praevia																										1	0	

DISCUSSION

The concept of the twin gestation being a high-risk pregnancy is well accepted [6]. The twin's risk of perinatal death is at least three times that of a singleton [4]. This results primarily from death in the neonatal period, although in one study it has been shown that the incidence of stillbirth is twice that of singletons [3]. Whatever the time of death, the risk of pregnancy wastage is substantial for the mother who has a twin gestation, and similar concern must exist for higher multiple gestations – ie triplets, quadruplets, etc.

A number of factors contribute to the augmented risk of perinatal death among twins. Among them are young maternal age, maternal primiparity, premature delivery, low birth weight, hydramnios, birth trauma, and delayed diagnosis of multiple gestation. Unfortunately, many of these risk factors lie beyond the capacity of the medical community to correct. For example, the young patient may be less likely to seek early prenatal care and more likely to develop a complication such as toxemia, which in itself may predispose to early delivery or premature labor. If the twin gestation has not been diagnosed prior to the onset of such a problem, the likelihood of intrapartum complications rises greatly.

TABLE 4. Causes of Death, Infants ≥ 2000 g

Number	Weight	Birth Order	Time of Death	Sex	Cause of death
1	2041	1	A	F	Unknown cause, maceration
2	2440	2	A	M	Abruptio placentae, maceration
3	2665	1	A	M	Unknown cause, maceration
4	2211	1	I	F	Interlocking head
5	2070	2	I	F	Interlocking head
6	2495	2	I	M	Prolapsed cord
7	2977	1	I	M	Velamentous cord, vasa praevia
8	2155	2	P	F	Respiratory distress syndrome

TABLE 5. Avoidable Pregnancy Loss in Twin Gestation

Class	Death avoidable	Number	%	Causes
I	No	23	27	Severe anomalies (2) Antepartum death < 1500 g (2)
II	Probably not	51	59	Intrapartum and postpartum causes Birth weight < 1500 g (49) Antepartum, unknown causes with fetal maceration (2665 g and 2041 g) (2)
III	Possibly	12	14	Postpartum RDS – birth weight > 1500 g (5) Abruptio placentae (1814 g and 2440 g) (2) Intrapartum asphyxia with interlocking heads (2211 g and 2070 g) (2) Intrapartum, unknown cause (1616 g) (1) Cord prolapse (2495) (1) Velamentous cord with vasa praevia (2977 g) (1)

The advancement of medical practice in recent years in the developed countries of the world has tended toward early diagnosis of multiple gestation if the gravida receives adequate medical attention. The increasing availability of ultrasound has reduced some of the uncertainty and/or risk associated with more traditional diagnostic methods such as physical examination or X-irradiation. In addition, ultrasound can be used to monitor the rates of intrauterine growth as the pregnancy progresses. When the technical capacity to perform ultrasound is coupled with today's monitoring equipment, the clinician is in a better position to evaluate fetal well-being later on in pregnancy as well.

In this series, second twins were found to have a higher overall wastage rate than first twins. When data were examined by the time of death and the cause of death, it became clear that the predominant factor associated with the increased risk of the second twin relates to low birth weight at delivery for infants weighing 1000–1500 g; the death rate of twin I was less than half that of twin II. Of the various causes of death among infants weighing 1000–1500 g noted in Table 3, many are beyond the ability of medical science to predict or correct. Nonetheless, it appears that this group of twins – ie, the second infant born with a weight of 1000–1500 g – will be the pivotal area where properly directed attention will yield gratifying improvement.

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