



Acta Genet Med Gemelloi 34: 81-88 (1985)
© 1985 by The Mendel Institute, Rome

Received 10 November 1984
Final 31 January 1985

Triplet Gestation: Maternal and Neonatal Implications

C.H. Syrop, M.W. Varner

Department of Obstetrics and Gynecology, University of Iowa Hospitals and Clinics, Iowa City

Abstract. Triplet pregnancy of over 20 weeks gestation occurred 20 times during 75,506 deliveries at a referral hospital. Commonly occurring maternal complications included premature delivery (75%), antepartum anemia (35%), postpartum hemorrhage (35%), preeclampsia (20%), and premature spontaneous rupture of the membranes (20%). Malpresentation was common. Neonatal complications were also common and included respiratory distress syndrome (45%), presumptive sepsis (36.6%), hyperbilirubinemia (33%), and neonatal death (21.6%). These high complication rates emphasize the importance of early identification and referral center care for these vulnerable pregnancies.

Key words: Triplets, Prematurity, Malpresentation, Postpartum hemorrhage, Neonatal death, Activity restriction

Triplet gestations have historically captured the interest of both obstetricians and the public. Each triplet gestation carries an increased morbidity risk for mother and infants. Early diagnosis of these pregnancies, as well as optimum management of antepartum and intrapartum complications, demand excellence of the obstetrician. Delivery should not serve as a final endpoint, since infants of triplet gestations are also prone to neonatal complications. Furthermore, the financial and emotional impact of triplet gestations cannot be denied and should be anticipated.

Although the overall incidence of triplets is low (though some authors suggest that it is increasing [2,4]), the increased incidence of maternal complications as well as of neonatal morbidity and mortality makes the study of triplet pregnancy of relevance.

MATERIALS AND METHODS

The University of Iowa Hospitals and Clinics serves as the state's tertiary care center. Its first

surviving triplets were born in 1946. With this as an origin, the computerized diagnosis records were reviewed for triplets up through December 1983. Twenty triplet pregnancies of over 20 weeks gestation were identified. Outside records of prenatal care prior to referral were reviewed when available. Total annual obstetric statistics were available from the Department of Obstetrics and Gynecology, University of Iowa Hospitals and Clinics and comparison year intervals of 1946-1959, 1960-1969, 1970-1979 and 1980-1983 were arbitrarily chosen.

In collection and reporting data, the duration of gestation is noted as weeks since last menstrual period (LMP). Division of mothers into a "restricted" activities level was based upon ordered activity levels or chart documentation of patient instruction of activity levels. This included such restrictions as modified bedrest (home or hospital supine rest BID to TID), bedrest with bathroom privileges, strict bedrest and bedrest (unspecified). Failure of documented maternal activity restriction resulted in classification as "unrestricted". Preeclamptic/toxemia designation was based upon the findings of hypertension, proteinuria, and edema in conjunction with the recorded impressions of the patient's physician. Premature spontaneous rupture of membranes was defined as spontaneous rupture of membranes at least one hour prior to the onset of labor, regardless of gestational age. Postpartum hemorrhage was defined as estimated or measured blood loss of over 500 cc at delivery. Prematurity was defined as delivery at less than 37 completed gestational weeks. In this study, the diagnosis of maternal anemia required a hemoglobin of < 10 gm/dl and/or hematocrit $\leq 30.0\%$. Malpresentation was defined as any delivery presentation other than vertex.

Neonatal mortality rate was the number of neonatal deaths at less than 28 days of life per thousand births weighing ≥ 500 g. Using gestational age and birthweights, infants were classified as appropriate for gestational age (AGA) or small for gestational age (SGA) according to a standardized growth curve [7]. All diagnosed neonatal complications were based upon recorded pediatric clinical assessments, laboratory values, and radiographic findings.

RESULTS

Incidence of Triplet Gestations

In the 28-year period from 1 January 1946 through 31 December 1983, the University of Iowa Hospitals performed 76,506 deliveries. The incidence of triplets over the time period is shown in Table 1. Although the incidence was one in 1822 deliveries (10,935 deliveries, 6 sets of triplets) during 1980-1983, if pregnancies resulting from ovulation induction ($n = 3$) are excluded, the incidence is one in 3642 deliveries and is not significantly different from the overall study period incidence.

Maternal Profile

Eighteen gestations occurred in Caucasians with the other two gestations born to the same black woman. The relative ranges and average ages of study mothers during corresponding years appear along with maternal parity in Table 2. Average maternal height was 158.1 cm (range 143.5-172.7) and reported nonpregnant weight averaged 63.7 kg (range 42.2-104.3 kg). At delivery, the average weight was 79.2 kg (range 57.6-118 kg). Although gestational weight gain averaged 15.5 kg, it ranged from 8.6 kg to 31.7 kg. Two

mothers previously had delivered multiple gestations (1 set of twins, 1 set of triplets). Triplet deliveries were almost twice as common from July through September and the LMP was much more likely to have occurred October through December.

Eighty percent of these pregnancies (16/20) were diagnosed antepartum and 20% (4/20) were diagnosed intrapartum. Ultrasound was employed in the diagnosis 9 times and on 4 occasions was misinterpreted, reporting a twin gestation on 3 occasions and a singleton gestation on 1 occasion. Abdominal scout film was employed 17 times but was also misinterpreted 4 times, reporting twins on two occasions, a singleton on one occasion, and an inability to visualize any fetuses due to maternal obesity in one patient.

Maternal Complications in Triplet Gestations

Maternal complications of pregnancy and delivery were common. Preeclamptic/toxemia was noted in 4 pregnancies, with one mother seizing despite treatment with magnesium sulfate. Postpartum hemorrhage occurred in 7 deliveries; in all cases this was due to uterine atony. Premature spontaneous rupture of the membranes occurred in 4 patients. Antepartum anemia occurred in 7 patients. Premature delivery complicated 15 gestations of over 20 weeks, 3 of which were less than 28 weeks by LMP. Three patients underwent cesarean delivery. All cesarean deliveries were primary in nature and have occurred since 1980. The average antepartum maternal stay was 14.5 days (range 0-57) while the average postpartum maternal stay was 5.6 days (range 0-17).

Table 1 - Incidence of Triplets

1. Overall, 1 Jan 1946 - 31 Dec 1983:		
76,506 deliveries, 20 sets of triplets		1/3825
2. Overall excluding ovulation induction (4)		1/4674
3. 1946-1959: 17,598 deliveries, 4 sets of triplets		1/4400
1960-1969: 22,334 deliveries, 7 sets of triplets		1/3190
1970-1979: 19,852 deliveries, 3 sets of triplets		1/6617
1980-1983: 10,935 deliveries, 6 sets of triplets		1/1822
without ovulation induction:		
10,926 deliveries, 3 sets of triplets		1/3642

Table 2 - Incidence of Triplets and Maternal Profile

	Incidence	Average maternal age	Average parity	Ovulation induction
Overall	1/3825	25.2 range 18-33	1.7 range 0-6	4
1946-1959	1/4400	27.5 range 23-33	1.8 range 0-4	0
1960-1969	1/3190	25.8 range 25-31	3.0 range 0-6	0
1970-1979	1/6617	20.3 range 18-24	0.7 range 0-1	1
1980-1983	1/1822	24.8 range 21-31	0.3 range 0-1	3

Malpresentation was frequently encountered. Thirty-one of 58 infants delivered as other than a vertex presentation (54%). This does not include a set of vertex-vertex conjoined twins (A-B) in one set of triplets. Four abnormal presentations occurred in triplet A, 12 in triplet B, and 15 in triplet C. Triplet presentations were vertex/breech/breech [7], vertex/vertex/breech [4], vertex/vertex/vertex [2], breech/breech/breech [2], vertex/breech/transverse [2] and one each breech/face/vertex, breech/vertex/breech and vertex/transverse/breech.

Delivery interval was known in 19 cases. The average interval from A to B was 5 min (range 0-13 min). The interval from delivery of B to C averaged 3.3 min (range 0-15 min). The sex ratio was 0.616 (23 males, 37 females), and 0.615 (5 males, 8 females) among infants who died.

With respect to triplet birth order, death was evenly distributed (A=4, B=4, C=5). In gestations ≥ 28 wk, A and B had only one death each and triplet C three deaths.

For all triplets > 20 wk gestation, the overall gestational age at delivery was 33.4 wk (range 27-41). Those undergoing ovulation induction [4] averaged 31.1 wk (range 27-35). Triplets of spontaneous ovulations averaged 34.0 wk LMP (range 27-41). Comparing gestational ages of those sets delivered vaginally [17] vs cesarean delivery [3], vaginally delivered triplets averaged 33.7 wk (range 27-41) and cesarean averaged 31.0 wk (range 27-35).

Mothers with "restricted" activity levels had an average documented first prenatal visit at 20.4 wk (range 8.5-35 wk LMP) with triplets diagnosed on the average at 29.8 wk LMP (range 20-41). Their gestation at delivery averaged 34.3 wk (range 27-41). From this group of mothers, 3 of 39 infants died. One was SGA and the other two were nonviable conjoined twins (AGA).

Mothers of "unrestricted" activity levels had their first prenatal visit at 24.6 wk average (range 18-39) with triplets diagnosed on the average at 31.2 wk LMP (range 27-39). Delivery averaged 31.3 wk (range 27-39) LMP. Ten of 18 infants from this group died, and 67% of these were SGA.

Table 3 lists infant weights and recorded Apgar scores grouped by maternal activity levels. The average total fetal weight was 4618 g (range 1770-7890).

Neonatal mortality rates were calculated in several ways. The overall neonatal mortality rate of triplets in this series is 216 deaths/1000 deliveries ≥ 500 g. Triplets C had higher neonatal mortality rates in comparison to A and B (250/1000 vs 200/1000).

Perinatal mortality varied with presentation. On a percentage basis, 14.8% (4/27) of vertex triplets (including face presentation) died, 20.7% (6/29) of breech triplets died, and 66% (2/3) transverse presentation triplets died. As mentioned, the overall perinatal mortality rate for all triplets (≥ 500 g birthweight, < 28 days life) was 216/1000. If one corrects for infants ≥ 28 weeks gestation and congenital anomalies, the overall rate becomes 61.2/1000.

Of course, mortality is only one endpoint. Neonatal complications are shown for each birth order and overall in Table 4. Hyperbilirubinemia, sepsis and respiratory distress were common neonatal complications. Necrotizing enterocolitis was fortunately uncommon.

Some form of follow-up was available on members of 13 sets of triplets. In general, these infants height and weights, by clinical notation, have shown progressive growth, though all but one remain below the 50th percentile for weight.

Table 3 - Weight and Apgar Score of Triplets by Maternal Activity

Maternal activity	Triplet A		Triplet B		Triplet C		Average total fetal weight (g)
	Weight (g)	Apgar score 1 min 5 min	Weight (g)	Apgar score 1 min 5 min	Weight (g)	Apgar score 1 min 5 min	
Overall average	1580	6.9 7.5	1533	5.5 7.0	1505	4.3 7.9	4618
Range (n=20)*	665-2600		370-2600		390-2690		1770-7890
Restricted average	1796	6.5 7.8	1642	5.5 6.9	1698	3.9 7.4	5136
Range (n=13)	720-2600		720-2600		950-2690		2390-7890
Unrestricted average	1247	9.1 9.1	1180	5.1 7.3	975	6.2 9.5	3402
Range (n=6)	665-1680		370-1840		390-1660		1770-5035

* Activity level not stated in one case

Table 4 - Neonatal Complications in Triplets

Complication	Triplet A (N = 20)		Triplet B (N = 20)		Triplet C (N = 20)		Overall (N = 60)	
	%	N	%	N	%	N	%	N
Hyperbilirubinemia	35	7	30	6	35	7	33	20
Hypoglycemia	0		5	1	5	1	3.5	2
Hypocalcemia	15	3	10	2	10	2	11.6	7
Peripheral nutrition	10	2	5	1	15	3	10	6
Sepsis	35	7	30	6	45	9	36.6	22
RDS ^a	45	9	45	9	45	9	45	27
NEC ^b	5	1	0		0		1.6	1
Death	20	4	20	4	25	5	21.6	13 ^c

a Respiratory Distress Syndrome

b Necrotizing Enterocolitis

c 1 death at 28 days

2 death non-viable conjoined twins

Three sets of triplets required placement in foster home care. One mother delivered two sets of triplets within 14 months, which, when combined with a preceding set of twins, gave her eight children under the age of 4. All of these infants required hospitalization for dehydration with signs of malnutrition and one infant succumbed.

DISCUSSION

The incidence of triplets varies in populations, reports ranging from 1 in 1014 [2] in a predominantly Negro population to 1 in 7921-9828 in whites. Holcberg and associates [4] reported an overall incidence of 1 in 3412 with a pre-1972 incidence of 1 in 5000. At the University of Iowa, the overall incidence of triplet gestations is 1:3825 deliveries. Considering only spontaneously conceived gestations, the rate is 1:4780. As seen in Table 1, the incidence at University of Iowa Hospitals has apparently been increasing, but excluding gestations following ovulation induction it is essentially constant. The recent increased incidence of triplet gestations in hospital populations probably represents the effect of ovulation induction but may also reflect an increased tendency to refer multiple pregnancies to high-risk obstetric services.

The higher incidence of triplets and other multiple gestations among blacks is due to their higher predisposition to multizygotic gestations [8]. Although the only black of the study series delivered two sets of monozygotic triplets, Iowa is an overwhelmingly caucasian state and it is not possible to draw any multiracial conclusions from our report.

The average maternal age and parity for the overall study group were 25.2 years and 1.7, respectively (Table 2). These figures are lower than those reported by Egwuato (29.3 ye) [2], Holcberg and associates (33.0 yr, range 27-47) [4], or Sogbanmu [4] (average parity = 3.5) [11], but are probably consistent with national trends. Higher maternal age and parity are known [8] to increase the incidence of multiple gestation. However, despite maternal age and parity decreasing over time, the incidence of triplets remained nearly static when gestations following ovulation induction are excluded. Average pregnant weight gain in Iowa exceeded that reported by Ron-El (11.3 kg, range 6-29) [10].

As noted, 80% (16/20) of study triplets were diagnosed on an antepartum basis. This contrasts with a recent report [4] in which the antepartum diagnosis was made in only 54.8% (17/31) patients. These authors feel that, although the ultrasound diagnosis of multiple gestations can be made in the first trimester, the most reliable diagnostic method is a late second or third trimester abdominal x-ray. Ron-El et al [10] also note that triplets may be misdiagnosed as twins. These studies support our findings of ultrasound and abdominal x-ray errors in triplet gestations.

A relative increase in triplet conceptions during the fall was noted. This is in agreement with the report of James [6] and the explanation as yet remains unclear.

The increased risks of prematurity, pregnancy-induced hypertension, PSROM, anemia, and postpartum hemorrhage noted in our study have also been reported by others [4,10], but require continuing reemphasis.

The optimum route of delivery for triplets is debated in the literature. Holcberg et al [4] believe that a contributing factor to favorable outcome is planned delivery, usually by cesarean section. Ron-El et al [10] believe that the preferable mode of delivery cannot be stated, while Michlewitz et al [9] believe that the reported increased morbidity and mortality of triplet C delivered vaginally implies that more frequent recourse to cesarean

delivery may be beneficial. Our study indicates decreasing neonatal mortality since 1946 and nearly identical overall neonatal mortality rates for each triplet of a set. Unfortunately, because our case numbers are small, we cannot conclude that abdominal delivery is advantageous per se. Only a prospective, randomized study could adequately answer this question.

Malpresentation has previously been reported in 47.7% of triplet births [9] and this was born out by our data (53.4%). Unlike Holcberg et al [4], who reported the most common presentation as vertex/breech/vertex, and Ron-El et al [10] (vertex/vertex/vertex most common), vertex/breech/breech was the most common group of presentations in our study. This was followed by vertex/vertex/breech.

Sex ratios have been variously reported [3,5,10]. Ron-El et al [10] found a male to female ratio of 1.7:1 while Brown and Daw [1] reported that female infants predominate in triplet births. Imaizumi [5] reported that male triplets may be selectively aborted in early gestation compared to twins or the general population. The latter two reports are consistent with our finding of a sex ratio of 0.616.

Holcberg et al [4] report that prolonged bedrest did not appear to influence labor onset or infant survival rate. Furthermore, Ron-El et al [10] report that a prospective non-randomized study found no difference in fetal outcome with or without bedrest. Although our retrospective data suggest a later average gestation at delivery, decreased percentage of SGA infants and larger individual and total triplet fetal weights when mothers had restricted activities when compared to mothers with unrestricted activities, such differences may be due to the marked difference in average registration for prenatal care. Overall, the percentage of SGA infants is markedly increased for triplets as a whole and is in agreement with prior reports [4]. Neonatal morbidity was high and reflects the high incidence of prematurity and its associated sequelae. Respiratory distress syndrome was the most frequent complication.

Holcberg et al [4] claimed an increased risk of neonatal death for triplet C (53%) as compared to triplets A and B (27-30%). Imaizumi et al [5] noted increasing infant mortality rates with increasing birth order. Our study does not support these findings and has found that the neonatal mortality rates for each triplet are nearly equal. Ron-El et al [10] noted a perinatal mortality rate of 185/1000 and corrected (≥ 28 wk) to 137/1000 for triplets born 1970-1978. In studying triplets born at the University of Iowa, the overall perinatal mortality was 216/1000, but when corrected for pregnancies less than 28 weeks gestation and for lethal congenital anomalies, the perinatal mortality rate becomes 61.2/1000.

It is important to note that mothering and supporting triplet gestations should be considered emotionally and financially stressful and difficult [3]. Utilization of community resources with close follow-up and early intervention would hopefully prevent some of the unfortunate past maternal and newborn problems previously mentioned.

Although the route of delivery and role of bedrest in multiple gestations remains in question, the neonatal mortality rates will remain unacceptably high until prevention of prematurity improves. Until then, neonatal complications will remain high as well. Maternal complications of triplet pregnancies will likely persist and the incidence of triplet gestations may continue to increase as ovulation induction is more widely performed. As a result, problems of triplet gestation will persist in future obstetric practice.

REFERENCES

1. Brown G, Daw E (1980): Some aspects of triple pregnancy in England and Wales, 1971-1975. *Br J Clin Pract* 34:134-135.
2. Egwuatu VE (1980): Triplet pregnancy; A review of 27 cases. *Int J Gynaecol Obstet* 18:460-464.
3. Goshen-Gottstein ER (1980): The mothering of twins, triplets and quadruplets. *Psychiatry* 43: 189-204.
4. Holcberg G, Biale Y, Lewenthal H et al (1982): Outcome of pregnancy in 31 triplet gestations. *Obstet Gynecol* 59:472-476.
5. Imaizumi Y (1982): Sex ratio of triplet births in Japan. *Hum Hered* 32:114-120.
6. James WG (1980): Seasonality in twin and triplet births. *Ann Hum Biol* 7:163-175.
7. Lubchenco LC, Honsman C, Boyd E (1966): Intrauterine growth in length and head circumference as estimated from live births at gestational ages from 26 to 42 weeks. *Pediatrics* 37:403-408.
8. MacGillivray I (1980): Twins and other multiple deliveries. *Clin Obstet Gynaecol* 7:581-600.
9. Michlewitz H, Kennedy J, Kawada C, et al (1981): Triplet pregnancies. *J Reprod Med* 26:243-246.
10. Ron-El R, Caspi E, Schreyer P, et al (1981): Triplet and quadruplet pregnancies and management. *Obstet Gynecol* 57:458-463.
11. Sogbanmu MO (1981): Triplet pregnancy in Nigeria: Socio-biologic aspects. *Int J Gynaecol Obstet* 19:301-304.

Correspondence: Michael W. Varner, M.D., Department of Obstetrics and Gynecology, University of Iowa Hospitals and Clinics, Iowa City, IA 52242, USA.