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The Small-for-gestational-age Infant: Obstetrical Management and Perinatal Outcome

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ABSTRACT

In order to study whether antenatal detection and supervision of small for-gestational-age (SGA) infants favours the prognosis, the obstetrical management and perinatal outcomes of all SGA infants born in Uppsala county between 1980 and 1985 were reviewed. Data on 154 mothers and their well-shaped, singleborn SGA infants (< -2 SD) were analysed. Twenty-three mothers delivering SGA infants were admitted to the hospital due to maternal diseases ("complicated SGA pregnancies"). Fetal well-being was regularly monitored in all these pregnancies. In the symtom-free SGA pregnancies (n = 131), fetal well-being was regularly monitored in 69 pregnancies whereas in 62 it was not.

There were eight stillborn SGA infants. These infants were all delivered by mothers with symtom-free pregnancies, not supervised with regard to fetal well-being. In the neonatal period, 15 SGA infants either suffered from postpartal asphyxia (Apgar 5' <7) or from a severe disease (meconium aspiration, convulsions, idiopathic respiratory distress syndrome or septicemia). Seven SGA infants (of whom two died postnatally) delivered by mothers with complicated pregnancies and eight SGA infants not supervised with regard to fetal well-being during pregnancy, suffered from one or more of these complications. In symtom-free SGA pregnancies, regularly supervised with regard to fetal well-being, all SGA infants (n = 69) escaped these severe neonatal problems.

INTRODUCTION

Clinical interest in fetal growth retardation remained dormant until Gruenwald in 1963 described the complete syndrome (5). Studies in the 1960's and early 1970's reported increased

risks for perinatal morbidity and mortality as well as neurological sequelae for the small-for-gestational-age (SGA) infants (4,19). During the same period of time, improvements of fetal outcome became increasingly one of the main targets of antenatal care. If SGA pregnancies were detected antenatally it would be possible to supervise these pregnancies with regard to fetal well-being, which in turn would permit timely and safe delivery. Different methods for antenatal detection of SGA pregnancies were therefore developed (1,21). Although such methods are today generally adopted, they have not been evaluated in a randomized controlled manner. Therefore, in order to tackle the question whether antenatal diagnosis of SGA is worthwhile, indirect methods like perinatal audit have been used. These studies are based on a retrospective expert panel examination of perinatal deaths in order to identify factors influencing perinatal mortality. Two studies using this method found the single most important avoidable factor for fetal death to be inappropriate action (or inaction) when clinical signs of fetal growth retardation were present (12,13).

When evaluating the importance of antenatal diagnosis of SGA, the heterogeneity of these pregnancies must also be considered. The prognosis of SGA infants suffering from severe congenital malformations may not be improved by antenatal detection of impaired fetal growth. In pregnancies complicated by proteinuric preeclampsia, the markedly increased risk of intrauterine growth retardation may call for supervision of fetal well-being, regardless of the outcome of the methods used to follow fetal growth (18).

In the present investigation, the obstetrical management and short-term outcome of normally formed SGA infants is studied, especially with regard to whether adequate supervision of fetal well-being was performed or not and whether the pregnancy was complicated by maternal disease or not.

MATERIAL AND METHODS

The study was performed in Uppsala county, Sweden. In this county each pregnancy is clinically examined at the antenatal clinics before week 14 to determine gestational age. Between 1980 to 1981, ultrasonic examination were performed if gestational age was considered uncertain after pelvic examination, if there had been any irregular menstrual periods or if the

woman was considered to be at risk for delivering a SGA infant. Since 1982, gestational age is generally assessed on the basis of an ultrasonic examination around the 17th week.

From 1979, a follow-up programme aiming at the detection of SGA pregnancies has been running (2). Fetal growth is followed routinely by repeated measurements of the fundal height. The measurements are performed every second week from the 20th to the 36th gestational week and thereafter weekly (21). A fundal height curve with at least one measurement three or more cm below the mean of the normal curve is considered as pathological (2). Ultrasonic measurements in late pregnancy are performed in all women with pathological measurements of the fundal height or if there were risk factors for SGA. From 1980 to 1981, ultrasonic estimation of fetal growth was assessed on the basis of repeated measurements of the biparietal diameter (BPD). Ultrasonic growth was considered as pathological if a measurement was 2 SD or more below the mean of the Swedish BPD growth curve (15). Since 1982, ultrasonic estimation of fetal growth is assessed on the basis of a reference curve for ultrasonic estimation of intrauterine weight for gestational age (3). A predicted weight deviation of -15 per cent or more is considered as pathological. Pregnancies with pathological late ultrasonic measurements are regularly supervised with regard to fetal well-being, foremost by using antenatal cardiotochographic (ctg) recordings. When intense supervision of fetal (or maternal) well-being is considered necessary, the woman is scheduled for admission to the University Hospital of Uppsala, which has the only maternity unit, serving the 240 000 inhabitants of the county.

From 1980 to 1985, 18 685 women living in Uppsala county delivered single births at the University Hospital. From the hospital's general obstetrical records, including data on all births, all singleborn SGA infants delivered at the hospital between 1980 to 1985 were traced. SGA was defined as birthweight for gestational age below -2 S.D. of the normal mean according to the Swedish growth curve used (8). SGA infants with congenital malformations, intra-uterine infections or chromosomal anomalies were excluded. Altogether 154 well-shaped SGA infants were born during that time (0.8 per cent of all births). Necessary data for analyses were obtained from the individual antenatal, obstetrical and neonatal records. All

antenatal and intrapartal ctg recordings were assessed retrospectively according to previously described methods (7,20).

Differences in birthweights and lengths of gestation were analyzed with Student's independent t-test.

RESULTS

Out of a total of 154 SGA pregnancies, 23 were scheduled for admission to the hospital due to maternal diseases (Figure 1).

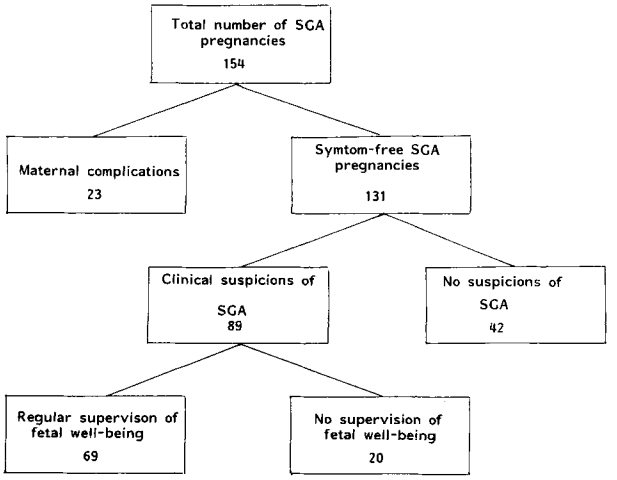

Figure 1.
Clinical management of SGA pregnancies in Uppsala county 1980-85.

Twenty were admitted due to proteinuric preeclampsia and three because of severe chronic diseases. Although the reason for antenatal hospital care primarily was maternal health, fetal supervision was regularly performed in all these pregnancies. In 69 symtom-free SGA pregnancies, fetal well-being was regularly monitored, mainly by antenatal ctg recordings (from twice to seven times a week). Despite an initial suspicion of SGA, adequate fetal supervision was not, for various reasons, performed in 20 SGA pregnancies: In ten cases the test results for estimation of fetal growth opposed each other - measurements of the fundal height were pathological but late ultrasonic measurements were normal, obvious signs of retarded fetal growth were neglected in six cases and in four cases time intervals between first suspicion of retarded fetal growth and delivery were too short to permit supervision of fetal well-being. Fetal well-being was not regularly monitored in another 42 SGA pregnancies, where retarded fetal growth was never suspected. Thus, altogether 62 symtom-free SGA pregnancies were not regularly supervised with regard to fetal well-being.

Table 1. Number of live births and stillbirths in SGA pregnancies

	maternal complications n = 23	symtom-free supervised n = 69	symtom-free not supervised n = 62	total n = 154
Live born	23	69	54	146
Stillborn	-	-	8	8

Eight stillborn infants were assessed as SGA even when gestational age was estimated from the last occasion when fetal heart sounds were recorded (Table 1). None of these pregnancies were supervised with regard to fetal well-being. In five pregnancies with stillborn SGA infants, there were no signs of fetal life after 32 completed weeks.

Table 2. Onset of delivery in SGA pregnancies (live births).

	maternal complications n = 23	symtom-free supervised n = 69	symtom-free not supervised n = 54	total n = 146
Spontaneous	2	25	49	76
Induced vaginal	9	29	2	40
Elective Cesarean section	12	15	3	30

Labour was induced in 40 of the SGA pregnancies, of which 24 were delivered vaginally and 16 by cesarean section (Table 2 and 3). Among the SGA pregnancies complicated by maternal diseases, 18 out of 23 were delivered by cesarean section. In symtom-free supervised SGA pregnancies, 24 of totally 29 cesarean sections performed were either due to ominous antenatal ctg recordings or failed inductions. In symtom-free SGA

pregnancies not antenatally supervised with regard to fetal well-being, seven of 11 cesarean sections were performed due to signs of asphyxia during labour (ominous ctg patterns).

Table 3. Indications for Cesarean sections in SGA pregnancies (live births).

	maternal complications n = 23	symtom-free supervised n = 69	symtom-free not supervised n = 54	total n = 146
Elective Cesarean section				
Ominious antenatal ctg	4	14	-	18
Maternal	8	-	-	8
Various	-	1	3	4
Emergency Cesarean section				
Failed induction	5	10	1	16
Intrapartal asphyxia	1	3	7	11
Various	-	1	-	1
Total	18	29	11	58

Table 4. Mean birthweights and lengths of gestation of SGA infants (live births).

	maternal complications n = 23	symtom-free supervised n = 69	symtom-free not supervised n = 54	total n = 146
Birthweight (mean ± SD)	1783±628**	2115±437***	2336±350	2145±482
Lengths of gestation (mean ± SD)	35.2±3.9***	37.8±2.5***	39.0±2.5	37.8±3.1

** $p < 0.01$
*** $p < 0.001$

Within the SGA group, there were significant differences in birthweights and lengths of gestation (Table 4). Seven of totally 13 SGA infants born before week 33 were delivered by preeclamptic mothers, primarily due to concern of maternal health. Fifteen SGA infants either suffered from postpartal asphyxia (Apgar at 5 minutes <7) or from a severe disease in the neonatal period. It is notable that all SGA infants where the pregnancy was symtom-free as well as supervised escaped these problems (Table 5). Low Apgar scores, meconium aspirations, and convulsions were rare conditions, but predominantly present among SGA infants not supervised with regard to fetal well-being.

Table 5. Neonatal characteristics of liveborn SGA infants.

	maternal complications n = 23	symtom-free supervised n = 69	symtom-free not supervised n = 54	total n = 146
Apgar score < 7 at 5 minutes of age	1	-	5	6
Meconium aspiration	-	-	3	3
Convulsions	1	-	2	3
IRDS*	4	-	1	5
Septicemia	2	-	-	2
Deaths during the first month of life	2	-	-	2
Assisted ventilation CPAP** and/or respiratory treatment	6	1	7	14
Treatment at the neonatal ward > 7 days	20	46	29	95

* Ideopathic respiratory distress syndrome
** Continuous positive airway pressure

Idiopathic respiratory distress syndrome (IRDS) and septicemia were present in seven SGA infants, all delivered preterm. Six of these infants were delivered due to maternal complications (severe preeclampsia). Two infants with IRDS died at the neonatal department 11 and 25 days after delivery. These infants were electively delivered after 28 and 30 weeks, due to severe preeclampsia. Of totally 14 SGA infants requiring assisted ventilation, nine were delivered within 28-32 weeks. The other five SGA infants with respiratory treatment were born at term and were not supervised with regard to fetal well-being during pregnancy. The length of treatment at the neonatal ward was mainly due to the length of gestation. However, as many as 29 of totally 54 SGA infants not supervised with regard to fetal well-being were treated for more than a week at the neonatal ward.

DISCUSSION

Less than one per cent of the infants were assessed as SGA. Since the study was bases on an unselected area-based population, the low prevalence of SGA probably reflects the needs for revision of the Swedish birthweight standards rather than a skewed selection of births.

Although focusing on the smallest and probably most vulnerable infants, the overall perinatal outcome was fairly good. Other studies, including more infants as SGA, have reported higher risks for an unsuccessful perinatal outcome (11,22). The homogenous Swedish socio-economic standard has previously been ascribed as one of the main reasons for the successful perinatal outcome (6). In Sweden, antenatal care is generally offered as well as generally accepted (17). This provides an excellent opportunity for developing uniform antenatal programmes aiming at the detection of SGA pregnancies. In the present study, all pregnant women were included in a routine screening programme aiming at the detection of SGA pregnancies (2). Sixty per cent of the SGA pregnancies were adequately supervised with regard to fetal well-being, which is in accordance with other Swedish studies using special programmes for detection of SGA pregnancies (7,9). However, all tests used for the monitoring of fetal growth and fetal well-being may be false positive, which makes the risk for an elective delivery of a healthy infant with normal birthweight obvious.

Improvements in neonatal intensive care of the preterm infant have probably also contributed to the present results. The preterm SGA infant is reported to run a high risk of a fatal outcome. Postnatal death rates of 40 per cent were reported from preterm SGA infants born in the 1970's (14,23). Holmqvist reported a postnatal death rate of 24 per cent of preterm SGA infants born in Sweden between 1977 and 1981 (7). In the present study, only two of 37 (five per cent) preterm SGA infants born during 1980 to 1985 died postnatally. Although the development in the neonatal management of the preterm infant has been almost explosive since the late 1970's, differences in mean gestational age between preterm SGA infants in the study of Holmqvist and the present one (31.2 and 33.6 weeks respectively) probably also account for the differences in postnatal death rate.

The postnatal outcome for SGA infants supervised during pregnancy and delivered by mothers with symtom-free pregnancies (n = 69), was very good. Except for one infant born after 31 weeks, who required assisted ventilation, these infants escaped severe problems in the postnatal period. When labour was induced, the risk of emergency cesarean sections was increased in these pregnancies. This was probably due to a combination of unfavourable cervical status and an increased risk of fetal asphyxia (10).

During recent years, different screening programmes for antenatal detection of SGA pregnancies have been developed (2,16,21). The results obtained indicate an overall good perinatal outcome of SGA infants, probably due to improved antenatal and neonatal care. However, despite recent improvements in detection of SGA pregnancies, 40 per cent of the SGA infants were not regularly supervised during pregnancy. These infants faced a markedly increased risk of intrauterine death as well as severe complications in the neonatal period.

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