Management of Suspected Fetal Macrosomia

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Fetal macrosomia, arbitrarily defined as a birth weight of more than 4,000 g (8 lb, 13 oz) complicates more than 10 percent of all pregnancies in the United States. It is associated with increased risks of cesarean section and trauma to the birth canal and the fetus. Fetal macrosomia is difficult to predict, and clinical and ultrasonographic estimates of fetal weight are prone to error. Elective cesarean section for suspected macrosomia results in a high number of unnecessary procedures, and early induction of labor to limit fetal growth may result in a substantial increase in the cesarean section rate because of failed inductions. Pregnancies complicated by fetal macrosomia are best managed expectantly. When labor fails to progress as expected, the possibility of fetopelvic disproportion should be considered within the context of the best estimate of the fetal weight. (Am Fam Physician 2001;63:302-6.)

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Maternity care professionals frequently encounter pregnant patients in whom fetal macrosomia is suspected. Recognizing the special risks of these pregnancies, clinicians have attempted to find accurate ways of predicting fetal weight and have sought interventions, including elective cesarean section[1,2] and induction of labor[3] to optimize the maternal and fetal outcomes. This article will review the accuracy of various methods of prediction of macrosomia and the efficacy of proposed interventions to prevent macrosomia-related complications in normal pregnancies and in those complicated by diabetes, previous cesarean section and a previous pregnancy complicated by shoulder dystocia.

Prediction of Fetal Macrosomia

The term "macrosomic fetus" is misleading because birth weight is never known with certainty until after delivery. The most commonly proposed criteria for macrosomia is a birth weight greater than either 4,000 g (8 lb, 13 oz)[4] or 4,500 g (9 lb, 15 oz).[5] In 1990, this represented 10.9 and 1.8 percent of infants born in the United States in 1990, respectively.[6] The most clinically useful definition of macrosomia is a weight below which "macro-somic" complications, such as shoulder dystocia, do not occur. Unfortunately, case series indicate that one half of all cases of shoulder dystocia occur at birth weights of less than the most commonly used cut-off—4,000 g.[7] Furthermore, almost one half of all cases of permanent brachial plexus injuries occur in infants weighing less than 4,500 g.[8]

Strategies to Predict Macrosomia

The three major strategies used to predict macrosomia are clinical risk factors, clinician estimation by Leopold's maneuvers and ultrasonography. Each method has substantial limitations.

RISK FACTORS

A number of risk factors for fetal macrosomia have been recognized (*Table 1*).[9-13] The strongest risk factor is maternal diabetes, which results in a twofold increase in the incidence of macrosomia.[9] Many of the risk factors (e.g., prolonged gestation, obesity and multiparity) are highly prevalent among parturients, limiting their utility. Even when two or more of these risk factors are present, the risk of macrosomia is only 32 percent.[9] Furthermore, 34 percent of macrosomic infants are born to mothers without any risk factors, and 38 percent of pregnant women have at least one risk factor.[9]

CLINICIAN ESTIMATION OF FETAL WEIGHT

The volume of amniotic fluid, the size and configuration of the uterus and maternal body habitus complicate estimation of the size of the fetus by palpation through the abdominal wall.[13] Several studies have documented mean errors of about 300 g (11.6 oz).[13,14]

ULTRASONOGRAPHY

Ultrasonography has been proposed as a more accurate method of estimation of fetal weight.[15] Unfortunately, the typical mean error ranges from 300 to 550 g (11.6 to 19.4 oz).[13,14,16] A study comparing fetal weight estimates of clinicians, multiparous patients and ultrasonography found that ultrasound was the least accurate of the three methods.[13] Limitations in the sensitivity and specificity of ultrasound have been observed in other studies.[15] Despite these limitations, clinicians continue to incorrectly believe that ultrasound is an accurate way of predicting macrosomia.[17]

Consequences of Fetal Macrosomia

FETAL CONSEQUENCES

The delivery of a macrosomic infant has potentially serious consequences for the infant and the mother. The most feared result of macrosomia is shoulder dystocia, and up to one fourth of infants with shoulder dystocia experience brachial plexus or facial nerve injuries, or fractures of the humerus or clavicle.[18] Brachial plexus injuries, such as Erb-Duchenne palsy, are ordinarily attributed to delivery complicated by shoulder dystocia; however, approximately one third of these injuries are not associated with a clinical diagnosis of shoulder dystocia.[19] The most feared complication secondary to shoulder dystocia is asphyxia, which is rare.[20,21]

MATERNAL CONSEQUENCES
OF FETAL MACROSOMIA

The mother is at increased risk for cesarean section, which occurs more commonly in pregnancies complicated by macrosomia. Vaginal delivery of a macrosomic infant increases the risk of third- or fourth-degree lacerations fivefold.[20]

Interventions for Suspected Macrosomia

Management strategies for suspected fetal macrosomia include elective cesarean section and early induction of labor.

ELECTIVE CESAREAN SECTION

Elective cesarean section for suspected macrosomia has been proposed as a way to spare the parturient an unproductive labor and to prevent birth trauma.[2] Unfortunately, the difficulties in predicting macrosomia[17] and the favorable outcome for most women who undergo a trial of labor[21] imply that a large number of unnecessary cesarean sections would have to be performed to prevent a single bad outcome in the pregnancy complicated by suspected fetal macrosomia.[22] A recent decision analysis estimated that to prevent one case of permanent brachial plexus injury, 3,700 women with an estimated fetal weight of 4,500 g would need to have an elective cesarean section for suspected macrosomia at a cost of $8.7 million per case prevented.[22] Thus, elective cesarean section for suspected macrosomia alone is difficult to support.

EARLY INDUCTION OF LABOR

Given that the fetus continues to gain about 230 g (8.1 oz) per week after the 37th week,[23]

Prediction of macrosomia is difficult, and the vast majority of macrosomic infants will have favorable outcomes. Elective cesarean section for suspected macrosomia is not recommended.

> *One half of all cases of permanent brachial plexus injuries occur in infants weighing less than 4,500 g (9 lb, 15 oz).*

elective induction of labor before or near term has been suggested to prevent macrosomia and its complications.[9] However, observational studies[24-27] suggest that induction actually increases the cesarean section rate without favorably altering perinatal outcomes.

One study[27] compared the outcomes of patients in whom macrosomia was suspected before delivery to those in whom it was not. The authors found that the risk of cesarean section was substantially higher (52 versus 30 percent) in pregnancies in which macrosomia was suspected, even after controlling for birth weight and other confounding variables. More importantly, the difference in the cesarean section rate was attributable to a greater proportion of failed inductions for macrosomia in the group in which it was suspected. Another observational study[28] compared the outcomes of infants with suspected macrosomia who were managed with induction versus expectantly. Again, the rate of cesarean section was substantially higher (57 versus 31 percent) in the group that underwent elective induction. In addition to these studies, a recent meta-

analysis[3] concluded that induction did not decrease the rate of cesarean section, instrumental delivery or perinatal morbidity.

Management of Suspected Fetal Macrosomia

The medical literature confirms that prediction of fetal macrosomia is difficult. Ultrasound estimation of fetal weight adds little additional useful information.[17,29]

What clinicians really want to predict is not macrosomia, per se, but the serious complications that physicians mistakenly associate as occurring only with macrosomia, such as brachial plexus injury or shoulder dystocia. Such complications, however, are not determined by birth weight alone, but by a complex and poorly understood relationship between fetal and maternal anatomy and other factors. Moreover, the vast majority of macrosomic infants who are delivered vaginally do very well, even if they experience shoulder dystocia.[17] The weight estimate of the suspected macrosomic fetus should be recognized as uncertain. The patient's obstetric history, her progress during labor, the adequacy of her pelvis and other evidence suggestive of fetopelvic disproportion should be used in determining an intervention, such as cesarean section.

Fetal Macrosomia in Special Populations

VAGINAL BIRTH AFTER CESAREAN SECTION

Vaginal birth after cesarean section (VBAC) was once recommended to be avoided in women whose fetuses were estimated to weigh more than 4,000 g. However, a study[30] in 1989 compared the sequelae of VBAC of macrosomic and nonmacrosomic infants and noted no higher risk of uterine rupture in the women delivering infants in the macrosomic group. The 1999 VBAC Technical Bulletin[31] of the American College of Obstetricians and Gynecologists states that there is "tendency to expand the list of obstetric circumstances under which VBAC may be appropriate," and

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"suspected macrosomia," though admittedly controversial, is on that list.

MOTHERS WITH DIABETES

Most studies now address diabetic and non-diabetic fetal macrosomia separately[22] because infants of mothers with diabetes are at a greater risk of shoulder dystocia than infants of mothers who do not have diabetes. This is probably because of the disproportionate growth of the fetal chest and shoulders compared with the fetal head.[32] Various authors have made different recommendations for treatment strategies, ranging from expectant management, to elective induction before the due date,[34] to elective cesarean section for estimated fetal weights greater than 4,000 g,[34] 4,250 g (9 lb, 6 oz),[1] or 4,500 g.[34]

If elective cesarean section for suspected fetal macrosomia is contemplated, the decision analysis discussed previously determined that for an estimated weight of 4,500 g, 443 cesarean deliveries at an estimated cost of $930,000 would be required to prevent one permanent brachial plexus injury.[21] Presumably, elective induction for suspected macrosomia in pregnancies complicated by diabetes has the same increased risk of cesarean delivery as it does in pregnancies with no diabetes. In addition, the higher risk of neonatal respiratory distress syndrome in infants of mothers with diabetes should be considered.

PREVIOUS SHOULDER DYSTOCIA

Two observational studies have examined the risk of recurrence of shoulder dystocia in subsequent deliveries. One study[20] of 93 patients showed a recurrence rate of 1.25 percent. Another study of 747 patients showed a recurrence rate of 13.8 percent with a single permanent birth injury.[35] These studies, when interpreted in the context of the uncertainty of the effectiveness of interventions for suspected macrosomia, suggest that for most women with a history of shoulder dystocia, expectant management usually is the most appropriate option.

> *The three major strategies used to detect macrosomia— clinical risk factors, clinician estimation and ultrasonography —all have substantial limitations in accuracy.*

Prevention of Macrosomia

With the exception of optimal blood glucose management in pregnancies complicated by diabetes, little is known about the prevention of macrosomia. The association between maternal weight, weight gain during pregnancy and macrosomia has led to a proposal that the optimization of maternal weight before pregnancy and limitation of weight gain during pregnancy would be useful strategies.[36] The impact of maternal weight restrictions or outcomes is unclear.

Final Comment

Macrosomia remains a common complication of pregnancy; its prediction is imperfect, and there are no reliable interventions to improve outcome in uncomplicated pregnancies. Elective cesarean section is seldom a suitable alternative, and elective induction of labor appears to increase rather than decrease the cesarean section rate. Uncertainty surrounds the management of suspected fetal macrosomia in pregnant patients with diabetes concerning elective cesarean section or elective induction versus expectant management. For almost all macrosomic pregnancies including diabetic mothers, previous deliveries with shoulder dystocia, or women considering VBACs, expectant management with vigilance for evidence of fetopelvic disproportion will have optimal results.

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