

## Fetal macrosomia: 3 management dilemmas

This condition—and its most-feared complication—is impossible to predict with accuracy. What's more, there is no evidence supporting a specific intervention. So, what is the best approach? Dr. Resnik offers practical observations.

**E**very clinician would like to avoid vaginal delivery of a macrosomic infant and the attendant potential for shoulder dystocia and permanent brachial plexus injury. Unfortunately, research findings offer little specific guidance, and we continue to wrestle with these dilemmas:

- We cannot accurately identify which fetuses are macrosomic.
- We cannot accurately predict serious morbidity in these fetuses.

### KEY POINTS

- Women with borderline glucose tolerance, as well as those with normal glucose tolerance but mildly hyperinsulinemic fetuses, are at risk of delivering macrosomic infants.
- Maternal risk factors include obesity, excessive weight gain, and a history of delivering a macrosomic infant.
- The precision of ultrasound measurements declines as fetal weight increases.
- Estimating birth weight does not accurately predict the risk of brachial plexus injury.
- Neither routine cesarean delivery nor induction of labor is appropriate routine management for suspected macrosomia.

- Evidence does not support a policy of avoiding vaginal delivery for all macrosomic fetuses.

Patient care is thus based on estimating the likelihood of macrosomia and its complications, evaluating the risks and benefits of cesarean versus vaginal delivery in each woman, and being prepared for optimal labor management.

### Dilemma 1

#### How to identify a macrosomic fetus?

**Ultrasound measurements** are reasonably accurate for estimating the weights of smaller fetuses, but precision drops off as fetal weight increases. Studies using abdominal palpation and fundal height to estimate the risk of macrosomia report sensitivities of 10% to 43% and positive predictive values of 28% to 53%.<sup>1,2</sup>

One investigation with results typical of other studies found that when birth weight exceeded 4,500 g, only 50% of fetuses weighed within 10% of the ultrasound estimate.<sup>3</sup> Both clinical and ultrasound estimates either overestimate or underestimate birth weight to such a degree as to limit their clinical utility.

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**Maternal factors** increase the risk of macrosomia (TABLE 1).

▪ **Obese women** are more likely to have large infants than women with normal body mass.<sup>4</sup>

▪ **Excessive weight gain during pregnancy** has been shown to increase risk of accelerated fetal growth.

▪ **History** of macrosomia is another leading risk factor for a large birth-weight infant.

▪ **Maternal glucose intolerance** is an established risk factor: Fetal growth is accelerated in women with poorly controlled type 1 or 2 diabetes mellitus. Less widely known is the fact that women with borderline glucose tolerance, as well as those with normal glucose tolerance but mildly hyperinsulinemic fetuses, have an increased risk of delivering macrosomic infants.

A study comparing pregnant women with and without insulin-dependent diabetes found that neonatal macrosomia was best correlated with umbilical total insulin, free insulin, and C-peptide levels.<sup>5</sup>

**Fetal hyperinsulinemia.** Many other studies corroborate the notion that fetal hyperinsulinemia is a major influence on excessive fetal growth. For example, Hoegsberg et al<sup>6</sup> found that cord-blood plasma insulin levels in macrosomic newborns were twice those of normosomic infants (all neonates were of nondiabetic mothers). Another study comparing 207 macrosomic infants with 200 controls demonstrated that the macrosomic infants had higher levels of plasma insulin and insulin-like growth factor-1.<sup>7</sup>

## Dilemma 2

### How likely is serious morbidity?

**F**etal macrosomia poses a threat to mother and newborn alike. Once fetal birth weight exceeds the 90th percentile, maternal morbidity increases linearly. Not surprisingly, labor abnormalities are more common and, when birth weights exceed 4,500 g, cesarean delivery rates for laboring women double.<sup>8</sup> Vaginal and perineal lacerations and postpartum hemorrhage are also more common fol-

**TABLE 1**

### Risk factors for fetal macrosomia

MATERNAL
Excess weight
Excessive weight gain during pregnancy
History of macrosomia
Maternal glucose intolerance or borderline tolerance
Multiparity
Postterm gestation
FETAL
Hyperinsulinemia

**TABLE 2**

### Risk factors for shoulder dystocia

Macrosomia, particularly likely with maternal glucose intolerance
History of shoulder dystocia
Prolonged second stage of labor
Forceps or vacuum delivery

lowing vaginal delivery of a large fetus compared with a newborn of normal size.

**Predicting risk of shoulder dystocia.** What worries the obstetrician most, however, is the potential for shoulder dystocia and permanent brachial plexus injury. Nesbitt et al<sup>9</sup> examined nearly 176,000 vaginal births of infants weighing more than 3,500 g, all occurring in 1 year in California, and found risk factors for shoulder dystocia included maternal diabetes, increased birth weight, and assisted delivery (FIGURE). Some specifics:

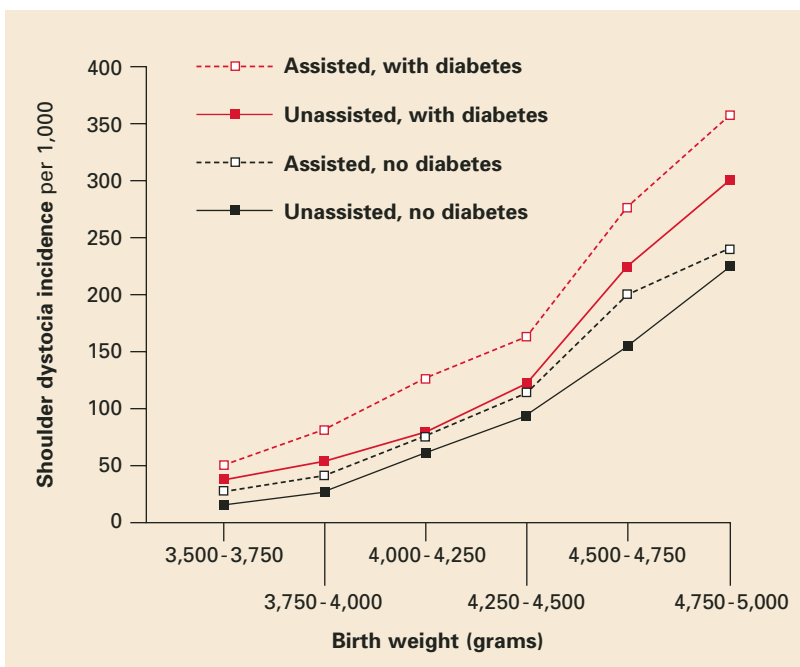
- In unassisted births not complicated by diabetes, the rate of shoulder dystocia was 5.2% for infants weighing 4,000 to 4,250 g; this rate rose to 9.1% for newborns weighing 4,250 to 4,500 g and jumped to 21.1% for those weighing 4,750 to 5,000 g.

- In diabetic mothers, the risk of shoulder dystocia in unassisted births was 8.4% at birth weights from 4,000 to 4,250 g, rising to 23.5% at 4,750 to 5,000 g.

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**FIGURE**

**Shoulder dystocia associated with increasing birth weight, maternal diabetes status, and method of vaginal delivery**



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investigators calculated that if cesarean delivery was performed in all instances in which birth weight was anticipated to exceed 4,500 g, from 155 to 588 cesareans would be required to prevent 1 permanent brachial plexus injury.

Similarly, Weeks et al<sup>13</sup> evaluated 504 women whose infants had birth weights greater than 4,200 g. An antenatal diagnosis of fetal macrosomia (in 102 women) increased the cesarean delivery rate (52% versus 30% for women whose fetuses were not expected to weigh more than 4,200 g)—but did not significantly reduce the incidence of shoulder dystocia or brachial plexus injury, which did not differ between the 2 groups.

- When delivery included use of forceps or vacuum, the incidence of shoulder dystocia rose by about 35% to 45% in nondiabetic mothers.

Of course, it must be noted that numerous cases of shoulder dystocia develop in fetuses weighing less than 4,000 g (TABLE 2).

**Predicting risk of brachial plexus injury.**

The risk of shoulder dystocia is high in macrosomic fetuses; still, permanent brachial plexus injury occurs in far fewer than 10% of infants with shoulder dystocia.<sup>10,11</sup> What's more, this injury may even develop in cesarean births. Thus, estimating birth weight does not accurately predict the risk of brachial plexus injury.

In a study of 63,761 consecutive deliveries, Bryant and colleagues<sup>12</sup> reported 80 cases (0.13%) of brachial plexus injury. As expected, diabetic women with newborns weighing more than 4,500 g had a higher risk of newborn injury. However,

**Dilemma 3**

**No evidence supports routine cesarean**

**S**tudies<sup>12,13</sup> suggest that routine cesarean delivery for macrosomia is not indicated. Supporting this impression is an analysis by Kolderup et al,<sup>14</sup> who examined the association between persistent injury and delivery method in macrosomic infants. The investigators found no support for an elective cesarean policy for macrosomia.

**Inducing labor** as soon as the term fetus is identified as macrosomic might seem a rational alternative. A trial<sup>15</sup> comparing induction with expectant management, however, does not support this assumption. Of 273 women whose infants had an estimated fetal weight of 4,000 to 4,500 g, the frequency of shoulder dystocia was identical in both groups, and no permanent brachial plexus injuries occurred.

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### What weight is macrosomic, and why does it matter? 4,000 g versus 4,500 g

**F**etal macrosomia is traditionally defined as a birth weight exceeding 4,000 g. From a statistical standpoint, this seems reasonable: Recent data from the National Center for Health Statistics shows that 90th-percentile birth weight at 40 weeks is 4,060 g.<sup>18</sup> But while maternal and fetal complications increase when the newborn weighs more than 4,000 g, morbidity rises sharply in infants of more than 4,500 g—particularly those born of diabetic mothers. For this reason, some observers consider 4,500 g a more appropriate criterion for macrosomia.

A May 2003 comparison of normal-weight (3,000 to 3,999 g) and macrosomic infants in the United States, using linked live-birth and infant-death cohort files from 1995 to 1997, supports the 4,500-g cutoff.<sup>19</sup> Labor and newborn complications were associated with birth weight of more than 4,000 g, but significant neonatal morbidity rose sharply when birth weight exceeded 4,500 g. When 4,500 g is used as the weight cutoff for a macrosomic fetus, overall frequency of such births is 1.5%.

#### Key recommendations

**Delivery route.** Trial of labor and vaginal delivery is generally the best approach for the macrosomic infant.<sup>14</sup> A practice bulletin on fetal macrosomia issued by the American College of Obstetricians and Gynecologists (ACOG) in 2000 still reflects the best evidence we have.<sup>16</sup> The bulletin recommends:

- When the estimated fetal weight is greater than 4,500 g, cesarean delivery is indicated with a prolonged second stage of labor or arrest of descent in the second stage.
- Consider cesarean delivery for estimated fetal weights greater than 5,000 g in nondiabetic women and 4,500 g in those with diabetes.
- Suspected fetal macrosomia is not a contraindication to attempted vaginal birth after a previous cesarean delivery.

**Shoulder dystocia.** Likewise, the ACOG practice bulletin on shoulder dystocia offers guidelines based on the best available information.<sup>17</sup> Among its main points:

- Shoulder dystocia cannot be predicted or prevented because accurate methods for doing so do not exist.
- Elective induction or cesarean delivery for all women with a suspected macrosomic

fetus is not appropriate.

- When evaluating the risks and benefits of cesarean and vaginal delivery in patients with a history of shoulder dystocia, the obstetrician should consider the estimated weight, gestational age, and maternal glycemic status.

**When birth weight exceeded 4,500 g, only 50% of fetuses weighed within 10% of the ultrasound estimate.**

#### Techniques for safe delivery

**T**he obstetrician must be prepared for the possibility of shoulder dystocia and be able to use appropriate techniques to deliver the fetus safely.

- Avoid excessive force, as most injuries occur during downward traction of the head to deliver the anterior shoulder.
- As an initial approach, I recommend the McRoberts maneuver and/or suprapubic pressure.
- When the anterior shoulder is seriously affected, move expediently to deliver the posterior arm. ■

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