Improvement Of Methods for the Prevention of Obstetric Complications in Women with Fetus Macrosomia

Yuldasheva Dilchekhra Yusufkhanovna
Tashkent Medical Academy
Doctor of medical sciences, associate professor
Scientific adviser MD

Uktamova Gavkhar Tolibovna
Tashkent Medical Academy
Department of Obstetrics and Gynecology №2 undergraduate 2nd year

ABSTRACT

Fetal macrosomia is associated with significant maternal and neonatal morbidity. In the long term, infants who are large for gestational age are more likely than other infants to be obese in childhood, adolescence and early adulthood, and are inherently at higher risk of cardiovascular and metabolic complications in adulthood. With over one billion adults in the world now overweight and more than 600 million clinically obese, preventing the vicious cycle effect of fetal macrosomia and childhood obesity is an increasingly pertinent issue. Fetal growth is determined by a complex interplay of various genetic and environmental influences. Consequently the prediction of pregnancies at risk of pathological overgrowth is difficult. Many risk factors for fetal macrosomia, such as maternal obesity and advanced maternal age, are also conversely associated with intrauterine growth restriction. Sonographic detection of fetal macrosomia is notoriously fraught with difficulties, with dozens of formulas for estimated fetal weight proposed but few with sufficient sensitivity to alter clinical practice.

Keywords: macrosomia, childhood, significant maternal, neonatal morbidity, fetus macrosomia.

Introduction

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. 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.

The most feared complication secondary to shoulder dystocia is asphyxia, which is rare. Elective cesarean section for suspected macrosomia has been proposed as a way to spare the parturient an unproductive labor and to prevent birth trauma. Unfortunately, the difficulties in predicting macrosomia and the favorable outcome for most women who undergo a trial of labor 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. 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. Thus, elective cesarean section for suspected macrosomia alone is

difficult to support. Your healthcare provider may order an ultrasound to check the fetal weight and amount of amniotic fluid. An ultrasound is a diagnostic procedure that transmits high-frequency sound waves through body tissues. These waves transform into video or photographic images.

Ultrasound can only estimate a fetus's weight within about 10%. For instance, if the ultrasound estimates your baby is 9 pounds, that's the "best guess." But your baby could actually weigh somewhere between 8 pounds and 10 pounds.

As ultrasound isn't precise and can't predict shoulder dystocia, your healthcare provider will combine information from your ultrasound with your pregnancy history and physical exam to determine the safest timing and route of delivery.

To determine if you need an ultrasound exam, your healthcare provider will:

- Measure your fundal height (the distance from the top of your uterus to your pubic bone).
- Feel your belly. Your healthcare provider may press your abdomen in certain areas to judge the size of the fetus.

If your tests indicate the fetus is big, your prenatal care provider may suggest further testing to monitor fetal health. This could involve a biophysical profile or a nonstress test.

Given that the fetus continues to gain about 230 g (8.1 oz) per week after the 37th week, elective induction of labor before or near term has been suggested to prevent macrosomia and its complications. However, observational studies suggest that induction actually increases the cesarean section rate without favorably altering perinatal outcomes.

One study 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 metaanalysis[3] concluded that induction did not decrease the rate of cesarean section, instrumental delivery or perinatal morbidity. The medical literature confirms that prediction of fetal macrosomia is difficult. Ultrasound estimation of fetal weight adds little additional useful information.

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.

Most studies now address diabetic and non-diabetic fetal macrosomia separately 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. Various authors have made different recommendations for treatment strategies, ranging from expectant management, to elective induction before the due date, to elective cesarean section for estimated fetal weights greater than 4,000 g,[34] 4,250 g (9 lb, 6 oz), or 4,500 g.

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. 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.

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.

Management of fetal macrosomia has long been an obstetric challenge, and is becoming an increasingly important problem because of its rising incidence and the associated risks to the mother and infant.

Fetal macrosomia has been defined in many different ways, including birth weight of more than 3,600 g, 3,800 g, 4,000 g, or 4,500 g, or more than the 90th percentile for gestational age. By far, 4,000 g is the commonest birth weight cutoff used to define macrosomia. Using this criterion, the incidence in Europe and North America has been reported to be 10%–20%. Recent evidence suggests that the incidence of macrosomia is increasing. A study from Denmark indicated an increase in the frequency of macrosomia from 16.7% in 1990 to 20.0% in 1999. The figures from North America show that the proportion of neonates with a birth weight over the 90th percentile increased by 5%–9% in the USA and reached 24% in Canada between 1985 and 1988.2 Such a trend was attributed to the increase in maternal anthropometry, reduced cigarette smoking, and changes in sociodemographic factors.

The incidence of macrosomia varies according to ethnicity, and is lower in the Chinese population. Epidemiologic studies have shown that Chinese and South Asian infants are smaller for their gestational age. This difference in birth weight distribution is likely due to the genetic differences and anthropometric discrepancies between populations. From a recent study, the incidence of macrosomia in Chinese population was reported to be only 3.4%.

A number of risk factors associated with macrosomia have been identified, and include maternal body mass index, weight gain, advanced maternal age, multiparity, diabetes, and gestational age >41 weeks. However, it is well known that prediction based on clinical risk factors alone has a very low positive predictive value. Screening for macrosomia by means of maternal factors and first trimester nuchal translucency and biochemical markers (free beta-human chorionic gonadotropin and pregnancy associated plasma protein A) has also been performed, but the detection rate is poor.

Diagnosis and management of macrosomia is a fundamental obstetric problem because it can lead to significant maternal and perinatal morbidity and mortality. These maternal and neonatal complications are reviewed and discussed below.

Maternal complications

Prolonged labor

The duration of labor is more prolonged for women carrying macrosomic babies, and the risk is increased with increasing birth weight. Both the first and second stages of labor are longer than for normosomic pregnancies, and arrest of descent in the second stage of labor can occur secondary to macrosomia. In a study of macrosomic infants weighing more than 4,500 g, the risk of shoulder dystocia is higher

when the second stage is longer than 2 hours, with a crude odds ratio (OR) of 1.17 (95% confidence interval [CI] 0.82–1.66. As expected, primigravidae have a higher incidence of prolonged labor compared with multiparous women when delivering a macrosomic baby weighing more than 4,500 g. Prolonged labor associated with macrosomia is, in turn, a contributor to other maternal complications, including operative delivery and postpartum hemorrhage.

Operative delivery

The mode of delivery significantly shifts with increasing macrosomia. The incidences of vaginal operative delivery and cesarean section are higher for macrosomic infants.9,11–13 The overall rate of cesarean section in babies with a birth weight >4,000 g varies widely between different studies and ranges from 14% to 44%.13–15 The risk of cesarean section escalates with increasing birth weight, and the proportion of vaginal instrumental delivery decreases with increasing birth weight. The increased risk of cesarean section is a consistent finding in different countries and in different ethnic groups, and the odds are particularly high for primiparous mothers. In macrosomic births, the risk of shoulder dystocia is associated with the need for vaginal instrumental delivery.

Postpartum hemorrhage

Postpartum hemorrhage occurs more commonly following delivery of macrosomic babies, and again, the risk increases with increasing birth weight. This association could be due to a direct consequence of a big baby or as a result of prolonged labor, labor induction, operative vaginal delivery, uterine atony, and perineal tears.

Perineal trauma

The risk of perineal tears increases 1.5-fold to 2-fold in cases of macrosomia. Some investigators suggest that the incidence of major perineal tear rises significantly with greater birth weight, but this has been refuted. The risk appears to be higher in Asian, Filipino, and Indian women than in Caucasian women. Such ethnic differences may be due to differences in body type and discrepancies in perineal anatomy. Major perineal trauma, including third and fourth degree tear, can cause significant long-term anal incontinence, which can have a negative impact on the woman's quality of life.

Fetal and neonatal complications

Although the literature frequently and consistently demonstrates an increase in perinatal morbidity and mortality with increasing birth weight, the overall incidence of neonatal complications remains low.

Shoulder dystocia

The incidence of shoulder dystocia ranges between 0.58% and 0.70% in Caucasians. It also appears to vary with ethnicity, with an incidence of only 0.3% in the Chinese population. It has been reported consistently in the literature that the risk of shoulder dystocia escalates with increasing birth weight. However, the incidence of shoulder dystocia in different birth weight groups varies widely between studies. In a recent study in Norway, the incidence was approximately 1%, 2%, 4%, and 6% for birth weights of 4,000–4,199 g, 4,200–4,399 g, 4,400–4,599 g, and ≥4,600 g, respectively, whereas another study reported an incidence of over 20% when the birth weight was above 4,500 g. Nevertheless, despite such an association, half or even more of the births complicated by shoulder dystocia occur in babies with a birth weight less than 4,000 g.

Birth trauma

The incidence of birth trauma, namely brachial plexus and skeletal injuries, increases with rising birth weight.

Brachial plexus injury

Congenital brachial plexus injury (BPI) is defined as flaccid paresis of an upper extremity due to traumatic stretching of the brachial plexus at birth, with passive greater than active range of motion. The incidence varies between countries and is approximately 1.5 cases per 1,000 live births. Most cases are transient, but permanent damage can occur in 5% of cases, and is often a cause of litigation.

BPI is characteristically related to shoulder dystocia; however, such complications can occur following normal spontaneous vaginal delivery and cesarean section. Both excessive exogenous traction and strong endogenous pushing forces contribute to BPI. The second most important risk factor for BPI is heavy birth weight, which is associated with a 14-fold increase in risk. In one study, the prevalence of BPI progressively increased with infant weight, occurring in only 3% of neonates in the 4,500–5,000 g group and 6.7% in the >5,000 g group. Moreover, the risk is further increased when macrosomia and gestational diabetes coexist, with an adjusted OR of 42 (95% CI 4.05–433.64). It has also been reported that BPI among infants weighing ≥4,000 g is more likely to be severe and persistent than in the normosomic group. Because the two main risk factors for congenital BPI, ie, shoulder dystocia and macrosomia, are not easily predictable, it is difficult to foresee and prevent its occurrence.

Skeletal injuries

Similar to BPI, skeletal injuries commonly occur in the presence of shoulder dystocia and are associated with large infants. Fracture of the clavicle is five times more common in macrosomic infants, and occurs more often in vaginal delivery than in cesarean section. Humeral fractures are less frequent, but also occur in big babies. On the other hand, Gregory et al analyzed neonatal complications following shoulder dystocia and reported that, unlike brachial plexus injury, the risk of having skeletal injuries in macrosomic infants is not higher than in those with normal birth weight. Clavicular fractures are usually managed conservatively and the outcome is most often benign, with complete recovery and no associated neurologic complications. Humeral fractures are managed mainly by closed reduction followed by splinting or traction techniques, and usually do not have long-term sequelae.

Chorioamnionitis

Macrosomia is related to chorioamnionitis. The risk of chorioamnionitis slowly and steadily increases as birth weight increases, and the ORs are 1.94, 2.17, and 2.42 for birth weight groups of 4,000–4,499 g, 4,500–4,999 g, and ≥5,000 g, respectively.

Aspiration of meconium

Some studies show that aspiration of meconium is a risk associated with macrosomia. Again, the risk increases with rising birth weight. The ORs are 1.28, 1.65, and 2.61 for babies with birth weights of 4,000–4,499 g, 4,500–4,999 g, and >5,000 g, respectively. However, other investigators reported that the association was not statistically significant.

Perinatal asphyxia

The risk of macrosomic neonates suffering from perinatal asphyxia increases 2–4-fold compared with that in normosomic infants. The odds of perinatal asphyxia increase considerably with rising birth weight; in one study, the OR was 2.3 if birth weight was 4,500–4,999 g and increased further to 10.5 if birth weight was >5,000 g.

Poor Apgar scores

Macrosomia has been reported to be associated with poorer Apgar scores. The greater the birth weight, the higher the risk of low Apgar scores. Boulet et al showed the OR for a 5-minute Apgar score ≤6 was 1.65 and 3.49 for infants with birth weight 4,500–4,999 g and >5,000 g, respectively, whereas that for a 5-minute Apgar score ≤3 was even higher, with corresponding ORs of 2.01 and 5.20. Furthermore, the risk of a low Apgar score is eight times higher in macrosomic babies when the delivery is complicated by shoulder dystocia. In contrast, Weissmann-Brenner et al could not demonstrate any statistically significant difference in low Apgar scores between normal and big babies.

Neonatal hypoglycemia

The risk of neonatal hypoglycemia is higher in heavy babies, and the risk increases with increasing birth weight. Neonates with a birth weight >4,500 g had a seven-fold higher risk of having neonatal hypoglycemia,

compared with those appropriate for gestation age. This risk further increases in the presence of gestational diabetes. Infants with a birth weight ≥4,000 g delivered by nondiabetic mothers had a 2.4% risk of neonatal hypoglycemia, whereas those whose mothers had gestational diabetes had an incidence of 5.3%.

Conclusion

In conclusion, the macrosomic infant poses significant challenges to obstetric care and can have potential implications for both mother and baby long after labour and delivery. Antenatal detection of the macrosomic fetus is inadequate but advances are being made, both in improvements to estimated fetal weight formulas and in first-trimester prediction. Maternal weight, gestational weight gain and glucose homeostasis are targets for primary prevention of fetal overgrowth and its implications.

References

1. D.J. Jenkins *et al.* Glycemic index of foods: a physiological basis for carbohydrate exchange. Am J Clin Nutr (2021)
2. C.J. Glueck *et al.* Metformin therapy throughout pregnancy reduces the development of gestational diabetes in women with polycystic ovary syndrome
3. Fertil Steril (2022) J.M. Walsh *et al.* Prevalence of physical activity among healthy pregnant women in Ireland
4. Int J Gynaecol Obstet (2021) K.R. Goetzinger *et al.* The efficiency of first-trimester serum analytes and maternal characteristics in predicting fetal growth disorders
5. Am J Obstet Gynecol (2019) F.F. Lauszus *et al.* Macrosomia associated with maternal serum insulin-like growth factor-I and -II in diabetic pregnancy
6. Obstet Gynecol (2021) P.M. Catalano *et al.* Increased fetal adiposity: a very sensitive marker of abnormal in utero development
7. Am J Obstet Gynecol (2023) M.F. Higgins *et al.* Fetal anterior abdominal wall thickness in diabetic pregnancy Eur J Obstet Gynecol Reprod Biol (2023)
8. S.P. Chauhan *et al.* Antepartum detection of macrosomic fetus: clinical versus sonographic, including soft-tissue measurements