Anticipating and properly preparing for possible shoulder dystocia is necessary with a mother exhibiting numerous risk factors. Pre natal risk factors for shoulder dystocia include:

1. Glucose intolerance, gestational diabetes;

2. Excess weight gain;

3. Macrosomia;

4. Short stature;

5. Abnormal pelvic shape;

6. Abnormal pelvic size;

7. Pregnancy that goes past the due date;

8. Maternal obesity; and

9. Prior difficult delivery.

10. Prior Delivery with Shoulder Dystocia.

Macrosomia and gestational diabetes are two risk factors that are most strongly associated with shoulder dystocia. Babies born to mothers who develop gestational diabetes are at greater risk of shoulder dystocia than are babies with similar birth weights born to women who do not develop gestational diabetes. The cause of this is believed to be the proliferation of insulin sensitive tissue that causes a relative disproportion in the size of the fetal chest and shoulders relative to the fetal head. According to the American College of Obstetricians and Gynecologists (ACOG), when fetal weight is more than 3,500 grams, the risk of shoulder dystocia is two to three times higher in diabetic women than in non-diabetic women.[1] The same ACOG Bulletin also states that consideration should be given to cesarean delivery when clinical estimated fetal weight exceeds 4,500 grams.

In the presence of macrosomia, the following is expected:

1. An 8-20% incidence of shoulder dystocia when fetal weight is greater than 4,500 grams;

2. A 15-30% incidence of brachial plexus injury when shoulder dystocia occurs in a macrosomic infant.[2]

When a pregnant woman begins prenatal care, a comprehensive evaluation should be undertaken by the obstetrician to determine the health status of the mother and fetus. The obstetrician should also determine the gestational age of the fetus, evaluate past high-risk pregnancies or traumatic deliveries, and initiate a plan for continuing obstetrical care, taking into consideration all risk factors.

During subsequent prenatal visits, the following factors should be evaluated:

1.   Fetal heart rate;

2.   Fundal height;

3.   Maternal blood pressure;

4.   Maternal weight;

5.   Fetal activity;

6.   Fetal size – actual and rate of change;

7.   Urine – protein/sugar;

8.   Vaginal exam – late in pregnancy for presenting part, station, clinical pelvimetry, state of cervix; and

9.   Presence of abnormal symptoms (i.e., headache, altered vision, abdominal pain, bleeding, vaginal fluids, dysuria).

In addition, periodic testing should be conducted during the prenatal period, including blood tests for glucose intolerance screening. At least one ultrasound is also usually performed, to verify gestational age, and to screen for abnormalities. Since pregnancies are more subject to diabetes, both with subsequent pregnancies and within a pregnancy as it progresses, a diabetes screening test conducted early in the pregnancy could appear normal, but may not rule out gestational diabetes that occurs later in the pregnancy. Therefore, a patient with risk factors for gestational diabetes may require more than one screening test. In cases involving a prior macrosomic baby and a prior shoulder dystocia a series of ultrasounds should be performed to follow fetal weight and size.

MACROSOMIA

As noted above, macrosomia (a large baby) is a risk factor for shoulder dystocia. Although many, but not all, obstetricians consider 4000 grams macrosomic, the general consensus places macrosomic fetuses at 4500 grams. Although it is known that a pregnancy complicated by diabetes mellitus is at increased risk for fetal macrosomia, the exact degree of maternal glucose intolerance associated with this complication is not well defined. Even minor abnormalities in carbohydrate metabolism are a risk factor for delivering a macrosomic infant. Fetal macrosomia may affect up to 40% of infants whose mothers have gestational diabetes.[3]

According to ACOG Technical Bulletin No. 200, screening for gestational diabetes mellitus should be performed between 24 and 28 weeks gestation as a 1-hour glucose tolerance test (1-hour blood sugar drawn after a 50 gm oral glucose load). A normal blood sugar or negative glucola screen in the first or second trimester can become abnormal as the pregnancy advances. Therefore, even if the screening done at 24-28 weeks is normal,

additional testing should be done if the physician has a suspicion that the mother may develop gestational diabetes.

Prenatal risk factors for macrosomia include:

1. Maternal diabetes;

2. Obesity;

3. Increased maternal birth weight;

4. Multiparity;

5. Prolonged gestation;

6. Male fetus;

7. Previous delivery of a macrosomic infant; and

8. Race.

Of these risk factors, maternal diabetes, obesity or both are the most important of known risk factors for the development of fetal macrosomia.

The recognition of risk factors for macrosomia, combined with careful serial physical measurements of fundal height, serial estimates of fetal weight by palpation and serial ultrasound determinations will greatly simplify the diagnosis of macrosomia. The recognition of risk factors for macrosomia dictates early ultrasound dating of the pregnancy and serial ultrasound examination in the second and third trimesters. Fetal abdominal measurements are probably the most reliable sonographic parameter for detection of macrosomia in utero. When both estimated fetal weight and abdominal circumference exceed the 90th percentile, macrosomia occurs in more than 88% of cases. Furthermore, the positive predictive value for detection of macrosomia exceeds 90% when abdominal circumference or estimated fetal weight is above the 95th percentile.[4] Careful ultrasound monitoring of fetuses with suspected or documented macrosomia will decrease much of the morbidity and mortality associated with these conditions.

Macrosomic fetuses are associated with labor abnormalities for the simple reason that the large baby does not easily fit through the maternal pelvis. Labor abnormalities can include a failure to properly dilate, and/or a failure to descend. Labor should be augmented (such as with Pitocin or oxytocin) only after both the internal pelvis and fetal presentation have been assessed. According to ACOG Technical Bulletin, No. 218 (December 1995), oxytocin should be used only when the patient is progressing slowly through the latent phase or there is a protraction/arrest of labor, when uterine contractions are hypotonic and when there are no fetal or maternal contraindications.

Macrosomic fetuses that develop shoulder dystocia have a higher incidence of labor abnormalities and operative deliveries than non-macrosomic fetuses.[5] Since macrosomic fetuses are associated with shoulder dystocia, it is important for the obstetrician to

appreciate any risk factors for macrosomia and to properly diagnose and treat any glucose intolerance so as to diminish the fetus' tendency to gain excessive weight.

DELIVERY WITH SHOULDER DYSTOCIA

Shoulder dystocia is an obstetric emergency. Anticipation and prevention are the best treatment for shoulder dystocia, but when impaction of the anterior shoulder occurs, the treating physician should employ the accepted maneuvers to alleviate the shoulder dystocia and avoid further pulling or traction on the infant's head, which will increase the impaction and cause injury to the child.

During the usual course of descent through the birth canal, the fetal head undergoes flexion so the chin is on the chest. At this time, the smallest diameter of the fetal head passes through the pelvis. As the head enters the pelvis, it undergoes internal rotation. The shoulders are only turned 45° so they are in the oblique diameter and the neck is twisted. Birth of the head occurs by extension. The nape of the neck pivots under the symphysis pubis while the vertex, forehead, face, and chin are born over the perineum. Once the head is born, it undergoes restitution and turns back 45° to the left and resumes the normal relationship with the shoulders. The shoulders now rotate 45° to the left, causing external rotation of the head. This brings the widest diameter of the shoulders into the anteroposterior diameter of the pelvis. With the next contraction, the anterior shoulder should emerge under the symphysis pubis and the posterior shoulder is then born over the perineum.

When shoulder dystocia occurs it is evident by recoil of the fetal head. The head is drawn back tightly against the perineum and this is the first indication to the obstetrician that shoulder dystocia has occurred. This occurrence is usually referred to as the "turtle sign."

When delivery of the posterior shoulder does not occur spontaneously following external rotation of the head, the obstetrician should have no difficulty diagnosing shoulder dystocia. The next concern is how much time can elapse before brain damage occurs:

> "Over 10 years ago Wood, etc. al. describes serial pH
> determinations between delivery of the head and the trunk. The pH
> declined at a ratio of 0.04U per minute. Thus, there is adequate
> time to proceed in a well-organized manner. Delays greater than 7-
> 10 minutes may be associated with low Apgar scores and perinatal
> asphyxia."[6]

Since the occurrence of shoulder dystocia only provides the obstetrician with about 7-10 minutes before asphyxia develops, the obstetrician and other delivery attendants must be well versed in the optimal methods of management. Some experts advocate "dystocia drills" so all members of the obstetrical team will be familiar with the guidelines for obstetrical management.

Based on ACOG recommendations, (Bulletin No. 152, February 1991), the following steps for management of shoulder dystocia are indicated:

1. Additional help is summoned including anesthesia and pediatrics;

2. A gentle attempt at traction may be indicated when assisted by maternal expulsive efforts with the next contraction;

3. Suprapubic pressure, not fundal pressure is applied;

4. A generous episiotomy is used to increase space for manipulation;

5. McRoberts' position is utilized to change pelvic configuration;

6. Rotation of the anterior shoulder with suprapubic pressure and/or anterior scapular pressure is performed;

7. Wood screw maneuver to rotate the fetus' position;

8. Posterior arm extraction may be indicated;

9. Clavicular fracture to decrease shoulder diameter may be used; and

10. Cephalic replacement and cesarean delivery used as a last resort.

A gentle downward pull is the standard maneuver for delivery of the anterior shoulder in an otherwise normal vaginal delivery. Therefore, it is understandable why this maneuver is repeated when shoulder dystocia is diagnosed. However, once the diagnosis of shoulder dystocia is made, physicians are instructed that they must not touch the baby's head again until after the shoulder dystocia is released so as not to cause injury to the brachial plexus nerves.

The cutting of a deep medial lateral episiotomy may also aid in alleviating shoulder dystocia. An episiotomy increases space for manipulation of the fetus as well as decreases interference from the soft tissues of the lower birth canal. An ample episiotomy will also reduce the possibility of en extension via a tear or laceration, which could be more difficult to repair and take longer to heal.

Suprapubic pressure is used to release the anterior shoulder. This adducts the anterior shoulder and forces it into an oblique diameter of the pelvis. Suprapubic pressure is only successful with milder forms of shoulder dystocia.

Many obstetric authors advocate the use of the McRobert's maneuver as the first method of treatment for shoulder dystocia, as it is usually successful and may eliminate the need for further maneuvers. The McRobert's consists of sharply flexing the maternal legs on the maternal abdomen. This requires the help of two assistants, one on each side of the mother, to lift her legs out of the stirrups, and flex them on either side of the abdomen. The effects of the McRoberts' maneuver include:

1. Anterior shoulder is elevated;

2. Fetal spine is flexed;

3. Posterior shoulder is pushed over the sacrum;

4. Maternal lordosis is straightened;

5.   Sacral promontory is removed as point of obstruction;

6.   Weight bearing force is removed from sacrum;

7.   Inlet is open to its maximum;

8.   Inlet is brought perpendicular to the maximum expulsive force.

When the McRobert's maneuver is not sufficient to release the impacted shoulder, the Woods corkscrew, or reverse corkscrew maneuver, may be attempted. Two fingers of the right hand are placed on the anterior surface of the posterior shoulder. Gentle downward pressure should be placed on the clavicle/scapula to produce clockwise (counter clockwise) rotation. By rotating the posterior shoulder in a corkscrew fashion, the anterior shoulder is released from behind the symphysis pubis.

Delivery of the posterior shoulder is another maneuver to treat shoulder dystocia. It consists of the obstetrician reaching in, grasping the fetus' lower arm, and carefully sweeping the posterior arm across the chest followed by delivery of that arm. The shoulder girdle is then rotated into one of the oblique diameters of the pelvis with subsequent delivery of the anterior shoulder.

BRACHIAL PLEXUS INJURY

The brachial plexus is a group of nerves including cervical roots 5 through 8 and thoracic roots 1 and 2. Injuries to the brachial plexus occur when there is strong lateral traction on the fetal head that causes stretching, tearing, or avulsion of nerve roots. The mildest form of a brachial plexus injury is a stretching of the nerves, resulting in hemorrhage into or edema of the nerve sheath and compression of the nerve fibers. In some instances, there may be a rupture of the sheath, accompanied by bleeding into the nerve trunk, and associated separation of the nerve fibers. Less often, there is an actual tear of the nerves or avulsion of the nerve roots from the spinal cord. After injury to the brachial plexus, complete recovery occurs in the majority of cases, as the injuries are not severe enough to cause permanent damage. Progressive recovery may ensue over many months, but there is unlikely to be further improvement after 24 months.

Two types of brachial plexus injuries are recognized. Erb's palsy involves the C5-C7 nerve roots. The weakness can be recognized soon after delivery. The shoulder is adducted and internally rotated, the elbow extended, the forearm pronated, and the wrist flexed. This position results from paralysis of the deltoid, supraspinatus, infraspinatus, biceps and brachioradialis muscles. The Moro reflex is absent or diminished, but the grasp reflex is intact. This injury is most common and occurs in 80% of infants.[7]

Klumpke's palsy is relatively uncommon (2-3% of injuries) and involves the nerve roots C8-T1. This lesion involves paralysis of the intrinsic muscles of the hand, causing weakness of the flexors of the wrist and fingers. The grasp reflex is absent. More commonly, the entire brachial plexus is damaged and the arm is completely paralyzed.

The limb is flaccid, the Moro and grasp reflexes are absent, and sensory loss occurs over a portion of the extremity.

Treatment for a brachial plexus injury includes initial stabilization of the arm to allow for healing, and then aggressive physical therapy to improve muscle strength and decrease contractures as healing and nerve regeneration occurs. On occasion, surgery is recommended to improve nerve function. When there is a complete avulsion, prognosis for a full recovery is not favorable. Almost all children are left with hypoplasia of the limb and deficits with fine motor skills, usually more marked in the proximal musculature. Contractures at the shoulder and elbow are common, and many also have sensory deficit.