Shoulder Dystocia and Brachial Plexus Injury in the Newborn – 4.0 CE Hours

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Course Objectives

1. Define shoulder dystocia.

2. Describe the causes of shoulder dystocia.

3. Recite the incidence of shoulder dystocia.

4. Identify risk factors associated with shoulder dystocia.

5. Recognize the various ways to manage shoulder dystocia.

6. Define obstetric brachial plexus palsy (OBPP).

7. Identify the 3 trunks involved in brachial plexus.

8. Discover the risk factors associated with obstetric brachial plexus palsy.

9. Name and describe the four types of brachial plexus injuries.

10. List the signs and symptoms of OBPP.

11. Discuss possible tests used to diagnose OBPP.

12. Explore the different types of palsies associated with OBPP.

13. Review the acute management of OBPP.

14. Cite the rate of nerve regeneration for the shoulder, elbow and hand.

15. Indicate additional treatment options for infants with OBPP after discharge.

16. Review the indications for nerve surgery.

17. Describe the average recovery process in OBPP.

Definition of Shoulder Dystocia

The inability to birth the shoulders of the infant whether it is anterior, posterior, or both, after the head has been delivered.

Cause of Shoulder Dystocia

In normal vaginal deliveries the vertex part of the baby's head comes out first. The soft, mobile bones of the fetal head can move and overlap. This helps the baby's head to fit into and through the maternal pelvis.

The baby's shoulders are also flexible and usually follow the delivery of the baby's head quickly and easily. The fetal shoulders usually descend into the maternal pelvis at an angle oblique to the pelvis' anterior-posterior dimension. This position gives the shoulders the most room during delivery. However, if the shoulders line up in a straight front-to-back position, there often times won't be enough room for them to squeeze through. The back of the mother's pubic bone is where the baby's anterior shoulder can get caught. If this happens, the shoulders and the rest of the body cannot be delivered. This is called a shoulder dystocia.

A less common way a shoulder dystocia can occur is when the baby's posterior shoulder gets caught on its mother's sacrum. The sacrum is far less likely to prevent the descent of the baby's posterior shoulder.

It is more likely that a shoulder dystocia will occur if the

infant’s head, shoulder, and chest are large in comparison to the shape and size of the maternal pelvis. In most deliveries, the fetal head has the largest dimensions. When the fetal head is delivered through the maternal pelvis without any problems, the rest of the infant’s body is usually delivered without any problems. When the dimensions of the fetal shoulders or chest are as large as or larger than its head, there is a high chance that a shoulder dystocia will occur. Shoulder dystocia is seen more often in large babies and in babies of diabetic mothers because of the larger ratios of shoulder circumference to head circumference. Babies of diabetic mothers also have larger arm circumference, larger triceps, and a higher percentage of body fat. The larger babies are the ones more likely to be involved in a shoulder dystocia during delivery.

Incidence of Shoulder Dystocia

Shoulder dystocia occurs in 1% of all deliveries.

Risk Factors

- Macrosomia: infant weighing > 4500 grams (9 pounds 1 ounce)
- Maternal obesity
- Prolonged second stage of labor
- 42+ weeks of gestation at delivery

Management of Shoulder Dystocia- Preventing Injury

- **Suprapubic Pressure**: Apply pressure to the Suprapubic area to assist the infant to adduct the arms closer to the body to release the trapped shoulder
- **Gaskin Position**: Mother is on her hands and knees to open the pelvic area. Used when Suprapubic pressure does not work
- **Rubin Maneuver**: Place a hand on the baby’s scapula and rotate the baby’s shoulders into oblique position

- **Woods Screw Maneuver**: In addition to Rubin's maneuver, use the other hand in front of the baby's arm to assist in rotation- see illustration below.
- **Reverse Woods Screw Maneuver**: Rotate the baby in the opposite direction-see illustration below.

- **McRobert's Maneuver**: The first person pushes the mother's knee back and down to open the pelvis while applying suprapubic pressure (pressing down on the shoulder that is stuck on the public bone), and the second person rotates the baby's head).

- **Delivery of the posterior arm**: A medical professional reaches in to the posterior arm/hand, pulls the arm across the chest, over the head and outside the vagina. Often leads to further success in rotation.
- **Episiotomy**: A surgical cut in the perineum (the muscular area between the vagina and the anus) made just before delivery to enlarge your vaginal opening.
- **Zavanelli Maneuver**: Pushing the infant's head back in and performing an immediate C-Section.

Obstetric Brachial Plexus Palsy (OBPP)

Brachial plexus palsy occurs as a result of shoulder trauma, tumors, or inflammation. Brachial plexus palsy can be classified as either traumatic or obstetric.

OBPP injury: is a mechanical injury involving shoulder dystocia during difficult childbirth. The brachial plexus is damaged during the delivery.

Traumatic Brachial Plexus Palsy injury: can result from injuries to the head and/or shoulder. Examples include: sports

injuries, car, motorcycle, or all-terrain-vehicle accidents, direct violence or gunshot wounds to the neck or shoulder, by violent traction on the arm, or by efforts at reducing a dislocation of the shoulder joint.

Brachial Plexus

The brachial plexus is a network of nerves that provides movement and feeling to the shoulder, arm and hand. The nerves supporting the arm exit the spinal column high in the neck; those that support the hand and fingers exit lower in the neck. This nerve complex is composed of four cervical nerve roots (C5-C8) and the first thoracic nerve root (T1). These roots combine to form 3 trunks:

- Upper trunk: C5 (shoulder) and C6 (elbow)
- Middle trunk: C7 (elbow)
- Lower trunk: C8-T1 (forearm and hand)

Occurrence

- Obstetric brachial plexus palsy (OBPP) occurs in 4-15% of shoulder dystocia cases.
- OBPP occurs in 1.6-5.1 per 1,000 live births

Risk Factors Associated with OBPP

- Shoulder dystocia
- Maternal diabetes
- Large gestational size
- Difficult delivery needing external assistance (vacuum, forceps)
- Prolonged labor
- Fetal distress may contribute to hypotonia and provide less protection of the plexus
- Breech presentation at birth
- Previous child with an injury

Types of Brachial Plexus Injuries

- **Avulsion:** Most severe; the nerve is torn away from its attachment at the spinal cord.
- **Rupture:** The nerve is torn, but not at the spinal cord attachment.
- **Neuroma:** Scar tissue has grown around the injury site, putting pressure on the injured nerve and preventing the nerve from sending signals to the muscles.
- **Neurapraxia:** The nerve has been stretched and damaged, but not torn.

Signs and Symptoms

After delivery, the infant will present with a limp or paralyzed arm, lack of muscle control in the arm, hand, or wrist, and lack of feeling or sensation in the arm or hand. The cardinal signs of brachial plexus injury then are weakness in the arm, diminished reflexes, and corresponding sensory deficits.

Diagnosing OBPP

An initial physical examination of the infant is done noting signs and symptoms of OBPP. Radiographic tests are done (x-ray or MRI) to identify fractures of the arm or clavicle. Electromyelogram (EMG) testing is done to evaluate the electrical activity of the nerves and identify the site of injury. The EMG can be done within a week of delivery. If there is no nerve conduction 72 hours after birth, it is most likely the infant has an avulsion injury. A myelogram, a radiographic examination of the spinal cord, can be done to look for spinal cord nerve injuries.

Types of Palsies Associated with OBPP Injuries

Group I-Erb's Palsy– The arm hangs by the side and is rotated medially; the forearm is extended and pronated. The arm cannot be raised from the side, flexed at the elbow, or the forearm supinated.

- Named after the physician who described it in 1874
- C5, C6 (Upper roots)
- Initial absence of shoulder abduction and external rotation, elbow flexion and forearm supination. Wrist and digital flexion and extension are intact
- Spontaneous recovery cited as high as 90%

Group II

- Involves C7 with the additional absence of wrist and digital extension along with C5-C6 impairment
- Waiter's tip posture of hand and wrist
- Prognosis is poorer when C5-C6-C7 involvement

Group III: Global OBPP

- Flail extremity without a Horner's syndrome (See Group IV)
- C5-T1 Involvement

Group IV: Horner's Syndrome

- Severe avulsion of lower brachial plexus (T1)
- Eyelid droop
- May have associated phrenic nerve palsy with elevated hemidiaphragm

Klumpke's Palsy– a form of paralysis involving the muscles of

the forearm and hand. The hand has lost function of the ulnar verve and the intrinsic muscles of the hand it supplies. The hand looks like claw like.

- Rare injury of the lower brachial plexus (usually following breech delivery)
- Nerves C8 and T1 are involved
- Hand muscles and finger flexors are paralyzed

Acute Management of OBPP

- No immobilization. Range of motion therapy is important to keep joints supple as well as to improve sensory integration.
- Early involvement of occupational or physical therapist to: Assess ROM, strength, and function. Educate parents on home exercise program. Monitor functional return and nerve recovery.
- Home exercise program which includes: daily gentle range of motion, developmental positioning for closed chain weight bearing, sensory stimulation/input, and protection of the arm during mobility and cares.
- Ongoing assessment from occupational or physical therapist as early as possible to make sure the infant is learning good habit patterns using the affected arm and hand before bad habits are formed.

Rate of Nerve Regeneration

- Nerves grow at 1 inch per month or 1 mm/day.
- Takes approximately 3 months for nerves to regenerate to the shoulder, 6 months to the elbow, and 12 months to the hand.

Additional OBPP Treatment Options after Discharge

- EMG- assess nerve function
- Botox – address muscle imbalance
- Electrical -Stimulation – sensory awareness

- Kinesiotaping – biomechanics
- Constraint induced therapy – forced use of affected arm
- Surgical intervention:
    - Primary Nerve Surgery (3-6 months) to correct nerve damage.
    - Muscle Transfer (3 months-3 years) to correct muscle imbalance. Muscle transfer transposes an innervated muscle to function as another muscle group.
    - Bony surgery (earliest 15 months) to correct bony deformities. Corrects deformities in the bone that resulted from bone growth under the influence of imbalanced muscle forces.

Indications for Nerve Surgery

- Biceps and deltoids recover by 1-2 months—full recovery, surgery not indicated
- Biceps and deltoids recover by 3-4 months—reasonable outcome, surgery likely not indicated
- Biceps and deltoid recovery begins after 3-4 months—poor outcome, surgery is likely indicated
- If there is no movement of the shoulder, elbow or hand by 3 months, surgery is indicated

Recovery Process

The site and type of brachial plexus injury determines the prognosis and recovery process. Avulsion and rupture injuries require surgical intervention for any chance of recovery. For milder injuries potential for improvement varies, but there is a fair prognosis for spontaneous recovery, with a 90 – 100% return of function. Complete recovery is full muscle strength and no asymmetry at 18 months of age. Children with persistent deficits at 18 months of age often complete daily tasks well, but in an asymmetrical/awkward way.

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