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# Obstetrical Brachial Plexus Palsy



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Obstetrical brachial plexus palsy is a disorder of the peripheral nervous system and occurs in as many as 0.4% of infants born. It is associated with shoulder dystocia, use of mechanical extraction, and macrosomia; it occurs more frequently in infants born by vaginal delivery. The unilateral injury to the brachial plexus complex occurs during the delivery phase as lateral traction is applied to the head to permit shoulder clearance. The infant typically presents in the delivery room

with decreased active movements of the affected arm and asymmetrical primitive reflex responses. The severity of nerve involvement can range from a stretch injury to complete avulsion. While full recovery is possible, prognosis is variable and up to 35% of children may have some degree of life-long functional impairment of the affected limb.

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## Introduction

**O**bstetrical brachial plexus palsy (OBPP) is an injury to the brachial plexus that occurs during birth. OBPP is rather common with an estimated incidence of 0.4–4 per 1000 live births.<sup>1</sup> Most cases are identified in the delivery room immediately after birth. However, diagnosis can be delayed if symptoms are subtle and therefore not readily apparent to examiners at birth. While it is possible that obstetrical brachial plexus injury can occur with infants born by cesarean section the incidence is significantly smaller compared to vaginal birth.<sup>2</sup>

for delivery of the shoulder. Despite having the same mechanism of injury, the severity of nerve involvement can be quite variable among patients. This can range from a stretch injury to a complete avulsion of the nerves from the spinal cord.<sup>4</sup>

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***Initiate therapy immediately in infants with OBPP to prevent shoulder contractures and joint deformity.***

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The level of injury varies as well. Classically, the following three different clinical syndromes are described: upper trunk involving C5–C6 and occasionally C7 (Erb's palsy), complete palsy involving C5–

C8 and occasionally T1, and a lower trunk palsy involving C8–T1 (Klumpke's palsy) (Table).

## Pathophysiology

The brachial plexus is formed by cervical nerves (C5–C8) and the first thoracic nerve (T1). This complex of motor and sensory nerves innervates the upper limb.<sup>3</sup> Typically, injury to the brachial plexus occurs during the delivery process as lateral traction is applied to the infant's head to allow

## Assessment

Evaluation of the infant with suspected brachial plexus injury should include a detailed maternal, delivery, and family history. While the majority of brachial plexus injuries in infants are birth related there are other less frequent causes including hemangioma, tumor, and upper extremity fracture.<sup>5</sup>

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***The severity of nerve involvement in OBPP can range from a stretch injury to complete avulsion.***

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Common features among infants with a diagnosis of OBPP include the use of vacuum or forceps suggesting a difficult delivery, shoulder dystocia, signs of bruising, or other injuries. Other risk factors include macrosomia, breech delivery, and prolonged labor.<sup>2</sup>

The infant with a brachial plexus injury typically presents with flaccid paresis of an upper extremity. Most

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**TABLE.** Functional impairment by level of injury

| Level of injury | Muscle involvement  | Weakness/functional impairment                                    |
|-----------------|---|---|
| C5              | Deltoid, biceps, brachialis                               | Shoulder abduction<br>Shoulder external rotation<br>Elbow flexion |
| C6              | Biceps, brachialis, brachioradialis                       | Elbow flexion<br>Wrist extension<br>Forearm supination            |
| C7              | Triceps, wrist extensors, wrist flexors, finger extensors | Elbow extension<br>Wrist extension/flexion<br>Finger extension    |
| C8              | Thenar muscles, wrist flexors                             | Wrist flexion<br>Finger flexion                                   |
| T1              | Lumbricals<br>Interossei                                  | Thumb/finger abduction<br>Thumb/finger adduction                  |

commonly the infant will hold the involved shoulder adducted and internally rotated with the elbow extended and the forearm pronated. The involved hand is positioned with the wrist flexed and thumb adducted. This is known as the “waiter’s tip” position. Passive range of motion, active muscle strength, and shoulder joint integrity should be assessed to determine muscles involved and assess for shoulder stability. The exam includes passive internal and external rotation of the shoulder to assess the glenohumeral joint motion and palpation to evaluate for posterior glenohumeral joint subluxation or dislocation. Passive range of motion is expected to be full in the newborn; it is unusual for contractures to develop before 2–3 months of age. Active range of motion will be limited in the affected limb leading to asymmetry of primitive reflex responses (Moro, asymmetric tonic neck, and symmetric tonic neck).

Depending upon the origin of the injury the presentation can vary in appearance.<sup>6</sup> Upper trunk obstetric brachial plexus palsy injuries (Erb’s palsy) involve the C5–C6 nerve roots and are characterized by lack of active shoulder abduction and elbow flexion while preserving hand function. Plexus injuries limited to the lower trunk involving the C8 and T1 nerve roots, known as Klumpke’s palsy are rare. These infants will present with complete hand and wrist involvement and may demonstrate a positive Horner’s sign with clinical features that include ptosis, miosis and anhidrosis on the ipsilateral side.<sup>7</sup> Involvement of the lower trunk is typically associated with more severe injuries. An injury to the total plexus involves C5–C8 and occasionally the T1 nerve roots; and will affect the shoulder, elbow, wrist and hand function and a positive Horner’s sign is present.<sup>2</sup>

Differential diagnosis of the brachial plexus palsy includes hemiplegia from a stroke or other central nervous system (CNS) injury and neuromuscular disease such as spinal muscular atrophy and congenital muscular dystrophy. Clarifying findings in the patient with hemiplegia will include possible involvement of the leg and hyper-reflexia in the arm. It is important to note that hyper-reflexia due to a CNS cause may not be apparent for up to three weeks following injury. Patients with neuromuscular disease will usually have more pervasive findings including weakness that is not limited to one arm. Infants who present with what appears to be bilateral brachial plexopathies should be evaluated for a spinal cord injury, especially if there is any difficulty with breathing or weakness in the legs.

Clavicle fracture on the ipsilateral side can be associated with brachial plexus injury.<sup>5</sup> While routine radiographic studies are not recommended, an assessment for fracture of the clavicle should be conducted in the infant with suspected brachial plexus injury. If signs of a clavicle fracture are present then radiographic studies are indicated. Typically, a clavicle fracture will heal within 1 month. No intervention is required although care should be taken to avoid pressure over the clavicle. Passive movement of the arm and shoulder should be minimized to prevent pain. Tummy time and side lying on the ipsilateral side should be avoided until the fracture heals.

Phrenic nerve injury may occur in conjunction with obstetrical brachial plexus injury. This association is more likely in the infant with breech presentation. While the incidence of phrenic nerve injury is low at

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