



## BRACHIAL PLEXUS INJURY

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### ABSTRACT

The brachial plexus is a network of nerve running from the spine. It is formed by the ventral rami of the lower four cervical and first thoracic nerve roots (C5-C8, T1). It proceeds through the neck, the axilla (armpit region), and into the arm. It is a network of nerves passing through the cervico-axillary canal to reach axilla and innervates brachium (upper arm), ante brachium (fore arm) and hand. The brachial plexus is responsible for cutaneous and muscular innervation of the entire upper limb, with two exceptions: the trapezius muscle innervated by the spinal accessory nerve and an area of skin near the axilla innervated by the intercostobrachial nerve. Lesions can lead to severe functional impairment. Brachial plexus injuries affects the nerves which send signals from the spine to your shoulder. Brachial plexus injury is an umbrella term for a variety of conditions that may impair function of the brachial plexus nerve network. The majority of pediatric and adult brachial plexus injuries are caused by trauma. A brachial plexus injury occurring during birth is called birth related brachial plexus palsy orobstetric brachial plexus palsy.

### INTRODUCTION

Injuries to the brachial plexus are common and are the most severe of all lesions of peripheral nerves.<sup>[1]</sup> Brachial plexus injuries or lesions can occur as a result of shoulder trauma, tumours, or inflammation. The rare Parsonage-turner syndrome causes brachial plexus inflammation without obvious injury but with nevertheless disabling symptoms.<sup>[2][3]</sup> Brachial plexus lesions can be classified as either traumatic or obstetric. Obstetric injuries may occur from mechanical injury involving shoulder dystocia during difficult child birth.<sup>[4]</sup> Traumatic injury may arise from several causes. "The brachial plexus may be injured by falls from a height on to the side of the head and shoulder, whereby the nerves of the plexus are violently stretched. The brachial plexus may also be injured by direct violence or gunshot wounds, by violent traction on the arm, or by efforts at reducing a dislocation of the shoulder joint".<sup>[5]</sup>

### Signs and Symptoms

Signs and symptoms may include 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. Although several mechanisms account for brachial plexus injuries, the most common is nerve compression or stretch. Infants, in particular, may suffer brachial plexus injuries during delivery and these present with typical patterns of weakness, depending on which portion of the brachial plexus is involved. The most severe form of injury is nerve root avulsion, which results in complete weakness in corresponding muscles.

This usually accompanies high-velocity impacts that occurs during motor vehicle or bicycle accidents.<sup>[6]</sup>

### Mechanism of Injury

True plexus injuries are as a result of traction on the plexus. These are the result of combined neck extension as well as ipsilateral side flexion and ipsilateral rotation.<sup>[7]</sup> The usual mechanism of traumatic injury involves a relatively high-speed impact. This mechanism causes severe traction forces on the brachial plexus especially in the upper trunk and can result in one of three scenarios.

### Neuropraxia

Mild traction which can result in a neuropraxia causing the "burners and stingers" well known and loved in rugby circles. As the name suggests the symptoms are characterised by a burning or stinging pain accompanied by numbness, paraesthesia and muscle weakness commonly affecting the whole arm from the upper fibres of the trapezius to the finger tips. Repeated neuropraxias at the same level can result in significant weakness affecting the deltoid and biceps.<sup>[8]</sup>

### Axontmesis

Moderate force and traction can result in an axontmesis where there is disruption of the axon and the myelin sheath with preservation of the fibrous epineurium.

### Neurotmesis

Neurotmesis is not very common in rugby but is seen often in motor-cycle racing and is sometimes associated with the significant trauma to the traversing major blood vessels, bone structure and muscles.

### Diagnosis

The diagnosis may be confirmed by an EMG examination in 5 to 7 days. If there is no nerve conduction 72 hours after the injury, then avulsion is most likely. The most advanced diagnostic method is MR imaging of the brachial plexus using a high Tesla MRI scanner like 1.5 T or more. MR help us in the assessment of the injuries in specific context of site, extent and the nerve roots involved. In addition, assessment of the cervical cord, post traumatic changes in soft tissues may also be visualised.

### Treatment

Treatment for brachial plexus injuries includes orthosis/splinting, occupational or physical therapy and, in some cases, surgery. Some brachial plexus injuries may heal without treatment. Many infants improve or recover within 6 months, but those that do not have a very poor outlook and will need further surgery to try to compensate for the nerve deficits.<sup>[2][4]</sup> The ability to bend the elbow (biceps function) by the third month of life is considered an indicator of probable recovery, with additional upward movement of the wrist, as well as straightening of thumb and fingers an even stronger indicator of excellent spontaneous improvement. Gentle range of motion exercises performed by parents, accompanied by repeated examinations by a physician, may be all that is necessary for patients with strong indicators of recovery.<sup>[6]</sup>

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