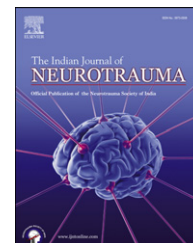


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## Original Article

## Timing for repair in brachial plexus injury

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## ABSTRACT

**Background:** Brachial plexus injuries predominantly target young individuals and result in severe functional impairment in the affected limb. Management of these injuries is challenging and functional gains are often unpredictable. Though there is a general agreement that early repairs result in better functional outcomes, a period of observation, sometimes, will allow a good spontaneous recovery in traction related injuries. Mode of injury will also have a bearing while deciding the timing of repair.

**Methods:** If attempted immediate, direct repair of plexal elements is feasible in clean transections. In late repairs, nerve ends retract and require nerve grafting. Missile injuries and traction induced injuries are observed for spontaneous recovery for a period of up to 3 months. Presence of pseudomeningoceles in MR myelography is an indication for an early surgery. Neurolysis, direct nerve repair, nerve grafting, nerve transfer, pedicle muscle transfer and functioning free-muscle transfer are the main surgical procedures in the management of brachial plexus injuries.

**Results:** Good results are expected following immediate and direct repair of clean transections in upper plexal elements. Early repairs give better results than delayed repairs in all kinds of brachial plexus lesions.

**Conclusion:** The timing of repair in brachial plexus injury is dependent on several factors, e.g; the mechanism of injury, type of injury, speed of the vehicle, and the mode of fall while victim lands on the ground. High speed motor cycle accidents usually result in root avulsions and demand an early intervention. Clean transections should be repaired immediately, whereas missile and traction induced injuries should be observed for spontaneous recovery for a period up to 3 months.

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## 1. Introduction

Brachial plexus injuries are devastating injuries resulting usually from high velocity motor bike accidents. Some of

these lesions show spontaneous recovery, mostly within a month of injury. However, majority of high speed injuries require microsurgical reconstruction.<sup>1</sup> Penetrating trauma, iatrogenic injuries, and missile injuries are other less common

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causes of brachial plexus injury. For the purpose of understanding the timing of repair could be an immediate, an early or a delayed repair.

### 1.1. Immediate repair

Brachial plexus transections following a penetrating trauma, e.g; a stab injury, or an iatrogenic injury during supra-clavicular explorations, is best treated by immediate repair, when a direct approximation of nerve ends is feasible.<sup>2</sup> In crush injuries, nerve ends are freshened and repaired with intraplexal nerve grafting. Such repairs are likely to result in good functional outcomes, especially when applied for upper plexal lesions. When a vascular injury (usually the subclavian vessels) is associated with a brachial plexus injury, neural repair should be contemplated at the time of vascular repair, in a hemodynamically stable patient. Otherwise on completion of vascular repair, nerve ends should be tagged with non-absorbable sutures and a formal nerve reconstruction should be performed as a delayed primary repair.

### 1.2. Early repair

An early repair indicates a repair performed in 8–12 weeks of injury. The indications include a flail limb with severe deafferentation pain, presence of pseudomeningoceles on MR myelography, a positive Horner's sign and an associated diaphragmatic palsy. These signs indicate a severe trauma to the plexus with little or no potential for spontaneous recovery. An early intervention, in such cases, is expected to regain some useful functions.

### 1.3. Delayed repair

A majority of brachial plexus lesions are the result of closed traction injuries and require a period of observation for up to 3–5 months.<sup>3</sup> There are several advantages; by this time tissue oedema gets resolved, neuropraxic injuries recover allowing a clear demarcation between injured and non-injured nerves, and the patient who has lived with a paralysed limb for some time, is in a better condition to appreciate the benefits as well as the limitations of reconstruction.

### 1.4. Missile injuries of the brachial plexus

Missile injuries of the brachial plexus differ considerably from the traction injuries.<sup>4</sup> Here root avulsions are a rarity. Low velocity missiles have a good prognosis on conservative management. Contrary to this high velocity missiles produce considerable composite tissue damage. The tissues are crushed and burnt from a direct contact with missile, and the then stretched via temporary cavitation. The resulting

wounds are heavily contaminated with virulent organisms with progressive tissue necrosis. Nerve lesions are often extensive and difficult to assess at primary stage. Therefore nerve injuries are better treated at a later date. In the acute stage attention is paid in wound closure. Baseline investigations (nerve conduction, electromyography) are performed at 4 weeks and repeated latter at 2–3 week intervals.<sup>5</sup> A final assessment is made at approximately 3 months post injury, based on clinical and electrophysiological examination. Patients with little or no recovery are the candidates for surgical repair. On exploration, nerve elements are electrically stimulated. The conducting neuromas are treated by neurololysis, whereas non-conducting ones are resected and repaired with nerve grafts.<sup>6</sup>

## 2. Conclusion

Clean transections of the brachial plexus are repaired primarily with good functional outcomes. Some of the traction injuries have potential for spontaneous recovery. Hence these injuries are observed for a period of 3–5 months. Patients presenting with a complete flail limb, positive Horner's sign, diaphragmatic palsy and pseudomeningoceles on MR myelography, should undergo surgical repair even earlier, i.e. at 8–12 weeks after injury. High velocity missile injuries are treated at 3–4 months after injury. Nerve repairs are generally not successful 1 year after injury. Such patients should undergo pedicled or free functioning muscle transfers.

## Conflicts of interest

All authors have none to declare.

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