Effect of Early Surgery, and Methods of Repair of Brachial Plexus Injuries in Adults on Long Term Improvement

Systematic review

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In Neurosurgery

By

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بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

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Mostafa Mohamed Sayed Ismail

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List of Abbreviations

Abbr.	Full-term
ABPI	**:** Adult brachial plexus injury
AD	**:** Arthrodesis
ADA	**:** Adult Age
ATBPI	**:** Adult Traumatic Brachial Plexus Injury
BPI	**:** Brachial plexus injury
C	**:** Cervical vertebrae
CMAP	**:** Compound motor action potential
CT	**:** Computerized tomography
eg	**:** For example
Edx	**:** Electro diagnostics
EMG	**:** Electromyography
FFMT	**:** Free Functional Muscle Transfer
FFMT	**:** Functioning free muscle transplantation
FP	**:** Fibrillation potentials
ie	**:** That’s to say
ICN	**:** Intercostal nerves
LMNL	**:** Lower motor neuron lesion
M	**:** Month
MCN	**:** Musculocutaneous nerve
MRC	**:** Muscle Charting of Medical Research Council
MRI	**:** Magnetic resonance imaging

MRN **:** Magnetic resonance Neurography

NAP **:** Nerve Action Potential

NCS **:** Nerve conduction study

NG **:** Nerve Graft

NL **:** Neurolysis

NT **:** Nerve Transfer

SVC **:** Superior vena cava

SAN **:** Spinal accessory nerve

SSN **:** Suprascapular nerve

T **:** Thoracic vertebrae

TT **:** Tendon Transfer

UMNL **:** Upper motor neuron lesion

VS **:** Versus

W **:** Week

Y **:** Year

(-) **:** Not Done

(+) **:** Done

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Rationalization and Justification of the study

The incidence of brachial plexus injuries (BPI) has rapidly increased over the last 50 years, due to technological advancements in transport, and specifically the motor vehicle field, during the 20th and 21st century ***(Vasileios et al., 2014).*** Brachial plexus injury (BPI) is one of the most devastating injuries from the point of view of the patient ***(Mukund R et al., 2009).*** It not only can lead to permanent severe limb dysfunction, but it can also life-threatening since many of these injuries are accompanied by vascular damage and sometimes even by lung injury ***(Casal et al., 2008).*** It effectively cripples function in one and rarely two upper limbs, causing significant loss of function and ability to perform tasks of daily living as well as delivering in his/her workplace. Potentially this can lead to unemployment, economic hardship, depression, and in rare instances even suicidal urges. The typical patient is a young male who has had an accident while riding a two-wheeler motorcycle where he has been thrown off the vehicle and suffered traction between neck and shoulder damaging his plexus to varying degrees ***(Mukund R et al., 2009).***

Over the years, opinions concerning the treatment of lesions of the brachial plexus have changed. The last three decades have witnessed big progress in the pathology and the treatment of the brachial plexus injuries ***(Monreal Ricardo et al., 2005).*** The results of brachial plexus surgery have been severely disappointing in the past. However, several technological advancements and newer surgical techniques, especially the advent of distal nerve transfers over recent years, have led to a paradigm shift in the outcome of patients with these injuries ***(Sumit Sinha et al., 2016).***

Also, the last 30 years had seen good progression in brachial plexus injury outcomes. Apart from non-operative (conservative) management, through which we can achieve reasonable mobility with the help of rehabilitation and physiotherapy, we also have new surgical options, such as nerve repair, use of nerve grafts and nerve transfer, and secandary surgical repair to obtain the best functional results, such as tendon transfer or functioning free muscle transplantation and arthrodesis. Also, Developments in microsurgery now offer us new modalities to improve the clinical outcome of brachial plexus lesions ***(Vasileios et al., 2014).*** Applying the microsurgical techniques in neurolysis,

nerve repair, has made it possible to restore a functioning limb in many of the patients with brachial plexus injuries, which was considered a difficult or impossible task just a few years back ***(Prem Singh et al., 2013).***

The best time window for surgery is the first 3 months after injury, and the next best time is the next 3 months. The timing is a crucial factor as the neuromuscular junctions degenerate in 20–24 months. The presence of spontaneous fibrillation in a muscle on electromyography (EMG) is an indication of denervated yet vital muscle. The restoration of elbow flexion is the first priority followed closely by the restoration of shoulder abduction and stabilization. The various surgical strategies in brachial plexus injuries should be directed toward accomplishing this goal. The global avulsion injuries have a poor outcome because of a very limited source of donors in such types of injury whereas the partial injuries have a remarkable outcome in a majority of cases. This systematic review will put spotlight into the guidelines and management algorithms of repair strategy and various surgical approaches utilized in the surgical treatment of brachial plexus injuries ***(Sumit Sinha et al., 2016).*** Also in this research, we review the ordinary common procedures in

comparison with the future new prospective developing procedures in the repair of brachial plexus injury in adults focusing on the better outcomes and least complications for the patient ***(Vasileios et al., 2014).***