

Observations on Rehabilitation of Peripheral Nerve Injuries in Kashmir Valley

Dr. Ali Mohammad Buhroo, M.S (Ortho), Associate Professor Department of Orthopaedics & Rehabilitation Medicine Sher-i-Kashmir Institute of Medical Sciences, Soura, Srinagar.

Abstract

Peripheral nerve injuries were commonly observed in Indian population due to various types of injuries. Conservative management is more effective if proper rehabilitation measures are taken. We evaluated rehabilitation management outcome after a long follow-up in 58 patients with age group of 15-60 years, who had peripheral nerve injuries in Kashmir valley. Brachial plexus injury was observed in 31 patients, radial nerve injury in 13 patients, 14 patients each had torture injury and post injection injury. Twenty-six patients had type-III injuries and 23 patients had type-I injuries of Seddon's criteria. All patients were advised exercises, splints, electrotherapy, sensory re-education and care of the skin along with ADL advise. Patients were followed up for 6 months to 3 years. After 3 years 28 patients recovered fully and 19 patients had partial recovery. In conclusion better rehabilitation management makes excellent outcome in type-I and type-II injuries without a need for surgical intervention.

Introduction

Nerve injuries are becoming more common because of increase in road traffic accidents, blast and fire arm injuries. Most of the injuries are closed traction type, usually of brachial plexus, due to torture. Other causes include fall, post surgical and post injection, post irradiation and knife cuts etc.

In the upper limb, brachial plexus or nerve injuries lead to sudden paralysis and loss of ADL. Nerve injuries of lower limbs lead to gait disturbances and hinder ambulation,.

Nerve injuries could be partial or complete. Severity of injuries varies from grade I to grade III (Seddon)

There are no proven procedures that will hasten nerve regeneration or accelerate the growth of regenerating axons along their sheath. Treatment is, therefore, directed to prevent complications which threaten the restoration of proper function after reinnervation.

Ultrasound and electrotherapy helps in maintaining muscles in functional status and prevent fibrosis and degeneration of nerve end

plates.

The main aim of rehabilitative programmes is to keep the denervated muscles, joints, periarticular tissues and skin in optimal functional position and prevent complications, pending recovery and reinnervation². After the reinnervation begins, remedial training procedures are started for integrated and well coordinated movements.

The peripheral nerve injuries have recently increased in the valley, mainly due to road traffic accidents, torture induced injuries, firearm and blast injuries. Hence the study was conducted on patients of nerve injuries who have been given a thorough trial of rehabilitative and therapeutic treatment and were followed from 6 months to 3 years.

Materials and Methods

This study was conducted between 1997-2000 in Physical Medicine and Rehabilitation department skims Srinagar . Patients with peripheral nerve injuries of all age groups and

either sex, whether operated or not, were studied. Birth injuries in neonates, post irradiation and malignant infiltration in neck, axilla or back and groin were excluded. A detailed history with thorough clinical examination and record of neurological examination ie. motor, sensory and autonomic deficit, were recorded.^{3,4} Muscle power grading, sensory charts, self assessment charts and functional assessment were recorded.⁵

Investigations :- Radiography like X- ray chest, neck, shoulder, L.S spine and pelvis etc were done for bony fractures, dislocations, accessory bones, degenerative joint diseases etc which could have been the cause of nerve injuries. CT scanning or cervical myelography was done in few cases to confirm preganglionic from post ganglionic nerve injuries of brachial plexus. NCV was done to specify the site and extent of nerve injury. EMG was done to confirm the neurogenic type of EMG and rule out the muscle disease as a cause of weakness. Other routine investigation like haemogram and urine were done to look for systemic ailments which could hamper recovery of nerve injuries.

Criteria for classification of nerve injuries:

Seddon criteria was applied as follows :-

Type I- Neuropraxia : minor contusion of the nerve with preservation of axis cylinder. Temporary injury with complete recovery.

Type II: Axonotmesis axonal breakdown with intact endoneurium. Spontaneous recovery is expected.

Type III- Neurotmesis complete anatomic disruption with no recovery.

Management

Treatment was mainly aimed at emotional support, care of denervated muscles, peri-articular tissues, joints and insensitive skin. This was achieved by various rehabilitative and therapeutic procedures to keep the paralysed

limb in optimal functional position, thus preventing development of contractures and deformity of joints.¹⁵

Care of Denervated Muscles :

These were protected against cold and heat exposures, minor trauma and overstretching by gravity. The muscles were kept in normal physiological length to prevent vascular and lymphatic stasis, contractures, joint stiffness and ankylosis. Procedures directed to achieve above goals were warmth, massage and movements, bandaging. TENS and electrotherapy, pneumotherapy, ultrasonic therapy, hydrotherapy and splints and other mechanical devices.

Splints and mechanical devices were used to give rest to the paralysed muscles and joints, preventing overstretching and shortening and thus avoiding contracture formation and deformity. These splints and other devices were detachable and dynamic to allow exercises and other therapeutic procedures to be given regularly and to prevent complications of continued immobilization.

Care of joints and periarticular tissues :

The insensitive joints and ligaments and other surrounding tissues were maintained in full functional position by daily and regular ROM exercises and dynamic detachable splints. These splints protected insensitive joint systems from external injuries.

Care of Skin :

Patients were asked not to handle hot and sharp objects and avoid use of hot water bottles, take care of nails and avoid exposure to cold and use of incorrect splints.

Sensory Reeducation

This was necessary to learn to interpret the altered profile of impulses reaching his/her conscious level after the injured limb is stimulated by stimulating the finger tips by eraser edge of pencil from proximal to distal area in early phase and involved repetitive object identification to learn stereognosis in late phase of recovery.⁵

Results

58 patients ranging between the age of 15-60 years, with maximum number of patients in the age group of 30-45 years (28) were studied. One patient was lost to follow up after six months. Sex ratio was 4:1 (male/female).

The high incidence of nerve injuries in younger adults was because of road traffic accidents and torture.

Table.1 : Age & Sex Distribution

Age in years	No. of Patients	Male	Female
15-30	27	20	7
31-45	28	24	4
46-60	03	02	1
Total	58	46	12

Site of Nerve Injury

31 patients had brachial plexus injuries: 20 patients had complete brachial plexus with 6 patients having bilateral involvement; 5 patients had left side and 9 right side involvement. Upper brachial plexus was involved in 3 patients, lower brachial plexus in 8 and total brachial plexus involvement in 20 patients.

Radial nerve was injured in 13 patients, ulnar nerve in 3 patients and median nerve in one patient. Sciatic nerve injury was present in 10 patients.

Table-II: Distribution of Nerve Injuries

Site of Injury	No of patients	R. Side	L. Side	Bilateral
Upper Brachial Plexus	03	02	01	-
Lower Brachial Plexus	08	02	06	-
Complete Br. Plexus	20	05	09	6
Radial Nerve	13	03	10	-
Ulnar Nerve	03	03	-	-
Median Nerve	01	01	-	-
Sciatic Nerve	10	04	06	-

Table-III: Nature of Trauma

Nature of Trauma	Brachial Plexus	Median Nerve	Radial Nerve	Ulnar Nerve	Sciatic Nerve	Total No.
Road Traffic Accident	10	-	-	2	-	12
Torture	10	1	3	-	-	14
Fall	06	-	-	-	-	06
Fire Arm Injury	02	-	02	-	02	06
Blast Injury	02	-	-	01	02	05
Post Injection			08		06	14
Post Surgical	01	-	-	-	-	01
Total	31	01	13	03	10	58

Nature of Trauma :

12 patients had road traffic accidents; 14 patients had torture induced injuries, usually of brachial plexus. 6 patients had fall from tree/houses; 6 had blast and 5 patients fire arm injuries, 14 patients had post injection nerve injuries, especially of radial nerve. One patient was post surgical.

Table IV : Showing pretherapy categorization of patients with nerve injuries .

Type of nerve injury	No. of Patients
I	23
II	09
III	26

Neurodeficit :

All the patients had both motor and sensory deficit. These patients were divided into 4 groups according to motor power. Maximum no. of patients i.e. 26 had grade I power with sensory loss. 9 patients had grade 1-2 power with sensory loss and 5 patients with grade 2-3 power and sensory loss. Remaining 18 patients had grade 3-4 power with minimum sensory deficit.

Table V : Distribution of PTS, as per neurodeficit.

No. of Patients	Motor Deficit	Sensory Deficit
26	Grade 0-1	+
09	Grade 1-II	+
05	Grade II-III	+
18	Grade III-IV	±

Follow up :

These patients were followed up for six months to 3 years. Maximum number of patients were followed upto one year only as they recovered fully during this

period. All the 58 patients were reviewed at one month, three months, six months, one year and three years. Patients with type-I injury (23) showed marked improvement within first six months. The intensive therapeutic and rehabilitative training programme and exercises enhanced recovery in these patients in all parameters i.e. sensory, motor and stereognostic. In first six months 21 patients recovered fully and were back to their job. Two patients showed recovery at the end of one year. None of these patients developed any complication of paralysis.

9 patients with type II injury showed signs of recovery at 3 months. 4 patients recovered

Table No. VI : Follow up

Type of Injury	No. of Pts.	1 month	3 months	6 months	1 year
Type-I	23	All pts. showed improvement in sensory & motor deficit	All pts. Showed further improvement in sensory & motor deficit & stereognostic function.	21 pts. Recovered completely 02 showed partial recovery	21 recovered completely and resumed their job 02 pts. recovered partially
Type-II	09	All pts. showed signs of improvement	6 pts. showed further improvement in sensory & motor deficit 3 pts. did not turn up for check up	4 pts. recovered completely. 3 pts. showed improvement only. 2 pts. did not turn up.	7 pts. recovered completely. 1 pts. showed partial recovery 1 pt. did not turn up.
Type-III	26	17 pts. did not show any improvement. 9 pts. showed no improvement. 6 pts. did not turn up. 3 pts. showed minor improvement	6 pts. of improvement. 6 pts. Showed minor sensory improvement. 5 pts. did not turn up.	15 pts. showed no signs of improvement at all. 16 pts. Showed minor improvement in sensory and motor deficit 1 pt. did not turn up.	9 pts. no improvement at all 16 pts. showed further improvement in motor & sensory deficit 1 pt. did not turn up.

fully at the end of 6 months and 3 patients showed signs of partial recovery at six months. 2 patients did not turn up for follow up. At the end of one year, 7 patients recovered completely and were back to their job without any

complications. 1 patient had residual neurodeficit at one year and another was lost to follow up.

In type III injury (neurotemesis) out of 26 patients 6 patients showed minor

improvement at 3 months, 15 patients did not show any improvement and 5 patients did not turn up. At the end of 6 months 16 patients showed minimum improvement in motor/sensory deficit. 9 patients had no improvement at all in any parameter and 1 patient did not turn up for follow up. At the end of one year 16 patients did not show any further improvement and 10 patients had no improvement at all. At the end of 3 years 16 patients persisted with partial sensory and motor deficit but had no stereognostic function and 07 patients had no improvement in any parameter at all and few of them had minor complications i.e. pressure sore. 3 patients did not turn up for follow up.

Final Results

The final results of 58 patients at the end of 3 years showed that 28 patients recovered fully, 19 patients had partial recovery and 7 patients had no recovery. 4 patients were lost to follow up.

Table VII: Final Results.

Total no. of cases	Recover			Lost in followup
	Full	Partial	No	
58	28	19	07	04

Discussion

The main aim of present study is to emphasize the need for various therapeutic and rehabilitation training programmes in peripheral nerve injuries of all types. 58 patients with various types of nerve injuries of both upper and lower limbs were studied. Type III nerve injuries with bad prognosis also need rehabilitation in early stages to prevent complications of joint stiffness, contractures and deformity. This is essential for their future reconstructive surgical procedures, amputations, orthodesis.^{13,14} Even after surgery remedial retraining programmes are necessary for proper functioning of stumps and use of prosthesis.

In the present series young adult males between

30-45 years of age were in majority. They had traction type injuries, especially of brachial plexus, post injection palsies and road traffic accidents. The neurodeficit varied from G0 motor power in maximum no of patients (27) to GIII-IV in 18 patients A.O. Ransford et al (1977) in their 10 years follow up study of 20 cases, have also emphasized role of initial intensive rehabilitation. They concluded that surgical procedures should be delayed upto one year in all types of nerve injuries when no further recovery is possible. Amputation is attempted when the limb is flail and non-dominant, hindering ADL and preventing supports activities.

In 1944 Henery advocated extensive surgical repair in brachial plexus injuries followed by extensive rehabilitative programmes. Yomann and Seddon (1961) in their series of 36 patients concluded that amputation with arthodesis offered better results than either surgical or conservative treatment. Seddon (1979) had seen near total recovery in a boy with complete brachial plexus lesion of poor prognosis. Wyn Parry (1974) in a series of 23 patients with complete brachial plexus injuries, had 14 patients, with amputation and orthodesis within 6 months of their injury. 10 patients returned to their job within one year. Wyn Parry¹⁶ (1981) described a patient with total brachial plexus injury whose sensory recognition recovered fully within 18 months after total denervation.

In our study of 58 patients, type I and II injuries (32) had better prognosis and maximum number of patients recovered fully by six months to one year. They had no complications of paralysis ie. Joint contractures, stiffness, deformity or anaesthetic sores and all these patients returned to their job within one year. The nature of trauma was torture, fall and road traffic accidents and in few cases injections palsies. These were usually avulsion type injuries with varying degrees of nerve trauma.

Out of 26 patients with type III injuries, only 6 patients had some recovery by the end of 6 months. However, at the end of one year 16 patients had partial recovery with minimum sensory deficit. Seven patients did not show any recovery at all. Their joint contractures and stiffness was managed by extensive rehabilitative procedures for maintaining them in near

normal physiological status, pending recovery or reconstructive procedures. These patients had mostly fire arm, blast injuries and severe road traffic accidents and in few cases injection palsies and with severe nerve damage. Seven patients with no recovery had nerve segment loss due to blasts and fire arm injuries and needed reconstructive procedures. Post injection nerve injuries, especially of radial nerve had type I and II injuries and recovered fully. One case of sciatic nerve injury due to injection had persistent foot drop due to type III injury.

Conclusion

Peripheral nerve injuries of type I to type III need intensive rehabilitative training and therapeutic approach for their better management. Type I and type II injuries have excellent prognosis, without surgical intervention, if managed properly at an early stage. Various therapeutic modalities and exercises will lead to proper recovery without any complications like wasting, contractures, joint stiffness and anaesthetic sores. Sensory reeducation will lead to proper functioning of hand in Type III injuries, before surgical intervention, also need rehabilitation for keeping their muscles and periarticular tissues in near normal physiological status, Even after surgery such injuries need continuous supervision in rehabilitation department. In this study we have mostly come across with traction type of peripheral nerve injuries which recovered completely in all parameters by various rehabilitative procedures.

Hence it is emphasised that management of nerve injuries as a whole needs a team approach consisting of rehabilitation specialist, physiotherapist, occupational therapist, orthotist, and neuro-surgeon/orthopaedic surgeon.

References

1. Barbee o., Mulghen J. Injury to brachial plexus by fragment of bone after fracture of clavicle- JBJS. 1997;79-B:534-6.
2. Barch R. and Grant C. Peripheral nerve injuries, Clinical cashes text book of Neurology for Physiotherapist, IV edition (1994) :470-516.
3. Edward A, Sealtle et.al, Sensory nerve conduction velocity and two point discrimination in sutured nerve. JBJS 1970:52-Af (4) 791-96.
4. George Bonny. The value of exon responses in determining, the site of lesion in traction injury. JBJS:588-609.
5. Henderson MR, Clinical assesment of peripheral nerve, injuries Lancet Nov;20; 1948:801-85.
6. Jannet Waylett-Sensibility evaluation and rehabilitation. Orthopedic Clinic of North America 19, 1988;1:43-55.
7. Kotwal P.P., Mittal R.- Trapezius transfer for deltoid paralysis JBJS, 1988; 80-B-114-16.
8. Kazateru, Yasunori H. Free muscle transfer can restore function after injuries of lower brachial plexus. JBJS. 1998 80-8; 117-20.
9. Ruhman O., Wirth C.J.- Trapezeus transfer after brachial plexus palsy- JBJS- 1998; 80-B: 109-3.
10. Richard W. Synderi, Johns Kukur et al. Phrenic nerve injury following stretch trauma. Journal of Trauma 1994; 36(5):734-36.
11. Rensfad A.O. & Hugies Complete brachial plexus injuries. A ten years, follow up of 20 cases. JBJS, 1977; 59-8(4), 5/417-20.
12. Birch R, Wynnparry. Peripheral nerve injuries. JBJS. 1986; 68-8(1), 6-18.
13. Sutherland Sir Sydney. The principles of non surgical treatment, in peripheral nerve injuries and their repair. Churchill Livingstone 369-77.
14. Santiago Suri, Xavier et al. Compression of the anterior interosseous nerve after use of a Robert Jones type Bandage for a distal and clavicle fracture- Journal of Trauma 1994; 36(5): 737-739.
15. William L. Lovett and Mercica A. Nerve injuries, management and rehabilitation . Orthopedic Clinics of North America 1986; 14(4):767-777.
16. Wynn Parry C.B. Rehabilitation of hand 4th edition Butterworth London 1981.