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Restoring Function of Upper Limb in Upper Brachial Plexopathy : A Case Study

Saisha Rao[1], Siddhi Patrekar[2] and Sandeep Shinde[*2]

[1]Department of Musculoskeletal Sciences, Krishna Vishwa Vidyapeeth, Deemed to be University Karad, Maharashtra, India
[2]Department of Musculoskeletal Sciences, Krishna College of Physiotherapy, Krishna Vishwa Vidyapeeth, Krishna Institute of Medical Sciences Deemed to be University, Karad, Maharashtra, India

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Brachial Plexopathy
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Range of Motion

ABSTRACT

This case report focuses on a 20-year-old male diagnosed with right upper brachial plexopathy, a neurologic condition that affects the ipsilateral upper extremity and produces pain or functional impairment (or both). Causes can be Medical disorders, as well as forceful straining, deep wounds, or direct trauma. Brachial plexopathies (BPs) are a diverse collection of disorders that can have a significant impact on a person's ability to function and quality of life. The study aims to highlight the significance of physiotherapy in managing this condition. The patient presented with complaints of pain and difficulty in lifting the right upper limb which was managed effectively with physiotherapy interventions which included Galvanic stimulation, mobility exercises, range of motion and strengthening exercises. The pre- and post-intervention assessments revealed improvements in range of motion, muscle strength, and functional activities, emphasizing the effectiveness of the holistic physiotherapy approach. This study contributes to the existing literature on the role of physiotherapy in managing brachial plexopathy, emphasizing the need for patient education and a comprehensive approach to improve overall physical functioning.

1. INTRODUCTION

Brachial plexopathy is a neurological disorder that affects the ipsilateral upper extremity, causing pain or functional disability. Medical diseases, as well as strong straining, deep wounds, and direct trauma, can all be the cause. Brachial plexopathies (BPs) are a wide range of illnesses that can significantly impair a person's capacity to function and their quality of life [1]. BPs were classed as traumatic, non-traumatic, or iatrogenic. Depending on the major site(s) of damage, they are classified as supraclavicular (including roots and trunks) or infraclavicular (affecting cords and terminal branches). Upper trunk injuries damage the C5 and C6 nerve roots, producing shoulder joint and shoulder girdle dysfunction, along with loss of shoulder flexion, abduction, and external rotation motions, and also elbow flexion, leading to the emergence of restrictions and disabilities [2].

Many clinicians see the brachial plexus as a bivildering tangle of nerve fibers. From proximal to distal, the plexus components having an ideal imaging plane for evaluation, as well as the most significant surrounding anatomy, will be discussed. The brachial plexus is made up of three spinal neurons ranging from C5 to T1, and it comprises both anterior (motor) and posterior (sensory) rootlets [3].The earliest component of the plexus, known as roots, is named by the level from where they emerge (C5-C8, T1). The axial plane best depicts the anterior and posterior rootlets, as well as the identified roots that exit the neural foramina [4]. The dorsal v root ganglion divides each root into preganglionic and postganglionic sections, which have implications for management.

The plexus is the continuation of the anterior rami of the postganglionic section. The branches, This case study evaluates the effect of physiotherapy management for upper brachial plexopathy. Divisions, cords, and trunks are more

[*]Corresponding author

[*]e-mail: drsandeepshinde24@gmail.com
ORCID ID: 0000-0002-6466-3888

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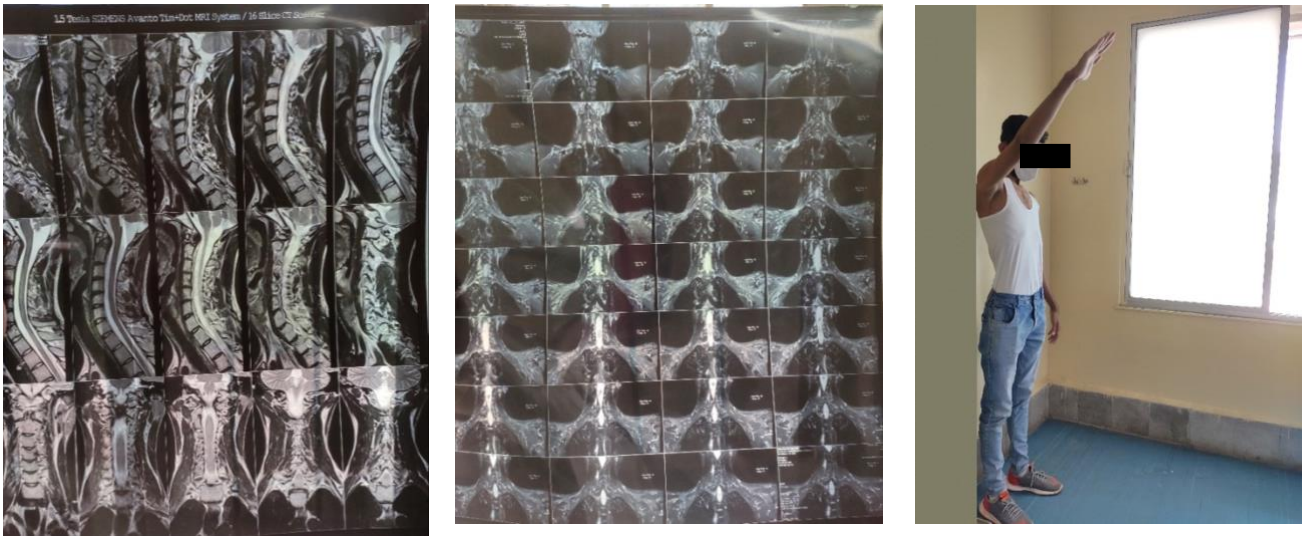
distal parts. There are three trunks, and the anterior and middle scalene muscles are in between them. The six divisions lie cephalad to the clavicle and lateral to the scalene muscles. The three cords are located medially to the lateral border of pectoralis minor muscle and caudal to the collarbone [5]. The sagittal plane cords can also be referenced using the subclavian artery, which can be used to identify medial, lateral, and posterior components. The five branch nerves that emerge from the cords lateral to the lateral border of the pectoralis minor muscle are radial and axillary (posterior cord), ulnar (medial cord), musculocutaneous (lateral cord), and median (medial cord) (medial and lateral cords). These nerves form an anastomotic loop that innervates the pectoralis major and minor muscles. The posterior cord is the source of the thoracodorsal nerve (latissimus dorsi muscle), axillary nerve, and upper and lower subscapular nerves (teres major and subscapularis muscles) [6].

2. MATERIALS AND METHODS

2.1. Case Presentation

A 20-year-old, male diagnosed with right upper brachial plexopathy on 28thJune 2021 came to Krishna college of Physiotherapy OPD on 3rd August 2021 for treatment. Patient complained of pain and difficulty in lifting the right upper limb. As told by the patient there was no pain at the initial stage, but after few days he started experiencing pain along with slight difficulty in lifting the right upper limb for which he visited an orthopedician who asked him to undergo radio diagnostic and electrodiagnostic investigations like MRI (Magnetic Resonance Imaging), EMG (Electromyography) and NCV (Nerve Conduction Velocity). The finding of EMG and NCV were within the normal ranges but MRI findings for cervical spine suggested that the patient had right upper brachial plexopathy. Patient has no history of diabetes mellitus or hypertension. VAS (Visual Analogue Scale) was used for pain assessment and SPADI (Shoulder Pain and Disability Index) for assessing pain and functional activities. ROM (Range of Motion Analysis) and MMT (Manual Muscle Testing) was used to assess the ranges of both cervical and shoulder joint and to assess the strength of the muscles respectively. VAS (on activity was 4.5), total score of SPADI was 90, ROM Analysis for the other joints were within the normal for range except for shoulder (shoulder flexion= 120 degrees, shoulder abduction= 90 degrees), MMT grades were within the normal range except for shoulder flexors and shoulder abductors which were weak (Grade 2+) [7]. Physiotherapy management was started on 3rd August 2021which was continued 24 weeks. Later the patient was asked to continue with the exercise programme at home which was taught to him and weekly once, patient was called for the follow up to check the status of his condition [8]. This study was conducted in accordance with ethical standards and received the necessary permissions and approvals. The participant gave informed consent through a voluntary consent form covering the study details, risks, benefits, confidentiality, and participant rights. The study strictly adhered to the ethical principles of the Declaration of Helsinki and prioritized the rights and well-being of the participant in the design, procedures, and confidentiality measures [9]



(A) ***(B)*** ***(C)***

Figure 1. (A) shows MRI projection of lateral section of cervical spine, (B) shows MRI projecting atrophy of right supraspinatus muscle, (C) Patient performing shoulder flexion

2.2. Physiotherapy Exercise Programme [3,4]

Table 1. Participants' Physiotherapy Exercise Program

	0-8 Weeks: Maximum Protection Phase	8-16weeks: Moderate Protection Phase	16-24weeks: Minimum Protection Phase
1	Patient Education	Wand exercises	Multiple angle isometrics
2	Galvanic stimulation to Deltoid, upper trapezius, biceps, scapular muscles	Wall ladder exercises	Resisted training
3	Free exercises for upper limb mobility	Scapular stabilization exercises	Exercises using weight cuffs and dumbbells
4	Shoulder stabilization exercises.	Proprioceptive Neuromuscular Facilitation exercises	Scapular stabilization exercises
5	TENS	Active abduction	Scapular Strengthening Exercises
6	Passive stretching of upper limb	External rotation	Replacement with orthosis – Night Worn Dynamic orthosis
7	Ultrasound	Hand behind head	Sensory retraining
8		Hand to back	
9		Hand to mouth	
10		Tendon gliding exercises	

After 24 weeks : Patient's follow up was taken once in a week.

3. RESULTS

After 24 weeks of physiotherapy treatment, during the follow up, the patient had no pain while performing overhead activities (VAS on activity=0) (Graph No. 1), or any discomfort or difficulty while performing any other activity. SPADI (Shoulder Pain And Disability Index) (Graph No.2). The ROM was improve pre treatment shoulder flexion and abduction were 120 and 90 whereas post tretement it was 175 and 170 respectively . MMT grading pre treatment for shoulder flexors (Anterior Deltoid: 2+, Pectoralis major: 2+, Coracobrachialis: 2) and post treatement ,(Anterior Deltoid: 3+, Pectoralis major: 3+, Coracobrachialis: 3+) whereas pre treatement MMT for shoulder abductors (Supraspinatus: 2+, Deltoid: 2+, Trapezius: 2+, serratus anterior:2+) and post treatement (Supraspinatus: 3+, Deltoid: 3+, Trapezius: 3+,serratus anterior: 3+) which shows significant improvement in shoulder Range of Motion and MMT.

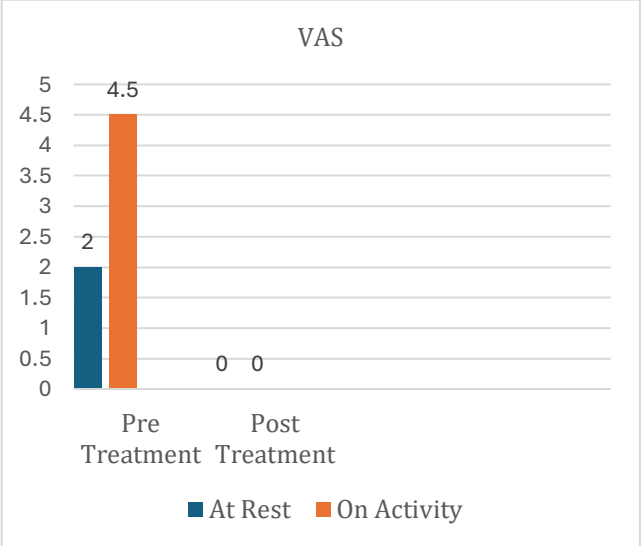


Figure 2. Visual Analogue Scale Readings for at Rest and on Activity

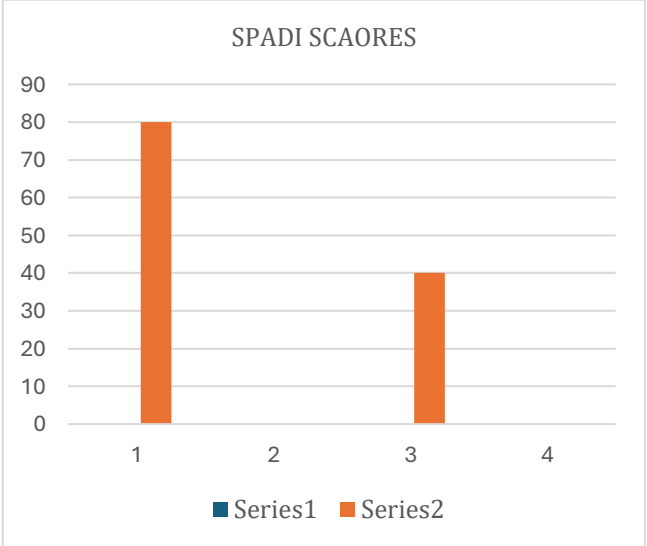


Figure 3. Shoulder Pain And Disability Index score interpretation

Table 2. Readings for range of motion analysis and manual muscle testing

	Range of Motion Analysis		Manual Muscle Testing	
	Shoulder Flexion (in degrees)	Shoulder Abduction (in degrees)	Shoulder Flexors	Shoulder Abductors
Pre-Treatment	120	90	Anterior Deltoid: 2+ Pectoralis major: 2+ Coracobrachialis: 2+	Supraspinatus: 2+ Deltoid: 2+ Trapezius: 2+ Serratus anterior: 2+
Post- Treatment	175	170	Anterior Deltoid: 3+ Pectoralis major: 3+ Coracobrachialis: 3+	Supraspinatus: 3+ Deltoid: 3+ Trapezius: 3+ Serratus anterior: 3+

4. DISCUSSION

The extent of the nerve damage, the site of the injury, the pathology underlying the trauma, and individual specific variables all influence the functional consequences of the injury. Common symptoms following a BPI include deficits in upper limb movements and deficient muscle strength and sensitivity. Additionally, BPI may limit the patient's ability to perform activities of daily living and work, potentially impacting their emotional and psychological well-being and quality of life, as well as having a significant socioeconomic impact. Purpose of this study is to evaluate the effect of Physiotherapy treatement in patients with brachial plexopathy. The main aim of the study is to assess impact of physiotherapy treatment in brachial plexopathy. Purpose of this study is to evaluate the effect of Physiotherapy treatement in patients with brachial plexopathy. The main aim of the study is to assess impact of physiotherapy treatment in brachial plexopathy.

In this study patient of brachial plexopathy aged 20 years was included. The present patient was diagnosed with right upper brachial plexopathy who had complain of pain and difficulty in lifting right upper limb. Patient had no history of Diabetes mellitus and hypertension. He had difficulty while riding bike for prolonged period with tingling sensation and numbness. Our investigations examined brachial plexopathy using VAS for pain assessment, goniometry for measuring Range of motion, Manual Muscle testing to check Muscle strength and SPADI to assess pain and functional activity.

Previously conducted study by Slavica Bajuk et al. concluded that program of complex physiotherapy combined with occupational therapy resulted in the rehabilitation in patient with brachial plexus lesion and break in axillary artery. Physiotherapy treatment included kinesiotherapy, audiovisual biofeedback, electrical stimulation, friction massage, lymph drainage active functional exercises and re-education. As a result of this program, the patient no longer had pain, passive range of motion was close to normal, active motion where present was improved, swelling was reduced, and the hand became functional again .She could use the affected left arm to grip, hold, and lift small, light, objects, and she can perform most activities requiring two hands, although more slowly than before or by adapting the activity.

The current case report on a 20-year-old male with right upper brachial plexopathy and the study by Immacolata Belviso et al. offer complementary insights into the prevalence and management of brachial plexus injuries (BPIs) in general practice and sports medicine, respectively. Because BPIs are challenging to diagnose and treat, their various aspects are highlighted in each study. According to Belviso et al., less severe BPIs are more common in sports environments and are frequently associated with certain sporting roles and equipment. Severe BPIs, however, are comparatively rare. They emphasize that in order to advise treatment and prognosis, a multidisciplinary approach involving clinical examination, imaging, and electrodiagnostic investigations is necessary. Their method emphasizes how crucial it is to combine multiple therapeutic modalities and, in extreme situations, use advanced neurosurgical methods.

The current case study highlights thorough examination of the effective use of physiotherapy for brachial plexopathy, whereas Belviso et al. give a general overview of BPI prevalence and management techniques in sports. Collectively these studies demonstrate the various types of BPI cases and the importance of individualized treatment programs. The combination of both researches supports that managing brachial plexus injuries effectively requires a multimodal strategy that incorporates both advanced and conservative techniques. According Alessandra Carolina de Santana Chagas et al. and the case report on a 20-year-old male with right upper brachial plexopathy, despite focusing on different aspects of physical therapy and rehabilitation, offer insightful information about various approaches to managing brachial plexus injuries (BPIs).

A Proprioceptive Neuromuscular Facilitation (PNF) program specifically developed for severe upper brachial plexus injuries was created by Chagas et al. Their research, which used a Delphi survey to reach a consensus, produced a thorough PNF protocol with 11 exercises targeted at the preoperative and postoperative phases of rehabilitation. The protocol offers a structured framework for enhancing functionality and quality of life

in patients with severe injuries. It describes biomechanical goals, patient and therapist positions, and PNF procedures. This method is renowned for its specificity and rigor and highlights the importance of comprehensive, empirically supported physical therapy approaches in clinical practice. However, the case study concentrates on a single patient with upper brachial plexopathy, demonstrating how physiotherapy procedures such as galvanic stimulation, mobility exercises, and strengthening exercises can be applied in real-world settings. The range of motion, muscular strength, and functional abilities of the patient were significantly improved after starting the physiotherapy program, according to the report. This case highlights the value of patient education and all treatment options, as well as the efficacy of an integrated physiotherapy approach in addressing less severe types of brachial plexopathy.

The current study suggest that the physiotherapy treatment in early stages of upper brachial plexopathy shows significant improvement in shoulder Range of motion, strength and functional activities in patients with upper brachial plexopathy.

5. *Conclusion*

This case study concluded that, the physiotherapy rehabilitation in early stages of upper brachial plexopathy is significantly effective in reducing pain and improving ROM, strength and functional activities in the patient with Brachial Plexopathy which helps to enhance the quality of life.

Conflict of Interest

The authors declare that there are no conflicts of interest related to the publication of this case study.

Ethics Committee

Patient informed consent form was obtained before initiation of study.

Author Contributions

Conception and design of the study: SR, SP, SS; Data collection: SR, SP; Data analysis and interpretation: SR, SP; Drafting the article and/or its critical revision; SR, SP, SSS; Final approval of the version to be published: SR, SS. All authors have read and agreed to the final version of the manuscript.

REFERENCES

1. Tharin, B. D., Kini, J. A, York, G. E., & Ritter, J. L. (**2014**). Brachial plexopathy: a review of traumatic and nontraumatic causes. *American Journal of Roentgenology,* 202(1), W67-75. [PubMed] [CrossRef]
2. Han, C. Y., Tarr, A. M., Gewirtz, A. N., Kaunzner, U. W., Roy-Burman, P., Cutler, T. S., & MacGowan, D. J. (**2021**). Brachial plexopathy as a complication of COVID-19. *BMJ Case Reports CP*, 1;14(3):e237459. [PubMed] [CrossRef]
3. Orebaugh, S. L., & Williams, B. A. (**2009**). Brachial plexus anatomy: normal and variant. *The Scientific World Journal*, *9*(1), 300-312. [PubMed] [CrossRef]
4. Kishan, A. U., Syed, S., Fiorito-Torres, F., & Thakore-James, M. (**2012**). Shoulder pain and isolated brachial plexopathy. *Case Reports*, 28;2012:bcr0320126100. [PubMed] [CrossRef]
5. Eteuati, J., Hiscock, R., Hastie, I., Hayes, I., & Jones, I. (**2013**). Brachial plexopathy in laparoscopic-assisted rectal surgery: a case series. *Techniques in coloproctology*, 1;17(3), 293-7. [PubMed] [CrossRef]
6. Milanovic, F., Abramovic, D., Ducic, S., Bukva, B., Dasic, I., Radovic, T., Miskulin, A. C, & Nikolic, D. (**2021**). Brachial plexopathy as a consequence of nerve root swelling after shoulder trauma in a patient following an acute seizure. *The Turkish Journal of Pediatrics*, 63(1), 161-6. [PubMed] [CrossRef]
7. Wilbourn, A. J. (**2007**). Plexopathies. *Neurologic clinics*, 1;25(1), 139-71. [PubMed] [CrossRef]
8. Hill, B., Williams, G., Olver, J., & Bialocerkowski, A. (**2015**). Do existing patient-report activity outcome measures accurately reflect day-to- day arm use following adult traumatic brachial plexus injury? *Journal of Rehabilitation Medicine*, 47(5), 438–444. [PubMed] [CrossRef]
9. Chagas, A. C., Wanderley, D., Barboza, P. J., Martins, J. V., de Moraes, A. A., de Souza, F. H., de Oliveira, D. A. (**2021**). Proprioceptive neuromuscular facilitation compared to conventional physiotherapy for adults with traumatic upper brachial plexus injury: A protocol for a randomized clinical trial. *Physiotherapy Research International*, 26(1), e1873. [PubMed] [CrossRef]