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**Dr. Dasari Sri Lakshmi**

Ayurvedic Physician and  
Physiotherapist, SGS Hospital,  
A Unit of Swami Narahari  
Teertha Medical Mission Trust,  
Sri Ganapathy  
Sachchidananda Ashrama,  
Mysore-570025, India.

**Correspondence:**

**Dr. Dasari Sri Lakshmi**

Ayurvedic Physician and  
Physiotherapist, SGS Hospital,  
A Unit of Swami Narahari  
Teertha Medical Mission Trust,  
Sri Ganapathy  
Sachchidananda Ashrama,  
Mysore-570025, India.

## Integrative Therapy for Brachial Plexus Birth Injury – Case Series

**Dr. Dasari Sri Lakshmi**

### Abstract

Brachial plexus birth injury (BPBI)/neonatal brachial plexus injury involves injury of one or all nerves of brachial plexus. It is conglomeration of lower four cervical and first thoracic nerves (C<sub>5</sub>-T<sub>1</sub>). Site of nerve root injury can be pre-ganglionic or post-ganglionic and severity of injury is inversely proportionate to extent of recovery. According to Ayurveda this can be considered as *abhighata janya ekanga vata vyadhi* (trauma induced *vata* afflicting one part of the body). Severe nerve injury/avulsion/complete nerve tear hampers muscle and bone growth hence it is *apatarpana* in nature (deprived growth of body tissue). Therefore *santarpana* (nourishing) and *vata hara* (pacifying *vata*) is the line of treatment. Ayurveda treatments included *sthanika abhyanga* (SA-oil massage) and *shashtika shali pinda sweda* (SSPS). Physiotherapy included electric stimulation for muscle power between 0-3 along with exercises. Type of exercises depends on muscle power; passive exercises for 0-2, active assisted for 2-3 and active exercises for muscle power 3-5. Five cases of BPBI successfully treated at SGS Hospital with early integrative treatments commenced between 8-12 weeks after diagnosis; treated for total of 6-12 sessions with optimal recovery are discussed. Encouraging results of 80-95% of recovery were observed in all five cases ranging from moderate to severe injury including nerve roots avulsion. Improved muscle power, active joint range and unhindered daily activity were achieved without any complications like limb length discrepancy, deformities, joint dislocation or contractures in all cases.

**Keywords:** Neonatal brachial plexus injury, brachial plexus birth injury, Erb's palsy, Klumpke's palsy, total brachial plexus palsy and complete nerve avulsion.

### Introduction

BPBI in neonates is with an estimated prevalence of range 0.9-2.6 per 1000 live births and significant arm weakness of 0.4-5 in 10,000 births.<sup>[1]</sup> Nerves traverse from spinal cord, cervicoaxillary canal in the neck runs over the first rib entering into armpit and supplying the arm. Upper roots C<sub>5</sub>, C<sub>6</sub> of the brachial plexus supplies the arm, especially supra scapular nerve, musculocutaneous nerve and axillary nerve. C<sub>5</sub>, C<sub>6</sub> injury results in Erb's palsy and lower roots C<sub>8</sub>, T<sub>1</sub> injury results in Klumpke's palsy. All five nerves roots (C<sub>5</sub>-T<sub>1</sub>) involvement causes total brachial plexus palsy. BPBI in neonates is caused due to either traction of supra-clavicular portion during birth, shoulder dystocia, breech presentation, macrosomia, small stature/cephalopelvic disproportion, diabetes during pregnancy or prolonged second stage of labour. Site of nerve lesion can be pre-ganglionic or post-ganglionic and the extent of nerve damage can vary from mild stretch to avulsion of nerve plexus from the spinal cord. Lesion may result in weakness, loss of sensation, partial or total paralysis of the arm. The amount of impairment varies depending on the site and extent of the damage. Hand weakness is the first sign observed immediately after birth, occasionally can go unnoticed for couple of days with less observation. Nerve bruise/mild injury usually resolves on its own over a period of 4-6 weeks. However in all other cases that do not resolve by itself, treatment is essential that includes physiotherapy for rehabilitation or surgical interference of nerve transplants usually from the opposite leg in severe cases, subscapularis muscle release for better movements, latissimus dorsi tendon transfers.<sup>[2-6]</sup>

### Incidence

Five cases of diagnosed BPBI treated at SGS Hospital, Physiotherapy department were taken

up. All children were primiparous, with complications during normal delivery and were between 2-3 months of age when treatment commenced. Among five patients right hand was affected in 4 and left hand in 1; 2 were females and 3 were male patients. There is a higher incidence of right-sided injuries due to most common “left occipito-anterior” presentation of baby; however both genders seems to be affected equally with BPBI.

#### Chief complaints:

All patients had weakness of one hand and were neither able to lift the hand actively nor were able to hold back from dropping freely without resistance since birth. Two patients presented with ‘waiter’s tip deformity’, two with ‘complete palsy position’ of hand and one with ‘complete wrist drop’.

#### Physical examination:

All patients had weakness in affected limb and were unable to move the hand actively. There were no active movements at shoulder, elbow and wrist joints and muscles were flaccid. All of them were uncomplicated cases with no ligament or vascular damages, shoulder subluxation/dislocation or fractures of clavicle/humerus. All five patients were also not associated with ptosis, myosis or any higher centres involvement. Mild muscle

wasting was observed with varied degree of deformities of hand, head and neck position was restricted towards unaffected side.

#### Radiological examination:

X-ray taken after diagnosis of BPBI revealed normal clavicular, humerus and shoulder contour in all 5 patients. Nerve conduction test, SSEP revealed varied lesion at different nerve roots suggestive of nerve damage. 3 Tesla MRI revealed complete avulsion of multiple nerve roots post-ganglionic in 3 patients and 1 patient with pre-ganglionic and 1 suggested moderate injury. Deformities and investigatory reports are detailed in plate-1. [7]

#### Procedures administered to the patient:

All five patients were treated with Ayurveda and Physiotherapy treatments. Total of 6-12 treatment sessions were given at a frequency of 10 days treatment followed by a gap period of one month. Last 3 sessions were given once in 3 months after optimal improvement was achieved and to reinforce the rehabilitation program. Active exercises were encouraged throughout the last three sessions and during the gap period too. Muscle power grading and details of treatment procedures were described in table-1, 2. [8-11] Electric stimulation and exercises were encouraged in gap period depending on muscle power. [12, 13]

**Table 1:** Muscle power grading.

Muscle grading	Muscle power	Movements
No contraction	0	Complete absence of muscle movements
Flicker of contraction	1	No visible movements
Weak	2	Movements in gravity eliminated position
Fair	3	Movements done against gravity
Good	4	Movement done against gravity with resistance
Normal	5	Same compared with other limb strength.

**Table 2:** Details of treatment procedures.

Treatment Modalities	Procedure followed
<b>Initial 3-9 sessions for all 5 patients</b>	
<b>Ayurvedic treatment – Bahyopakrama Sthanika Abhyanga</b>	Application with equal quantity of <i>bala taila</i> and <i>maha masha taila</i> to upper trapezius and complete affected upper limb for 15-20 minutes.
<i>Shastikashali Pinda Sweda</i>	<i>Shastikashali</i> was cooked in milk processed with <i>bala mula</i> and <i>ashwagandha churnas</i> . SSPS was performed over above mentioned areas and rubbed gently and repeatedly for 15-20 minutes.
<b>Physiotherapy – Electrical stimulation</b> Faradic stimulation	To weak muscles motor points of affected upper limb for 20 contractions.
Galvanic stimulation	To weak muscle groups of affected upper limb those are essential for joint movements for 20 contractions.
<b>Last 3 sessions for all 5 patients</b>	
<b>Ayurvedic treatment</b>	After optimal recovery; SA and SSPS were given once in 3 months for 7 days
<b>Physiotherapy</b>	Only active exercises were encouraged throughout the last (9 months) 3 sessions so that child can carry out unhindered daily activities.





Plate. 2: Progress in activities

### Discussion:

All five cases of BPBI were primiparous, presented with severe muscular weakness and unable to move one upper limb. These were also non-complicated cases without higher centres involvement. Mild muscle wasting was observed with varied degree of deformities of hand. Two cases presented with waiter's tip deformity, two with complete palsy and one with complete wrist drop along with inability to move the affected hand. Head and neck position was more towards the unaffected side due to unhindered activity of opposite/unaffected muscles of the neck and arm. Mild injury/nerve bruise usually resolves by itself over a period of 4-6 weeks. All BPBI cases need early intervention after 6 weeks of unresolved symptoms. Hence commencement of treatment was selected only after 8-12 weeks after birth.

X-ray revealed normal bone and joint alignment. Any structural derailment adds to complications in BPBI cases. Nerve conduction test, SSEP revealed varied lesion at different nerve roots with delayed transmission of impulses suggestive of nerve damage. 3 Telsa MRI revealed complete avulsion of multiple nerve roots post-ganglionic in 3 patients and one patient with pre-ganglionic and one suggested moderate injury. Hence four cases were suffering from severe injury and one with moderate injury. Clinical presentation and diagnostic study too revealed the same.

All five patients were treated with total of 6-12 sessions with each session including 10 days of integrative treatments followed by a gap period of one month. Last 3 sessions were given at a frequency of once in 3 months. Oils for SA, powders for SSPS and Physiotherapy sessions were given with same ingredients helped to improve muscle bulk and tone.<sup>[14, 15]</sup> One patient with pre-ganglionic nerve root avulsion recovered after 12 treatment sessions, one patient with moderate injury recovered after 6 sessions and remaining three recovered between 8-10 sessions. Hence the number of sessions depends on the severity and site of nerve root lesion. Extent and site of injury are indirectly related to recovery. Less severe injury relatively improves faster compared to very severe injury, similarly post-ganglionic cases improves better than pre-ganglionic or those with higher centre involvement.

Electric stimulation was given only to improve muscle power from 0-3. Passive, active-assisted and active exercises helped to build muscle tone and power. Exercises were customised and encouraged in gap period depending

on muscle power of each patient. If the child exhibits intentional voluntary control, encouraging bimanual activities avoids 'developmental apraxia'. However in such cases 'group rehabilitation' with muscle power 3 and above 1 year of age helps children to interact and perform active exercises as desired. Encouraging child to be the same sided handed person as injury also prevents developmental apraxia and also avoids constant concentration on affected limb for exercises.

In Ayurvedic classics, it may be considered as *apatarpana vyadhi* (under nourished disease), so *santarpana chikitsa* (nourishing treatment) was selected. Hence equal quantity of *bala taila* and *maha masha taila* were used for SA and *Bala churna* and *ashwagandha churna* for processing milk were used in SSPS. All ingredients used for treatment have *santarpana gunas* and are indicated for *balya* (strengthening), *bruhmana* (nourishing) and *vata hara* activity. SSPS is *balya* and *bruhmana* of *mamsa* and *asthi dhatu* thus pacifying *vata dosha*, improving strength to bone and muscles tissues.<sup>[16-18]</sup> Due to the properties of ingredients used in SA and SSPS muscle power, tone and bulk was improved. Probably limb length discrepancy was not observed including severe cases with root avulsion injury too. *Snehana* and *swedana* are the first line of treatment to pacify vitiated *vata dosha*. SA is *snehana* and SSPS is *snigdha swedana karma* which pacifies *vata* improves local blood supply due to the *ushna upachara* thus reducing muscle spasm and stiffness of hyper acting muscles and stimulates the weaker group of muscles.

Shoulder joint is multiaxial diarthrosis ball and socket joint. Due to its bony configuration and loose joint capsule shoulder, joint allows movements along three planes. Stability of shoulder joint is mainly dependent on the strength of the muscles supporting the joint. Botox injection helps to reduce the power of unaffected muscle group thus reducing the difference between affected and unaffected group to prevent complications. On contrary SA and SSPS helped to increase the muscle power of affected muscle thus reducing the difference of strength between the two groups of muscles. Before patient reached crawling phase enough care was taken to strengthen shoulder girdle to prevent shoulder joint subluxation/dislocation. Chances of subluxation/dislocation are high during the phase of crawling since patient weight bears on hand and transfers weight forward. Hence insufficient strength at shoulder joint can precipitate shoulder subluxation/dislocation.

Botox injection was not taken by all the 5 patients at any phase during the treatment. Integrative treatments took care of both muscle tone and joint condition.

Contractures are the second hindering factor in BPBI cases. Initially, muscles are flaccid but later tend to develop spasticity in few groups of muscles. After reaching muscle power 3 the most common affected muscle was biceps. This also prevents elbow extension with shoulder flexion and gives flexed posture at elbow in resting position. Few other muscles like brachioradialis, deltoid or scapular muscles can also develop spasticity depending on the nerve root injury. If untreated patient can develop contractures hindering the activity though muscle power is improved. Hence in such cases careful identification and timely 'spasm releasing massage' is to be given till the muscle returns to the normal tone compared to unaffected limb. Hand is internally rotated since birth hence external rotation is to be encouraged initially with passive exercises and later with activities that involve the movement. Supination and pronation are also difficult to achieve at elbow joint. Since supinator is deeply placed and pronators are in flexor group of forearm where in all the five cases had good forearm flexors; hence balancing the counteracting supinator and pronators was a challenging task. Hence improperly managed BPBI may lead to 'beggar's hand position' or 'internally rotated flexed elbow position'.

In Ayurveda *nava* (recent origin) and no *upadrava* (uncomplicated) are *susadhya* (easy to cure) unlike *purana* (more than a year of origin) and with *upadrava* (complications) cases are *kashta ashadhya* (difficult to treat). All five cases were *nava* and had no *upadravas*. Though the extent of nerve root injury was diagnosed to be moderate to severe with varied level of muscular weakness and deformities; yet the results seemed to be appreciable in those with early intervention at an age of 8-12 weeks with a recovery rate of 80-95% with no complications like deformities, muscular spasms, joint subluxation/dislocation or limb length discrepancy. Hence total sessions of 6-12 were required; after 3-9 treatment sessions recovery was optimal depending on severity of injury. Last 3 sessions were to reinforce rehabilitation of patients to encourage more usage of affected limb to carry out unhindered activity. Further detail study in more number of patients may help to establish an integrative treatment protocol for uncomplicated moderate to severe injured neonatal BPBI with optimal recovery which may also prevent surgery.

#### Conclusion:

All five cases of BPBI treated with integrative approach starting at an age of 8-12 weeks yielded appreciable results. To conclude uncomplicated BPBI cases with early integrative therapy with varied level of nerve root injury including nerve root avulsion recovered 80-95% with a total of 6-12 treatment sessions facilitating unhindered daily activities.

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