Ayurvedic approach in the management of spinal cord injury: A case study

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INTRODUCTION

The prevalence of acute traumatic spinal cord injury (SCI) is estimated to be 236 per million in India. Much of the morbidity associated with SCI occurs due to the limited intrinsic ability of the spinal cord to recover following transaction or contusion. The pathophysiology of SCI is considered biphasic in nature. Primary injury results from mechanical force injuring the spinal cord. Secondary injury occurs via the subsequent edema, ischemia, inflammation, cytokine production, free radical damage, glial scar formation, apoptosis, and necrosis.

ABSTRACT

Spinal cord injury (SCI) is associated with consequences such as full loss of spinal movements, incontinence of bladder functions, bed sores, etc. There is no satisfactory treatment available in biomedicine with only limited treatments only for enhancement of spinal cord function. These treatments have many limitations. Ayurvedic drugs and Pancakarma procedures have been in use to treat such conditions since a long time. We present a case of SCI with lesion at C4 level which was treated for 2 months with an Ayurvedic combined intervention. The combined treatment plan involved Ayurvedic oral medications (Brhadvātacintāmaṇi rasa - 125 mg, Ardhanāgavātāri rasa - 125 mg, Daśamūla kvātha - 40 ml, Aśvagandhācūrṇa [powder of Withania somnifera DUNAL] - 3 g, Amṛtā [Tinospora cordifolia WILLD] - 500 mg, Muktāśukti piṣṭi - 500 mg and Trayodaśāṅga guggulu - 500 mg) twice daily. Combined procedures involved such as śāliṣaṣṭika piṇḍasvedana (sudation with medicated cooked bolus of rice) every day for 2 months and Mātrā basti (enema) for first 15 days with Aśvagandhā oil. From 16th day, Mustādi yāpana basti (MYB, enema with medicated milk) was given for 16 days. After an interval of 7 days, MYB was further repeated for next 16 days. Substantial clinical improvement was reported after 2 months of the Ayurvedic treatment in existing neurological deficits and in quality of life.

KEYWORDS: Matra basti, Mustādi yāpana basti, patient centered outcome, quadriplegia, spinal cord injury, stem cells therapy

CASE REPORT

On February 11, 2014 a 70-year-old patient came for consultation in the Pancakarma O.P.D. of National Institute of Ayurveda, Jaipur, India. He was admitted and examined in the I.P.D. of the Institute. Upon examination, it was revealed that he was unable to move either of the upper or lower limbs. He was fully conscious and awake except that he was not able to move any part of his body. His spine was stiff and hence he was unable to turn on the bed or to sit even with support. Patient had autonomic dysfunction and was neither able to feel nor control the urge for micturition and defecation [Table 1]. The patient had a history of trauma on head due to collapse of a wall on him in the evening of June 26, 2013. After the accident, he remained unconscious for about 2.5 h and regained consciousness on the way to hospital. The accident had led to multiple wounds on his head, face.
Table 1: Neurological finding in a case of spinal cord injury before and after the Ayurvedic therapy

| Symptoms/signs                        | Before treatment | After 2 months of treatment |
|---------------------------------------|------------------|----------------------------|
| Ability to turn on the bed            | Absent           | Present                    |
| Ability to sit with support           | Absent           | Present                    |
| Ability to stand                      | Absent           | Present                    |
| Ability to walk                       | Absent           | Can walk more than 500 m and more than 30 min |
| Muscles function grade                |                  |                            |
| Right shoulder                        | 1                | 3                          |
| Left shoulder                         | 1                | 3                          |
| Right elbow                           | 0                | 3                          |
| Left elbow                            | 0                | 3                          |
| Right wrist                           | 1                | 3                          |
| Left wrist                            | 1                | 4                          |
| Right hip                             | 1                | 5                          |
| Left hip                              | 2                | 5                          |
| Right knee                            | 1                | 5                          |
| Left knee                             | 2                | 5                          |
| Right ankle and toes                  | 2                | 5                          |
| Left ankle and toes                   | 2                | 5                          |
| Sensory function                      | No deficit       | No deficit                 |
| Reflexes                              |                  |                            |
| Right biceps jerk                     | 1                | 1                          |
| Left biceps jerk                      | 1                | 1                          |
| Right triceps jerk                    | 1                | 1                          |
| Left triceps jerk                     | 1                | 1                          |
| Right knee jerk                       | 2                | 1                          |
| Left knee jerk                        | 2                | 1                          |
| Right ankle jerk                      | 1                | 1                          |
| Left ankle jerk                       | 1                | 1                          |
| Superficial reflexes (anal, bulbocavemosus) | 1                | 1                          |
| Grip right hand                       | Absent           | Present                    |
| Grip left hand                        | Absent           | Present                    |
| Muscle coordination                   | Absent           | Present                    |
| Muscle tone right upper limb          | Spastic          | Less spastic               |
| Muscle tone left upper limb           | Spastic          | Less spastic               |
| Muscle tone right lower limb          | Spastic          | Normal                     |
| Muscle tone left lower limb           | Spastic          | Normal                     |
| Bowel and bladder activities          | Incontinence     | Normal                     |

and right thigh. After waking from unconsciousness, he had reported severe headache and inability to move all four limbs. He was admitted to Intensive Care Unit (I.C.U.) for 3 days where suturing of wound had been done along with administration of other supportive medication. In I.C.U., patient had incontinence of urine and stools. On June 28, 2013 magnetic resonance imaging of cervical spine was done. This revealed posterior and bilateral posterolateral disc osteophyte complex was found at C3/C4 level indenting anterior thecal sac. Focal cord signals, hyperintense on T2W and isointense on T1W sequence, at C3 and C4 was suggestive of cord edema. Posterior and bilateral posterolateral disc osteophyte complex was found at C5/C6 and C6/C7 level indenting anterior thecal sac. A noncontrast computed tomography (CT) scan of the head was performed on July 1, 2013, which revealed no significant abnormality. On July 9, 2013 a CT scan of C1 vertebra to C7 vertebra was done which revealed severe cervical spondylisis with multiple level prolapsed intra vertebral discs. Failing to get any response from the treatment, the patient consulted in O.P.D. of Neurology Department of G.B. Pant Hospital, New Delhi on July 20, 2013. Upon a detailed clinical neurological examination done this time, he was diagnosed with quadripareisis and SCI at C4 level. Patient and the relatives were explained about the unavailability of satisfactory treatment. A CT scan of the cervical spine was advised and it revealed (July 25, 2013) significant changes of cervical spondylisis with endplate irregularity and decrease in intervertebral discs space at C3-4, C4-5, and C5-6 level. The recommended physiotherapy was continued for about 5 months following the injury, but there was no improvement in the clinical condition. After this period, he was treated in an Ayurvedic hospital in Delhi in the hope of better treatment. Ayurvedic diagnosis was āghātaja sarvāṅgaroja (neurological problems due to trauma). The patient was prescribed śirodhārā (continuous pouring of medicated liquid on head) with ḍhanuvantaram oil and whole body massage with this oil. Patient had taken this regimen for 7 days in January 2014. There was no clinical improvement during this period, but the patient had the feeling of well-being. Then the patient discontinued treatment as it was costly. He remained away from direct medical supervision for next 1 month. After this, the patient came to our institute in the hope of better Ayurvedic management. He was diagnosed for āghātaja sarvāṅgaroja in our Institute and was treated on the line of management of vātavāyādiḥ.

Oral medication administered to the patient included: A combination of Brhaduvātacintāṃani rasa - 125 mg, Ardhanāgavātāri rasa - 125 mg, Aśvagandhācūrṇa (powder of Withania somnifera DUNAL) - 3 g, Amṛtā (Tinospora cordifolia WILLD) - 500 mg, Muktāśukti piṣṭi - 500 mg and Trayodāśāṅga guggulu - 500 mg that were given twice a day for 2 months along with Daśāmúla kvātha - 40 ml. Sālisāṣṭika pindasvedana (SPS) (sudation with medicated cooked bolus of rice), Mātrā basti (oil enema) and Mustādi yāpana basti (MYB) (enema with medicated milk) were prescribed.
DISCUSSION

As there is no specific line of treatment for sarvāṅgaroga, general line of treatment for vātavyādhi was adopted to treat this condition. Due to the spastic nature of the disease SPS (sudation with medicated cooked bolus of rice) and Mātrā basti (MB) (enema using medicated oil) with Aśvagandhā oil was given for first 15 days. In addition to these local therapies, the patient was also recommended oral Ayurvedic drug regimen as described earlier twice a day for 2 months. After 15 days of therapy, little improvement was observed in neurological deficits. Most remarkably, the patient had gained control on the urge for micturition and defecation. Initially, the patient was not able to retain MB for more than 1 min but after 7 days, he was able to retain MB for about 30 min. After 15 days of therapy, to maximize the therapeutic effects Panchakarma procedure was changed to MB (enema with medicated milk) and SPS. From 16th day, MB (enema with medicated milk) was given for 16 days. After an interval of 7 days, MB was further repeated for next 16 days [Table 2]. After 2 months of Ayurvedic therapy administered by us, the patient was found to have a substantial recovery of neurological deficits. He was able to turn on the bed unaided, able to sit unaided for more than 30 min and was able to walk without any support. He was able to move all the joints of the four limbs and was able to move his fingers. He was able to grip using both hands and was able to eat with his hands with minimal support. An interview with patient and his caretakers reflected their satisfaction with the outcome achieved in 2 months of therapy [Videos 1 and 2].

For assessment of qualitative improvements in the life of the patient with SCI, Spinal Cord Independence Measure (SCIM-III) scoring was used. Improvement was assessed by observing the level of independence achieved after the therapy. A 17 item SCIM-III has a range of scores 0-100 where 0 denotes a complete dependence, and 100 denotes a complete independence. Higher scoring in net score is indicative of decreasing dependence. We observed an increasing independence in this case. The net SCIM-III score was 10 before treatment which increased to 88 after treatment. The complete independence of functions was not found in this case, but this treatment had certainly reduced the level of dependence as was observable with the improved SCIM-III score.

Aśvagandhā oil and ghṛta therapies were mainly employed in this case. In various experimental studies of ketogenic diet in rodents, substantial improvements in many intractable neurological conditions are reported. 24 Sneha pravicāraṇa (preparations employed for oleation therapy) are the best examples for the administration of Ayurvedic ketogenic diet in which abhyaṅga (oleation/massage) and basti are also considered along with rice, gruel, etc. Increased ketone bodies in blood (β-hydroxybutyrate, acetocacetate, and acetone) cross the blood-brain barrier and enter neuronal and glial cells through monocarboxylic acid transporters (MCTs) of which MCT1 is the primary

### Table 2: Ayurvedic treatment given to a case of spinal cord injury

| Name of the drug used orally | Composition | Dose             | Anupana | Days of treatment |
|-----------------------------|-------------|------------------|---------|------------------|
| Brhadvātacintāmaṇi rasa     | Au, Ag, Abhraka, Moti, Praval, Lauha, Hg, S | 125 mg twice a day | Honey   | 2 months         |
| Ardhanāgavātāri rasa        | Hg, Cu, S, Trikaṭu Jambīra | 125 mg twice a day | Honey   | 2 months         |
| Daśamūla kvātha             | A decoction of roots of 10 herbs | 40 ml twice a day | -       | 2 months         |
| Aśvagandhā cūrna (Withania somnifera DUNAL) | 3 g twice a day | Milk   | 2 months         |
| Giloy (Tinospora cordifolia Willd) | 500 mg twice a day | Honey | 2 months         |
| Amṛtā piṣṭi                 | 500 mg twice a day | Honey | 2 months         |
| Trayodaśāṅga guggulu        | 500 mg twice a day | Honey | 2 months         |

Panchakarma procedures

| Method of preparation | Method of application | Days of treatment |
|-----------------------|-----------------------|------------------|
| Śālīṣaṣṭika pinḍa sveda | Whole body massage for 45 min with the help of a cotton bag filled with bolus | 2 months         |
| Aśvagandhā oil mātrā vasti | Given after meal with Vasti Yantra | First 15 days From 16th day for 32 days (16 days each in two set) with 7 days of interval |
| Mustādi yāpana vasti | Given before meal with Vasti Yantra | 2 months         |
isoform found in astrocytes, oligodendrocytes, and endothelial cells. MCTs facilitate the transport of monocarboxylic acids such as lactate, pyruvate, and ketone bodies across biological membranes and play a role in neuroprotection leading to the improved recovery of neuronal function after SCI. Multiple mechanisms may account for the neuroprotective effects of ketones, which may be in part due to the reduction of neuronal excitation due to several mechanisms including the inhibition of vesicular glutamate transporter by acetoacetate, and increased adenosine levels and increased activity of the ATP-sensitive K+ channels and dampen excitation.

Various studies have been done on bone mesenchymal stem cells implantation in SCI. In MYB bone marrow was used as an ingredient. When bone marrow is administered through basti, it may work like bone marrow implantation. In one study stem cells implantation was done with curcumin in SCI which impart a very good result in the recovery of SCI. Curcumin (diferuloylmethane) is the active ingredient of turmeric (Curcuma longa L.) which is a tikta rasa (bitter taste) dominant plant. Likewise, it other drugs which have tikta rasa dominance may have a positive impact on recovery in SCI. MYB is a combination of drugs many among which have tikta rasa dominance such as Dāruharidrā (Berberis aristata DC.) and Aśvagandhā oil. Ghṛta and majjā and honey are other components. Various factors described above may be the cause of good recovery in SCI treated with MYB of this case report. Tikta rasa has soothaghna (anti-edematous and anti-inflammatory) and pittahara (suppression and elimination of deranged pitta dosa). Ghṛta and honey have madhura rasa (sweet taste) dominance. The combinations of these drugs act as vāta pittahara (suppressors and eliminators of deranged vāta and pitta dosas) that reduce inflammation and treat the paralytic condition. In any type of paralysis abhyānga (oleation/massage), svedana (sudation) and mr du virecana (mild purgation) are the lines of treatment as indicated in Caraka Samhita. Tikādī kṣastra basti is also indicated for any bone pathology in Caraka Samhita. All these principles were applied for combined Ayurvedic management used in this case. Initially there was no retention of MB. Patient had no proper bowel evacuation. Due to MB, bowel was properly evacuated and retention of MB gradually increased. In this way, incontinence of bowel was reduced in this patient. Bhṛadvatācintāmani rasa which was used in treatment is indicated in all type of vātaja (diseases due to vāta dosa) and also respiratory diseases. Ardhanaṅgavātārā rasa is helpful in vātika disorders and in hemiplegia. Dasāṁūla kuśa has tridosaghnā property (alleviates deranged dosas of the body) and is helpful in all types of vātika and respiratory disorders. Aśvagandhā and Amṛtā have rasāyana (immunomodulatory) and balya (anabolic) properties. Muktaśuki piśī is indicated in udar roga (splenic and hepatic diseases) and is helpful in G.I.T. disorders such as hyperacidity. Trayodasāṅga guggulu is useful in snāyugatāvāta (~various tendon and ligament disorders), asthiɡatāvāta (disorders of bone), majjā gatavāta (disorders of bone marrow), kharajavāta (limping disorders), and various vāṭika disorders (~neurological, rheumatological, and musculoskeletal diseases). These drugs have the capabilities to address all the manifestations of SCI. A good result was obtained in this case. An informed consent was taken from patient for this case study. Results obtained in this case demonstrate that management of stabilized SCI with Pancakarma procedures and Ayurvedic intervention may offer a good approach to manage neurological deficits. This approach may be useful for clinical practices and further studies on treating SCI.

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REFERENCES

1. Hagen EM, Rekand T, Gilhus NE, Grønning M. Traumatic spinal cord injuries – Incidence, mechanisms and course. Tidsskr Nor Laegeforen 2012;132:831-7.
2. Renaut-Mihara F, Okada S, Shibata S, Nakamura M, Toyama Y, Okano H. Spinal cord injury: Emerging beneficial role of reactive astrocytes’ migration. Int J Biochem Cell Biol 2008;40:1649-53.
3. Pandey GS, Sastri K. Caraka Samhita, Vidyotini Hindi commentary. Sutrasthan 2010;11. Vol. 1. Varanasi: Chaukamba Sanskrit Sansthan; 2006. p. 399.
4. Nishteswar K. Vidyanath R. Sahasrayogam. 3rd ed. Varanasi: Chowkhamba Sanskrit Series Office; 2011. p. 109.
5. Tripathi B. Ashtanga Hridaya, Nirmala Hindi commentary. Nidansthan 1/5/40. Delhi: Chaukhamba Sanskrit Pratishthan; 2003. p. 278.
6. Dwivedi R. Chakradatta, Vaidyaprabhā Hindi commentary, 22/141-145. Varanasi: Chaukhamba Sanskrit Pratishthan; 2005. p. 225.
7. Itzkovich M, Gelernter I, Biering-Sorensen F, Weeks C, Laramee MT, Craven BC, et al. The Spinal Cord Independence Measure (SCIM) version III: Reliability and validity in a multi-center international study. Disabil Rehabil 2007;29:1926-33.
8. Pandey GS, Sastri K. Caraka Samhita, Vidyotini Hindi commentary. Sutrasthan 13/23-25. Varanasi: Chaukhamba Sanskrit Pratishthan; 2005. p. 225.
9. Yudkoff M, Daikhin Y, Meles TM, Nissim I, Sonnewald U, Nissim I. The ketogenic diet and brain metabolism of amino acids: Relationship to the anticonvulsant effect. Annu Rev Nutr 2007;27:415-30.
10. Guzmán M, Blázquez C. Ketone body synthesis in the brain: Possible neuroprotective effects. Frontaglandins Leukot Essent Fatty Acids 2004;70:287-92.
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11. Halestrap AP, Price NT. The proton-linked monocarboxylate transporter (MCT) family: Structure, function and regulation. Biochem J 1999;343:281-99.
12. Enerson BE, Drewes LR. Molecular features, regulation, and function of monocarboxylate transporters: Implications for drug delivery. J Pharm Sci 2003;92:1531-44.
13. Lutas A, Yellen G. The ketogenic diet: Metabolic influences on brain excitability and epilepsy. Trends Neurosci 2013;36:32-40.
14. Ormond DR, Shannon C, Oppenheim J, Zeman R, Das K, Murali R, et al. Stem cell therapy and curcumin synergistically enhance recovery from spinal cord injury. PLoS One 2014;9:e88916.
15. Pandey GS, Sastrī K. Caraka Samhita; Vidyotini Hindi commentary. Siddhisthan 12/15. Vol. 2. Varanasi: Chaukamba Sanskrit Sansthana; 2006. p. 1096.
16. Pandey GS, Sastrī K. Caraka Samhita; Vidyotini Hindi commentary. Sutrasthan 28/27. Vol. 1. Varanasi: Chaukamba Sanskrit Sansthana; 2006. p. 573.
17. Pandey GS, Sastrī K. Caraka Samhita; Vidyotini Hindi commentary. Siddhisthan 4/54. Vol. 2. Varanasi: Chaukamba Sanskrit Sansthana; 2006. p. 1013.
18. Mishra S. Bhaisajyaratnavali. Sidhiprada Hindi commentary. Vol. 141-144, Ch. 26. Varanasi: Chaukhamba Surbharati Prakashan; 2007. p. 530-1.
19. Rastantrasara and Siddhayogasara Sangrah. 17th ed., Vol. 1. Ajmer: Krisna Gopal Ayurveda Bhavana; 2006. p. 586-7.
20. Brahmasankar M. Bhavaprakasha Nighantu. Vidyotini Hindi commentary. Guducyadivarga. 10th ed., Vol. 41. Varanasi: Chaukhamba Sanskrit Sansthana; 2002. p. 294.
21. Brahmasankar M. Bhavaprakasha Nighantu. Vidyotini Hindi commentary. Guducyadivarga. 10th ed., Vol. 190. Varanasi: Chaukhamba Sanskrit Sansthana; 2002. p. 393.
22. Brahmasankar M. Bhavaprakasha Nighantu. Vidyotini Hindi commentary. Guducyadivarga. 10th ed., Vol. 8-10. Varanasi: Chaukhamba Sanskrit Sansthana; 2002. p. 268.
23. Tripathi B. Ashtanga Hridaya. Nirmala Hindi commentary. Chikitsasthan 15/96. Delhi: Chaukhamba Sanskrit Pratisthan; 2003. p. 392.
24. Mishra S. Bhaisajyaratnnavali. Sidhiprada Hindi commentary, 26/98-101. Varanasi: Chaukhamba Suhbharati Prakashan; 2007. p. 526-7.

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