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Advances in Bioresearch

CASE STUDY

Ayurvedic Management of Avaranjaniya Pakshaghata through Classical Virecana: A Case Series

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ABSTRACT
Stroke is ranked as the second leading cause of death worldwide with an annual mortality rate of about 5.5 million. Majority of stroke survivors develop either paralysis/weakness of the limbs known as haemiparesis/hemiplegia, a condition similar to Pakshaghata in Ayurveda which is mentioned as one of the 80 nananatmaja vata vyadhies by Acharya Charak under the name 'Pakshavadha'. Vayu being the main dosa involved here, the samprapti is of two types – avaranjanya and dhatukshaya janya. In Ayurveda, many holistic modalities are mentioned for management of such condition including both external and internal therapies and have proven to be effective since time immemorial. If Ayurvedic therapies are incorporated alongside the modern medical care, stroke survivors may experience better rehabilitation outcomes, faster and balanced recovery. This study involves a case series conducted on five Pakshaghata patients in order to assess the efficacy of Ayurveda in management of such specifically avaranjanya through sodhan kriya. Mrdu Vairocana with trvrit avaleha was administered after snehapana with murchita goghrta and only patients with madyam to pravara bala were selected for the study. All the patients were assessed before and after the treatment using standard scales of assessment. The results showed improvement in the motor and physical functioning of the affected limbs leading to enhanced mobility and subsequently improving quality of life.
Keywords: *Pakshavadha (Paralysis), nanatmaja vyadhies, Avaranjanya, dhatukshaya janya*

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INTRODUCTION

According to Global Burden of Diseases (GBD) study in 1990, stroke was the second leading cause of death worldwide [1-3]. Generally, ischemic strokes account for about 80% of stroke cases while hemorrhagic stroke accounts for 20% but the actual proportions of stroke types depend on the population [4]. The cumulative incidence of stroke ranged from 105 to 152/100,000 persons per year, and the crude prevalence of stroke ranged from 44.29 to 559/100,000 persons in different parts of the country during the past decade [5]. The long-term effects of stroke among the survivors involve hemiparesis/hemiplegia sometimes including facial muscles, spasticity of the involved muscles, lack of co-ordination and balance, difficulty in walking and holding objects, reduced motility of the involved limbs, etc. Because of the permanent impairment of motor and sensory function, dependency, resulting polypharmacy and the constant need of intense physical therapy, the outcomes of treatment are unsatisfactory and limited. Modern medicine is effective for acute management of stroke, along with prevention of subsequent strokes via medications for both existing co-morbidities and underlying causes such as HTN, diabetes, hypercholesterolemia, etc. but regarding long term rehabilitation, it needs to address personalized care as period of recovery and severity of the condition differs from patient to patient. Neurological deficit post stroke is not reversible and optimum recovery is dependent on maximum rehabilitation and effort on the part of the patient and his caretakers Therefore, there comes

the need to integrate Ayurvedic therapies under the rehabilitation program as it has got remedies, both external(*bahya chikitsa*) and internal(*abhyantara chikitsa*) that target on the root cause that are the vitiated *dosas*, *dhatus* and disrupting the involved pathogenesis of the disease(*samprapti ghatakas*) of the disease *Pakshaghata* through initial detoxification, pacification of the vitiated dosas and subsequent nourishment. *Vata dosa* is the main dosa involved in *Pakshaghata* and it is the stimulating factor for all physiological functions and movements of the body. *Samprapti* may be *kevala vatapradhanya* or may involve pitta and kapha as subsidiary *dosas* depending on the *nidana*. *Vayu* in general gets vitiated due to *dhatukshaya* or *avarana*, which in context of Pakshaghata can be understood precisely as hemorrhagic and ischemic causes of stroke, as blood loss in hemorrhage leads to *dhatu kshaya* and ischemic stroke involves formation of atherosclerotic/thrombotic plaque in the macro or micro bloods vessels in the brain. In *Avaran janya Pakshaghata*, the flow of the *vayu dosa* specially *prana vayu* is hampered due to *avarana* by kapha, pitta, *meda*, etc. The ayurvedic therapies are aimed at restoration of the normal movement of *vayu* leading to subsidence of the *lakshanas*. As per classics, general line of treatment of vata vyadhies include *snehan*, *swedan*, *abhyanga, basti* and *sneha virecana* [6]. *Virecana* is the major intervention mentioned for pitta dosa but in *avaranjanya Pakshaghata* it can be adopted as the line of management as snigdha and *sroto suddhi karaka* is the ideal protocol for management of *avaran janya vyadhies*[7] and Acharya Charak has mentioned *snehayukta virecana* for *Pakshaghata*[8]. Also, *Sneha samyukta virecana* has been mentioned by Vagbhata for the same [9]. Hence mrdu virecana can be administered in *madyam bala* to *pravara* bala rogi, in those who have *bahudosa* and *avarana avastha*.
To treat patients suffering from Avaranjanya Pakshaghata through classical Mridu Virechana and to evaluate its therapeutic efficacy.

MATERIAL AND METHODS

Study design: A case series was conducted on 5 IPD based patients who are well oriented and diagnosed with *Avaranjanya Pakshaghata* i.e. hemiplegia due to ischemic stroke, admitted in Panchakarma IPD ward of PIA, devoid of uncontrolled HTN, DM type 2, cardiovascular diseases whose ages were ranging from of 30 to 55 years. Only madhyam bala to pravara bala patients were chosen for the study. Patients were assessed before and after the treatment on the improvement of motor functions and lifestyle.

Table 1: Details of patients

	Case 1	Case 2	Case 3	Case 4	Case 5
Age in years	47	50	51	50	55
Gender	Male	Male	Male	Female	Male
Occupation	Farmer	Labor	Civil engineer	Housewife	Farmer
Chief complaints with duration	Weakness in right upper and lower limbs along with pain, unable to lift right upper limb or hold objects with right hand in the past 9 months	Weakness of left upper and lower limbs in the past ten months, difficulty in walking without support in the past 10 months	Mild Imbalance while walking, mild dysphagia, mild and weakness of left upper and lower limbs in the past 1 year.	Weakness of left upper and lower limbs, unable to hold objects or move the fingers of the left hand in the past 1 year and 3 months	Weakness and heaviness of right upper and lower limbs, unable to hold objects with right hand in the past 11/2 year
Associated symptoms	-	constipation	Slurred speech in the last 1 year, half side(right) headache in the last 6 months	Generalized fatigue	-
Past History	CVA 9 months back, K/C/O HTN in the past 2 years	CVA 10 months back, K/C/O HTN in the past 10 months	CVA 1 year back, K/C/O HTN in the past 1 year	CVA 1 year and 3 months, K/C/O HTN in the past 1year and 3 months	CVA 11/2 year back
Medication	1.Tab Atenolol IP 50 mg-1 tab OD A/F in the past 9 months 2.Tab Atorvastatin 40mg-1 tab HS in the past 9 months	1.Tab Amlodipine 5 mg-I tab OD in morning in the last 10 months 2.Tab disprin -½ tab OD in the last 10 months 3.Tab tranexamic acid IP 500mg and mefenamic acid IP	1.Tab Aspirin 150 mg-1 tab OD A/F in the last 1 year 2.Tab Atorvastatin 40 mg-1 HS in the last 1 year 3.Tab Amlodipine 5 mg-1 BD A/F in the last 1 year	1.Citicoline IP 800 mg and piracetam sodium IP 50mg 1tab OD A/F in the last 1 year and 3 months 2.Levetiracetam IP 500mg 1tab BD A/F in the last 1 year and 3 months 3.Clopidogrel and aspirin tab(75+ 150)mg 1 tab OD A/F in the last 1 year and 3	1.Tab Aspirin IP 150 mg 1 tab HS in the last 11/2 year

		250 mg in the last 10 months		months 4.Rosuvastatin IP 20 mg 1 tab HS in the last 1 year and 3 months	
Surgical history	None	None	None	None	None
Personal history					
Mala	2 times/day	1-2 times/day	1-2 times/ day	1 time/day	1-2 times/day
Mutra	3-4 times/day, 1-2 times/night	2-4 times/day, 2-3 times/night	2- 3 times/day 1-2 times/night	2-3 times/day, 1-2 times/night	3-4 times/day, 2-3 times /night
Kshudh	*Prakrit*	*Prakrit*	*Prakrit*	*Prakrit*	*Prakrit*
Nidra	*Prakrit*	*Prakrit*	*Alpata*	*Prakrit*	*Prakrit*
Ahara	Vegetarian	Vegetarian	Vegetarian	vegetarian	Vegetarian
Addictions	None	None	None	None	None

Table 2: CT Scan/ MRI reports

Case no.	Impression
1	Small sub-centimeter size hyper-acute infarct in posterior limb of left internal capsule
2	Right MCA territory recent(acute) infarcts involving right centrum semi-ovale, right basal ganglia, right corona radiata, right insular cortex and right fronto-parieto-temporal cortical – subcortical atrophy.
3	Area of restricted diffusion in left lateral medulla s/o recent ischemia/acute infarct; loss of flow void in intracranial part of left vertebral artery may suggest thrombosis
4	Multiple patchy areas of diffusion seen in right frontal, parietal, temporal lobes and basal ganglia appear hypointense on ADC – s/o hyperacute infarcts in right MCA territory
5	Recent infarct involving occipital region(left PCA territory), tiny recent infarct in posterior thalamus, few small hyper intense lesion are seen in bilateral frontal and peritrigonal white matter, possibly chronic ischemic foci.

Clinical Findings:

Respiratory, Cardiovascular, Gastrointestinal systems examinations - no any abnormalities detected in all of the cases.

The Central Nervous System Examination is given in the table 2 below:-

Table 3 : Examination of higher mental function and cranial nerves

Higher mental function test					
	Case 1	**Case 2**	**Case 3**	**Case 3**	**Case 4**
Consciousness and Orientation	Conscious and well oriented	Conscious and well oriented	Conscious and well oriented	Conscious and well oriented	Conscious and well oriented
Behavior	Normal	Normal	Agitated	Anxious	Normal
Intelligence	Average	Average	Average	Average	Average
Memory	Intact	Intact	Intact	Intact	Intact
Hallucination	Absent	Absent	Absent	Absent	Absent
Speech	Normal	Normal	Slurred	Normal	Normal
Cranial nerves					
Olfactory	Smell intact	Smell intact	Smell intact	Smell intact	Smell intact
Optic					
Vision acuity	Normal	Near sightedness	Blindness of left eye	Normal	Normal
Vision field	Intact	Intact	Intact in right eye	Intact in left eye	Intact
Color vision	Intact	Intact	Intact in right eye	Intact	Intact
Pupillary light reflex	Present	Present	Absent in left eye	Present	Present
Oculomotor, trochlear and abducens					
Eye ball movement	Possible in all directions	Possible in all directions	Possible in all directions	Possible in all directions	Possible in all directions
Pupillary light reflex	Present	Present	absent in left side eye	Present	Present
Accommodation reflex	Present	Present	absent in left eye	Present	Present
Strabismus and nystagmus	Absent	Absent	Absent	Absent	Absent
Trigeminal					
Facial sensation	Intact and equal of both	Intact and equal of both	reduced on left side	Intact and equal of both	Intact and equal of both

	halves of the face	halves of the face		halves of the face	halves of the face
Jaw jerk	Positive	Positive	Positive	Positive	Positive
Corneal and conjunctival reflexes	Present	Present	absent in left eye	Present	Present
Clenching of teeth	Possible	Possible	Possible	Possible	Possible
Lateral movement of jaw	Possible	Possible	Possible	Possible	Possible
Facial					
Forehead frowning	Possible and equal in both sides	Possible and equal in both sides	Possible and equal in both sides	Possible and equal in both sides	Possible and equal in both sides
Eyebrow raising	Possible	Possible	Possible	Possible	Possible
Eyes closure	Possible	Possible	Possible	Possible	Possible
Teeth showing	Normal	Normal	Normal	Normal	Normal
Blowing of cheeks	Possible	Possible	Possible but weaker in left side	Possible	Possible
Vestibulocochlear					
Hearing	Intact	Intact	Intact	Intact	Intact
Glossopharyngeal and Vagus					
Taste sensation	Intact	Intact	Intact	Intact	Intact
Gag reflex	Present	Present	Reduced	Present	Present
Position of uvula	Centrally placed	Centrally placed	Centrally placed	Centrally placed	Centrally placed
Spinal accessory					
Shrugging of shoulders against resistance	Possible	Possible but reduced on left side	Possible	Possible but reduced on left side	Not possible on left side
Lateral movement of neck against resistance	Possible	Possible but reduced in left side	Possible	Possible	Reduced left lateral movement
Hypoglossal					
Position of tongue	Central	Central	Central	Central	Central
Power of tongue muscles	Intact	Intact	reduced power on left side	Intact	Intact
Fasciculation or wasting or abnormal movement	Absent	Absent	Absent	Absent	Absent

Table 4: Examination of motor and sensory function (UL – upper limb, LL – lower limb)

Motor system		**Case 1**		**Case 2**		**Case 3**		**Case 4**		**Case 5**	
		UL	LL	UL	LL	UL	LL	UL	LL	UL	LL
Muscle power	Left	5	5	2	3	3	4	2	3	2	3
	Right	3	4	5	5	5	5	5	5	5	5
Deep tendon Reflexes	Left	2	2	2	3	3	3	3	3	3	3
	Right	3	2	1	2	1	2	1	1	2	2
Gait		Patient can walk without support		Patient can walk without support		Patient can walk better with support		Patient can walk with support		Patient can walk with support	
Plantar reflex		Present		Babinski sign +ve on left side		Absent		Present		Babinski sign +ve on left side	
Tone		Spasticity in right upper and lower limbs		Spasticity in left lower limb		spasticity in left lower limb		spasticity in left upper and lower limbs		spasticity in left upper and lower limbs	
Co-ordination		Present but reduced on right side		Present but reduced in left side		Reduced on left lower limb		Present but reduced on left side		Present in lower limb but reduced in left upper limb	
Sensory system											
Touch and temperature		Reduced in right side		Present but reduced in left side		Reduced sensation in left side		Present but reduced in left side		Present and equal on both sides	
Vibration and pressure		Reduced in right side		Reduced in left side		Reduced in left side		Present but reduced in left side		Present and equal on both sides	

Table 5: *Dasavidh Pariksha*

	Case 1	Case2	Case3	Case4	Case5
Prakriti	*Vata kaphaja*	*Pitta kaphaja*	*Pitta kaphaja*	*Kaphaja*	*Kaphaja*
Vikriti	*Vata pradhan pitta and kapha anubandha*	*Vata pradhan pitta and kapha anubandha*	*Vata pradhan pitta and kapha anubandha*	*Vata pradhan pitta and kapha anubandha*	*Vata pradhan pitta and kapha anubandha*
Sara	*Madhyam*	*Madhyam*	*Madhyam*	*Avara*	*Madhyam*
Samhana	*Madhyam*	*Madhyam*	*Madhyam*	*Avara*	*Avara*
Pramana	*Madhyam*	*Madhyam*	*Madhyam*	*Madhyam*	*Madhyam*
Satmya	*Madhyam*	*Madhyam*	*Madhyam*	*Avara*	*Madhyam*
Satva	*Madhyam*	*Madhyam*	*Madhyam*	*Avara*	*Madhyam*
Ahara sakti	*Madhyam*	*Pravara*	*Pravara*	*Madhyam*	*Madhyam*
Vyayama	*Avara*	*Avara*	*Madhyam*	*Avara*	*Avara*
Vaya	*Madhyam*	*Madhyam*	*Madhyam*	*Madhyam*	*Madhyam*
Others					
Kostha	*Mrdu*	*Madhyam*	*Krura*	*Madhyam*	*Madhyam*
Jihva	*Sama*	*Sama*	*Sama*	*Sama*	*Sama*

Treatment: - After making sure patient is fit for *virecana*, *deepana* and pachana were started using *aampachak vati* and *panchakola kashaya* along with *udvartana* and *baspa sweda* until *nirama avastha* was obtained. This was followed with administration of *snehapana* with *murchita goghrta* early morning between 6 am to 7am with a starting dose of 30/50ml depending on *sneha satmya* and the type of *kostha* using *sukhosna jala* as *anupana*. From second day onwards, depending upon the *Sneha Jeerna kala*, the dosages were escalated each day until samyak *snigdha lakshanas* were achieved and total duration of *snehapana* ranged from 3 to 4 days. After *snehapana*, an interval of 2 to 3 days was kept as *vishram kala* during which *sarvanga* abhyanga and *patra pinda sweda* were administered. Finally on the day of *virecana* procedure, after checking the vitals, the patients were subjected to sarvanga *abhyanga* and *nadi sweda* early morning. Then, *trivrt avaleha* and *draksha kashaya* were administered between 8 am to 9am. Warm water was given for drinking during the period of digestion of *virecana yoga* and a *virecana* chart was provided to each patient to record the observations such as no. of *vegas*, character of the *mala* (color, consistency, etc.). From the evening of same day, *Samsarjan krama* for 5 or 8 days as the cases fall under either *avara* or *madhyam suddhi*. *Samsarjan krama* was carried out by sequential administration of *peya*, *vilepi*, *akrit mudga yusa*, *krita mudga yusa* in 8 and 4 *annakala* for *madyam* and *avara suddhis* respectively.

Table 6: Intervention given to all the patients with duration

S no.	Intervention	Duration
1	*Deepana* and *pachana* with *aamapachak vati* and *panchakola Kashaya*	2-3 days
2	*Sarvanga udvartana* with *yava lot* and *triphala churna* followed by *baspa sweda*	Patients attained *nirama lakshanas* in 3-5 days
3	*Snehapana* with *murchita goghrta*	Patients attained *snigdha lakshanas* in 3-4days
4	*Sarvanga abhyanga* with *moorchita til taila* followed by *patra pinda sweda*	During v*ishram kala* .i.e.2 days
5	*Sarvanga abhyanga* with *murchita til taila* followed by *nadi sweda*	On the morning of *virecana*
6	*Virecana karma* with *trivrit avaleha and draksha Kashaya*	1 day
7	*Samsarjan krama*	3-5 days(all patients had *avara* to *madhyam suddhi*)

Table 7: Details of Snehapana

Case No.	Duration of *Snehapan*	Dosage per day (1st/2nd/3rd and so on)	Time of administration	*Kshudha kala*	*Sneha jeerna kala*
1	3 days	30ml/50ml/90ml	7am/7:15am/ 7:10am	12:10am/12:20am /4:15pm	5hrs/5hrs/9hrs
2	3 days	30ml/60ml/100 ml	6:30am/6:15am/ 6:30am	11:45am/11:50am /4:30am	5hrs/51/2hrs / 10hrs
3	4 days	50ml/90ml/120ml/ 150ml	7am/7am/7:10 am/7:15am	12pm/2pm/5:10 pm/5:20pm	5hrs/7hrs/7hrs / 10hrs
4	3 days	30ml/70ml/120ml	7am/7:20am/ 7:30am	11am/12:30pm/ 4:30pm	4hrs/5hrs/9hrs
5	3 days	50ml/90ml/120ml	7am/7am/7am	12pm/1:30pm/ 4pm	5hrs/61/2hrs / 9hrs

Table 8: Details of Virecana karma

Case No.	Dosage of *trivrit avaleha*	Dosage of *Draksha kashaya*	Time of administration
1	75gm	200ml	8:30am
2	70gm	200ml	9am
3	80gm	200ml	8am
4	70gm	150ml	9am
5	70gm	200ml	8:00am

Table 9: Observations of *Virecana karma*

Observations	Case 1	Case 2	Case 3	Case 4	Case 5
Time of initiation of *vega*	9:10am	9:45am	9:20am	10am	9am
Time of ending of *vega*	6:20am	7pm	5:30pm	6:30pm	6pm
Total duration of *vega*	9hrs10min	8hrs15min	8hrs10min	8hrs30min	9hrs
No. of vegas	11	15	10	13	12
Complication if any	None	None	None	None	None
Antiki lakshanas	*Kaphanta*	*Kaphanta*	*Kaphanta*	*Kaphanta*	*Kaphanta*
Laingiki lakshanas	*Madhyam suddhi*	*Madhyam suddhi*	*Avara suddhi*	*Madhyam suddhi*	*Madhyam suddhi*

RESULTS: All the patients showed relief in the symptoms with improvement in mobility of the affected limbs making patients able to perform daily routine tasks easier and hence improving quality of life. The patients were assessed using standard scales of assessment specific for stroke patients as shown in table 11 along with grades of muscle power and tone as well as range of movements of various joints using goniometer as demonstrated in table 12 and 13 respectively .

Table 10: Stroke Specific Quality Of Life Scale (BT – before treatment, AT – after treatment)

Ss-Qol	Case 1		Case 2		Case 3		Case 4		Case 5	
	BT	AT	BT	AT	BT	AT	BT	AT	BT	AT
Energy	11	12	7	10	10	12	5	7	4	6
Family roles	10	12	10	10	8	10	4	7	4	7
Language	25	25	25	25	9	11	25	25	25	25
Mobility	22	25	17	22	18	23	12	17	10	14
Mood	17	19	18	20	15	21	13	16	12	16
Personality	11	12	15	15	7	12	12	12	6	8
Self-care	19	22	17	21	18	23	7	11	7	10
Social roles	15	15	14	15	12	14	8	11	6	8
Thinking	15	15	15	15	12	15	8	7	11	15
Upper limbs function	16	18	13	15	23	25	6	9	5	8
Vision	15	15	10	10	4	5	15	15	15	15
Work/productivity	7	9	7	8	7	10	4	6	3	5
Total score	**183**	**199**	**168**	**192**	**143**	**181**	**122**	**143**	**108**	**137**

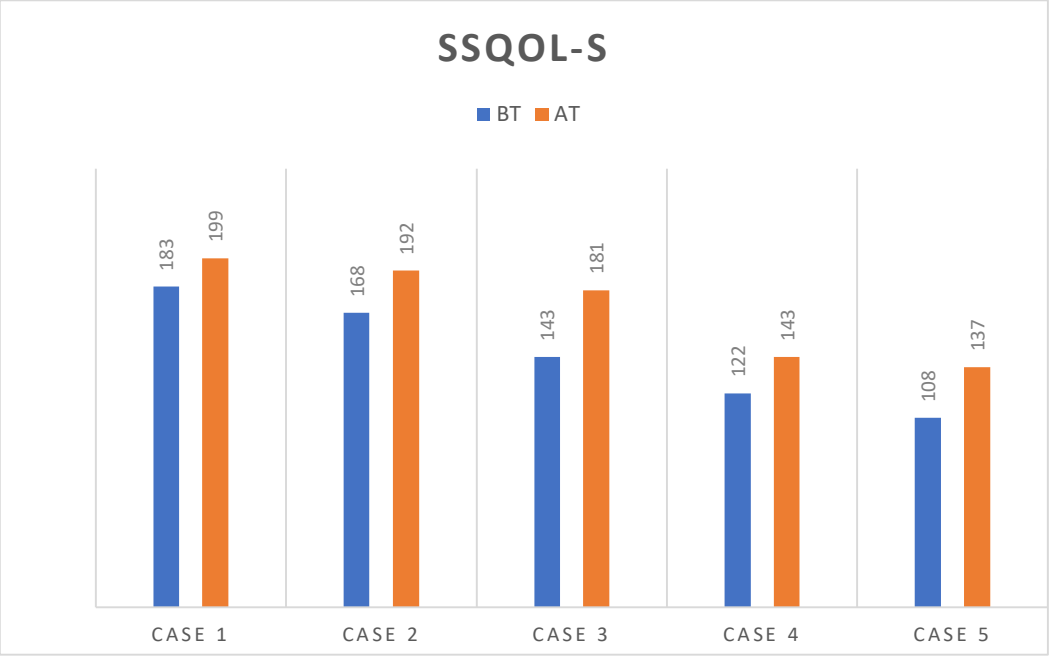
Table 11: Grades for muscle power and tone

Case no.	MRC muscle power grade of the affected limbs				Modified Ashworth scale of the affected limbs			
	UL		LL		UL		LL	
	BT	AT	BT	AT	BT	AT	BT	AT
1	3	4	4	4	1+	1	1	0
2	2	3	3	4	2	1+	1+	1
3	3	4	4	4	1	0	1	1
4	2	3	3	4	3	2	2	1+
5	2	3	2	3	2	3	3	3

Table 12: Range of motion of affected limbs

	ROM	Case1		Case 2		Case 3		Case 4		Case 5	
		BT	AT	BT	AT	BT	AT	BT	AT	BT	AT
Shoulder	Flexion	1000	1200	900	1200	900	1500	700	900	900	1000
	Extension	350	450	200	300	300	450	200	300	00	100
	Abduction	1100	1200	1000	1300	1200	1400	600	900	200	450
	Internal rotation	300	300	200	300	200	450	100	300	300	300
	External rotation	300	300	300	450	300	600	200	300	200	300
Elbow	Flexion	1000	1200	1000	1250	1200	1400	800	1000	200	450
Wrist	Flexion	300	450	300	450	300	500	300	400	00	200
	Extension	300	300	300	450	300	600	200	300	00	200
Forearm	Supination	300	450	450	600	600	800	200	450	00	200
	Pronation	300	300	450	600	600	800	200	450	00	300
Hip	Flexion	1000	1200	70	900	900	1200	700	900	700	900
	Extension	300	300	200	300	200	300	300	200	100	100
	Abduction	450	450	300	450	300	450	300	450	200	300
	Adduction	300	300	200	300	300	300	100	200	100	100
	Internal rotation	45	450	100	300	300	450	200	300	00	10
	External rotation	300	300	100	200	300	300	200	30	00	10
Knee	Flexion	1000	1300	900	1200	900	1200	800	950	300	450
Ankle	Dorsiflexion	200	300	200	300	200	300	100	250	00	100
	Plantar flexion	150	200	100	200	250	300	100	200	00	100

Figure:1: The Stroke-Specific Quality of Life Scale (SSQOL-S) scores of all five cases showed a consistent improvement after treatment (AT) compared to before treatment (BT).



Note: Case 1: Improved from 183 → 199;Case 2: Improved from 168 → 192 Case 3: Improved from 143 → 181 ;Case 4: Improved from 122 → 143;Case 5: Improved from 108 → 137

DISCUSSION

In *Avaranjanya Pakshaghata,* the *samprapti* involves *avaran of vata dosha* specially *prana vayu and Pakshaghata* due to cerebrovascular accident has major role of *rakta*, *pitta*, *kapha* and *meda* in association with *Vata*[10]. Again, *sodhan chikitsa* is important in *avaran janya vyadhies* but *Pakshaghata* being a *vata Pradhan vyadhi*, *tiksna* sodhan must be avoided as it will lead to *vata prakopa*. Also, *Virecan* has been mentioned for both *pittavrita* and *kaphavrita vayu*. So, *snigdha* and *mrdu virecana* was adopted as the main line of treatment for the case series study. The role/purpose of the above treatment modalities can be analyzed as follows: -

Management of *ama* - in order to properly achieve the benefits of *sodhana chikitsa*, one has to adopt proper regimen of *poorva karma*, *pradhan karma* and *paschat karma*. Hence *rukshana chikitsa* was started first in order to remove the *ama avastha* of the patients which set the *kostha* and *agni* in the desired status for the subsequent *Snenapana* and *Virecana*. The ingredients of *ampachak vati* includes *haritaki, sunthi, maricha, pippali, hingu, gandhaka, kumari, saindhav,* kupilu and that of *panchakola kashaya* are *pippali, pippalimoola, chavya, chitrak* and *sunthi* because of which both they possess *usna virya; laghu, ruksha, usna and tiksna guna; titka* and *katu rasa*; *vata-kapha hara*, *deepana*, *pachana* and *anulomana karmas. Deepan-Pachan* drugs cause digestion of the *ama* leading to removal of obstruction/*srota avarodh* while also increasing *jathar agni* and *dhatwa agni*. As acharya Hemadri has rightfully mentioned that *pachan* performs digestion of *ama, deepana* does separation of *dosas* from *dhatus, snehana* does *utklesha* of *dosa* and *swedana* shifts *dosas* from *sakha* to *kostha*[11]. *Udvartana* with *yava lot* comes under *rukshana chikitsa* and causes *meda* and *kapha vimlapan*, *siramukha vivikatatvama, sthiri karana anganam*[12],*sonitakrit, twak prasada and mrdutwakrita*[13]**.** By *udvartana, dhatugata agni* specially *twak agni* gets enhanced leading to *pachan* of *ama* residing in the *sakha. Baspa sweda* was administered after *udvartana*, it is a type of *ruksha sweda* and swedan dravyas are usna, tiksna in nature which further helps in *deepan* and *amapachana.* By its definition, it is *stambhagna, gouravahara, sitaghna*[14] and induces *mardava* and *laghuta*[15]. *Bashpa Sweda* transmits heat through convection method the effects of *Sweda Dravya* (sudation substance) and the effects of heat will reach to micro level [16]. *Swedan karma* in general increases blood circulation, improved oxygen and nutrient supply hence resulting in healing of tissue, relaxation of stiffened muscles, enhanced movement of tendons and ligaments. Thus, *lakshanas* like *sankocha, gourava, stambhata* were seen to be reduced by *udvartana* and *bashpa sweda.*

Role of *Snehapana-* *Snehapana* was done for 3-5 days until patients showed features of *samyak snigdha lakshanas* such as *susnigdha twak*, vit *saithilya*, *deepta agni*, *mrdu gatrata*, *glani*, *laghavam anganam, adhahastat sneha darshanam*[17]. After *deepan-pachan*, the digested ama needs to move from *sakha* to *kostha*, for this, *snehapan* act as the medium. Ghee acts as good solvent for many metabolic waste products and it enters cells easily because cell wall is made up of phospholipids [18]. In *snehapana*, there is additional supplementation of lipids to the body in great amount for short span of time between 3 to 7 days. This creates unnatural saturation of lipids in extracellular environment which drains the lipid soluble waste product from the cellular environment in soluble form or in bound form. It also facilitates the lipid membrane bond waste product containing structures to move out from the cellular environment [19]. Sneha administered internally reaches to *srotamsi* and acts as a solvent to remove the obstruction by dissolving dosha in it, resulting in the removal of *srotarodha,* which is one of important steps in *samprapti vighatana[*20]. In short, *Sneha dravyas* because of their *Suksma guna* reaches upto the microchannels and causes *vishyandana* of *dosa sanghata* by its *snigdha, sara* and *drava guna* due to which the *dosas* and *malas* gets softened and easily detaching from the affected srotas.

Role of *Abhyanga, Patrapinda Sweda* and *Nadi Sweda* - By the procedure of abhyanga and patra pinda sweda, lakshanas like *sira snayu sankochata, sandhi vimokshana, stambhata* of the *anga* were reduced while *mrduta* and *bala* of the patients were increased. *Abhyanga* falls under *bahya snehan karma* and its benefits include *ati artha bala karmani, apachita anga balvana* [21] and *mardavakara, kapaha vata nirodhi, dhatunam pushtijanana* [22]. *Snigdha* and *guru guna* act as *Vatahara, snehana, balya* and *pushtikara; mrdu guna* reduces stiffness by its opposite quality of *kathina guna* and *suksma guna* helps the penetration of drug into the minute channels [23]. *Sneha*(oil) used for *snehana* (oleation) enters in the body through *romakupa, siramukha* and *dhamani* and nourshises the body[24]. The action of *swedana karma* also includes *dosa dravata* [25], *sroto sudhhi and vata niyamana*[26] by its *usna, tiksna* and *suksma guna* which leads to liquefaction of dosas, opening up of the channels and finally flow of dosas from *sakha* towards *kostha.*

Role of *Virecana* - Because *Pakshavadha* is basically caused due to Pran Vayu obstruction, the natural direction of Prana Vayu is from above downwards and this can be achieved by Virecana [27]. The pradhana sthana of vayu is pakwashaya [28] and again line of treatment of pakwashaya gata vata is snehavirecana [29]. The involvement of *Sira* and *Snayu* in the *Samprapti* of *Pakshaghata* accounts the role

of *Raktadhatu* in *Pakshaghata* for which *Virechana* is the treatment [30] as they are the upadhatus of rakta dhatu and again, pitta and rakta have ashraya-ashrayi relationship [31]. Dalhana has described Mastulunga as "*Avileena Ghritakara Mastaka Majja*" and the adhisthana of Pakshaghata vyadhi is Mastulunga or basically "the brain". He has further mentioned that Pittadhara kala and Majjadhara kala are same. As virecana is the line of treatment for pittadhara kala, it can be also adopted for majjadhara kala [32]. Trivrit avaleha contains sweta trivrit as the main ingredient which is known as sukha virecak Dravya (mild, gentle purgative agents)[33]. It is kapha pitta hara which are the dosas involved in avaran janya Pakshaghata. Another important role of virecan is its action on gut microbiome and subsequently gut-brain axis (GBA). Both clinical and experimental evidence suggests that enteric microbiota has important impact on GBA, interacting with not only local intestinal cells but also directly with CNS through neuroendocrinal and metabolic pathways [34]. Virecana may remove the harmful bacteria from the intestine that produces toxins which might trigger neuronal inflammation while enhancing growth of useful bacteria which are known to produce precursors of neurotransmitters and neuroactive compounds which subsequently mediates CNS function.

CONCLUSION

Pakshaghata being included under vatavyadhis, use of virecana for management of such is debatable. However, after crucial analysis of the samprapti involved in *avaran janya vyadhies*, it is concluded that *virecana* is essential for *samprapti vighatna*. In this regard, it not only removes the *avarana* but also serves a good role in restoring the normal function and movement of *vayu anulomana.* Hence it was adopted as the main protocol of management rather than *basti* which is said to be the best for *vata dosa* [35]. By observing the results such as reduction in *stambha, sankocha, sandhi vimoksha* and also increase in range of motion of the affected limbs to a certain extent, virecana karma has once again proven to be efficacious in management of *avaran janya Pakshaghata* . The authors declare that there are no conflict of interest.

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