Research Article

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AN EXPERIMENTAL EVALUATION OF VEDANASTHAPANA EFFECT OF JALAVETASA AND DEVADARU: A COMPARATIVE STUDY

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ABSTRACT

Symptoms like pain is perhaps one of the important aspects to study in detail, because in almost all disease manifestation pain is accompanied and it is the common symptom which brings a patient to physician. So, search for safe drug preparations, which are much effective with very fewer side effects, are from herbal remedies, is the necessity of the present age. To treat the vedana (Pain), Devadaru (*Cedrus deodera* Roxb. Loud) and Jalavetasa (*Salix tetrasperma* Roxb.) are the drugs found to be very effective. 'Vanjula' is the synonym to Jalavetasa, which included under Vedanasthapana Mahakashaya (group of ten analgesic dravya) by Charaka Samhita¹. In this study Devadaru and Jalavetasa has been selected to evaluate its efficacy in Vedanasthapana action. The efficacy of the drugs has been evaluated through experimental studies. The aim is to evaluate the Vedanasthapana (Analgesic) property of Jalavetasa and Devadaru on Albino mice through animal experimentation using Hot Plate Method. Study has been undertaken as pre-clinical method. *In-vitro* method on Albino mice. Four trial groups have included to evaluate the Vedanasthapana (Analgesic) action. Control group, Standard drug group. Group- 1- Devadaru, Group-2- Jalavetasa. Control group has no significance. Trial group 1 & 2 have significance. Standard group has shown marked significance throughout the study. Interpretation: Gradual increase in action has been observed in the trial groups. The standard group has shown immediate onset of action but same progress has not maintained after 90 minutes. The trial drugs Devadaru and Jalavetasa have sustained analgesic action as observed by experimental study.

Keywords: Cedrus, Salix, Vedanasthapana, Analgesic, Kwatha, Hot plate.

INTRODUCTION

Preservation of the health has been instinctive necessity of mankind and knowledge of preserving it is a growing concern. Indigenous medical wisdom in India known as Ayurveda was coeval with the growth and development of great civilizations of India. Vedas which are considered to be the repository of recorded Indian culture, have mentioned this knowledge both in the theoretical and practical form. Several achievements of today advanced medical science are already incorporated in the treatise of Indian Medicine. But these concepts were suggested several centuries ago, in view of availability of newer methods of investigation in modern age these concepts need critical analysis, comments, elaborations and scientific explorations to bridge the gaps between Ayurveda and Western Modern Medicine. Importance of this study is that, a total safe drug against pain is yet to emerge on scene. Many researchers are searching for herbal based analgesic drugs, which are to be safe. In this study the Vedanasthapana effect of two herbal drugs, Devadaru [*Cedrus deodera* (Roxb.) Loud] and Jalavetasa (*Salix tetrasperma* Roxb.), has find out through the Hot Plate methods on mice. The Vedanasthapana properties of these plants are mentioned in different classical texts of Ayurveda including Nighantus.^{2,3}

MATERIALS AND METHODS

The present study has aimed to compare the efficacy of the two drugs Devadaru and Jalavetasa by following Hotplate method using Eddy's Hot Plate⁴. Experiments had been carried out on 24 healthy Albino mice, weighing in between 20-25 grams. Animals were procured from the experimental house attached with ALN Rao Memorial Ayurveda Medical College. They were kept in the cages under identical condition with 12 hours light and 12 hours

dark cycles. The animals were fed as per standard requirements and they were kept in well ventilated rooms under hygienic conditions.

Collection and Preservation of the Drugs

Fresh bark of Jalavetasa had collected from Koppa, in early summer as per standard method of collection. Devadaru heartwood had procured from raw drug market at Calicut, Kerala, Identified by experienced botanist.

Method of preparation of Kwatha (decoction)

The Kwatha (decoction) has prepared at A. L. N. Rao Memorial Ayurvedic Medical Collage pharmacy. The Jalavetasa and Devadaru bark and heartwood have made in to course powder separately. Then 48 grams of drug has taken and 16 times of water has been added to the stain less steel vessel in which trial drugs have been kept. Then it has been kept for one night. Next day morning contents were heated over low flame to reduce the quantity up to 1/8th and filtered with clean cloth and kept in glass jar⁵ Ibuprofen had been used as the standard drug. It is widely used in conditions where pain is more prominent than inflammation. Plasma-t_{1/2} of Ibuprofen is 2 hours and dosage are 400-800 mg TDS.⁶ (Figure 5)

Pharmacognostical study of trial drugs Macroscopic Study (Jalavetasa)

Wood

The sapwood is white or nearly so, merging into the heartwood, which is uniformly light red, turning light reddish brown to light

brown with age. The wood is lustrous; especially sapwood, with silky sheen when first exposed, but becomes dull with exposure.

Bark

Thin channel pieces, 1 to 2 cm wide, 1 to 2 mm thick. Outer surface glossy, smooth or slightly wrinkled longitudinally in young bark. Old bark pieces-brown-greyish to green in colour. Inner surface striated fibrous, yellow-red-or brown in colour. Fracture: Short in outer part, fibrous in Phloem. Transverse section exhibits tangentially arranged groups of fibbers Figure 1, 2.

Physical property

Odour - Not distinct, Taste - Bitter.

Microscopic study

The transverse section of bark of *Salix tetrasperma* Roxb. Shows outermost coverings of dead cork cells, rectangular to tangentially elongated and filled with colouring materials. This region is followed by a big zone of rhytidome, a mass of dead cells going inside the live cells and inhibiting the supply of nutrients to cork cells leaving them dead. Beneath this lies a zone of cork cambium cells (phellogen) giving rise to new cells below the rhytidomes. Below the cork cambium, a zone of living cells constituting the whole as phelloderm lies. This zone is consisting of bands of secretary cells having tannin deposition or red colouring material. These cells are schizogenous in nature. Few prismatic crystals of calcium oxalate are distributed throughout the section. (Figure 9)

Identity, Purity, Strength

- Total ash - 0.62 %
- Acid insoluble ash - 0.043 %
- Alcohol-soluble extractives - 8.4 %
- Water-soluble extracts - 40 %
- Moisture content - 3.63%

Macroscopic study (Devadaru)

Wood moderately hard, light yellowish-brown to brown; wood splits readily longitudinally; annual rings well marked; medullary rays appear as whitish lines; resin canals is present, arranged in long tangential rows, showing up as dark, narrow line on the radial surface of the wood pieces (Figure 3 and 4)⁷

Physical Property

Odour - Strong, Oily, aromatic, Taste - Not distinct.

Powder

Brownish yellow in colour and oily, shows entire or fragments of tracheid's and xylem ray cells.

Identity, Purity and Strength

- Foreign matter - Not more than 1%

- Total ash - 0.44%
- Acid insoluble ash - 0.06%
- Alcohol soluble extractive - 25%
- Water soluble extractive - 6.875%
- Moisture content - 3.33%

Ethical clearance Number

The study had cleared approval of the Institutional Animal Ethical Committee. (Ref No: AE. / 2007-08/003/DG).

Animal selection criteria

Inclusion criteria

20-25 Gram Albino mice, Both male & female irrespective of sex, Active mice, Healthy mice.

Exclusion criteria

Normally mice show hind paw licking or jump response within 6-8 seconds. A cut off period of 15 sec is observed to avoid damage to the paws. Any animal failing to hind paw licking or jump response within 6-8 sec had rejected.

Mice Maintenance

All the animals have been maintained at the Animal house attached to A. L. N. Rao Memorial Ayurvedic Medical College, Koppa, under identical condition of place, light, temperature, food. Twenty-four Albino mice were selected and made into four groups and kept in clean cages. All the cages were washed regularly with detergent followed by disinfected phenol solution and with spirit to maintain hygiene. Paddy husk bedding was provided in the cages.

Feeding Schedule

The quantity of food suggested for the mice weighing 20-25 gram was about 5 grams per day and water was provided as required. Readymade standard laboratory mice feed prepared by Lypton India has procured and used.

Examination of the Animal prior to the Experiment

All the Wister Albino mice were subjected to general check-up for weight. Weight of each animal was checked by using spring balance. Heart rate was counted as number of beats/minutes by feeling the heart rate by thumb. Respiratory rate was counted as number of inspiration and expiration per minute observing the movement of the abdomen. Each mouse in the experiment was identified by colouring the forehead by using permanent marker. The cages were labelled with name of the group and drug.

Grouping

24 mice were divided into 4 groups for the experimental study, each group consisting of 6 mouse, one control group, one standard and two trial groups.

Table 1: Experimental protocol

Groups	No. of Animals	Route of administration	Type of Grouping	Administration	Dose
1	6	Oral	Control	Saline Water	0.24 ml
2	6	Oral	Standard	Ibuprofen	0.24 ml
3	6	Oral	Trial-1	Devadaru Kwatha	0.24 ml
4	6	Oral	Trial-2	Jalavetasa Kwatha	0.24 ml

Dose fixing

The dose fixed as 0.0026 x 50 x Human dose. i.e., 0.0026 x 50 x 96 ml⁷ i.e., 12.48 ml/kg body weight. So, 12.48 x 20 (mice weight in gram.)/1000 = 0.24 ml⁷

Mode of Administration of the drug

Administration of drug through 2 ml disposable syringe fitted with 18 gauge stainless steel needle with a smooth tip to prevent injury to the oesophagus which bent in the middle to facilitate its smooth entry inside the throat. Known quantity of the Kwatha (decoction) has been taken in to the Syringe and pushed directly in to the stomach of the mice after inserting the needle in to the oesophagus carefully. All the trial drugs are in liquid form hence no vehicle had been selected. (Figure 6)

Eddy's Hot Plate is fitted with a Hot plate maintained at constant temperature (Adjustable) with the help of front panel control marked set up and down. Hot plate is to be maintained at 55°C. It is provided with acrylic box with lifting lid fitted over the hot plate for placing the mice on the hot plate. (Figure 7)

Procedure

The Basal pain threshold (Basal Reaction Time) of each individual animal has noted by placing the mice on the Hot- plate on which the temperature is maintained at 55°C. Then observed the reaction time by noting the jump response or paw licking response using a stop-watch. Then the mice were removed from Hot- plate immediately by taking off the lid. Three such observations were made for each animal and the mean has been taken. This reading is considered as Basal Reaction Time. (Table 2-5)

The trial drugs have been given orally and the reaction time were noted at regular intervals at 15, 30, 60, 75 and 90 minutes in each group. When the reaction time reaches 15 seconds it has considered as maximum analgesia and the mouse has been removed from the source of heat to avoid tissue damage. (Figure 8)

Observation

Paw licking or Jump response (whichever comes first) in all the four groups were noted separately and subjected to statistical analysis in order to evaluate the analgesic activity of the compounds by using student – 't'-test (Paired and Unpaired).

Table 2: Basal Reaction Time (Control)

S. No.	Basal Reaction Time in sec.			Mean
	1	2	3	
1	6.2	5	5.11	5.43
2	4.6	5	6.27	5.29
3	4.7	6	5.55	5.41
4	4.94	5.2	6.01	5.38
5	6	5	5.24	5.41
6	5	5.02	6.1	5.37

Table 3: Basal Reaction Time (Standard drug)

S. No.	Basal Reaction Time in sec.			Mean
	1	2	3	
1	6	5.45	5.3	5.5
2	5.45	5.69	5.67	5.6
3	6.21	5.34	4.5	5.37
4	4.98	5.43	6.65	5.69
5	6.45	5	5	5.48
6	6	4.09	5	5.03

Table 4: Basal Reaction Time Trial Group – 1

S. No.	Basal Reaction Time in sec.			Mean
	1	2	3	
1	5.34	5.28	5.37	5.33
2	5	6	5.67	5.56
3	5.24	5.3	5.26	5.34
4	5.24	6.08	5.53	5.62
5	5.02	6	5	5.34
6	4.85	5.12	5.23	5.07

Table 5: Basal Reaction Time: Trial Group – 2

S. No.	Basal Reaction Time in sec.			Mean
	1	2	3	
1	5.01	6	5	5.34
2	5.02	5.87	6.01	5.63
3	5	5.43	5.73	5.39
4	5.38	6.45	4.98	5.6
5	5.41	5.45	5.56	5.47
6	4.02	6	5	5

Table 6: Pain threshold observed at different intervals: Control Group

S. No.	Pain threshold in Minutes					Mean
	15 min	30 min	60 min	75 min	90 min	
	Sec	Sec	Sec	Sec	Sec	Sec
1	5.4	5.35	5.35	5.35	5.35	5.36
2	5.55	5.54	5.5	5.53	5.79	5.58
3	5.37	5.63	5.6	5.59	5.33	5.50
4	5.37	5.12	5.1	5.09	5.34	5.20
5	5.41	5.42	5.48	5.43	5.35	5.41
6	5.11	5.12	5.15	5.15	5.33	5.17

Table 7: Pain threshold observed at different intervals: Standard Drug

S. No.	Pain threshold in Minutes					Mean
	15 min	30 min	60 min	75 min	90 min	
	Sec	Sec	Sec	Sec	Sec	Sec
1	5.9	6.4	6.5	7.5	14.02	8.06
2	5.6	6.32	6.99	8.21	13.87	8.19
3	5.97	6.02	7.02	8.9	10.4	7.66
4	5.98	6.4	7.05	8.2	10.34	7.59
5	5.75	6.98	7.08	8.64	11.55	8
6	5.6	6.65	7.06	9	13.21	8.30

**Table 8: Pain threshold observed at different intervals:
Trial Group –1**

S. No.	Pain threshold in Minutes					Mean
	15 min	30 min	60 min	75 min	90 min	
	Sec	Sec	Sec	Sec	Sec	Sec
1	5.45	6.7	7.75	8.23	10.35	7.69
2	5.56	6.04	8.43	8.45	9	7.49
3	5.35	6.35	7.75	7.57	8.25	7.04
4	5.63	5.98	6.4	7.21	8.75	6.79
5	5.35	5.45	6.84	8.21	9.76	7.12
6	5.08	5.12	6.43	9.12	10.54	7.25

**Table 9: Pain threshold observed at different intervals:
Trial Group –2**

S. No.	Pain threshold in Minutes					Mean
	15 min	30 min	60 min	75 min	90 min	
	Sec	Sec	Sec	Sec	Sec	Sec
1	5.34	5.59	5.67	6.01	6	5.72
2	5.63	5.65	5.9	6.1	6	5.86
3	5.39	5.47	5.89	6.15	5.97	5.77
4	5.6	5.65	5.88	6.4	6.45	6.03
5	5.47	5.4	5.91	6.64	5.9	5.85
6	5	5.01	5.98	6.69	5.32	5.60

Table 10: Control Group (Difference, Before (BT) and after (AT) administration)

S. No.	BT-AT of Control Group					Mean
	15 min	30 min	60 min	75 min	90 min	
1	0.03	0.08	0.08	0.08	0.08	0.07
2	0.26	0.25	0.21	0.24	0.5	0.29
3	0.04	0.22	0.19	0.18	0.08	0.09
4	0.01	0.26	0.28	0.29	0.04	0.17
5	0	0.01	0.07	0.02	0.06	0.08
6	0.26	0.25	0.22	0.22	0.04	0.19

BT: Before Treatment, AT: After Treatment

Table 11: Standard Drug: (Difference, Before and after administration)

S. No.	BT-AT of Standard Group					Mean
	15 min	30 min	60 min	75 min	90 min	
1	0.4	0.9	1	2	8.52	2.56
2	0.00	0.72	1.39	2.61	8.27	2.59
3	0.6	0.65	1.65	3.53	5.03	2.29
4	0.29	0.71	1.36	2.51	4.65	1.90
5	0.27	1.5	1.6	3.16	6.07	2.52
6	0.57	1.62	2.03	3.97	8.18	3.27

BT: Before Treatment, AT: After Treatment

Table 12: Trial Group-1: (Difference, Before and after administration)

S. No.	BT-AT of Group -1					Mean
	15 min	30 min	60 min	75 min	90 min	
1	0.02	1.37	2.42	2.9	4.9	2.34
2	0	0.48	2.87	2.89	3.44	1.93
3	0.01	0.96	2.41	2.23	2.9	1.70
4	0.01	0.36	0.78	1.59	3.12	1.17
5	0.01	0.11	1.5	2.87	4.41	1.78
6	0.01	0.05	1.36	4.05	5.46	2.18

BT: Before Treatment, AT: After Treatment

Table 13: Trial Group – 2: (Difference, Before and after administration)

S. No.	BT-AT OF GROUP -2					Mean
	15 min	30 min	60 min	75 min	90 min	
1	0	0.25	0.33	0.67	0.66	0.38
2	0.02	0.02	0.27	0.47	0.37	0.23
3	0	0.08	0.5	0.76	0.58	0.38
4	0.18	0.05	0.28	0.8	0.85	0.43
5	0.07	0.07	0.44	1.17	0.43	0.38
6	0.01	0.01	0.98	1.69	0.32	0.60

BT: Before Treatment, AT: After Treatment

RESULTS

Table 14: Paw licking or Jump response at 15 minutes

Group	S.D.	S.E.	T	P
Control	0.131	0.054	0.866	> 0.10
Standard	0.160	0.065	4.650	< 0.01
Group 1	0.177	0.072	1.962	> 0.10
Group 2	0.209	0.085	1.266	> 0.10

Under Hot-plate method at 15 minutes, it shows in control group with t value is 0.866 ($P > 0.10$). In Standard drug with t value is 4.650 ($P < 0.01$) and trial drug -1 with t value 1.962 ($P > 0.10$) and trial drug- 2 with t value 1.266 ($P > 0.10$). (See Table 14) Statistically it shows that at 15 minutes the trial drug -1 and -2 have been showing any significance. Standard drug only shows significance.

Table 15: Paw-licking or Jump response at 30 minutes

Group	S.D.	S.E.	T	P
Control	0.193	0.079	0.870	> 0.10
Standard	0.296	0.121	6.741	< 0.01
Group 1	0.521	0.213	3.239	< 0.05
Group 2	0.222	0.090	1.834	> 0.10

Under Jump or Paw-lick response at 30 minutes shows in control group with t value 0.870 ($P > 0.10$). In standard group with t value is 6.741 ($P < 0.01$) and trial drug- 1 with t value 3.239 ($P < 0.05$) and trial drug -2 with t value 1.834 ($P > 0.10$). (See Table 15) Statistically it shows that the Standard group has significance but the trial group-1 is having mild significance and Trial group-2 is having no significance at 30 minutes. Same time control group has no significance.

Table 16: Paw-licking or Jump response at 60 minutes

Group	S.D.	S.E.	T	P
Control	0.184	0.075	0.880	> 0.10
Standard	0.203	0.083	12.331	< 0.001
Group 1	0.759	0.311	6.772	< 0.01
Group 2	0.096	0.039	5.044	< 0.01

Paw-licking or Jump response at 60 minutes shows in control group with t value is 0.880 ($P > 0.10$). In Standard group with t value is 12.331 ($P < 0.001$) and trial group 1 with t value 6.772 ($P < 0.01$) and trial group 2 with t value 5.044 ($P < 0.01$). (See Table 16) Statistically it showed that the trial group 1 and trial group 2 are having significance at 60 minutes. But trial group 2 has less significance compare to trial group 1. This trend of gradual increase gives a clue that trial drugs are having slow and steady action.

Table 17: Paw-lick or Jump response at 75 minutes

Group	S.D.	S.E.	T	P
Control	0.183	0.075	0.935	> 0.1
Standard	0.509	0.208	11.552	< 0.001
Group 1	0.614	0.251	9.524	< 0.001
Group 2	0.264	0.108	6.062	< 0.01

Under Paw-lick or Jump response at 75 minutes, it shows, in control group with t- value 0.935 ($P > 0.1$). In case of standard group, it shows that t- value is 11.552 ($P < 0.001$). Trial group 1 with t- value 9.524 ($P < 0.001$) in trial group 2 with t -value 6.062 ($P < 0.01$) (See Table 17). Statistically analysis of above values shows that the trial group 1 is highly significant than the trial group 2, A the same time Standard drug maintaining same trend of analgesia at 75 minutes. Same time trial drug 1 shows competent increase in its Analgesic action. Compare to trial group 2. Control group shows same trend of no significance.

Table 18: Paw- lick or Jump response at 90 minutes

Group	S.D.	S.E.	T	P
Control	0.168	0.068	0.988	> 0.1
Standard	1.540	0.631	10.974	< 0.001
Group I	0.839	0.343	10.860	< 0.001
Group II	0.279	0.114	7.591	< 0.001

Paw-lick or Jump response at 90 minutes table shows that control group with t value 0.988 ($P > 0.1$) has no significance. In standard group with t value 10.974 ($P < 0.001$) and trial group-1 with t value 10.860 ($P < 0.001$) has marked significance. In trial group-2 with t value 7.591 ($P < 0.001$) increasing trend of significance. (See Table 18). Above trend can be interpret statistically in this

way that both the trial groups i.e., Group 1 & 2 are having the significant result at 90 minutes. Standard is showing same trend of analgesia in its action from the beginning itself. At the same time trial drugs 1 and 2 shows increasing trend in its analgesic action.

Figure 1: Morphological characters of *Salix tetrasperma* Roxb.
(Courtesy: Indian Medicinal Plants by Kirthikar & Basu, Part IV Plates No 915)

Figure 2: *Salix tetrasperma* - Bark

Figure 3: Macroscopical structure of *Cedrus deodera* Roxb. Loud.
(Courtesy: Indian Medicinal Plants by Kirthikar Basu Part IV, Plate 928)

Figure 4: *Cedrus deodera* Roxb. Loud. - Kanda sara (Heart wood)

Devadaru-Kwatha

Jalavetasa-Kwatha

Figure 5: Prepared trial drugs

Figure 6: Infusing the trial drug

Figure 7: Analgesiometer (Eddy's Hot Plate)

**Figure 8: Mice inside the Analgesio meter
(Showing paw- licking response)**

Microscopical Characters of Bark of *Salix tetrasperma* Roxb.

Upper portion

Middle portion

(Low Power)

Lower portion under low power

Schizogenous cells and tannin cells

(Under high power)

Figure 9: Microscopical Characters of Bark of *Salix tetrasperma* Roxb.

cce- Cork cell., sc - Scretory cell., phg - Phelloderm., phy - Phyllogen., cc - cork cambium., tc-tannin bearing cell., Sch - Schizogenous cell

DISCUSSION

According to Modern Medical science Analgesia or Pain is an ill-defined, unpleasant sensation, usually evoked by an external or internal noxious stimulus and Analgesics are drugs that selectively relieve pain by acting in the CNS or on peripheral pain mechanisms, without significantly altering consciousness. Analgesics relive pain as a symptom, without affecting its cause.

In Ayurvedic literature the word Vedanasthapana (Analgesic) is used to indicate the drug actions which remove the pain of a particular part of the body. Vedanasthapana (Analgesic) drugs not only remove pain but also re-establish the lost sensation (by normalizing the hyper sensitivity of tissues of the effected part) of the Dhatu (major structural components of the body). Analgesics relive pain without any attempt to rectify the

underlying cause. At the same time Vedanasthapana drugs try to restore the normalcy by rectifying the damaged tissues. Even in Ayurveda pain is used synonyms to Vedana, It is not clear whether animals perceive pain in the same manner as man and whether the pathways transmitting nociceptive stimuli to the brain transmitters and their receptors in animals are similar to those in humans. Therefore, in animal experiments, it is worthwhile to define pain in the operational sense based on stimulus conditions and observable responses.

Discussion on the trial drug

Devadaru and Jalavetasa had selected as trial drug for the study because in Ayurvedic literature from Vedic periods to present age including modern texts on medicinal plants described the Pain-relieving property of these drugs.

Willow bark (*Salix alba*) had been used for many centuries as Analgesics in Modern medicine. Salicylic acid was prepared by hydrolysis of the bitter glycoside obtained from this plant. Sodium salicylate was used for fever and pain from 1875 onwards. From this introduction of acetylsalicylic acid (aspirin) occurred in 1899.

Jalavetasa botanically identified as *Salix tetrasperm* Roxb is commonly available in Malanadu region of South Karnataka. The drug Jalavetasa is synonyms to the drug Vanjula which comes under 'Vedanasthapanadeshaamani' of Charaka¹. Renowned Ayurvedic scholars of 21st century like P.V. Sharma, Bapalal vaidya and other scholars like Kertikar and Basu accepted Jalavetasa as *Salix tetrasperma* and it have similar property to Vetasa mentioned in Samhithas.⁸⁻¹⁰

Regarding second drug Devadaru it is included Katukaskanda and Vata samsamana gana and indicated mainly for diseases associated with Shula (pain) by Contemporary literature of Ayurveda like Dravyagunavignnan of P.V. Sharma,¹⁰ Dravyagunahastamalak of B. L. Misra¹¹.

The experimentation conducted on all the four groups showed an excellent basal reaction. The pain threshold values of the control drug, standard drug and the trial drugs have been analyzed through the schedule of time by following 15 minutes after the administration of the drug as first reading followed by 30 minutes, 60 minutes, 75 minutes, 90 minutes respectively. The basal reaction of the mice on hot plate as paw licking or jump response was the criteria to analyse the analgesic effect of the drug were carefully conducted by stop watch reading method.

Statistical analysis has given the evidence that trial group 1 and 2 have no analgesic effect after 15 minutes of administration of drug same as control group. But standard drug has marked analgesic action at 15 minutes itself. (Table 14)

Table 15 reveals that the trial drug group- 1 at 30 minutes showed a mild significance with $P < 0.05$, with standard drug $P < 0.01$ at the same time both trial group 2 and control group showed insignificance. So above statistical data shows that trial drug-1 have mild analgesic action at 30 minutes after its administration. At the same time control group and Trial group-2 shows any significant action in this stage. Standard drug shows same trend of increasing its Analgesia.

Table 16 shows that the trial drugs 1, 2 and standard drug have significance after 60 minutes with $P < 0.01$, $P < 0.01$ & $P < 0.001$ respectively. The control group shows an insignificant result with $P > 0.10$. When we interpret this data, we can get in to a conclusion that after one hour the trial drug 2 also started to show analgesic action. But compare to Trial drug 1, the analgesic action of Trial drug 2 is less and delayed. At the same time Standard drug shows high significance after one hour also.

Table 17 reveals that trial drug-1 at 75 minutes showed a high significance with $P < 0.001$. Standard drug also shows same trend with high significance with $P < 0.001$. Trial drug 2 has moderate significance with $P < 0.01$. Control group shows same insignificance with of $P > 0.1$.

While interpreting above data, it shows that Trial drug Devadaru and Jalavetasa have marked analgesic action at 75 minutes onwards and Devadaru have high significance compare to Jalavetasa. Standard drug shows same trend of high significance here also. Control group have no action.

Table 18 reveals that the trial drug-1 and 2 after 90 minutes shows high significance with $P < 0.001$. The Standard drug also shows the same high significance ($P < 0.001$). It shows that after 90 minutes the drug Devadaru acquired same level of analgesic action to the standard drug. At the same time standard drug is not showing any progress. Trial drug 2 also shows an increasing trend of analgesia. The control group shows the same in significance with $P > 0.1$.

Mode of action of Trial Drugs

According to Ayurveda the action of the drug has analysed based on the rasa (taste), guna (physical attributes), veerya (Potency) (Vipaka and Prabhava (exceptional activity)). Trial drug- 1 possess tikta rasa (Bitter taste), laghu (lightness), snigdha (unctuousness) guna, (Physical attributes) ushna veerya (hot potency) and Katu Vipaka (bio transformed pungent taste). Trial drug-2 possess tikta, (bitter) kashaya (astringent) rasa (taste), Ruksha (dryness) guna, Sheeta veerya (coldness in potency), Katu Vipaka (Pungent in biotransformation). Vedana (pain) is Manoathishtitham (inferring in mind) Manovahasrothas (faculty of mind) are samjnavaha srothas. Chanel of consciousness). Vata is the controller of mind. Vedana is of two type one is sugathmaka (joy full) other is dukkatohmaka (sorrow full). In diseased state a person infers dukkathmakavedana (sorrow full pain). Dukka is always associated with raja-tamo guna (passion and delusion) Vata (Dosha responsible for movement and cognition) is that principal constituents of the living body, whose structure is Akasha (space element) – Vayu (air element) and whose function is rajasik (passionate) in nature. It is being concerned with the production of those physical and mental processes which are predominantly rajasik (passionate) in nature; hence the presence of vata is to be in such mental phenomena as exhibition of enthusiasm, concentration, etc. as also in such physical phenomena as respiration, circulation, voluntary action. These physical phenomena are included among the activities of the nervous system. So, any property positively influential to vata is simulative to nervous system. Devadaru is tikta rasa, ushna veerya, Katu Vipaka. All these are vata Kopana (aggravate) in nature, but its laghu, snigdha guna subside vata and provide tonicity to the tissue. Same way in the case of Jalavetasa all other properties such as tikta kashaya rasa, Ruksha guna, Katu Vipaka are Vata Kopana in nature, but Sheeta veerya is having the properties like Hladana, Moorcha nashaka. Both are action related to mind. This indicates that Sheeta guna (coldness) is directly influencing mind. But we know all Sheeta and Snigdha Draya are not acting on manovahasrothas. For that a high stimulation is required. vata gets this acceleration by other properties like Kapha-avrita vatavastha blocks the pain sensitizing mechanism.

CONCLUSION

Based on this study it became clear that the two drugs are having analgesic activity in different degree. The experimental observations are further explored in clinical manner in order to develop an economic and safe analgesic formulation for suffering humanity.

The reason for the analgesic action of the drug is possible because of its Snigdha guna and Katu Vipaka in Devadaru and Sheeta veerya and Katu Vipaka in Jalavetasa. The trial drugs found to be absolutely free from any side effects during the animal experimentation studies. This study was conducted on primitive animal models (albino mice). So clinical trial may be undertaken to prove their efficacy in patients.

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