

## Evaluation of Wound healing activity of *Jatyadi* Ointment and *Jatyadi taila* in the management of clean wound (*ShuddhaVrana*)- A Randomised Controlled Trial

Pradeep Shahjirao Shindhe, Ramesh Shivappa Killedar, Laxmikant S D, Santosh Y M, Manjula Madiwalar  
Department of Shalyatantra KAHER Shri BM Kankanwadi Ayurveda Mahavidyalaya, Belagavi, Karnataka, India

Corresponding Author's Email: drramesh39@gmail.com

Date of Submission: 11 Feb 2020; Date of Acceptance: 22 May 2020

### ABSTRACT

**Background:** *Vrana* (Wound) is a one which does the *gatravichurnan*(disruption of tissues) and does the *vivarnata* (discolouration) of body part. These wounds are frequently encountered in our day today life and they are produced mainly due to the trauma or pathological insult to the body and may cause long term agony to the patient. Retrospective analysis of Medicare beneficiaries reveals that 8.2 million people had wounds with or without infections in 2018.

**Objective:** To evaluate wound healing efficacy of *Jatyadi* ointment in *shuddhavrana*(clean wound)

**Materials and Method:** A total number of 30 patients were included in the study and were randomly divided into two groups using random number generator software. The patients of Groups A were treated with *Jatyadi* ointment application and Group B treated with *Jatyadi taila* local application for a period of 7 days, assessment of changes in wound were recorded before treatment and on 8<sup>th</sup> day. Bates Jensen wound assessment tool containing eight parameters indicating the features of healing wound were assessed. Wilcoxon matched pair test was used to assess within group results and Mann-Whitney U test to assess in between group results.

**Results:** Significant improvements were seen in within group results and in between group results were comparable in all the selected parameters of Bates Jensen wound assessment tool.

**Conclusion:** *Jatyadi* ointment and *Jatyadi taila*, both are effective and results are comparable.

**Key words:** Wound healing, *Jatyadi* ointment, *Jatyadi taila*, Clean wound

Annals Ayurvedic Med. 2020; 9 (2) 98-107

### Introduction

The *vrana* is one which causes *gatravichurnana* and does the *vivarnata* of the *shareera* which is described as 'a break in the continuity of tissue, from violence or trauma' and is regarded as healed if there is a restoration of the wounded or inflamed tissue to normal condition.<sup>1,2</sup> Wound healing is an important biological process involving tissue repair and regeneration and various stages.<sup>3</sup> Worldwide prevalence of wounds is 1%, estimated that 1.5 million cases of traumatic wounds (13%) found every year.<sup>4</sup>

The reference of *vrana* in regards to its definition, classification and management are available in the classics. Its effective management for a surgeon is the basic skill required on which the outcome of surgery revolves. Wound healing is a dynamic and complex process which requires suitable environment to promote healing process.<sup>5</sup> It is era of evidence based medicine which requires aid of modern equipment's, various drug delivery system, dosage form for global acceptance of any drug or therapy. Ayurveda is accepted as alternative and traditional system of medicine which requires modernisation, scientific approach towards drug preparation, drug delivery and patient care. JT is a

medicated oil formulation popularly used in the treatment of various topical wounds (AFI, 2003).<sup>6</sup> JT is known for *vranashodhana*, *ropana* and *raktastambhana* properties. *Malahara kalpana* is considered as ointment preparation as per modern pharmaceutical science which comprises *sikthataila* (bees wax and oil mixture) or *ghrita*, as basic ingredient.<sup>7</sup> It possess properties like *snehana* (oelation), *shodhana* (cleansing), *ropana* (healing) and *varnya* (beautifying) which depends on the composition of drugs used. The *malahara* form has advantages like, it is easy to apply, to store and also possess good shelf life period.<sup>7</sup> Hence the study was undertaken to pharmaceutically modify *Jatyadi taila* into an ointment form and to evaluate its wound healing efficacy in *shuddhavrana*.

### Materials and method

The patients attending the OPD and IPD of KAHER'S B.M.K Ayurvedic Hospital, Belagavi were enrolled for the study. The CONSORT Statement guidelines were followed in reporting the study outcome. The study was approved by Institutional ethical committee with Ethical clearance number - BMK/17/SL/PS/1.

### Raw drugs and Finished Products

Drugs were collected from KAHER's GMP Certified Ayurved Pharmacy, Khasbag, Belagavi and natural sources. Control drug (*Jatyadi Taila*) was procured from GMP certified Pharmacy. *Jatyadi* ointment was prepared with collaboration of GMP certified KAHER Ayurveda pharmacy, Khasbag.

### Hypothesis

H0 – There is no significant effect of *Jatyadi* ointment over *Jataydi Taila* in the management of *shuddhavrana*

H1 - There is significant effect of *Jatyadi* ointment over *Jataydi Taila* in the management of *shuddhavrana*

**Subjects-** Total 30 patients of *shuddhavrana* were recruited for the study from the OPD and IPD of

KAHER'S BMK Ayurveda Hospital and Medical research centre, Belagavi.

**Source of Subjects** – Patients exhibiting *shuddhavrana* features in cases of traumatic injuries of upper and lower limb, post-operative wounds like pilonidal sinus, fistulectomy wounds, abscess (post drainage) were selected for the study.

**Inclusion criteria** - Patients of either sex between 20-70 years of age and having the sign and symptoms of *shuddhavrana* were included in the study.

**Exclusion criteria** - Patients suffering from *dustavrana* (non healing wounds), wounds associated with systemic diseases like diabetes mellitus, tuberculosis, malignant wounds, arterial, varicose ulcer, pressure ulcer, HbsAg, HIV I & II positive were excluded from the study.

**Screening methods** - Patients included in the study were thoroughly examined for the wound and all data collected was systematically recorded. Wound was assessed by selected parameters of Bates-Jensen Wound Assessment Tool i.e. 1,2,3,7,9,10,11,12 and 13 indicating the features of healing wound.

**Study design** - The study was prospective randomised controlled trial and patients were randomly allotted to both the groups by computer generated random numbers. The patients were allocated to control and trial groups in 1:1 ratio.

**Intervention** - All the 30 patients were randomly divided into two groups, Group A (intervention) was treated with *Jatyadi* ointment and Group B (control group) was treated with *Jatyadi taila*. In both groups method of application was external, duration of application was once in a day and duration of treatment was 7 days. Assessment was done on baseline and 8<sup>th</sup> day for changes and recorded systematically. The nature and study design was explained to every patient and informed consent was taken. Institutional Ethics Committee approval was obtained for the study. Patients were instructed to report any adverse events to the investigator during the study period.

Table 1: Ingredients of Jatyadi Ointment.<sup>8</sup>

Sl.No.	Name of the Ingredients	Parts use	Quantity of Ingredients Batch 15 kg	10 gm of Jatyadi Ointment contains
1.	<i>Jati (Jasmine officinale Linn.)</i>	Leaves	208.33gm	0.138gm
2.	<i>Nimba (Azadiracta indica A. Juss)</i>	Leaves	208.33gm	0.138gm
3.	<i>Patola(Trichosanthus dioica Roxb.)</i>	Leaves/Plant	208.33gm	0.138gm
4.	<i>Naktamala (Pongamia pinnata Linn.)</i>	Leaves	208.33gm	0.138gm
5.	<i>Madhuka (Glycyrrhiza glabra Linn.)</i>	Root	208.33gm	0.138gm
6.	<i>Kushta (Saussure alappa C.B.Clarke.)</i>	Root	208.33gm	0.138gm
7.	<i>Haridra (Curcuma longa Linn.)</i>	Rhizome	208.33gm	0.138gm
8.	<i>Daruharidra (Berberis aristata DC.)</i>	Stem	208.33gm	0.138gm
9.	<i>Manjishtha (Rubia cordifolia Linn.)</i>	Stem	208.33gm	0.138gm
10.	<i>Katurohini (Picrorhiza kurroa Royle ex Benth.)</i>	Rhizome	208.33gm	0.138gm
11.	<i>Padmaka (Prunus cerasoides D.don)</i>	Heart wood	208.33gm	0.138gm
12.	<i>Lodhra (Symplocos racemose Roxb.)</i>	Stem bark	208.33gm	0.138gm
13.	<i>Abhaya (Terminalia chebula Retz.)</i>	Pulp	208.33gm	0.138gm
14.	<i>Nilotpala (Nelumbo nucifera Gaertn. )</i>	Flower	208.33gm	0.138gm
15.	<i>Tutthaka (Copper sulphate)</i>	Mineral	208.33gm	0.138gm
16.	<i>Sariva (Hemidisums indicus Linn )</i>	Root	208.33gm	0.138gm
17.	<i>Naktamala (Pongamia pinnata Linn.)</i>	Seed	208.33gm	0.138gm
18.	<i>Siktha( Yellow Honey bee wax)</i>	Wax	208.33gm	0.276 gm
19.	<i>TilaTaila (Sesame indicum Linn.)</i>	Oil	15kg	10gm
20.	Water		60liter	40ml
21.	<i>Siktha for ointment form</i>		208.33gm	0.138gm

**Method of Malahara (ointment) preparation<sup>7</sup>**

Appropriate quantity of honey beeswax was taken and gently heated in a suitable vessel until it melts completely. In another vessel appropriate volume of *Jatyadi taila* was taken and it was added slowly in to the vessel containing

melted bees wax. Gentle stirring was done until homogeneous mixture was obtained and was allowed to cool at room temperature. The appropriate amount of homogeneous mixture was taken on ointment tile and it was mixed properly to get consistency of ointment and it

## Shindhe PS et.al. : Evaluation of Wound healing activity of Jatyadi Ointment...

was stored in a wide mouth container, at room temperature.

### Criteria for Assessment

**Primary Outcome** - Wound was assessed by selected parameters of Bates-Jensen Wound Assessment Tool i.e.1,2,3,7,9,10,11,12 and 13 (Size, Depth, Edge, Exudates Type, Skin Colour Surrounding Wound, Peripheral Tissue Oedema, Peripheral Tissue Induration, Granulation Tissue, Epithelialization).

**Statistical Methods** - SPSS version 20.0 was used for the statistical analysis. Chi Square test was used to evaluate the homogeneity of data across the groups. Comparison of two study groups (A and B) before and after treatment was carried out by using Mann-Whitney U test. Comparison of within the groups was carried out by using Wilcoxon matched pair test. Dependent T test was used to assess before and after treatment total scores in two study groups (Table 4). All tests were considered statistically significant at  $p < 0.05$ .

Total patients screened were 31 and enrolled were 30. No adverse effect was reported during the study. There was one drop out in the study as patient did not come for dressing properly.

**Subject characteristics** - The mean age ( $p = 0.3182$ ) and gender ( $p = 1.0000$ ) were comparable between the groups (Table 2).

**Primary Outcome** - The study showed that in between group results were comparable in all the assessed wound parameters (Table 3). However in within group, significant results were observed in all the parameters of wound i.e. Size ( $p = 0.007$ ), Depth ( $p = 0.007$ ), Edge ( $p = 0.007$ ), Exudates Type ( $p = 0.0010$ ), Exudate Amount ( $p = 0.001$ ), Skin Colour Surrounding Wound ( $p = 0.0051$ ), Peripheral Tissue Oedema ( $p = 0.0180$ ), Peripheral Tissue Induration ( $p = 0.0180$ ), Granulation Tissue ( $p < 0.007$ ), and Epithelialization ( $p = 0.007$ ) at baseline and on 8<sup>th</sup> day.

**Table 2:- Percentage of Sex wise distribution of male and female in Group A and B.**

Gender	Group A	%	Group B	%	Total
Male	11	78.57	13	86.67	25
Female	3	21.43	2	13.33	5
Total	14	100.00	15	100.00	30
Chi-square with Yates's correction = 0.0001 P = 1.0000					
<b>Comparison of two study groups (A and B) by age groups</b>					
Age groups	Group A	%	Group B	%	Total
20-29yrs	3	21.43	3	20.00	7
30-39yrs	7	50	4	26.67	11
40-50yrs	4	28.57	8	53.33	12
50 – 70yrs	0		0		0
Total	14	100.00	15	100.00	30
Mean age	37.87	42.40	40.13		
SD age	13.53	14.83	14.13		
Chi-square= 2.2941 P = 0.3182* $p < 0.05$					

**Table 3: Comparison of two study groups (A and B) with status of wound parameters before and after treatment in between groups (Mann-Whitney U test) and within groups (Wilcoxon matched pair test)**

Sl No.	Parameter	Treatment	Group	Sample size (n= 30)	Mean	SD	S.E	Z value	P Value
1.	Size	BT	Trial (A)	14	2.214	0.699	0.1869	-	0.8357
			Control (B)	15	2.250	0.577	0.1443	0.2074	
		AT	Trial (A)	14	1.143	0.363	0.0970	-	0.7875
			Control (B)	15	1.063	0.442	0.1106	0.2696	
2.	Depth	BT	Trial (A)	14	2.571	0.513	0.1373	-	0.9827
			Control (B)	15	2.563	0.512	0.1281	0.1625	
		AT	Trial (A)	14	1.214	0.425	0.1138	-	0.8432
			Control (B)	15	1.438	0.512	0.1281	0.3111	
3.	Edge	BT	Trial (A)	14	2.714	0.468	0.1253	-	0.9339
			Control (B)	15	2.750	0.577	0.1443	0.0830	
		AT	Trial (A)	14	1.143	0.363	0.0970	-	0.1199
			Control (B)	15	1.500	0.516	0.1291	1.5554	
			Control (B)	15	1.000	0.000	0.000		
4.	Exudate type	BT	Trial (A)	14	2.429	0.937	0.2506	-	0.0814
			Control (B)	15	2.813	0.655	0.1638	1.7421	
		AT	Trial (A)	14	1.071	0.2673	0.07143	-	0.1199
			Control (B)	15	1.375	0.500	0.1250	1.5554	
5.	Exudate amount	BT	Trial (A)	14	2.286	0.726	0.1941	-	0.0723
			Control (B)	15	2.500	0.730	0.1826	1.6324	
		AT	Trial (A)	14	1.357	0.497	0.1329	-	0.1072
			Control (B)	15	1.375	0.500	0.1250	1.4325	
6.	Skin colour surrounding wound	BT	Trial (A)	14	2.071	1.207	0.3225	-	0.6482
			Control (B)	15	2.125	0.957	0.2394	0.4563	
		AT	Trial (A)	14	1.000	0.000	0.000	0.000	1.000
			Control (B)	15	1.125	0.500	0.1250		
7.	Peripheral tissue edema	BT	Trial (A)	14	1.500	0.650	0.1738	-	0.7716
			Control (B)	15	1.500	0.632	0.1581	0.2903	
		AT	Trial (A)	14	1.000	0.000	0.000	0.000	1.000
			Control (B)	15	1.000	0.000	0.000	0	

8.	Induration	BT	Trial (A)	14	1.643	0.744	0.1991	-	0.493
			Control (B)	15	1.813	0.750	0.1875	0.684	7
		AT	Trial (A)	14	1.000	0.000	0.000	0.000	1.000
			Control (B)	15	1.000	0.000	0.000	0	
9.	Granulation Tissue	BT	Trial (A)	14	2.857	0.663	0.1772	-	0.851
			Control (B)	15	2.875	0.718	0.1797	0.186	9
		AT	Trial (A)	14	1.286	0.468	0.1253	-	0.755
			Control (B)	15	1.313	0.478	0.1197	0.311	7
10.	Epithelialization	BT	Trial (A)	14	3.143	1.167	0.3120	-	0.604
			Control (B)	15	3.250	0.930	0.2327	0.518	1
		AT	Trial (A)	14	1.429	0.513	0.1373	-	0.533
			Control (B)	15				0.622	8

**Table 4: Comparison of Before and After treatment total scores in two study groups (A and B) by Dependent T Test**

Groups	Treatment	Mean	Std. Dv.	Mean Diff.	SD Diff.	% of change	Paired t	p-value
Group A	Before treatment	18.60	3.04	9.67	2.61	51.97	14.3471	0.0001*
	After treatment	8.93	1.44					
Group B	Before treatment	19.40	2.85	9.73	3.28	50.17	11.4810	0.0001*
	After treatment	9.67	1.84					

\*p<0.05

### Discussion

Wound treatment is given prime importance by *Acharya Sushruta*, which involves two major components i.e. *shodhana* and *ropana*.<sup>1</sup>When the wound attains *shudhha laxana* (features of clean wound), *ropana* is adopted which is important phase of healing, where wound is more prone for trauma and infection.<sup>7</sup>Wound healing is a complex process and involves three phase's viz., inflammation (0–3 days), cellular proliferation (3–12 days) and remodelling (3–6 months).<sup>9</sup> During healing process wound requires adequate tissue perfusion/oxygenation, proper nutrition and moist environment. Healing is complete by firm knitting of wound edges with collagen.<sup>10</sup>

Dressings are broadly divided into two types i.e. Irritant and Emollient. In the presence of slough it requires mechanical measures and chemical agents which are irritant agent and does desloughing (Hydrogen peroxide, Povidone iodine solution. etc). Emollient dressing constitutes application of lubricating agents when wound is not having any slough (Hydrogels, Hydrocolloids, and Ointment etc.).<sup>11</sup> Ointment form of drug is essential for wound healing because of its Biocompatibility, it maintains moist environment thus preventing dehydration, it provides protection against dust and microorganisms, it allows gas permeability, promotes epithelisation, painless dressing due to non-adherent property.<sup>12,13</sup> Dressing with ointment are considered as occlusive, which blocks transcutaneous

water loss and natural essential fatty acids easily penetrate into cell membranes, to enhance drug penetration and hastens wound healing.<sup>14</sup>

### Wound parameters

**Size, Depth and Edge:** A significant reduction in wound size (Table 3)(Fig.1 and 2)was observed within the groups because of phytochemicals presents in *Jatyadi* ointment (Table 1) such as flavonoids, essential oils (terpenoids), tannins (phenolics), glycosides, steroids and alkaloids which helps in wound contraction and thus promotes wound healing.<sup>15</sup> Ingredients of *Jatyadi* ointment possess *tikta, kashaya rasa, laghu, ruksha gunas*. These *rasa* and *guna* possess properties like *vrana ropana, twak-mamsa sthireekarana* (Strengthening the tissue).<sup>16</sup>

**Exudate type and amount:** There was significant reduction in exudate (Table 3) was observed within the groups. Decrease in the quantity of exudate is due the *shodhana* effect of *ointment* as it contents *Jati, Kushta, Padmaka, DaruHaridra, Lodra* having *kashaya* (astringent), *tikta* (bitter) *rasa* (taste), *lekhana* (scraping), *kleda shoshana* (drying of exudates) properties.<sup>17</sup> Recent animal study proved the Beeswax is effective in reducing wound exudates.<sup>18</sup>

**Peripheral Tissue Oedema and Induration:** Significant reduction in peripheral odema (Table 3) and induration was observed within the groups. *Patola, Jati, Katuki, Lodra, Sariva* has *shothahara* (anti-inflammatory) properties and thereby reduces the peripheral tissue oedema.<sup>19</sup> Curcumin present in *Haridra* has anti-inflammatory, antiseptic, antibacterial and antimicrobial property, Salicylic acid present in *Jati* is antibacterial, antifungal and anti-inflammatory property, *Kushta* has Anti-inflammatory action.<sup>19</sup> Beeswax has the qualities like *mridu* (soft), *snigdha* (unctuous) and having the properties *vrana shodhana* (cleansing the wound), *vranaropana* (healing the wound).<sup>20</sup>

**Granulation Tissue:** Promotion of collagen synthesis by fibroblast, neoangiogenesis increases amount of

granulation tissue which speeds up the regeneration process. *Jatyadi* ointment helps in knitting of tissue matrix (Fig. 3 and 4), soothes the mucosa. It does the *snehana* of tissue, provides adequate nourishment. *Rakta prasadak dravya* like *Manjishta* and *Sariva* enhances the *raktadhātu* which helps in improving tissue perfusion and strengthening local venous structure as *sira* is the *upadhātu* of *rakta*.<sup>21</sup> *Katuka* present in the *Jatyadi* ointment improves re-epithelialization, neovascularization and migration of endothelial cells, dermal myofibroblasts and fibroblasts into the wound bed.<sup>22</sup> Recent studies proved that *Tuttha* (CuSO<sub>4</sub>) promotes angiogenic responses in vitro, in vivo wound models, thus helps in rapid filling of wound area with granulation tissue in turn helps in closure of wound area.<sup>23</sup>

**Epithelization:** Decrease in the epithelization time was observed within the groups (Table 3) (Fig. 5 and 6). This was due to the presence of Tannins and phytosterols which promote the wound healing process with increased capillary formation and fibroblast proliferation enhancing the rate of epithelization.<sup>24</sup>

### Conclusion

The present study showed that both the formulations (*Jatyadi* ointment and *Jatyadi taila*) are effective within group results and comparable in between group results. Ointment form of application was easier and has showed its efficacy in all the selected parameters of the Bates Jensen wound assessment tool.

### References

1. Kaviraja Ambika Dutta Shastri editor, Sushruta Samhita of Acharya Sushruta, Chikitsa Sthana, 1<sup>st</sup> chapter, verse 8, 1<sup>st</sup> ed. Reprint; Varanasi: Chowkhamba Sanskrit Sansthan; 2007. p. 04.
2. G Mwaka, S thikra, Mungayi. The Prevalance of post-operative pain in the first 48 hours following day surgery at a tertiary hospital in Nairobi. African health sciences. 2013;13(3):768-776.

## Shindhe PS et.al. : Evaluation of Wound healing activity of Jatyadi Ointment...

3. S Das. A concise textbook of surgery. 9<sup>th</sup> edition. S. Das publishers, Kolkata; 2014, p. 02
4. Fletes-Vargas G, León-Mancilla B, Esquivel-Solis H, Advances in the Management of Skin Wounds with Synthetic Dressings. Clin Med Rev Case Rep, 2016; 3(9):2-6
5. Dhivya S, Padma VV, Santhini E. Wound dressings - a review. Biomedicine (Taipei). 2015;5(4):22. PMID: 26615539
6. Shailajana Sunita, Menonb Sasikumar, Pednekara Suhas, Singha Ashish. Wound healing efficacy of Jatyadi Taila: In vivo evaluation in rat using excision wound model. Journal of Ethnopharmacology, 2011,138 ;99– 104
7. Dubey Somil. Review of Malahara Kalpana of Rasa Tarangani. J Ayurveda Integr Med Sci 2019;2:79-84. <http://dx.doi.org/10.21760/jaims.4.2.15>.
8. K.R Sreekantha Murthy. editor, Sharangadhara Samhitha of Sharangadhara, Madhyamakhandha, 9<sup>th</sup> Chapter, Verse 168-171, Chaukhambha Orientalia, Varanasi; 2010, p.336, 132.
9. Kulkarni YS, Emmi SV, Dongargaon TN, Wali AA. Wound healing effect of Vimlâpanakarma with Jâtýâditailam in diabetic foot. Ancient Sci Life. 2015;34:171-4.
10. Martin P. Wound healing – Aiming for perfect skin regeneration. Science. 1997; 276:75–81. [PubMed]
11. Gvalani A K. Manual of clinical surgery, 1<sup>st</sup> edition, CBS publishers and Distributors, New Delhi; 2011, p. 95-96
12. M. Kuhlmann, W. Wigger-Albertib, Y.V. Mackensenb, M. Ebbinghausb, R. Williamsb, F. Krause-Kyora, R. Wolbera. Wound healing characteristics of a novel wound healing ointment in an abrasive wound model: A randomised, intra-individual clinical investigation. Wound Medicine, 2019; 24:24–32.
13. Judith E. Thompson, Melgardt M. De Villiers. A Practical Guide to Contemporary Pharmacy Practice. Ointment Bases, 3<sup>rd</sup> Edition: 23<sup>rd</sup> Chapter., Lippincott Williams & Wilkins; 2009, p.277-290.
14. Punam Sawarkar, Gaurav Sawarkar. Management of Chronic burn wound by compound Ayurvedic preparation Dagdhahar Malahar. Ayurlog: National Journal of Research in Ayurved Science- 2018; (6)(4): 1-11
15. H. Tsuchiya, M. Sato, T. Miyazaki, S. Fujiwara, S. Tanigaki, M. Ohyama, T. Tnanka, M. Linuma. Comparative study on the antibacterial activity of phytochemical flavanones against methicillin resistant Staphylococcus aureus. J Ethnopharmacol. 1996;50(1):27-34. PMID: 8778504
16. V Dev Satheesh, S Shailaja, Sharma Vishwanath. A Comparative Clinical Study on the effect of Jatyadi Taila in Varicose Ulcer and Diabetic Ulcer. IAMJ: 2015;3; (7); 1952-58
17. Satheesh V Dev, Shailaja S V, Vishwanath Sharma. A comparative clinical study on the effect of Jatyadi Taila in Varicose Ulcer and Diabetic Ulcer. IAMJ, 2015;7:52-58
18. Moustafa Alaa, Ayman Atiba. The Effectiveness of a Mixture of Honey, Beeswax and Olive Oil in Treatment of Canine Deep Second-Degree Burn, Global Veterinaria, 2015; 14 (2): 244-250.
19. Gokhale AB, Damre AS, Kulkarni KR, Saraf MN. Preliminary evaluation of anti-inflammatory and anti-arthritis activity of S. lappa, A. speciosa and A. aspera. Phytomedicine 2002; 9(5): 433-7. PMID: 12222664

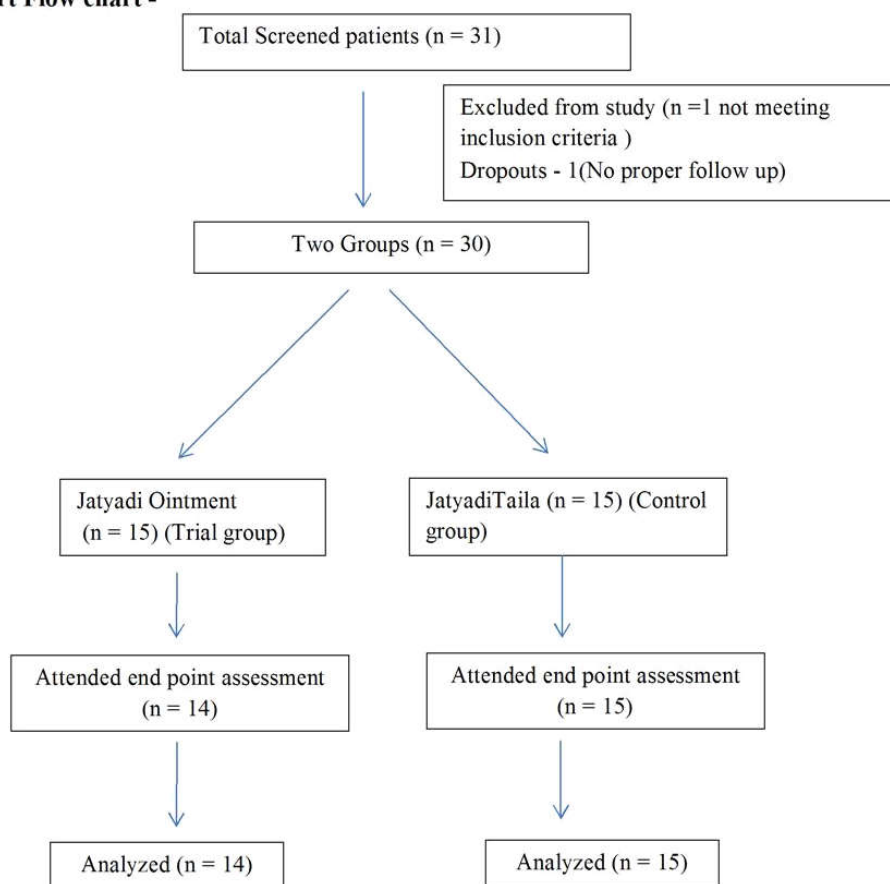


## Shindhe PS et.al. : Evaluation of Wound healing activity of Jatyadi Ointment...

20. Mishra Kumar Abhaya, Krishnapriya , N.V Ramesh. Therapeutic uses of bees wax in Ayurveda and its physico chemical analyses: A review. Int. J.Res. Ayurveda Pharm. 2017; 8(1):25-26.
21. Waghmare S. D, Londhe Gaurav P, Dakhore Rajesh N, PatangeGauri P. Varicose Ulcer managed with Panchavalkala Kashaya and Jatyadi Taila- A Case Study 2019; 8(5):1321-1327.
22. Singh AK, Sharma A, Warren J, Madhavan S, Steele K, Rajesh Kumar NV, Thangapazham RL, Sharma SC, Kulshreshtha DK, Gaddipati J, Maheshwari RK. Picroliv accelerates epithelialization and angiogenesis in rat wounds. Planta Med. 2007; 73(3):251-6. PMID: 17318779
23. Katari S. Raju, GiulioAlessandri, Marina Ziche, Pietro M. Gullino. Ceruloplasmin, Copper Ions, and Angiogenesis. Journal of the National Cancer Institute, 1982;69(5): 1183–1188.
24. Ibrahim N', Wong SK, Mohamed IN, et al. Wound Healing Properties of Selected Natural Products. Int J Environ Res Public Health. 2018;15(11):2360. PMC6266783

**Source of Support : Nil**  
**Conflict of Interest : None**

### Consort Flow chart -





**Fig. 1** Before treatment of Excised pilonidal sinus wound



**Fig. 2** After treatment of Excised pilonidal sinus wound



**Fig. 3** Before treatment of Fistulectomy wound



**Fig. 4** After treatment of Fistulectomy wound



**Fig. 5** Before treatment of Lacerated wound



**Fig. 6** After treatment of Lacerated wound