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TITLE

***Shashti Upakrama (Sixty Procedures) in the
management of Vrana (Wound) - A Review***

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ABSTRACT

Background: Sushruta Samhita, compiled by *Acharya* Sushruta, lays down the principles of Ayurveda in general and the branch of Surgery or *Shalyatantra* in particular. As a warfare surgeon he provides a detailed description of the conditions the surgeons faced in their practice like wounds, fractures, dislocations, torn or damaged ears, nose, limb etc which either had to be amputated or reconstructed; haemorrhage, pains, intestinal obstruction, ascites etc. Management of wounds and ulcers was a challenge to Sushruta and other physicians of those times and continues to be so even in today's medically advanced era. **Aim:** To compile and evaluate the *Shashti Upakrama* mentioned for the management of *Vrana* in *Sushruta Samhita* and to understand their utility in accordance to the present day wound management concepts. **Materials & Methods:** The 60 *Upakrama* mentioned in Sushruta Samhita were analysed and scientifically discussed to check for their relevance for the management of *Vrana* in accordance to today's needs. **Observations:** The challenges faced by him in his practice made him to lay down an elaborate method of managing the *Vrana* (Wound). *Shashti Upakrama* (Sixty procedures) deals with the management of *Vrana Shophha* (Inflammation), *Vrana* and the cosmetic repair of the formed scar. The management principles adopted for the wound management in the present modern science and the *Shashti Upakrama* mentioned by Sushruta are similar and Sushruta moreover lays great emphasis on the cosmetic repair of the formed scar and also mentions treatment modalities to prevent wound dehiscence and its recurrence. **Conclusion:** *Shashti Upakrama* is not only a scientific method for the management of a wound/ulcer from the stage of abscess to the stage of a well formed, cosmetically acceptable scar but is a more advantageous methodology.

Keywords: *Ayurveda, Shashti Upakrama, Sushruta Samhita, Vrana, Wounds*

Introduction

Ayurveda, is one of the most ancient system of medicine known to the human kind. The Vedas have numerous references of diseases and their managements. Ayurveda is considered as the Upaveda (Axillary) of Atharvaveda [1] and hence is considered to be divine as well as precious for the maintenance of health of the mankind.

Sushruta Samhita, though provides knowledge of all the 8 specialized branches of Ayurveda; it mainly deals with the science of surgery or *Shalyatantra*. To begin with the knowledge of anatomy through dissection of human cadavers; the process of theoretical learning and then practical training under a surgeon, the models created to train a surgeon before he uses his skill on a human, the ethics laid down for a surgeon before and during his practice, shows the strict training a surgeon had to go through before he could practice his skills in the society.

Wounds were a common occurrence during wars and hence have been mentioned in detail by Sushruta. A surgeon, who cannot adequately manage a wound created by him (during surgery) or those caused by a trauma, cannot claim success in his practice.

A surgeon, who cannot adequately manage a wound created by him (during surgery) or those caused by a trauma, cannot claim success in his practice. Hence giving importance to the minutest details of the stages of wound healing, he has explained *Shashti Upakrama* [2] for the management of a wound. It covers the management of abscess, the created wound and even the scar formed so that in the process of healing even the cosmetic disfigurement is minimised. Giving due importance to these *Upakrama*, an attempt has been made to understand them in accordance to the modern principles.

The aim of the study was to screen and evaluate the *Shashti Upakrama* mentioned for the management of *Vrana* in Sushruta Samhita and to understand their utility in accordance to the present day wound management concepts.

Materials & Method

Source of data compiled:

The concepts of wound/ulcer management as mentioned in Sushruta Samhita under the heading of *Shashti Upakrama* was screened. An effort was made to understand each *Upakrama* from the point of view of its role in promotion of wound healing.

Observation

The details of *Shashti Upakrama* for the management of a *Vrana* are found in *Chikitsasthana*, 1st chapter of Sushruta Samhita. These can be understood under different headings as:

1. Measures of management of *Vranashopha* (abscess)
2. Measures of management of *Vrana* (wound/ulcer)
3. Measures of cosmetic repair of the formed scar (*Vaikrtapahachikitsa*)

Shashti Upakrama starts with *Apatarpana* (having light and nutritious food) or *Langhana* (fasting). This causes *Deepana* (strengthens the *Agni* or digestive fire) and *Pachana* (digestion or breakdown), digests the *Ama* (toxins of improperly formed metabolic products) and thus breaks the acceleration of the abscess pathology in the initial stage itself. *Apatarpana* (non nourishing) helps to stimulate the *Kayaagni* (digestive fire) which also stimulates its constituent *Dhatwagni* (fire or energy required to absorb nutrition at tissue level).^[3] A strong *Kayaagni* is essential for *Ayu* (life), *Varna* (lustre), *Bala* (strength), *Swasthya* (health), *Utsaha* (enthusiasm) etc. and most importantly the *Ojus* (vigour).^[4] *Ojus* is responsible for the natural immunity of all the *Dhatu* (tissue) against any type of vitiation or *Vyadhi* (disease).

Decreased blood flow to an area of ulceration results in reduced oxygenation, nutrition, and healing rates. ^[5] *Alepa* (ointments) and *Parisheka* (irrigation with medicines) helps to pacify the vitiated local *Dosha*. They improve the blood flow to the area thus bringing in fresh blood, along with oxygen and nutrients vital to the fighting tissue. It thus helps to reduce *Vedana* ^[6] (pain) and *Daha* ^[7] (burning sensation) locally.

Abhyanga and *Vimlapana* (massage and massage with light pressure) helps to overcome *Srotoavarodha* (obstruction to the free flow of materials in the body channels). In the inflammatory stage, there is outpouring of blood into the local area which causes congestion as a result of which oedema sets in. Wounds heal slowly and may not heal at all in an environment in which they are repeatedly traumatized or deprived of local blood supply by oedema.^[8] When *Sroto Avarodha* is eliminated, venous return is re-established, the toxins are removed and thus their deleterious effects are eliminated.

Swedana (fomentation) helps to control the vitiated *Vata* and weakens the vitiated *Kapha* thus causing *Amapachana* (breakdown of *Ama* or toxins of improper metabolic products) and relieving pain as well. Fomentation ^[9] increases the blood flow, thus making more neutrophils, macrophages, oxygen, nutrition etc. available to the local battling tissues and helps in the early repair of the damaged tissues. It also promotes venous return and helps in the elimination of the toxins of the process of inflammation which is very vital for maintaining the tissue integrity.

Upanaha (poultice) and *Pachana* (digestion or breakdown) helps in the *Doshavilayana* (breakdown of vitiated *Dosha*) and thus either the *Vranashopha* undergoes *Shamana* or advances the *Pakavastha* (stage of suppuration). *Shamana* relieves the patient of his complaints and when *Pachana* occurs and the pus gets localised, it either breaks open or discharges on its own or the surgeon incises it open and thus relieves the patient of his complaints.

Visravana is letting out the vitiated *Dosha* through the medium of *Rakta* (blood). Depending on the vitiated *Dosha* predominant in the area, *Shrunga* (cow's horn), *Jalauka* (leech) or *Alabu* (gourd) are used for letting out the blood. *Rakta* is the media through which the vitiated *Dosha* travel and spread from one site to another site. When vitiated *Rakta* is let off by the process of *Visravana*, the *Dosha* are unable to vitiate newer *Dhatu*, *Vranashopha* is not able to spread to the newer *Dhatu* and the disease process remains localised.

Jalukavacharana or hirudotherapy, acts by stimulating microcirculation, causing vasodilatation, increasing vascular permeability and reducing venous congestion improves oxygen and nutrients perfusion to the healing tissues thus promoting wound healing. The enzymes in saliva of the medicinal leech has a great impact on wounded tissue, enhancing the power of angiogenesis, thereby leading to a better perfusion effect on the damaged tissue. ^[10]

Snehana (internal use of ghee, oil etc), *Vamana* (emesis) and *Virechana* (purgation) are vital to remove the vitiated *Dosha* from the body and to set right the *Jataragni* (digestive fire) and *Dhatwagni*, which is very vital to improve the immunity of a person. The *Shodhana* (detoxification) of the body in turn normalises the vitiation of the *Dosha* and prevents recurrence of the wound (disease) as well. ^[11]

By these measures, generally the *Vranashopha* subsides and does not get supplicated to cause a *Vrana*. Once supplicated, Sushruta explains certain surgical procedures for the incision and drainage of pus from the

area. *Puynirharana* (drainage of pus) is important procedure to clear the pathogens and toxins of inflammation from the area, so that they don't get strengthened and involve newer and farther tissues. Thus, measures like *Darana* - incising upon the abscess with the use of medicines (not instruments), *Chedana* (excision), *Bhedana* (incision using instruments), *Lekhana* (scrapping), *Eshana* (probing), *Aharana* (extraction), *Vyadhana* (puncturing), *Visravana* (draining) and *Sivana* (suturing) have been mentioned. Once through the surgical procedures like *Darana*, *Chedana* etc. mentioned above if the abscess is completely drained and the created wound is cleaned, the wound can be sutured for early healing. When certain drugs in the form of ointments are used to cause the union of edges of the wound (non-surgically), it is termed as *Sandhana*.

Peedana (squeezing) is a method of pressing the abscess area in order to cause *Puynirharana*. When abscess is situated over a *Marmapradesha* (vital regions)^[12] where the usage of instruments is contraindicated or if the patient is not consenting to surgical procedure to drain the pus, then medicines are made into a paste and applied over the abscess leaving its mouth uncovered. Unlike other conditions, here *Lepa* is allowed to dry. As the *Lepa* dries it creates pressure over the abscess and thus squeezes out the pus from the abscess and draining it non-surgically.

Shonithasthapana is a measure of arresting haemorrhage. During the process of incising and draining out the pus from the abscess, the surgical procedures may create varying intensity of haemorrhage. For this purpose, Sushruta has advocated *Shonithasthapana*. He has advocated mainly four methods to arrest haemorrhage i.e. *Sandhana* (drugs with *Kashaya Rasa* are used for the purpose of unification of the wound), *Skandana* (ice cold liquids used locally promotes coagulation), *Pachana* (ash of plants cause desiccation) and *Dahana* (cauterization causes contraction of blood vessels).^[13]

Sushruta has considered *Rudhira* (blood) as the main support for the *Shareera* (body)^[14], the loss of which can destroy the body itself. After surgical drainage of the abscess, Sushruta has advocated *Shonithasthapana* measures.

Further after the abscess has been drained and all the pus is removed and a wound is created. Sushruta has explained methods for cleansing (*Shodhana*) and healing (*Ropana*) of the wound.

Nirvapanam (irrigation with cold materials) helps to reduce *Daha*, *Paka* and other symptoms manifested. The process of inflammation ends with the drainage of pus.

Any remnant symptoms like pain, bleeding, hemorrhage, hyperaemia etc is set right by this process of irrigation. The process carried out along with milk, ghee etc. for this purpose is one of the important methods mentioned.^[15]

Utkarika is the application of semisolid pastes of *Vatahana Dravya* over the wound. The wound edges are prevented from becoming dry and hard by the application of *Utkarika*.

Kashaya (decoction), *Varti* (wick), *Kalka* (paste), *Sarpi* (ghee), *Taila* (oil), *Rasakriya* (semisolid extracts) and *Avacurmana* (dusting) are procedures mentioned for the purpose of *Shodhana* and *Ropana* of the formed wound. Depending on whether cleansing (if the wound is unhealthy) or healing (if the wound is clean) is required; various drugs are used in these mentioned forms. For e.g. *Dashamoola Kivatha* is used for cleansing vitiated *Vata*, *Nyagrodhadi Kivatha* for vitiated *Pitta* and *Aragvadhadi Kivatha* is used for cleansing *Kapha* vitiation. Dusting of above drugs is also mentioned when the wound is deep seated, foul smelling and covered with thick slough. Once the *Vrana* is *Shuddha*, *Ropana* is mentioned. For this purpose, *Madhu* and *Ghrta* is commonly used. The antibacterial activity of honey is mainly due to inhibins in honey. These inhibins consist of hydrogen peroxide, flavonoids, and phenolic acids, plus many other unidentified substances.^[16] The glucose content of honey and the acid pH (typically between pH 3 and 4) may assist in the bacteria-destroying action of macrophages. This chemical debridement action of honey, apart from accelerating wound healing, spares the necessity for surgical debridement under general anaesthesia.^[17] Ghee contains several saturated and unsaturated fatty acids which are capable of taking part in metabolic processes involved in healing of any wound.^[18]

Dhupana (fumigation) is one of the unique methods mentioned for the removal of *Krimi* (microorganisms), *Kandu* (itching), *Ruja* (pain) etc. *Dhupana* with the fumes of ghee mixed with *Guggulu* (*Commiphora wightii*), *Vacha* (*Acorus calamus*), *Sarshapa* (*Brassica juncea*) etc. is mentioned. Fumigation was used for the purpose of elimination of any remnant infections from the site as well as to prevent the subsequent contamination of the created clean wound. Further onwards, Sushruta was clear that *Vaikrtapaha Chikitsa* needs to be implemented so that as the wound heals the scar formed would be minimal and cosmetically acceptable.

Utasadana (elevation) and *Avasadana* (depression) are measures mentioned for increasing or decreasing the local granulation tissue so that the wound floor is maintained same as that of the surrounding tissue. Depressed wound floor or elevated wound floor would surely lead to an unacceptable scar area and hence various measures have been mentioned.

Mridu Karma (softening) is a measure mentioned to soften the edges of the wound by the usage of *Vatahara* drugs in the form of pastes etc. or *Raktamokshana* -blood letting (using *Shringa*). This was a method mentioned to prevent callousness. The wound as it heals sometimes becomes chronic or callous which delays the wound healing and hence this measure is mentioned.

Similarly, *Daruna Karma* (hardening) is mentioned when the wound becomes soft. Wounds having less tensile strength undergo dehiscence and thus wound healing gets delayed. This measure restored the tensile strength of the wound thus restoring the process of wound healing.

Kshara Karma (application of caustics) is mentioned to be used when there is excessive raised, hard, indurated tissue or excessive slough over the wound area. As the wound heals, secondarily it may again get infected resulting in the formation of slough which is to be removed and for this purpose application of *Kshara* is mentioned. *Kshara* helps to debride the slough and also has action against *Staphylococcus*, *pseudomonas* etc, [19] and thus is able to restore a clean wound and aid the healing process.

Agnikarma (thermal cautery) was mainly mentioned as a measure to arrest *Raktasrava* (blood loss). After caustic application, or by any other reason, if there is haemorrhage from the wound, Sushruta has mentioned *Agnikarma* for the purpose of arresting haemorrhage.

Kishna Karma (blackening) is a procedure for darkening the light-coloured scar formed in the area and for this, *Bhallataka* is mentioned.

Pandu Karma (lightening) is a procedure for reducing the colour of hyper pigmented scar to normalcy for which application of *Manjishtha* (*Rubia cordifolia*), *Haridra* (*Curcuma longa*), *Daruharidra* (*Berberis aristata*) etc. is mentioned.

Pratisarana (anointing) is mentioned where in powder of hen's egg, *Mukta* etc is applied or rubbed over the scar when the scar formed is smoother than the surrounding skin.

Romasanjanana (repilation) is a measure for re-growth of hairs when the hairs over the scar area are lost and causes cosmetic disfigurement. For this ash of *Hastidanta* (ivory) is mentioned to be used along with *Daruharidra* and goat's milk.

Romapaharana (depilation) is similarly mentioned to remove any excess hair growth over the scar. Hairs act as a foreign body which can prevent the complete healing of the area or can be a source of infection as well. So, the hairs are removed using knife, scissors etc or by the application of *Bhallataka Taila* (oil of *Semecarpus anacardium*) with *Snuhiksheera* (latex of *Euphorbia nerifolia*) etc.

Basti (therapeutic enema) and *Uttarabasti* (douching) are mentioned for the management of ulcers vitiated by *Vata*, those situated below umbilicus or in the genital regions. As the person is wounded he becomes weak and loses his strength. *Dhatukshaya* (loss of tissue) causes *Vataprakopa* (aggravation of *Vata Dosha*) which can cause wound dryness or dehiscence.

Patradana (covering the wound with leaves), *Bandhana* (bandaging and splints) are mentioned to protect the wound, retain softness of the wound and support the affected limb so that the wound healing occurs completely.

Krimighna (disinfection) measure helps to remove *Krimi* from the area and promote healing. Usage of *Ksharodaka* is mentioned along with various other measures. These measures basically remove the acidic media, remove any remnant slough and prevent the growth of microorganisms thus preventing any chance of recontamination of the healing wound.

Brmhana (nourishing) measure is mentioned to improve the strength of the emaciated (due to the complications of the wound) person.

Vishagna (detoxification) measure is mentioned to remove the effects of *Visha* (poisons/toxins) in the body. For this purpose, Sushruta has mentioned various *Agadha* (antidotes) to be used internally and externally. These measures remove the pathogens and toxins which accumulate in the body as a result of the pathology of the wound. These toxins or *Amavisha* could contaminate and create recurrence of the wound or be a cause for any subsequent illnesses.

Shirovirechana (cleansing the region above clavicle), *Nasya* (nasal medications) and *Kavaladharana* (gargling) are measures specifically mentioned for the management of the wounds caused in the oral cavity, nose etc (regions above the clavicle).

Madhu and *Sarpi* (application of honey and ghee) is mentioned for early healing of wide wounds. Honey has the inherent capability to increase the formation of granulation tissue, stimulate tissue growth, and reduce oedema and inflammation. [20]

Yantra Karma (use of instruments) is mentioned for the purpose of removing any remnant *Shalya* or any slough or unhealthy tissue from the wound site and thus makes the area clean and causes the correct healing of the wound.

Ahara (wholesome food) and *Raksha karma* (protective measures) are mentioned to prevent recurrence of the wound and to improve the immunity of the person.

Patient is advised *Snigdha, Ushna, Laghu Ahara* (food which is unctous, hot and light) which can also maintain the *Agni*. The place where he stays for recovery (*Vranitagara*), was also advised to be fumigated with the fumes of ghee, *Guggulu, Sarshapa, Vacha, Hingu* [21] etc so that the area is sterilized.

Thus these 60 measures were mentioned for the purpose of achieving complete healing of the wound without complications and with minimal cosmetic disfigurement.

Discussion

The stages through which a *Vrana Shophha* passes i.e. *Amavastha* (initial stage of inflammation), *Pachyamanavastha* (stage of further aggravation of inflammation) and *Pakavastha*, till the formation of *Vrana*, the process of its healing, the complications which can appear during its healing was clearly understood by Sushruta. Thus, in these 60 measures, there are treatments which are mentioned for managing the *Vrana Shophha*, there are measures mentioned for managing the formed *Vrana* and most importantly there are measures mentioned for repairing the scar, so that it is cosmetically acceptable to the patient.

The measures from *Alepa* to *Virechana* are basically from the point of prevention of continuation of the disease from the stage of *Vrana Shophha* to a *Vrana*. *Alepa* with various drugs when allowed to dry over the *Vrana Shophha* causes pressure effect over the area and thus help in the process of subsidence of the local oedema. *Snehana* and *Svedana* promote the circulation of fresh blood to the area. During the process of inflammation for the fight against antigens, the flow of antibodies, WBCs to the local area is of utmost importance. *Snehana* and *Svedana* dilate the blood vessels, improve the oxygen availability to the tissues and also promote the inflow of antibodies to fight against the antigens.

Meanwhile because of the increased flow of blood to the local area and accumulation of debris of the tissue destruction, the swelling increases. In order to reduce the swelling Sushruta has advocated the *Raktamokshana* measure. *Raktamokshana* measure either by *Jalukavacharana* or any other method, reduces venous congestion, increases the blood flow to the area and thus not only reduces the oedema but also improves the blood flow to the area and thus reduces inflammation and further tissue destruction.

Vamana and *Virechana* are advocated for the process of cleansing the body. The locally vitiated *Dosha* enter the circulation, vitiate the *Dosha* and *Dhatu* elsewhere and produce symptoms elsewhere and thus a local condition starts showing systemic features. Thus, to weaken the process of spread and strengthening of the *Dosha*, Sushruta has advocated the process of *Shodhana* either in the form of *Vamana* or *Virechana*.

All these measures are for the process of subsidence of the *Vrana Shophha* in the *Amavastha* or *Pachyamanavastha* itself. In spite of all these measures, if the vitiation is strong and the *Paka* continues, then *Pachana* measure has been advocated so that the suppuration process in enhanced and the vitiated, dead tissues in the form of pus can be removed from the body thus relieving the patient of his discomfort and also preventing the vitiation of the deeper tissue (if the pus is not drained it can result in the formation of a *Nadi Vrana - Sinus*).

Once *Paka* occurs, for the drainage of the collected pus, Sushruta has advocated *Darana* or any one of the *Ashtavidhashastrakarma* (8 main surgical procedures) as necessary. It is important to note here that he has explained both surgical and non-surgical procedure for the drainage of pus. In people who are not very comfortable with the surgical procedures, he has explained the application of the paste of certain drugs which can cause the drainage of pus and for others he has explained the surgical procedures. Thus, Sushruta was a very practical surgeon and has explained all the methods required for the drainage of pus depending on the type of patient we get in our clinical practice.

Once the Incision and Drainage has been done, in order to squeeze out the pus from the surrounding area, he has explained *Peedana*, where in the surgeon physically applies pressure and removes the pus. He has also explained *Lepa* (the applied paste has to be left to dry) which does the same action of squeezing out the pus - more importantly painlessly.

As the process of drainage involves surgical incision etc, the damage of tissues is certain and haemorrhage can be one of the complications which a surgeon has to face. For overcoming this complication, Sushruta has explained four methods – *Sandhana* (joining), *Skandana*, *Dahana* (cautery) and *Pachana*; methods which either hasten coagulation or decrease blood flow to the area or help in the union of edges of the formed wound and thus arrest haemorrhage.

In spite of the above four measures, if the haemorrhage fails to cease, then he has advocated the *Seevana* (suturing) measure by which the bleeder can be ligated and the cut edges can be brought together and thus the wound can be healed by primary intention.

As the pus gets drained and a wound gets formed, the process of maintaining the wound clean gains great importance. The drugs mentioned for the purpose of *Vranashodhana*, used in the form of *Kashaya, Lepa, Parisheka* etc., basically are of *Kashaya Rasa* and are *Krimighna* in action. So, these drugs not only clean the

area by removing the dead slough but also prevent the growth of microorganisms and thus create a conducive environment for the process of healing to occur.

In spite of these measures, if the wound still gets infected, then he has explained a special procedure, wherein the wound is fumigated with various bacteriostatic drugs like *Guggulu*, *Vacha*, *Haridra* etc. This measure of *Vrana Dhupana* destroys the growth of microorganisms at the wound site and thus accelerates the process of healing.

Once the wound formed is *Shuddha* (clean), Sushruta has advocated *Ropana* measures for the complete healing of the wound. Healing process cannot get initiated in the presence of dead, decaying, necrosed tissue and hence he has advocated the *Ropana* measures to be initiated only after the *Vrana* is *Shuddha*. And during the process of healing, the scar formed should be as minimal as possible so that the cosmetic disfigurement is also minimal.

For the correction of the formed scar, he has explained various measures wherein either excess hairs formed are removed permanently, or lost hair is made to regrow, lightened areas are darkened or vice versa and so on and so forth, which together are termed as *Vaikrutapahachikitsa*.

Thus, treatment measures from the stage of *Vrana Shopha* to the repair of the formed scar has been explained so that the surgeon is able to completely heal the wound as close to as possible to the surrounding tissue.

Conclusion

Sushruta has explained 60 measures for the management of the wound going into every detail of the stages of wound healing which is highly time tested and scientific. These measures are practical and continue to have great value and significance even in today's scientific and surgical era. The importance Sushruta has laid down to correct wound cleansing, healing and formation of a minimal scar needs to be re-looked into by the present surgeons and give due credit to the principles laid by him and Ayurveda centuries ago.

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