

**BANDHAN KARMA: CRAFT OF BANDAGING****Dr. Chhavi^{1*} and Dr. Ajay Kumar Gupta²**

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ABSTRACT

Ever since the life originated, human being is susceptible to injury, which made him to think about healing from very early stage of development. For better healing of wound, some additional protection, or immobilization, or support etc. is also needed along with the medicinal intervention. Therefore, *Bandhan karma* of injured site is done for faster healing as well as providing comfort to the patient. *Bandhan karma* is correlated with bandaging in current surgical practices. *Acharya Sushruta* and *Vagbhatta* have described various methods of *Bandhan* (Bandaging). So, a review of *Bandhan karma* has been done to highlight its various practical application in different surgical conditions.

INTRODUCTION

Vrana, which is referred as 'wound' in modern science, is the oldest element from which the humankind has suffered from. Also, a surgeon essentially creates a wound which he has to manage accordingly by different methods. *Vrana* is not only limited to the cutaneous lesions but may also extend up to muscles, blood vessels, ligaments, bones (fracture), joints (dislocation), visceral organs and other vital parts of body. The healing process of *Vrana* is a natural process, which also starts immediate after injury but there may be chances that some adverse conditions (e.g., contamination from outer environment, etc.) may delay this process. Moreover, during joint dislocation or any muscle pain, immobilisation of body part is needed. So, all these functions are managed by proper *Bandhan*.

Acharya Sushruta has narrated vast description regarding *Bandhan*.^[1] According to him:

ततो बन्धः प्रधानं, तेन शुद्धिर्व्रणरोपणमस्थिसन्धिस्थैर्य च ॥

(सु.सू. 18/3)

Bandhan keeps the *Vrana* sterile, promotes healing and also stabilizes bones and joints. *Acharya Sushruta* and *Acharya Vagbhata* have broadly described *Bandhan* along with its uses. *Acharya Sushruta* mentioned 14 patterns of *Bandhan*^[2] whereas *Acharya Vagbhata* describes one additional pattern of *Bandhan*, viz. *Utsangi*.^[3]

Patterns of bandaging: *Acharya Dalhana* gives the proper explanation of all the patterns of *Bandhan* along with their application which are described as under^[4]

1. **Kosha:** *Kosha* means cocoon like sac or envelop filled with medicine. This kind of bandage is tied around thumb, finger and their joints.
2. **Daam:** *Daam* means four. It is a bandage having four tails or ends. It is use in *Samabandhang* (body parts which are uniform in circumference e.g., upper arm, abdomen).
3. **Swastika:** It is a cross or a plus mark like bandage. It is used for the joints, *kurcha* (areas overmetatarsals), palms, soles, external ears, between the eye brow and breast.
4. **Anuvellita:** It is spiral bandage progressing ahead in which turns are made overlapping the previous turn. It is use in extremities.
5. **Mutoli:** It is loosely woven bandage like a net and use for neck and penis.
6. **Mandal:** It is a ring-like or circular bandage which is used for cylindrical parts, e.g., Abdomen or lower back of the body.
7. **Sthagika:** It is stump like bandage which is used for finger, thumb, tip of penis.
8. **Yamaka:** It is a roller kind of bandage for covering two wounds simultaneously.
9. **Khatwa:** It is kind of four-tailed bandage having shape like a cot. It is used for bandaging lower jaw, temples and cheeks.
10. **Cheen:** It is multiple tailed bandage. It is used at the outer canthus of eye or eye.
11. **Vibandh:** It is also a type of multiple tailed bandage. It is used for back, abdomen and chest.
12. **Vitaan:** It is multiple tailed bandage. It is used for scalp or head.
13. **Gophana:** It is slingshot type bandage. This bandage has its border area in concave shape. It is use for chin, nose, lips, shoulder and supra-pubic area.
14. **Panchaangi:** It is a bandage having five (*panch*) tail (*ang*). It is used for the parts above the shoulder.

15. *Utsangi*^[5]: It means to hold. It is a sling kind of bandage used for supporting breast, scrotum, bone fracture of forearm.

Bandhan Dravya^[6]: *Bandhan Dravya* can be of various materials based on their properties and are used according to the condition of *Vyadhi*. *Acharya Dalhana* has described following types of *Bandhan Dravya*-

Kshom –It is a cloth woven with the fibres of *Atasi* (flax) plant.

Karpaas - It is a cloth woven with the fibres of cotton plant.

Aavik- It is a cloth made up of sheep's wool.

Dukool- It is a very fine cloth made up of bark of plant named *Dukool*.

Koshay- It is a silk made from saliva of silkworm. Also known as *Trasar* in common.

Patrona- It is also named as *Dhautkoshaya* by other *Acharyas*. A kind of cloth made of the green fibres of *Naga* trees typically found in *Magdha* and *Paundrak* countries.

Chinpatta- It is a Chinese cloth and a type of *Patrona*. Other *Acharyas* also named it as *Netra*.

Charma- It is skin obtained from deer and other animals. According to locals of *Turuk* place, this cloth is made up by the animal skin coated with gold powder (*Swarna Pishti*).

Antarvalakala- These are the fibres obtained in middle of the outer layer and inner layer of the bark of tree.

Alaabu shakal- It is skin of dried fruit of bottle gourd.

Lata vidal- These are the creeper like *Shayama lata*, etc. *Vidal* is also related to *Charma*(skin) or to strips formed by Bamboo by some *Acharyas*.

Rajju-It is a rope formed by the fibres of *Munja*, *Balvaj*, etc.

Toolphal-It is silk cotton obtained from *Bombax ceiba* tree.

Santanika- It is cream obtained from the milk or *Kushal Santanika* which is made of two to three fibres or shelter of monkeys.

Lohani- These are the sheets of silver, copper, iron, etc.

These *Bandhan dravyas* are used as per as condition and duration(*kala*) of *Vyadhi*. *Acharya Dalhana* further mention their specific application. In case of snake bite, one should use *Arishta Bandhan*. In case of excessive bleeding from wounds *Santhanika* should be used. In fractures, bandage of *Lata-Shyam*, etc. should be use. Metals like iron, gold should be use in *Bandhan* of teeth. *Trapu* (tin) should be used in diseases like *Arbuda*, *Granthi*, etc. In case of head injury, *Alabushakal* should be used.

Acharya Vagbhata also gives a description about *Bandhan dravyas* with their properties.^[7]

Aavik, Ajjin (deer), *Koshya* are warm in nature whereas *Kshoma* is cool. *Tool, Santanika, Karpaas, Snayu, Valakala* are *Sheetoshan* (warm-cold) in nature. *Tamra, Loha, Trapu, Seesha* should be used in *Vrana* which has *Meda- Kapha* predominance. In case of fractures, *Phalak, Charma, Valakala, Kusha* are used.

Types based on site^[8]: Different sites of body requires different technique for *Bandhan Karma* so as to achieve adequate therapeutic effect. Based on this, all *Acharyas* has classified *Bandhan* into three major categories, viz.-

1. **Gaadh:** *Gaadh Bandhan* is tough, firm and does not cause any pain. It is used at hip, abdomen, axilla, inguinal region, thigh, head.
2. **Sam:** *Sam Bandh* is neither firm nor loose. It is used at the extremities, face, ear, throat, scrotum, penis, back, flanks, abdomen, chest.
3. **Shithil:** *Bandhan* which after applying allow the movement of exhalation or inhalation is named as *Shithil Bandh*. It is used at eyes, joints.

***Bandhan niyantrana* (Tightening the bandage)^[9]**

Yantrana means control, tightening or putting knots to keep the *Bandhan* in place. It can be done at three places of the wound - above, below and sides of *Bandhan*.

***Bandhan vidhi* (Procedure of tying bandages)**

A thick *kavalika* (wick or roll of paste of drugs) be kept on *Vrana*. Then *Bandhan* should be tied moving it in the direction of the left hand, straight without folding, without anytwist and inserting a soft pad (of cotton cloth, gauze). The knot should not be tied above the wound as this give rise to pain.

***Vikeshika aushadha*^[11]**(paste of drug applied on a band of cloth or threads which is rolled and made like a wick). This paste should be neither very wet nor very dry or uneven (irregular) because too much of wetness produces exudation and too much of dryness produces tearing and unevenness causes friction at the edges the wound.

If wound of *Pitta Dosha* origin, situated on places indicated for *Gaadh Bandh*, then *Sama Bandh* should be done, if situated on the places of *Sama Bandh* then *Shithil Bandh* should be done, if situated on places of *Shithil Bandh* then no *Bandhan* is needed. This procedure should be followed similarly in diseases caused by vitiation of blood. For diseases of *Kapha Dosha* origin, situated on places meant for *Shithil Bandh*, then *Sama Bandh* should be done, if present

on places of *Sama Bandh* then *Gaadh Bandh* should be done and if situated on places meant for *Gaadh Bandh*, then *Gaadhtar Bandh* should be done. This procedure is same for diseases caused by vitiation of *Vata Dosha*.^[12]

Bandhan kala (Timing of bandaging)^[13]

In diseases due to *Pitta Dosha* or during *Sharad* (autumn) and *Grishma* (summer) *Ritu*, *Bandhan* should be done twice a day. It is similar for blood vitiated diseases. In diseases due to *Kapha Dosha* or during *Hemant* (winter) and *Vasant* (spring) *Ritu*, *Bandhan* should be done once in three days which is similar for the diseases caused by aggravation of *Vata Dosha*.

Harms due to improper bandhan^[14]

If *Gaadh Bandhan* is done on places indicated for *Sama Bandh* and *Shithil Bandh*, then the drug inside the *Vikeshika* become a waste and cause swelling and pain. On other hand, if *Shithil Bandh* is applied on places indicated for *Gaadh Bandh* and *Sama Bandh* then the medicine in *Vikeshika* will fall off and there will be damage to the edges of the wound due to friction. If *Sama Bandh* is done on the places indicated for *Gaadh Bandh* and *Shithil Bandh* there will be no effect of it.

Benefits of bandhan

In absence of *Bandhan*, then there may be contamination by different agents like *Dansh* (bite of insect), *Ashak*, *Trina* (grass), *Kashth* (stick), *Upala* (stone), *Panshu* (sand), *Sheetvaata* (cold wind), *Atap* (sunlight) which develop pain and many kinds of complications. Moreover, without *Bandhan* the applied drug paste gets dried easily.^[15]

Churnit (Crushed) and *Mathit* (lacerated) wounds, *Bhagna* (fractured), *Vishlisht* (dislocation of joints), *Atipaaitit* (bone hanging after fracture of wound), *Asthisnayusirachinnam* (cutting /tearing of bones, tendons, veins) heal quickly by *Bandhan*. The wounded person will be able to sit, walk, and stand easily. Also, he finds comfort in lying and sitting postures. With *Bandhan* wound heals quickly.^[16]

Contraindication of bandhan

Bandhan should not be done on *Vrana* caused by vitiated *Pitta* and *Rakta* (blood) *Dosha*, by injury and poison when associated with symptoms like swelling, burning sensation, pus formation, red colouration, pain and other troubles, *Vrana* caused by alkali and fire, where the muscles of the wound are decomposed and falls off.^[17]

Vrana of *Kustha* (leprosy), *Agnidagdha* (burns), *Pidika Madhumehi* (diabetic eruptions), *Kanikashinduvishu* (rat bite poison), *Mamsapaake* (suppuration of muscles), *Gudapaake* (gangrene and severe ulceration of rectum) and severe ulceration of rectum should not be bandaged. The intelligent physician should decide by his own wisdom, whether to apply *Bandhan* or not.

The *Vrana* specialist should decide *Bandhan* after considering the nature of habitat, *Doshas* and season.^[18]

Therefore, a *Vrana* which is properly secured by *Bandhan* has a great chance of not being affected by lying down, sitting up, or any other movement of the patient. *Vrana* affecting muscles, skin, deep situated in any internal chambers (cavities) of the body, any junction of the limbs or organs, in bone and whether of a deep, superficial, malignant, or corrosive character, cannot be brought to a successful termination without the help of a *Bandhan*.^[19]

Bandaging

With the advancement in technologies, there is immense upgradation in the medical science both in the field of getting better understanding of various diseases, as well as in the field of management of these diseases. Hence over centuries man is curating and innovating different possible ways to simplify and upgrade the unrevealed information of medical science.

Similarly, rise of the modern bandage and its many forms was coupled by increased knowledge of human anatomy and physiology which enabled medical professionals to designate specific bandages for unique applications to certain portions of the human body.

Bandage is derived from the French term '*Bande*', means article used to secure an injury and to bind it. It is important to distinguish between two terms most commonly used interchangeably for one another, viz. "dressing" and "bandaging".

The term 'dressing' refers more correctly to the primary layer in contact with the wound. 'Bandage' refers to a piece of material used to either bind a dressing or to support a portion of the body.^[20] Moreover, based on the requirement it can be used to apply pressure to control the bleeding, to support a medical device such as a splint, to correct deformity to restrict a part of the body.

Bandages are available in a wide range of types, from generic cloth strips to specialized shaped

bandages designed for a specific limb or part of the body, although bandages can often be improvised as the situation demands, using clothing, blankets or other material.

Materials commonly used for the bandages

Generally, cotton is used for the formation of gauze. For the compression effect elastic materials are used, viz. viscose, polyamide, elastomeric yarns, polyesters, polypropylene, polyurethane, etc.

Types of bandages

I. On the basis of shape

1. Roller bandage^[21]

These bandages are long strips made up of variety of materials. It is basically of two types, viz. **Cotton gauze or Linen roller bandage** and **Elastic roller bandage**. Former one is used to cover the gauze dressing and can come in any number of widths and lengths which can be used for almost any bandage application. While the latter one is used to support to a strain or sprain over a part of body.

2. Tube bandage^[22]

It is a knit bandage with a tubular shape which can be wear over an extremity to secure a dressing or splints on the limbs. This type of bandage provides support for the soft tissue around the wound and is more comfortable to wear than other types of bandages. It can be used on finger and toes also, as these areas are difficult to bandage with gauze. Moreover, it highly useful in keeping dressing in place on the movable joints, e.g., knee, elbow, etc.

3. Triangular bandage^[23]

This name is derived due to its resemblance with geometrical triangular shape. It is made from a strong type of cloth which has been cut into a right-angle triangle. The longest side of the triangular bandage is called the base; the corner directly opposite the middle of the base is called the apex and the other two corners are called ends. Due to its versatility of folding, this can be used in variety of ways to fit almost any part of the body. It might shape a sling for an injured arm, or can be folded several times into a cravat of any desired width. Also, it can be folded in the shape of a rectangle which tends to be set over a large wound to absorb blood and stop bleeding, functioning as a trauma pad. It may also be used to support or immobilize an injury to a bone or joint or as improvised padding over a painful injury.

II. On the basis of it uses

1. Simple elastic bandage^[24]

It is a stretchable (extensible) bandage used to create localized pressure. These are commonly used to treat muscle sprains and strains by reducing the flow of blood to a particular area by the application of even stable pressure which can restrict swelling at the place of injury.

Elastic bandages should not be confused with compression bandages, as such bandages are specifically designed to deliver graduated compression from the ankle to the knee, to assist with venous return.

2. Compression bandage^[25]

These kinds of bandages are used to create a pressure over the part to be bandaged. Compression bandages are mainly classified as elastic and inelastic. Elastic compression bandages are categorised according to the level of pressure generated at the ankle and named as Class 1, Class 2, Class 3A, Class 3B, Class 3C, Class 3D. Class 1 bandages are lightweight conforming bandages which is applied for low levels of sub-bandage pressure and are used to hold dressings in place. Class 2 bandages are light support bandages that provide moderate sub-bandage pressure and are used to prevent oedema or for the treatment of mixed-aetiology ulcers. Class 3A bandages impart light compression of 14–17 mmHg, Class 3B bandages impart moderate compression of 18–24 mmHg and Class 3C type bandages impart high compression between 25–35 mmHg. These bandages are used to provide support to treat venous diseases like DVT, Varicose vein, etc. The 3D type extra high compression bandages (up to 60 mmHg) are not often used because this very high pressure reduces the blood supply to the skin. It must be noted that approximately 30–40 mmHg at the ankle is generally adequate for healing of most types of venous leg ulcers.

3. Plaster bandage^[26]

These are cotton bandages impregnated with Plaster of Paris (calcined gypsum) which is the most useful tool when it comes to art of mould making and casting. Currently, bandages of synthetic materials are often used as they are more lighter and water resistant and more easily penetrated by the X-rays. These are knitted **fiberglass bandages** impregnated with polyurethane resin. These bandages usually applied to stabilize and immobilize the fractured limb.

Principles and procedure of bandaging^[27]

There are some basic principles and patterns of bandaging which a surgeon can modify to

different types according to the situation. These basic principles and procedure of bandaging can be divided under three headings, viz. Pre-procedural, Intra-procedural and Post-procedural. Under Pre-procedural steps, firstly inspect for the presence of and status of wound (discharge, pain, etc.). Open wound requires a dressing before a bandage is applied, so the patient is asked for any pain (its location, intensity, onset, and quality) and the presence of discharge is examined (amount, colour, odour, viscosity). Then, part to be bandaged is cleaned and dried and a comfortable position is given to the patient with a proper support. Now, choose a neatly rolled bandage of correct width and length. Whenever possible, bandage of a part should be done in its normal position with the joint slightly fixed to avoid putting strain on ligaments and muscles of the joint.

During Intra-procedural part, bandaging is started at least two inches beyond the edges of the dressing to prevent the dressing and wound from becoming contaminated. Also, one must avoid unnecessary unwinding and wrinkling of bandage as it may cause discomfort to the patient.

This is followed by Post-procedural part in which bandage is fixed with a circular turn and is properly secured by using a knot, pin or adhesive tapes. It must be kept in mind that the knot, pin, or ties should be away from wound because these materials can exert localised pressure and irritation.

Basic forms of applying a bandage^[28]

There are four basic forms which are used to apply any kind of bandage, viz. Circular bandage, Spiral bandage, Figure-of-eight bandage and Reverse spiral bandage.

- 1. Circular bandage:** It is used for dressings on body parts like arms, legs, abdomen, etc. and before starting or ending the other type of bandage. We use strips of cloth or gauze roller or triangular bandage folded down to form strip for circular bandage. In this technique, layers of bandage are encircled over the body part as needed in a manner that each turn directly covering the previous turn.
- 2. Spiral bandage:** It is used for the body parts which are almost cylindrical. At the tapered body parts, an elasticated bandage can be used for spiral bandaging as with the increasing or decreasing diameter of the body the elasticity will allow the bandage to fit closely to the skin. Start the bandage with few circular turns then continue spiral turns at about a 30-degree angle, each turn overlapping the preceding one by two thirds the width of the bandage.

3. **Figure-of-eight bandage:** It is used to apply bandage over the flexing joint or body part which are above and below the joint. Using a roller bandage, start with few circular turns and carry the bandage above the joint, around it and then below it, making a figure-of-eight continue below and above the joint, overlapping the previous turn by two thirds the width of the bandage. The crossing points will be located at either the flexing or extending side of the joint; the side where the turns do not cross remain uncovered.
4. **Spiral reverse turn:** It is a spiral bandage where the bandage is folded back on itself by 180° after each turn. Starting with few circular turns, bandage is brought upwards at about 30-degree angle. A thumb of the free hand is placed on the upper edge of the bandage to hold it and bandage is folded above it. Now bandage is unrolled about 4-6” then the hand is turned so that the bandage is folded down. Bandage is continued around the limb, overlapping each previous turn by two-thirds the width of the bandage. This V-shaped fold allows a non- elasticated bandage to fit to the tapered shape of the body part all the way along. Nowadays, this technique is far less commonly used as with the development of the elasticated fixing bandage it is more easier and time saving to bandage a tapered body part.

Complications of bandaging^{[29][30]}

Bandaging is not just merely a procedure but an art which has to be learn by regular practice overtime. So, there could be chances of some complications due to inappropriate bandaging. These complications can be minor like redness, oedema, abrasion, etc. or may be severe like ischemia, necrosis, etc. Compression bandages may also initiate the back and leg pain with urinary difficulties. Other complication may be generated like pressure sores, loss of joint mobility and range of motion.

CONCLUSION

Bandhan Karma is one of the most distinctive topics of *Shalya Tantra* which is attributed by all *Acharyas*. In fact, *Bandhan Karma* and surgery go hand in hand. The above description helps to highlight all the concepts of *Bandhan Karma* (Bandaging) which a medical professional has to keep in mind to become well-versed in the craft of *Bandhan Karma* (Bandaging).

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