REVIEW ARTICLE

Kshara Sutra Preparation of Various Types: A Review Article

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ABSTRACT

Corrosive or caustic thread is referred to in the Kshara sutra. Because Kshara does the work of incision, puncture, and scarification to relieve Tridosha derangements and uniformly affect the sick part to which they are administered, it is regarded as superior to all surgical and parasurgical procedures. Tridoshaghnana, Saumyata, Dahana, Pachana, Darana, Katuka, Ushna, Tikshna, Vilayana, Ropana, Shoshana, Stambhana, Lekhana, and Krimighna are among the attributes possessed by Kshara. Snuhi Ksheer, Apamarga Kshara, Haridra powder, and Barbour Linen Thread No. 20 are the ingredients used to prepare the Kshara sutra. Although the normal Apamarga Kshara sutra is effective in treating fistula in ano, there are issues with its preparation and administration that should be noted. Due to these issues, this thread needs to be modified going forward. Snuhi latex is one of the key elements of this thread. The preparation of the thread is complicated by the latex. If not utilized right away, it coagulates. Summer collection issues, this thread needs to be modified going forward. In a rare instance, the severity is so great that patients stop their therapy. Numerous studies have been conducted to find solutions to these issues. The focus of the researchers is to find medications with superior effects and acceptability to Snuhi latex and Apamarga Kshara. These medications ought to be easier to obtain in bulk, less irritating (Sheeta veerya), possess vranashodhak and vrama ropuna qualities, be antiseptic and anti-inflammatory, and have extra therapeutic effects.

1. INTRODUCTION

The word Kshara is derived from the root Kshara, which meaning to melt away or to expire, according to shabdakalpadruma. The term “Kshara sutra” refers to a thread formed of caustic substance that disintegrates skin or other tissues and kills or removes devitalized tissue.[1] A pioneer in Ayurvedic medicine, the preparation of Kshara sutra was not stressed when it was initially described by Acharya Sushruta in the treatment of Nadi Vrana (sinus), Bhagandara (fistula in ano), arbudai (benign tumor), etc. The process of preparation was first mentioned by Chakrapani Dutta, who gave its indications in the Bhagandara (fistula in ano) and Arshai (hemorrhage) sutras. He described the procedure as repeatedly coating a thread with latex made from the Euphorbia neriifolia plant and turmeric powder.[2] Nearly every author after Chakrapani Dutta mentioned the same process for making Kshara sutra. However, it lost favor among Ayurvedic surgeons due to the difficulty of preparation and the insufficient manner of application. A more effective method for preparing the Kshara sutra was provided by Rasatarangini, which was then published by Chakradutta. In the modern period, Prof. P.J. Deshpande,[3] Dr S.R. Gupta, and other individuals deserve most of the credit for standardization and development for practical use. The work of incision, puncture, and scarification to reduce pain is performed by Kshara, which is regarded as superior to all surgical and parasurgical measures.[4] The sick part to which they are applied experiences uniform Tridosha[5] derangements. Sushruta claims that Kshara possesses the following traits: Tridoshaghnana due to several medications, it can calm all the humors, due of their white tint; Saumyata due to its burning characteristics; Pachana, its capacity for digestion due to the presence of numerous medications of an Agneya type in their composition; darana because of its strong flavor; Katuka, Ushna, due to its ability to generate heat; Tikshna, due to its ability to irritate; Vilayana, due to its ability to cause liquefaction; Shodhana, due to its ability to purify; Shoshana promotes absorption; Ropana enhances granulation (healing); Stambhana, the act of stopping or arresting nature Lekhana-property scraping because of its antibacterial

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properties; and Krimighna if used excessively sterility.\(^5\) It makes Aama, Kapha, and when administered in the correct dosages, visha, medo dhatu, and also treats kushta. Acharya Charak also assigned two other qualities, Laghu and Bhedana.\(^9\) According to Vagbhatta, Kshara completely cures the condition by removing all the poisons from the affected area.\(^{10}\)

1.1. Aims and Objectives

The aims and objectives of the study are to examine the material on Arsha in Ayurvedic texts, gather data on the medications referred to as Arshoghna, and identify possible therapy strategies for Arsha.

2. MATERIALS AND METHODS

All sorts of references have been collected from our ancient Ayurvedic texts, namely Sushruta Samhita, Charaka Samhita, Dalhana teeka, Ashtanga Hridaya, and Ashtanga Samgraha. Modern books such as Bailey and Love’s, Short Practice of Surgery, Surgery of the Anus Rectum and Colon, and Atlas of General Surgery Jaypee Brothers Medical Publishers are used as literature.

The following safety precautions must be taken during the Kshara preparation process:

a. Kaala-Sharad kala\(^{(11)}\) (between October and November)

b. Place-nearby hilly area.

After conducting the religious preparation (Mangalacharana), the healthy musk Aka plant and its root are cut into small pieces and boiled until they are completely reduced to ash. After the burnt limestones have been separated, the ash is collected in a container with care to prevent contamination of the container with moisture. The Praathamika kshara,\(^{(12)}\) or fundamental kshara, is this.

2.1. Preparation of Kshara sutra

The current method of making Kshara sutra is mostly the result of repeated experiments based on clinical experiences.

3. MATERIAL USED

Thread: The ideal thread for making Kshara sutra should be strong enough to support the 21 coats of all the chemicals during treatment. The different types of threads were subjected to progressively higher strain on a tensiometer until a point was reached where the thread simply broke. Various investigations were conducted in this regard. Following these tests, it was discovered that surgical linen no. 20 maintains its strength during processing and has a maximum tensile strength of 5.0 kg.\(^{(13)}\) As a result, non-absorbable natural linen thread no. 20 is selected as the best thread for making Kshara sutras [Figure 1].

Kshara (also known as alkali or a caustic agent): for the manufacture of Kshara sutra, must be a fine, dry, and white powder, which cannot be obtained from the Madhya and Tikshna forms of kshara. Chemically, the mrudu variety of pratisarniya kshara (described by Sushruta in Kshara Paka Vidhi) has the most hygroscopic and caustic effect. Shankha nabhi, danti, and other additives that are used to boost a substance’s potency raise a substance’s irritability and decrease its alkalinity (pH >9.0).\(^{(14)}\) Hence, the mrudu kind of kshara is said to be appropriate for the creation of Kshara sutra. Additional research employing several kshara kinds has revealed that Apamarga kshara is the most efficient.

Ksheera (Latex): Ksheera does not naturally stick to anything. Ksheera, which is mostly used as an adhesive, has an acidic pH of 9.7 and uses proteolytic enzymes to generate debridement. Due to its alkaline nature, Kshara overshadows Ksheera’s debridement effect while maintaining its adhering ability. Due to the high concentration it absorbs, Ksheera additionally enhances Kshara’s debridement effect. To prepare several forms of Kshara sutra, latex from snuhi Arka, guggulu, papaya, udumbara, etc. can be utilized as a binding agent.

Haridra (Turmeric): It has been discovered that kshara is very hygroscopic, which attracts moisture and renders it unusable if exposed to the environment. Kshara can be maintained and used for a longer amount of time because of Haridra, which prevents direct contact with the atmosphere. In addition, it has antibacterial and antihistaminic effects.

3.1. Snuhi Ksheera’s Collection

- Botanical name: E. neriifolia
- Family: Euphorbiaceae
- Size of the Plant: 2–3 years old
- Best time for collection: October–April.

On the stem, linear cuts are made, and latex is collected in a clean dish. Once there is enough collected, it is put into a glass bottle. Take precautions to ensure that the latex does not include any dust or bark fragments. Use latex right away to prevent clotting [Figure 2].

3.2. Preparation of Kshara

Burning the entire plant along with the Tila Nala produces Kshara ash. The ash is properly filtered after being combined with 4 times as much water or gomutra. To make dry powder, boil the filtrate and then evaporate the water. An airtight container should be used to store powder.

3.3. Required Equipment

1. An ultraviolet (UV)-light cabinet housing the Kshara sutra
2. Petri dish that has been autoclaved (used to store raw materials while applying)
3. Polythene packets (used to package the ready-to-use Kshara sutra).

3.4. UV-light Cabinet Containing the Kshara Sutra

This was created specifically for the Kshara sutra preparation process. It comes in both horizontal and vertical designs. The processor can create a custom Kshara sutra cabinet based on his needs and available resources. The larger of its two rooms is for the Kshara. Hangers are the rectangular-shaped structures constructed from thick, 2 cm wide by 3–4 mm thick aluminum/wooden strips. Small cuts (notches) are positioned at 2–2.5 cm apart on both sides of each hanger. The purpose of these notches is to allow the thread to be hooked along the breadth and length of the hangers. There are 15–20 notches on either side of each hanger. Depending on the size of the cabinet, the hanger’s dimensions may vary. The hanger is approximately 30 cm wide. In this manner, one Kshara sutra cabinet can hold up to 50 hangers and one hanger can hold up to 30–40 threads at once. Therefore, a cabinet may produce 900–1600 threads of Kshara sutra in a single batch. In addition, a cabinet is employed to avoid contamination caused by airborne dust particles adhering to wet threads. It uses UV light to quickly dry the coated thread and preserve sterilization; it also functions as a bactericidal by maintaining a constant temperature of 40°C by supplying dryness and consistent heat. In addition, it inhibits the coated medicated Kshara sutra’s hydrophilic function.
3.5. Quantity Required
- For 1000 Kshara sutra
- Surgical linen no. 20 = 300 m
- Snuhi latex (E. nerifolia, Euphorbiaceae) – 3.5 L
- Apamarga Kshara (Achyranthes Aspera, Amaranthaceae) – 1 kg
- Haridra powder (Curcuma Longa, Zingiberaceae) – 500 g.

The length and breadth of the hangers are wrapped in linen thread and set over a hanger stand in preparation for the Kshara sutra. The hanger’s threads are then evenly spread with latex using a clean piece of gauze to smear it on all four sides, including the front, rear, above, and below. The hanger is then put back in the cabinet. After processing all the hangers, the cabinet must be carefully closed before hot air is blasted into it to dry the threads. There should be 11 of these coatings with Snuhi Ksheera. The 12th coating is applied by first smearing the thread with latex and then putting it through a mass of Kshara that has been finely ground. After applying kshara to each thread, the hanger should be lightly shaken to remove any remaining surplus. Kshara flakes tumble to the ground. Three coatings of Ksheera and Haridra powder were applied during the final stage. The thread has now received all 21 coats. Let it air dry.

3.6. Kshara sutra Packing and Sterilization

By keeping the prepared Kshara sutra in the Kshara sutra cabinet for 20–30 min at 400°C, UV radiation is used to sanitize them. Cut away at two ends, a sterilized Kshara sutra of around 10–12 inches is placed in a polythene bag or glass tubes. When placing the sutra in a glass tube, care must be taken to ensure that only one fold at the center is made, as folding at multiple locations will cause the coating to be stripped off. The cabinet should once more be filled with sealed polythene that will be subjected to UV light. The final step is to label each polythene with the batch number, date of manufacture, date of sealing, etc.

The reason for the strict order of 21 coats is: when linen no. 20 has received 21 coatings, it grows to a size of 14–15 gauge, which-a size that can be inserted into the lumen of a typical fistula. According to Hindu mythology, it is also a lucky number. The following are the goals of the precise sequence of 21 coatings: first 11 latex coatings: simply serves as a binding agent for minute latex serves as a binding substance to keep all the Kshara’s qualities intact. The Kshara sutra operates through a pressure action produced by ligation, which results in the mechanical strangulation of tissues and blood arteries, which results in the pressure necrosis of any bulge in the body. Through its corrosive qualities, Kshara penetrates the lesion’s cells until engorged tissue is destroyed. Being proteolytic by nature, snuhi latex dissolves the tissue at its base. The antibacterial and healing effects of turmeric powder are produced by its activity. These three medications assist each other’s actions by having an equivalent and desirable effect rather than conflicting with one another. Kshara sutra’s controlled chemical cauterization gives it the capacity to slowly accomplish incision and excision.

Blood may ooze during the cutting effect, but this is stopped by the sclerosing effect of kshara due to its protein coagulation capability. Therefore, there was no possibility of bleeding while the mass was being cut. The persistent anti-infective property of Kshara reduces the likelihood of infection. Kshara sutra also functions as a seton in the case of Bhagandara (fistula in ano), enabling adequate pus drainage and the removal of diseased tissue, creating a cleaner foundation for wound healing with little scarring and no issues.

3.8. Standardization of Kshara sutra

To ensure quality control and cost-effectiveness at the clinical level, Kshara sutra and its raw materials have been standardized based on analysis of numerous physical as well as chemical criteria. Chandigarh and Lucknow laboratories conducted the analysis. According to these assessments, many qualities of a perfect Kshara sutra include the following:
- PH = 10.1
- Length: 30 ± 1 cm
- Diameter: 1.9 mm
- Min. breaking load: 5.83 kg
- Weight of coating: 0.83 g
- Thickness of thread after coating: 2.10 + 0.11 mm [Tables 1 and 2].

3.9. Several Kshara sutra Kinds

3.9.1. Udumbara Kshara sutra

Ficus glomerata latex was utilized in this thread.

It is a substance known as a sheeta veerya and is utilized in dushta vrana.

The thread was coated with this kshara 11 times. Fresh latex was applied each time. The thread has a pH of 8.5.

3.9.1.1. Advantages
a. It takes little time and is simple to prepare
b. Less painful since it is less irritating
c. Cutting that is smooth, good wound healing
d. Patient tolerance is high.

3.9.1.2. Disadvantages
a. Unit cutting time (UCT) was lower than with normal thread
b. The latex’s ability to stick to the thread was decreased
c. Knotting was challenging following application.

3.9.2. Papaya sutra

Papaya is a potent purifying and restorative substance.

Ingredients: Papaya fruit pulp, papain powder (the active ingredient is obtained by drying unripe fruit juice), and Haridra powder. The following method results in a total of 13 coatings: 11 coatings made of papaya fruit pulp and papain powder, and 2 coatings made of papaya fruit pulp and Haridra powder.

3.9.2.1. Advantages
Because papain includes potent proteolytic enzymes, necrosed tissue is quickly debrided following treatment. It promotes quick wound
healing. It is quick and simple to prepare. After use, patient tolerability was likewise excellent.

3.9.2.2. Disadvantages
Very short UCT time.

3.9.3. Guggulu-based Kshara sutra
Guggulu solution was utilized in this thread in place of snuhi latex. Guggulu possesses anti-inflammatory, healing, and analgesic effects. In addition, it effectively binds thread, and studies have demonstrated that it has anti-inflammatory properties. It is readily available, and making a solution in either alcohol or water is simple.

3.9.3.1. Advantages
a. The availability of guggulu in large quantities makes cooking simple
b. Early sittings have less pain, discharges, and indurations than other threads
c. Large quantities of threads can be prepared for commercial purpose
d. The patient’s excellent toleration
e. Because of its analgesic activity and non-bleeding nature, pain and anxiety are significantly reduced both during and after application
f. A scar that heals well and looks acceptable cosmetically.

3.9.3.2. Disadvantages
Due to its soapy nature, it loosens after application. Subsequent coatings remove the first coating to a lesser extent if alcoholic solution is used. Hence, water solution may be used. Although it has been noted that in skill hands, this problem is rarely noted. Nowadays, guggulu-based Kshara sutras have been using successfully at various centers all over the country.

3.9.4. Sutra covered with Yavakshara
Yavakshara is well recognized for its ability to be scrapped. According to studies, it has hygroscopic, anti-inflammatory, and fibrinolytic properties.

3.9.4.1. Advantages
Both during and after application, pain and suffering significantly decreased. Compared to the conventional thread (9.01 days/cm), UCT was shorter (6.48 days/cm). The thread was also extremely well tolerated.

3.9.5. Ghritakumari (Aloe vera) Kshara sutra
Instead of using snuhi latex, Ghritakumari pulp was employed in this thread. Researchers contend that it has local anesthetic properties that can be used for burns. It is less corrosive than snuhi. Its pulp has a binding effect.

3.9.5.1. Advantages
It includes things such as easy accessibility and preservation, quick healing of wounds, good tolerance, and no allergic responses.

3.9.5.2. Disadvantages
Sticking was uneven, which was not advantageous. Because the thread was beaded, discomfort was felt as it was being applied.

4. RESULTS
Despite the typical Apamarga's(Kshara sutra’s) efficacy in treating a variety of surgical conditions, it is important to note the challenges associated with its preparation and use. Due to these issues, this thread needs to be modified going forward. Snuhi latex is one of the key elements of this thread. The preparation of the thread is complicated by the latex. After cutting the stem, a very small amount is gathered. If not utilized right away, it coagulates. Summer collection is more challenging therefore just a few seasons are suitable for preparation. The fact that people experience excruciating agony while the thread is being applied is another drawback. In a rare instance, the severity is so great that patients stop their therapy. In addition, allergic responses are noted. Numerous studies have been conducted to find medications with better actions and acceptability than Snuhi latex and Apamarga kshara.[18] and various forms of Kshara sutra have been created to address these issues.

4.1. PH values of Different Ingredients
a. Snuhi Ksheera - 5.6
b. Haridra - 6.2
c. Apamarga Kshara - 10.2.

4.2. Expiry Date of Kshara Sutra
6 months from the date of manufacture.

5. CONCLUSION
The care of hemorrhoids, fistula in ano, chronic fissure with tags, anal warts, pilonidal sinus, chronic sinuses, rectal polyps, anal papilloma, neoplastic pedunculated growths, etc. can all be managed with the Kshara sutra. For evaluation and establishing its action in India as well as other nations such as Sri Lanka and Japan, numerous clinical trials have been conducted in various famous institutes. It is necessary to create Kshara sutra by combining various forms of Kshara and binding material, such as Kshara and Guggulu to achieve the most powerful combination for the benefit of humanity, as described in our ancient teachings. The current situation calls for standardizing all Kshara sutra as Apamarga Kshara sutra and comparing the outcomes, benefits, and drawbacks of each type of material employed. The “Kshara sutra” is now a blessing for the sick. However, efforts are still being made to increase the Kshara sutra’s effectiveness and acceptability by preparing it with diverse materials.

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Figure 1: Barbours thread

Figure 2: Snuhi ksheer

Figure 3: Prepared Apamarg Kshar

Figure 4: Prepared Kshar sutra
Table 1: List of source plants for Kshara preparation as per Sushruta Samhita\(^{[12]}\)

<table>
<thead>
<tr>
<th>Name</th>
<th>Botanical name</th>
<th>Family</th>
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<tr>
<td>Mushkaka</td>
<td>Elaeodendron glaucum Pers.</td>
<td>Celastraceae</td>
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<td>Kutaja</td>
<td>Holarrhena antidysenterica Linn.</td>
<td>Apocynaceae</td>
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<td>Palash</td>
<td>Butea monosperma Linn.</td>
<td>Fabaceae</td>
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<td>Cassia fistula Linn.</td>
<td>Caesalpinioidae</td>
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<td>Asclepiadaceae</td>
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<td>Nertium indicum Mill.</td>
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<td>Premna integrifolia Linn.</td>
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<tr>
<td>Gunja</td>
<td>Abrus precatorius Linn.</td>
<td>Fabaceae</td>
</tr>
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</table>

Table 2: Division of plants based on their Doshaghnata

1) Vataghna    
   - Kadali

2) Pittaghna   
   - Aragvadha, Krutavedhan, Kutaja

3) Kaphaghna   
   - Palash, Karanja, Tilvak, Vaasa, Agnimantha, Apamarga, Snuhi, Putika, Ashvakarna, Nimba, Bibhitaka, Karavira, Arka, Saptachhada, Chitraka, Krishnamushkaka

4) Tridoshaghna 
   - Patala, Sariva, Gunja