MANAGEMENT OF FISTULA IN ANO IN ANCIENT GREEK AND AYURVEDIC MEDICINE – A HISTORICAL ANALYSIS


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There is a general belief that the Ayurvedic approach to management of fistula in ano, especially the method of caustic ligature, is similar to that of Greek medicine and has no relevance in the history of world medicine or the advancements made in modern surgery. This article attempts to bring to limelight the uniqueness of the method of caustic ligature expounded in the classical Ayurvedic texts and also emphasizes the fact that the surgical interventions described by Suśruta are comparable with modern surgical methods now in use. In fact, there is evidence that the ancient method of caustic ligature is superior to modern seton thread as well as other surgical procedures.

Key Words: Alkali, Ayurveda, Fistula, History, Incisions, Kṣāra Sūtra, Probing, Seton Technique, Thread

Fistula in ano is a disease that has plagued humanity since time immemorial. Modern methods for managing this disease have their roots in ancient Greek medicine, especially the Corpus of Hippocrates. Hippocrates described the use of tent, lint thread and surgery for treatment of fistula. Today, fistulotomy and fistulectomy constitute the main line of treatment for anal fistulae. The lint thread method of Hippocrates has reincarnated in the form of the seton thread technique, which is still practiced to some extent by modern surgeons today. Fistula in ano has also been well described in classical text books of Ayurveda. The Suśruta samhitā, the renowned text book of surgery in Ayurveda recommends fistulotomy, fistulectomy, caustic ligature and thermo cautery for the management of anal fistulae. From a historical perspective, there is a wide-

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spread notion that the Ayurvedic approach to manage fistula in ano is not very different from the Greek method and that it does not have any contemporary relevance in the light of the advancements made in modern surgery. However, a close study of references from ancient texts reveals that the Ayurvedic methods were more advanced than that of Greek medicine. It is also quite interesting to note that the Ayurvedic surgical procedures are quite comparable with the most modern surgical interventions for management of fistula in ano. There is indicative evidence to show that the technique of caustic ligature for healing fistulous tracks may even be superior to conventional techniques used in modern medicine. This article attempts to highlight the unique contributions made by Ayurveda in the management of anal fistulae, which have not only a historical but also contemporary relevance.

**Anal Fistula in Ancient Greek Medicine and Classical Ayurveda**

The Corpus of Hippocrates described tent, lint thread and surgery for the management of anal fistulae. The earliest Ayurvedic text book on surgery, the *Suśruta samhitā*, elaborates surgical methods, medicated suppository, caustic ligature and thermo cautery. The surgical procedures mentioned by *Suśruta* are far more detailed than that of Hippocrates and does not even warrant a comparison. Hippocrates described tent for anal fistula as the first line of treatment in the following manner. For an already formed fistula, a stalk of fresh garlic is used to measure the depth of the fistula. Then, a strip of cotton cloth is moistened with the juice of the great tithymallus. This is roasted and triturated and made into a tent equal to the length of the fistula track. This tent is inserted into the fistula track. After the tent is placed inside the fistula track, a ball of horn is introduced into the rectum, which is left there and removed when passing stools and replaced again. On the sixth day, it is removed and the tent is drawn out of the flesh. The ball is filled with alum and again introduced into the rectum. It is kept there till the alum melts. Finally, the rectum is anointed with myrrh until the parts are united. *Suśruta* mentions a medicated suppository that is to be placed inside a fistula to promote healing. The medicated suppository is in the shape of a wick and is made of powdered Cassia fistula bark; turmeric and Capparis sp. mixed with honey and clarified butter. The Lint thread mentioned in Greek medicine is quite different from the caustic thread mentioned in classical Ayurvedic texts. Hippocrates recommended the
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use of a slender thread made of raw lint, which is to be folded five times to a length of one span (nine inches). Horse hair is wrapped around the raw lint to keep the fistula track patent and to facilitate rethreading. The lint thread is to be directly inserted into the fistula track with the help of an eyed probe. The ends of the thread are knotted twice or thrice and the rest of the thread is twisted. The thread is tightened whenever it is loose and the old thread is replaced when it rots. In classical Ayurvedic texts, a strong thread is recommended, which is to be coated with caustic alkali. The probing of the track is recommended before inserting the thread unlike Hippocrates who recommends the direct insertion of the thread, which may lead to creation of a new track. After probing, the caustic thread is introduced into the track with the help of a needle and is taken out through the other end. The two free ends of the thread are then tied together. The number of knots is not specified, nor has it been mentioned that the thread should be tightened. When the caustic coating becomes weak, rethreading is to be done. The process is repeated till the track is cut completely. It is wrong to erroneously generalize that the Lint thread method and the caustic ligature of Ayurveda are essentially the same. The unique aspects of the Ayurvedic caustic thread has accounted for its continued use in the evolutionary history of Ayurveda.

Table 1

<table>
<thead>
<tr>
<th>Raw Lint Thread used in Greek Medicine</th>
<th>Caustic Thread used in Ayurvedic Medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slender Thread of Raw Lint</td>
<td>Strong Thread - Material not specified.</td>
</tr>
<tr>
<td>Raw Lint united into five folds.</td>
<td>Single Thread with no folds (Cakrapāṇidatta)</td>
</tr>
<tr>
<td>Length of thread is one span.</td>
<td>Length of thread not mentioned.</td>
</tr>
<tr>
<td>Horse Hair is wrapped around the folded lint Thread. The purpose of the Horse Hair is to keep the fistula track patent and enable replacements with new thread.</td>
<td>Horse Hair is not used. Instead, the thread is coated with latex of Euphorbia antiquorum and power of turmeric several times. (Cakrapāṇidatta) probably developed this technique from a combination mentioned by (Suṣruta)</td>
</tr>
<tr>
<td>Lint Thread is inserted directly into fistula track with the help of a director with eye.</td>
<td>Course of track is determined first by probing and then needled thread is introduced into the track (Suṣruta)</td>
</tr>
<tr>
<td>The ends of the thread are knotted twice or thrice and the rest of the thread is twisted.</td>
<td>Two ends of thread to be tied, number of knots not specified (Suṣruta)</td>
</tr>
<tr>
<td>Thread is to be tightened whenever it gets loose.</td>
<td>Tightening of thread not specified.</td>
</tr>
<tr>
<td>Old thread to be replaced when it rots before cutting the track.</td>
<td>Old thread to be replaced when the caustic coat becomes weak (Suṣruta)</td>
</tr>
<tr>
<td>The Lint Tread method became outdated. However, it later gave rise to the practice of the seton thread technique in modern medicine.</td>
<td>The Ayurvedic Caustic Ligature was revived in the 1960s and modernized without radical changes in the ancient materials and procedure.</td>
</tr>
</tbody>
</table>
The choice of a strong thread and the caustic coating made a world of difference between the procedures used by the Greek and Ayurvedic surgeons. The Table 1 given here highlights the major differences between the two threads and the techniques of ligature.

**The History of the Use of Caustic Thread in Classical Ayurveda**

The use of caustic thread in Ayurvedic classics begins with the *Suśrutasaṃhitā* (1500 BC–5th cent AD). Suśruta does not describe the material to make the thread or the alkaline substances to be used to coat the thread, though he elaborates the method of tying the thread. It is Cakrapāṇidatta (11th cent AD), who first described the method of making the caustic thread. According to him, a strong thread has to be coated with the latex of Euphorbia nerifolia and turmeric powder several times. However, Suśruta does mention this combination for application as caustic alkali in the context of the treatment of hemorrhoids. In the work *Gadanigrāhah* (12th cent AD), Soḍhala describes a formula for making a caustic alkali to be used in anal fistula and similar other conditions. However, a close study of the ancient texts seems to indicate that caustic ligature was indicated only in children, old people and others who could not tolerate surgery. Over a period of time, surgical intervention for fistula in ano went into disuse and caustic ligature may have come into prominence as can be understood from Table 2.

Fistulotomy and fistulectomy followed by cauterization with alkali and heat seem to have been the first line of treatment in the *Suśrutasaṃhitā, Aṣṭāṅga sangrahaḥ* (5th cent AD) and *Aṣṭāṅga hṛdayam* (6th cent AD). Except *Bhaisajyaratnāvali* (19th cent AD), all other major texts indicate surgery in anal fistula. The *Cakradattaḥ, Gadanigrāhah, Vangasena samhitā* (13th cent AD), *Bhāvaprakāśaḥ* (16th cent AD) and *Yogaratnākaraḥ* (17th cent AD) describe only fistulotomy. Caraka recommends purgation, probing and incision followed by cauterization with heated oil. It is very likely that fistulectomy was not practiced after the period of *Aṣṭāṅga sangrahaḥ*, probably because the procedure was very painful and comparatively more risky. The different types of incisions mentioned by *Suśruta* are as follows: Curvilineal (*lāṅgalaka*), Semi-curvilineal (*ardhalāṅgalaka*), Crucial (*sarvatobhadra*) and Longitudinal (*goīrthaka*), which are indicated in the *Śataponaka* type of fistula. In the
parisrāvi type of fistula, the incisions to be made are: kharjūra patra (leaf of date palm), ardha candra (half moon), candra cakra (moon’s disc), sūcīmukha (needle’s mouth) or avāṅgmukha (with downward mouth). Specific incisions for fistulotomy depending on the type of fistula are also mentioned in Vāṅgasena saṃhitā and Bhāvaprakāśaḥ. By the time of Bhaisajyaratnāvalī, even fistulotomy seems to have been discarded and application of caustic alkali and conservative methods of management became the preferred approach.

Probing, incisions, caustic alkali and thermo cautery are mentioned as the general line of treatment in Cakradattah, Gadanigrahaḥ, Vāṅgasena saṃhitā, Bhāvaprakāśaḥ and Yogaratnakaraḥ. Probing, incisions, caustic alkali and thermo cautery are mentioned as the general line of treatment in Cakradattah, Gadanigrahaḥ, Vāṅgasena saṃhitā, Bhāvaprakāśaḥ and Yogaratnakaraḥ. Caustic ligature for the management of anal fistula is mentioned in the context of treatment of sinuses (nādivrāna) in all the major text books on Ayurveda like Suśruta saṃhitā, Aṣṭāṅga saṅgrahah, Aṣṭāṅga hṛdayam, Cakradattah, Gadanigrahaḥ, Vāṅgasena saṃhitā, Bhāvaprakāśaḥ, Yogaratnakaraḥ and Bhaisajyaratnāvalī. Only Caraka has indicated the use of caustic thread directly in the context of treatment of fistula in ano. From a historical perspective, it appears that Suśruta preferred the surgical techniques of fistulotomy and fistulectomy as the first line of management in anal fistula followed by cautery with alkali and heat. Over a period of time, the practice of fistulectomy seems to have declined and was replaced by the simpler technique of fistulotomy. On the other hand, the technique of caustic ligature, which was earlier performed on person unfit for surgery, gradually became the preferred method of treatment, especially in modern times. However, it is important to note that Aṣṭāṅga saṅgrahah recommends caustic ligature in the parikṣepinī type of fistula. It is an example of one instance where caustic ligature is not just an alternative to surgery.

Emergence of the Seton Technique and the Rebirth of Ayurvedic Caustic Ligature

The seton technique is a modification of the lint thread described by Hippocrates. There are historical records that indicate that this was practiced in the 14th century AD. Today, modern surgeons continue to use the seton technique in anal fistulae. At the same time, the ancient Ayurvedic technique of caustic ligature has also been revived, thanks to the efforts of Dr Deshpande in the 1960s.
Table 2

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Text</th>
<th>Date</th>
<th>Indication of Surgery</th>
<th>Fistulotomy</th>
<th>Fistulectomy</th>
<th>Type of Surgical Incisions</th>
<th>Caustic Alkali</th>
<th>Thermo Cautery</th>
<th>Caustic Thread</th>
<th>Caustic Alkali Method</th>
<th>Caustic Thread Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Caraka samhitā</td>
<td>1000BC-400 AD</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>2</td>
<td>Suśruta samhitā</td>
<td>1500BC-500 AD</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3</td>
<td>Aś tāṅga sangrahāh</td>
<td>5th cent AD</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>4</td>
<td>Aśtāṅga hṛdayam</td>
<td>6th cent AD</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>5</td>
<td>Cakradattaḥ</td>
<td>11th cent AD</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>6</td>
<td>Gadanigrāhah</td>
<td>12th cent AD</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>7</td>
<td>Vaṅgasena samhitā</td>
<td>13th cent AD</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>8</td>
<td>Bhāvaprakāśa</td>
<td>16th cent AD</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>9</td>
<td>Yogaratnākaraḥ</td>
<td>17th cent AD</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>10</td>
<td>Bhaiṣajyaratnāvalī</td>
<td>19th cent AD</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

Note: Caustic Alkali and Thermo Cautery are applied after fistulotomy or fistulectomy. Types of surgical incisions are specifically indicated in certain types of anal fistula. Caustic Alkali Method refers to procedure for preparing alkali to be used specifically in anal fistula. Caustic Thread Method refers to procedure for making Caustic Thread for use in anal fistula.
The modern seton is made out of large silk suture, silastic vessel markers or rubber bands. Two methods are employed in the seton technique. In the single stage seton, a single thread is use for cutting, while in the double stage seton, two threads are used for cutting and draining respectively. The seton technique requires local, regional or general anesthesia. Before inserting the seton into the fistulous track, the overlaying skin, subcutaneous tissue, internal sphincter muscle and subcutaneous external sphincter muscle have to be opened surgically. Both ends of the seton have to be tied with a silk thread after passing through the fistulous track. Thread is tightened on subsequent visits\textsuperscript{43}.

Cutting time has been estimated to be 6-8 weeks\textsuperscript{44} and the success rate\textsuperscript{45} is 60-78%. Even a success rate\textsuperscript{46} of 90% has been reported in some studies. A low recurrence rate\textsuperscript{47} of 3.7% and a high recurrence rate\textsuperscript{48} of 17% have been reported by different studies.

The modernized Ayurvedic caustic thread is made out of surgical cotton linen\textsuperscript{49} No.20 or Barbour thread No.40. The thread is to be coated 21 times with the latex of *Euphorbia nerifolia*, alkali made out of *Achyranthes aspera* and turmeric powder\textsuperscript{50}. The resin of *Commiphora wightii* (guggulu) is also applied sometimes and this has been found to be more effective according to some studies. The tensile strength of this thread has been standardized as 7-9 kg and the pH value\textsuperscript{51} at 9.7. Only a single thread is applied, which does both the cutting and draining.

The advantages of the Ayurvedic caustic thread are: a) only a single thread is used, b) rarely needs even local anesthesia, c) there is no need for incising or excising or excising the fistula track before introducing the thread, and d) no need for a separate thread for tying knots. However, rethreading has to be done once in week till the entire track has been completely cut from inside out. The cutting rate has been found to be around 1cm per week\textsuperscript{52}. A very high success rate\textsuperscript{53} of 98.7% and a very low recurrence between 2-5% has been reported\textsuperscript{44,55}.

Several scientific studies have established the safety and efficacy of the modernized Ayurvedic caustic ligature. Scientific studies have also been conducted to evaluate the efficacy of the modern seton technique. It is interesting to note that studies have also compared the seton technique with the modernized Ayurvedic caustic ligature. In fact, there is some evidence to indicate that
The modern Ayurvedic Caustic Ligature may in fact be more superior and more effective than the seton technique\textsuperscript{56}.

The seton technique has been found to be efficacious and safe compared to the modern surgical procedures of fistulotomy and fistulectomy\textsuperscript{57}, though other studies have also challenged its efficacy\textsuperscript{58}.

<table>
<thead>
<tr>
<th>Seton Thread</th>
<th>Modern Ayurvedic Caustic Ligature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not widely used, but not in disuse.</td>
<td>Revived by Deshpande in the 1960s.</td>
</tr>
<tr>
<td>Evidence of having been practiced during 1307-1390</td>
<td>Described by Sus\textbrittle{\textacute{r}}uta and mentioned in later Ayurvedic literature.</td>
</tr>
<tr>
<td>Large silk suture, silastic vessel markers and rubber bands are widely used.</td>
<td>Surgical cotton linen No.20 is used: some surgeons prefer Barbour thread No. 40.</td>
</tr>
<tr>
<td>Length not mentioned.</td>
<td>Length not mentioned.</td>
</tr>
<tr>
<td>Tensile strength and pH Value are not mentioned</td>
<td>Tensile strength standardized at 7-9 kg and pH Value at 9.7.</td>
</tr>
<tr>
<td>Single thread is used in single stage seton and two threads are used in double stage seton for both cutting and draining.</td>
<td>Only a single thread is used.</td>
</tr>
<tr>
<td>No coating is applied on the thread.</td>
<td>21 coatings of latex of Euphorbia nerifolisa, alkali mode of Achyranthes aspera and turmeric power are made to the thread. Some surgeons apply a coat of the resin of Commiphora wightii (guggulu), which is reportedly more efficacious.</td>
</tr>
<tr>
<td>Needs Local, Regional or General Anesthesia</td>
<td>Rarely needs Local Anesthesia</td>
</tr>
<tr>
<td>The overlaying skin, subcutaneous tissue, internal sphincter muscle and subcutaneous external sphincter muscle should be opened before passing the seton thread through the fistulas tract.</td>
<td>No excision or opening of the track is required. The caustic thread is passed into the fistulous tract after probing the tract with a malleable probe.</td>
</tr>
<tr>
<td>After passing the seton, both ends are to be tied and the knot is to be secured with a separate silk thread.</td>
<td>No need for separate thread to secure the knot.</td>
</tr>
<tr>
<td>Thread should be tightened on subsequent visits.</td>
<td>Thread should be replaced with a fresh caustic thread once in a week.</td>
</tr>
<tr>
<td>Cutting rate is not mentioned.</td>
<td>Cutting rate is 0.5 to 1 cm per week</td>
</tr>
<tr>
<td>Cutting time is 6-8 weeks.</td>
<td>Cutting time depends upon the type of fistulae and the body constitution of the patient.</td>
</tr>
<tr>
<td>Success rate is 60-78%.</td>
<td>Success rate is 98.72%.</td>
</tr>
<tr>
<td>Lowest reported recurrence is 3.7% and highest is 17%.</td>
<td>Lowest reported recurrence is 2% and highest is 5%.</td>
</tr>
</tbody>
</table>
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However, the modernized Ayurvedic caustic ligature appears to be no less effective than the seton thread. The table 3 highlights the major differences between the seton technique and Ayurvedic caustic ligature.

**Comparison of Sus’ruta’s ancient surgical methods with modern surgical intervention for anal fistula**

It is quite fascinating to observe that the surgical line of treatment for anal fistulae advised by Sus’ruta compares well with the modern procedures of fistulotomy and fistulectomy. In fistulae with blind internal openings, Sus’ruta advises fistulotomy and in those which open internally into the anal canal, he advises fistulectomy. In modern fistulotomy, curetting and skin grafting is also done. Fistulectomy is also done by modern surgeons. Anesthesia, blood transfusion and other modern surgical advancements make the modern procedures of fistulotomy and fistulectomy more bearable for the patient. Otherwise, the technique adopted by Sus’ruta is quite similar to what modern surgeons do today. Additionally, Sus’ruta describes different types and methods of incision for various types of anal fistulae.

**Sus’ruta’s fistulotomy**: A modified proctoscope is inserted into the anal canal and the probe is inserted into the fistulous track. The course of the track and internal opening are determined. The probe is then raised and the track is incised below the position of the probe.

**Modern fistulotomy**: The fistulotomy track is laid open with the knife. Cutttering is then performed so that the underlying clean tissue facilitates fast healing. The procedure is followed by skin grafting.

**Sus’ruta’s fistulectomy**: In open mouthed fistula, after introducing the probe, the track is completely excised.

**Modern fistulectomy**: This is complete excision of the fistulous track.

Sus’ruta recommends cauterization of the surgical wound by heated instruments or caustic alkali after both fistulotomy and fistulectomy. Thermo cauterity is indicated in some conditions by modern surgeons also. The *Aṣṭāṅga saṅgrahaḥ* and *Aṣṭāṅga hṛdayam* also describe the same procedure.

A comparison may be seen in Table 4.

Sus’ruta could conceive of surgical procedures several thousand years ago that are not very different from what is done today by modern surgeons. The caustic thread is indeed an ingenious invention and contribution from
Ayurvedic surgery. This method has been in practice through the centuries and even got better over a period of time. Today, it has proved to be equally effective or perhaps even more effective than available modern methods of management. This is a glowing tribute to the genius of the ancient surgeon Suśruta, who devised a technique that has stood the test of time and is as relevant today as it was in ancient times.

It would be gross injustice to dismiss the Ayurvedic contributions as outdated and not very different from what the Greek physicians were doing in ancient times. On the other hand, the unique contributions of Ayurvedic surgeons in the management of anal fistula should be acknowledged and given due recognition in view of its historical significance and contemporary relevance.
ACKNOWLEDGEMENTS

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5. The dates of classical Ayurvedic texts given here are based on P.V. Sharma’s views and does not reflect the personal judgement or opinion of the authors. It is important to realize that many scholars place texts like the Suśruta samhitā and Caraka samhitā in 500 BC. These texts were revised several times and attained their present shape a few centuries after Christ.


7. ibid, p 229


9. Suśrutasamhitā, Cikitsā sthānam, 6.12 : ata ērdhamars'asāmālepān vakyāmah snuhi kṣirayuktām hariddācūrṇamālepah prathamah ata ērdhamar'sasāmālepān vakyāmāh snuhiśkṣirayuktām hariddācūrṇamālepah prathamah//

10. P. V. Sharma, āyurved kā vaigvānīk itīhās, p. 311

12. Suśruta samhītā, Cikītsā Śthānam, 17.29 : ksṛdurbalabhī rūnām nāḍī marmāṣāritā ca yā / kṣārasūṭreṣa tām cchindyāṁna tu śaṣṭreṇa buddhīmāṁ//

13. P. V. Sharma, āyurved kā vaigaṇīk itihās, pp. 186-188

14. ibid, p.299
15. ibid, p.293
16. ibid, p.205
17. ibid, p.297
18. ibid, p.127


20. Suśruta samhītā, Cikītsā Śthānam, 8.9-10 : vyādhau tatra bahucchidre bhīṣajā tu vijānata / ardhalāṅgala kaccchedah kāryolāṅgalo'pi ca/ sarvatobhadraṇko vā api kāryo gotīrthako 'pi vā//

21. ibid, Cikītsā Śthānam, 8.26,27 : gatimānikṣaṃ śaṣṭreṇa cchindyaṭkhorjuṛapatrakam / candrārdham candracakraṇca sūcīmukhamavāṃmukham // chitvāgninā da hetsamayeveṃ kṣāreṇa vā punah //


26. Gadanigrahāh, Śalyāntantre Bhagandarādhikaraḥ, verse 17: eṣāṇīpātanakṣāravahinadāhādikam kramam / vidhāya vraṇavatkāryaṃ yathādoṣaṃ yathābalam; 

27. Vaṅgasena saṃhitā, Bhagandara Cikitsā, verse 14: etāsāṃ pātanakṣāravahinadāhādikam kramam / vidhāya vraṇavatkāryaṃ yathādoṣaṃ yathākramam; 

28. Bhāvaprakāśāḥ, Cikitsāprakaraṇaḥ 8, Bhagandarādhikāraḥ 50.14: eṣāṇīpātanakṣāravahinadāhādikam kramam / vidhāya vraṇavatkāryaṃ yathādoṣaṃ yathākramam; 


30. Suśruta saṃhitā, Cikitsāsthānam, 17.29: kṛṣadurbalabhīrūṇām nāḍī marmāśritā ca yaḥ / kṣārasūṭreṇa tām chindyānna tu sastreṇa buddhimān; 


32. Harisasasiva Shastri, Aṣṭāṅga hrdayaṃ, Chaukambha Sūrharati Prakashan, Reprint, (Varanasi, 1997), Uttara Sthinām, 30.35: aṣṭaṅkṛtyāmesiṇyā bhitvānte samayeveśita m/ kṣārāpitena sūtraṃ bhūṣaṇa dārayet gatim; 

33. Cakradattaḥ, Nāḍīvraṇa Cikitsā, verses 10: kṛṣadurbalabhīrūṇāṃ nāḍī marmāśritā ca yaḥ / kṣārasūṭreṇa tām cchindyānna tu sastreṇa buddhimān;
34. Gadanigrahah, Nāḍīvrana dhikāraḥ, 8.20-22 : eṣ nyā gatimarṣitaḥ kṣārasūtrāṇu sāriniḥ / sācīm nidadhyād gatyante tāthomanyāśu nirharat / sūtrasāṃtaḥ samanī yagādāṃ bandham samācāret/tataḥ kṣārabalam viśya sūtramanyat praveṣayet / kṣārāktam matimāṇ vaidyo yāvanna chidyate gatiḥ / bhagandare'pyeṣa visṛtiḥ kāryovaidyena jānata//

35. Vāngasena saṁhītā, Nāḍīvrana, verse 30 : kṛṣadurbalabhirūn āṃ nāḍī marmāśritā mapi// kṣārasūṭreṇa tāṃ echindyānna tu sastreṇa kadācana//

36. Bhāvaprakāśah, Cikitsāprakaraṇaḥ 8 Bhagandāra dhikāraḥ 49, verses 33 : kṛṣadurbalabhirūn āṃ nāḍī marmāśritā mapi // kṣārasūṭreṇa tāṃ echindyānna tu sastreṇa kadācana//

37. Yogarātnākaraḥ, Nāḍīvrana Cikitsā, verse 2 : kṛṣadurbalabhirūṇāṃ nāḍī marmāśritā tu yā / kṣārasūṭreṇa tāṃ echindyānna tu sastreṇa kadācana//

38. Bhaisajyaratnāvāli, Nāḍīvrana dhikāraḥ, verse 1 : kṛṣadurbalabhirūṇāṃ nāḍī marmāśritā tu yā / kṣārasūṭreṇa tāṃ echindyānna tu sastreṇa kadācana/


40. Astānīga saṁgrahah, Uttara Sthānam, 33.25 : evameva ca parīkṣe pinyāmapi kramāt gatim nāḍī vihitena kṣārasūṭreṇa dviśastriśovai' vadārayet / sakṛđeva hyavadarānādāsādhyaṭa yāpyatā vā syāt//


44. ibid

45. ibid


47. ibid


49. Dr. Shobha G Hiremath, A Text Book of Bhaishajya Kalpana, IBH Prakashana, Bangalore 2000, Preparation of Kṣāra Sūtra, p.223

50. ibid, page 226


59. Suśruta samhitā, Cikitsā Sthānām, 8.4 : pakveṣu copasnigdhamavāgāhasvinnam śayyā yām samnivesyārśasamiva yantrayitvā bhagandaram samīkṣya parācīnām arvācīnām vā tataḥ pranidhāyais añihnāmāmyāmāgyamuddha recchastrenah //


61. Suśruta samhitā, Cikitsā Sthānām, 8.4 : antarmukhe caivaṃ samyagyantram prāṇidhā ya pravāhānāṃ asya bhagandaramukhamāśādyai śa anīṃ datvā śastrāṃ pātayet //


63. Aṣṭāṅga saṅgrahāḥ, Uttara Sthānam, 33.23 : pakvapiṭakam punarupasnigdhaharīkādi – kvāthasuddham svabhakta māvāgāhasvinnam bhuktavantam śayanasthamarśasaniva yantrayitvā parācīnāmarvācīnām bhāhirmukhamantarmukhām vā bhagandaram samyagyā kṣetā//tato ‘antarmukhe yantram pranidhāya pravāhana pravīṣaṃ bhagandar amabhisamikṣya samyagesītvā sāstren a pātayet / bahirmukhe tvēsan’im pranidhāya sāśayamuddharecchastrenantām cobhayamapyagninā / ksārenā copakrameta uṣu tragī vam tu ksāren aiva // tatoḥ nirvāpana śodhanaropanair yathākālam sā dhayed iti śāmānyo vidhih //

64. Aṣṭāṅga ṣrīdayam, Uttara Sthānam : aṭhāntarmukhamesītvā samyak sāstreṇa pātayet/ bahirmukham ca nihśeṣam tataḥ ksārenā sādhyet//