



A review of experimental and clinical studies on suture materials described in Sushruta Samhita

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Abstract-

The Sushruta Samhita is considered as the most important treatise for learning discipline of surgery, i.e., 'Shalya Tantra'. *Sivana Karma* i.e., Suturing is primarily important among *Ashtvidh Shastra Karma* described in there. There can be grave consequences and even death, if suturing or closing the wound is not done in a proper way. In this regard, the *Sivana Sutra*, i.e., suture threads such as, bark of *Ashmantak*, *Shana* (*Crotalaria pallida*), *Kshom* (*Atsee*) (*Linum usitatissimum*), *Snayu* of animals, Hair of animals, tendrils of *Murva* (*Sansevieria Roxburgiana*) and *Guduchi* (*Tinospora cordifolia*) are mentioned in Sushruta Samhita. Many researchers have studied usage of these suture materials in experimental as well as clinical studies. For present review, research publications from AYUSH research portal, DHARA (Digital

Helpline for Ayurveda Research Articles) and Google Scholar were studied. Findings of this review clearly indicate that suture materials study is a promising, yet under explored arena in field of Ayurveda surgery.

Keywords- Suture, *Guduchi*, Sushruta, Wound Healing, Surgery, Shalya Tantra

Introduction

The traditional medicine system of Ayurveda encompasses both medical and surgical aspects of treatment. The Sushruta Samhita is considered as the most important treatise for learning discipline of surgery, i.e., 'Shalya Tantra'. There are 8 important types of surgical procedures described in Sushruta Samhita. These are described as '*Ashtavidha Shastrakarma*', *Chhedana* (excision/removal), *Bhedana* (incision), *Lekhana* (scrapping), *Vedhana* (piercing),

Eshana (probing), *Aaharana* (extraction), *Visravana* (drainage) and *Sivana* (suturing).¹

May it be any type of surgery, suturing or closing the wound remains an integral part of it. If it is not done in a proper manner, there can be grave consequences and even death. We can even say that success of surgery is also dependent on this. The procedure involves two aspects, the skill/technique and the suture materials. The suturing techniques described in Sushruta Samhita are- *Vellitaka* (Continuous), *Gophanika* (blanket), *Rujugranthi* (Interrupted) and *Tunnasevani* (quilted).² There are various indications and contraindications also reported for using the suture technique.

The suture material such as the thread/fibres are also mentioned in Sushruta Samhita. Today, artificial fibres are mostly used for the purpose. However, the suture materials described in Sushruta are all biological and compatible with body and easily available. The *Sivana Sutra*, i.e., suture threads such as, bark of *Ashmantak*, *Shana* (*Crotalaria pallida*), *Kshom* (*Atsee*) (*Linum usitatissimum*), *Snayu* of animals, Hair of animals, tendrils of *Murva* (*Sansevieria Roxburgiana*) and *Guduchi* (*Tinospora cordifolia*) are mentioned in Sushruta Samhita.³ Many researchers have studied usage of these suture materials in experimental as well as clinical studies. These can provide a natural, cost-efficient option to currently used suture materials. Although such researches are published, there is no publication to present a collective review of these. Thus, present Figure 1.

review was planned to compile published experimental and clinical studies on suture materials described in Sushruta Samhita.

Materials and Methods-

Research publications from AYUSH research portal⁴ and DHARA (Digital Helpline for Ayurveda Research Articles)⁵ were first searched. For this database search, keywords “*Suture materials and Ayurveda*” were used. As the search results were very less, Google Scholar was also searched for obtaining research publications beyond these two databases. The research publications in English language only were included. Only experimental and clinical studies related to before-mentioned suture materials were included. Other publications, such as literary reviews were excluded. No other exclusion criteria such as, journal, year, authors etc. were applied. Research articles published until May 2022 were included in this study.

Next, manual screening of all the articles obtained from searching the databases and Google Scholar were compiled and screened by reading their “title” and then the “abstract.” Studies that fulfilled the inclusion criteria were only included at this stage and others excluded.

Duplicate studies were also excluded.

The selected research publications were finally screened by reading the full-text or abstract as per availability and further analysis was done. This search process for present review was done as described in

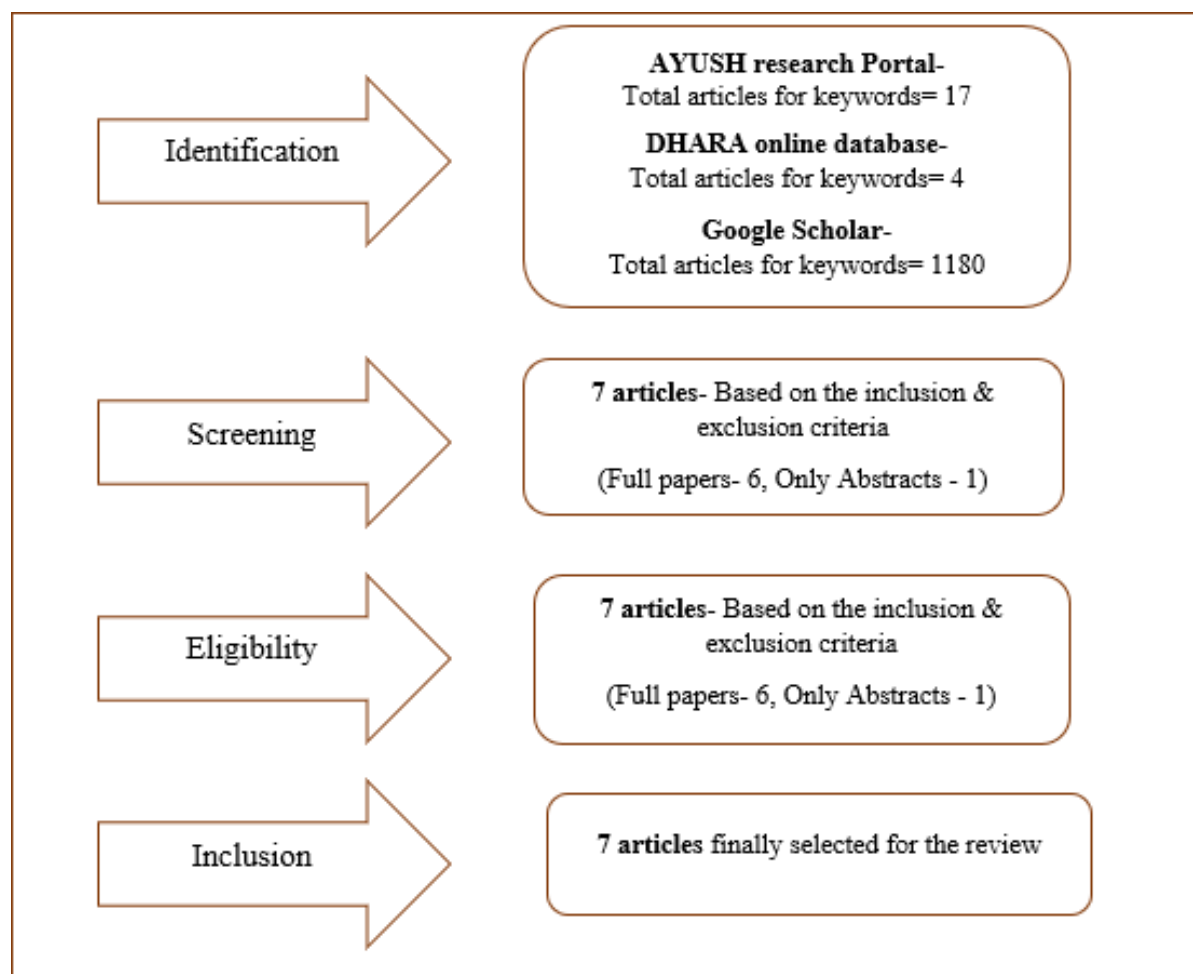


Figure 1- Phases of review- Flow of information

Results-

The AYUSH research portal search for keyword “*Suture Materials and Ayurveda*” yielded 17 articles. The DHARA online database search for keyword “*Suture Materials and Ayurveda*” yielded 4 articles. The Google Scholar search for keyword “*Suture Materials and Ayurveda*” yielded

1180 articles. Of all these search results, only 7 articles were retrieved on basis of before-mentioned inclusion and exclusion criteria. These seven articles were further categorized as, experimental studies (n=4) and clinical studies (n=3)

The details of selected research publications are mentioned in Table 1

. Table 1- Details of selected research publications

Sr. No.	Title of publication	Authors	Publication Details	Database	Type

1	<i>Extraction and Characterization of Antimicrobial surgical Suture from the bast of Tinospora Cordifolia</i>	Shohag Chandra Das & Mohammad Abbas Uddin	Journal of Natural Fibers, 2022	Google Scholar	Experimental
2	<i>Guduchi fibres (Tinospora cordifolia Linn.) as a skin suturing material - A Controlled Clinical Trial</i>	Monica Shrestha, C.D. Jagdhane, T.S. Dudhmal	International Journal of Research in Indian Medicine, 2017	Google Scholar	Clinical
3	<i>A review of clinical trial on evaluation of Taila Payita Amrutha Tantu and Mersilk as suturing material w.s.r. to Riju Granthi technique in Sadyo Vrana</i>	Dr. Ashitha Krishna, Dr. KM Sweta	Journal of Ayurveda and Integrated Medical Sciences, 2020	Google Scholar	Clinical
4	<i>Sana- A Suturing Material in Operated Cases of Inguinal Hernia - An Evaluation</i>	Sudeep, Muralidhar Sharma	Aryavaidyam, 2014	AYUSH research portal	Clinical
5	<i>Experimental evaluation of horse hair as a nonabsorbable monofilament suture</i>	Swati R. Yedke, Subhash Y. Raut, C. R. Jangde	Journal of Ayurveda & Integrative Medicine, 2013	DHARA & online database, Google Scholar	Experimental

6	<i>In-vivo study of tissue reaction to Crotalaria pallida and Sansevieria roxburghiana fibers</i>	Sahana Kamath,	Journal of Ayurveda & Integrative Medicine, 2017	DHARA online database, Google Scholar	Experimental
7	<i>Experimental Evaluation of Moorva as a Non-Absorbable Mono Filament Suture</i>	Nikhil Patil, Umesh Vaidya, Jayshree Shriram Dawane	International Journal of Ayurveda and Pharma Research, 2016	Google Scholar	Experimental

Of the aforementioned options from Sushruta Samhita, studies have been found on *Guduchi*, *Moorva*, *Shana* and horse hair. These are described as follows-

A. *Guduchi* (*Tinospora cordifolia*)-

In their experimental study, Das & Abbas Uddin⁶ prepared suture material from bast, i.e., fibrous material of *Guduchi* and studied its physical, chemical and mechanical properties. They also studied antimicrobial activity as well as tensile strength of suture thread. Their observations suggested that this could be a best natural alternative for sutures.

A clinical study was undertaken by Shreshtha et al,⁷ where *Guduchi* was used as a suturing material for suturing skin in post operative and traumatic fresh wounds. Of the 60 patients, cotton thread suturing was

done in 30 patients (control group) and for other 30 patients, fibres obtained from *Guduchi* stem were used. The outcomes were assessed on basis of pain, wound discharge, oedema, restoration of daily work and days taken for wound healing as per gradation. This study revealed that, due to better tensile strength of *Guduchi* fibres than cotton thread, spontaneous breakage was not observed in trial group until suture removal.

Also, pain, oedema and infections were significantly lesser in these patients.

Another study by Krishna et al,⁸ was carried out in similar population and outcome assessment measures. Mersilk thread was used as comparator. Also, instead of plain *Guduchi* fibres, those treated with *Tila Taila* were used. This study also reported less scarring, less tissue reaction and good knot security for *Guduchi* suturing.

B. *Moorva* (*Sansevieria Roxburgiana*)-

In an experimental study by Patil et al,⁹ suturing material was prepared from leaves of *Moorva*. Its tensile strength etc. were studied and compared with Ethilon 3.0. Further, its efficacy was studied in rat model, based on surgical wound pain, temperature, approximation and histopathology changes. This study presented *Moorva* as an equally efficient non- absorbable filament suture, when compared with Ethilon 3.0.

C. *Shana* (*Crotalaria pallida*)-

In a clinical study by Sudeep and Sharma,¹⁰ suture material was prepared from extracting fibres from stem of *Shana*. The efficacy was seen in post-surgical wound of inguinal hernia surgery patients. Cotton thread was used as control. Various physical properties such as breaking load, tensile strength etc. were studied and compared for these two suture materials. In addition, clinical parameters such as, pain, oedema, infection, tissue reaction etc. were also studied and compared. It revealed that, the tensile strength of *Shana* fibres was just less than that of cotton thread. Its good knot security caused minimum tissue reaction. Thus, it was suggested as useful as cotton thread for suturing.

D. *Moorva* (*Sansevieria Roxburgiana*) & *Shana* (*Crotalaria pallida*)

An animal study was carried out by Kamath et al¹¹ to compare tensile strength and deep tissue reaction caused by suturing material obtained from fibres of *Moorva* (*Sansevieria*

Roxburgiana) & *Shana* (*Crotalaria pallida*). In rat model, *Moorva* suturing exhibited least tissue reaction, while *Shana* fibres had greater tensile strength. It concluded that, due to its least tissue reactivity & good biocompatibility, *Moorva* suture material is better suitable for deep tissue approximation. On the other hand, *Shana*, due to its moderate tensile strength, more hydroxyproline content and ability to sustain sterilization, can be a better choice for deep tissues requiring long term support.

E. Horse hair-

Yedke et al¹² carried out an experimental study to evaluate mechanical and biophysical properties of horsehair obtained from caudal end of tail. In rat model, it showed high promise as it minimized tissue reaction and helped tissue healing. It was also considered to be good because of its less diameter and very cost-effective nature.

Discussion & Conclusion-

Sivana Karma i.e., Suturing is primarily important among *Ashtvidh Shastra Karma* described in Sushruta Samhita. For a successful surgery, proper suturing with flawless technique and material is very crucial. For traumatic wounds too, closure of the wound provides a better chance for proper wound healing. The suturing material plays a major part in this altogether. Today, variety of absorbable and non-absorbable suture materials are available in modern medicine. However, most of them are either artificial or costly. Ayurveda, especially Sushruta Samhita has provided some options in term of suture materials. Some of them are absorbable like

Snayu, while others are of non-absorbable variety, such as horse hair. The present review was undertaken to compile the existing knowledge about various studies undertaken on these suture materials from major databases.

It was found out that, plant-based fibers such as *Guduchi* are studied most. Although the number of studies is less, the variety of studies is impressive. It was found out that, all these studies were focused on non-absorbable sutures. Thus, there remains a scope on studying absorbable sutures such as *Snayu* etc., which can be used in internal organ surgeries too.

Evaluation of suture material is generally done on basis of its physical features, ease of handling, and biological characteristics. It was observed that, all these studies focused on these features. In addition, sterilization aspect was handled very well in them. Thus, methodologically these studies are adequate.

The present review only focused on research publications in AYUSH research portal, DHARA online database and Google Scholar. During literature review, it was observed that, some dissertations were also carried out concerning study of suture materials in Sushruta Samhita. However, their studies were not published for further consideration, as it was out of scope for present review. Another review can be undertaken to incorporate these dissertations after their qualitative evaluation.

However, findings of this review clearly indicate that suture materials study is an under explored arena in field of Ayurveda surgery. As most of these materials are easy

to prepare, store and handle, they are also cost-effective. It holds immense potential but, more detailed studies, especially of clinical nature can be undertaken.

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