



Review Article

SURGICAL PROCEDURES IN *SUSHRUTA SAMHITA* AND ITS RELEVANCE IN MODERN SURGERY

Satheesh V Dev^{1*}, Sharada B S², Vishwanath Sharma³, Shailaja S V⁴, Baidyanath Mishra⁵

¹P.G. Scholar, ²Professor, ³Lecturer, ⁴H. O. D., Dept. of P.G. Studies in Shalya Tantra, SKAMCH & RC, Bangalore, Karnataka, India.

⁵H. O. D., Dept. of Rachana Shareera, SKAMCH & RC, Bangalore, Karnataka, India.

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*Corresponding Author

Dr. Satheesh V Dev
P.G. Scholar, Dept. of PG Studies
in Shalya Tantra, SKAMCH & RC
Bangalore, Karnataka, India.
Ph: +919035852076
Email: satheeshvdev@gmail.com

ABSTRACT

Sushruta Samhita is the first and foremost authentic text of Ayurveda in the specialty of surgery written in the holy city of Kashi around 1000BC by *Acharya Sushruta* who was primarily a surgeon and recognized as The Father of Surgery in the world. Even though *Sushruta Samhita* gives importance to surgery, it contains 184 chapters which describes on 1120 illness, 700 medicinal plants, 57 preparations from animal sources, 64 preparations from mineral sources and detailed anatomical description. *Sushruta Samhita* gives detailed description on plastic surgery, treatment of ulcers, various instruments used for surgery, para-surgical procedures and also in other aspects of medicine such as eye diseases, toxicology, paediatrics, obstetrics and gynaecology etc. All these concepts are relevant in present day modern surgery also. So an attempt is made to explore the surgical procedures mentioned in *Sushruta Samhita* and its relevance in modern surgery.

INTRODUCTION

Ayurveda, the science of life which deals with the maintenance of physical, mental and spiritual well-being of an individual has its origin thousands of years ago from Vedic period. Among the four Vedas, *Atharva veda* contributes more to *Ayurveda*. *Ayurveda* is also considered as fifth Veda or *Upaveda*. *Ayurveda* is divided into eight main branches for the convenience in clinical practice. They are *Shalya tantra*, *Shalakya tantra*, *Kaya chikitsa*, *Koumarabritya*, *Bhuta vidya*, *Agada tantra*, *Rasayana* and *Vajikarana tantra*¹. Among these *Shalya tantra* (surgery) has been given prime importance because of *Aasu kriya karanaath* (gives immediate relief), *Yantra Sashtra Kshara Agni pranidhaanat* (use of blunt instruments, sharp instruments, caustics, cauterization), *Sarva tantra Saamanyat* (accepted by all the other allied sciences)². *Sushruta Samhita* is the first and foremost authentic text of Ayurveda in the specialty of surgery (*Shalya tantra*).

The main concepts of Surgery mentioned in *Sushruta Samhita* are follows:

Anatomical Dissection³

Sushruta was the first person who had established the preservation of deceased and cadaver dissection in the scientific manner to learn the medical science. For the dissection purpose, brushes made of *Usira*, *Bala*, *Venu*, *Balvaja* were used. His description of different body parts such as skin, muscles, bones, blood vessels, tissues, vital spots etc, reflect the sound knowledge of the surgeons of those days. This idea of practical anatomical study is considered as a most noteworthy contribution of *Sushruta* to the modern surgery.

Practical Training⁴

Before proceeding to surgery on the human being, various surgical demonstration techniques are explained by *Sushruta* in "*Yogyasoothreeya adhyaya*". It helps to obtain proficiency, acquiring skill and speed in different surgical procedures. Various models used for *Sashtra karma* (surgical procedures) mentioned in *Sushruta Samhita* are.

Sasthra karma	Models used for surgical practices
<i>Chedana, Utkarthana, Apakarthana</i>	<i>Phala of Kushmanda, Alabu, Kalinthaka, Trapusa, Ervaruka, Karkaruka</i>
<i>Bhedana</i>	<i>Drithi, Basthi, Prasevaka filled with Udaka, Panka</i>
<i>Iekhana</i>	<i>Charma with Roma</i>
<i>Vyadhana</i>	<i>Mrithapasu sira, Utpalanaala</i>
<i>Eshana</i>	<i>Gunopahata kashta, Venu, Nala, Naali, Sushka Alabumukha</i>
<i>Seevana</i>	<i>Sookshma ghana vasthranthayo, Mridu charmaanthayo</i>
<i>Bandhana</i>	<i>Pusthamaya purushaanga prathyanga</i>
<i>Agni, kshara</i>	<i>Mridu mamsa khanda</i>
<i>Karna sandhi bandha</i>	<i>Mridu charma, Mamsa, Peshi, Utpalanala</i>
<i>Nethra pranidhana basthi, Vrana basthi peedana</i>	<i>Udaka poorna ghataparswa srotasi, Alaabu mukha</i>
<i>Aharana</i>	<i>Panasa, Bimbi, Vilva-phalamajja Mrithapasu dantha</i>
<i>Visravana</i>	<i>Madhoochishta upaliptha saalmali phala</i>

The concept of practical training mentioned in *Yogya soothreeya adhyaya* is still relevant. This is followed by the modern medical practitioners by performing the surgery on dummies and natural objects which are having the same features. Before entering in the field of practice, the training at internship serves the same purpose which was proposed by *Sushruta* years back.

Tri Vidha Karma⁵

Sushruta was the first person to classify surgical procedures in three divisions.

- Purva karma* (Pre-Operative)
- Pradhana karma* (Operative)
- Paschat karma* (Post-Operative)

i. Poorva Karma (Preoperative)

It can be further classified into arrangement of operation theatre and preparation of the patient.

Arrangement of *Shashtra karmagaara* (Operation theatre)⁶

'Agre' - Prior to surgical operations

'Upaharana' - arrangement of accessories, instruments etc.

Accessories beginning with blunt instruments are to be arranged before the surgical procedures as explained in this context. *Sushruta* has mentioned in detail about the materials to be collected before any surgical procedures, which includes instruments and other preparations. Preparation of the surgical trolley, positioning surgical instruments and supplementary items in a way which facilitates their access and use, according to the anticipated sequence of the operative procedure which is followed nowadays can be considered as a modified form of *Sushruta Acharya's* concept.

Sterilization

It is evident that *Acharya Sushruta* also followed the sterilization method for various surgical procedures such as *Thaila Paayana*, *Udaka Paayana* and *Kshara paayana* and in the context of *Bhinna vrana chikitsa Agni tapta salaka* is used. Autoclaving of the surgical instruments, clothing and bandaging is being done by the modern surgery.

Preparation of Rogi (Patient)

Diet Restriction

Generally light food is advised before doing the procedures. But surgeries pertaining to *Moodha garbha* (abnormal position of foetus), *Udara* (abdominal enlargement), *Arshas* (piles), *Ashmari* (renal calculus), *Bhagandara* (Fistula in ano), *Mukha roga* (Diseases of mouth) are done nil by mouth⁷. Even now also surgeries are usually performed by nil orally.

Management of Pain

Evidence of anaesthesia used during *Sushruta's* period are:

Patients were advised to take food before undergoing surgical operations so that the patients would not faint, to take alcohol to alleviate pain during surgery⁸. The development of branch of anaesthesia has led to the better advancement of surgery now days and depending on the type of surgery different anaesthetic drugs are used.

Consent

Sushruta has mentioned the importance of taking consent in the context of *Ashmari chikitsa*⁹. In condition where death is certain if surgery is not done, when there is doubt between life and death while performing the surgery, then the surgeon

should take consent from the authorities. *Acharya* has also mentioned about the consent in the context of *Mudhagarbha chikitsa*.

ii. *Pradhana Karma (Operative)*¹⁰

Aacharya Sushruta has classified basic surgical procedures into eight types viz.,

Chedana (excision), *Bhedana* (incision), *Lekhana* (scrapping), *Vyadhana* (puncturing), *Eshana* (probing), *Aharana* (extraction), *Visravana* (drainage) and *Seevana* (suturing).

1. *Chedana – Excision*¹¹

Chedana is indicated in diseases like *Bhagandara* (fistula-in-ano), *Granthi* (cyst), *Tilakalaka* (mole), *Arbuda* (tumour), *Adhimamsa* (muscular hypertrophy) etc., *Acharya* has also explained about types of *Chedana* in different places like *Tiryak* (oblique) *Chedana* in *Bhru*, *Ganda*, *Lalata* etc, *Chandra mandala* (circular) in *Pani* and *Pada*, *Ardha chandrakruthi* (semi circular) in *Guda* and *Medra*¹². Instruments like *Mandalagra*, *Karapatra*, *Vridhi patra*, *Nakha sastra*, *Mudrika*, *Utpala patra*, *Ardha dara*, *Kutarika* are used for *Chedana karma*.

2. *Bhedana – Incision*¹³

Bhedana is indicated in diseases like *Vidradhi* (abscesses except *Sannipataja*), *Granthi* (cyst), *Vruddhi* (scrotal enlargement), *Prameha pidaka* (diabetic carbuncles), *Sopha* (Inflammatory swelling), *Anusaayi* (abscess of the foot), *Nadi* (Sinus ulcers) etc. *Bhedana* is indicated in wound which have pus inside, wound without opening, wound which have bulged up, mend wound having sinuses inside. It is done by inserting the lancet/ scalpel in the direction of hair (Langer's line) till pus is seen, avoiding vital spots, veins, ligaments, joints, bone and arteries. The *Sastra* should be taken out at once and quickly¹⁴. In large inflammation the incision should be made two or three *Angulas* apart. Counter Incision or multiple incisions is still relevant in I & D of abscess of parotid gland.

A Surgical incision should have adequate length and width, clear division done at proper time and there should not be any hollow space inside. Wherever there is collection of pus (multiple pus pockets) incisions should be done so that vitiating material do not remain inside¹⁵. The multiple or counter incision are required where the pus is not properly drained in a single incision. Different types of incisions to remove the fistulous tract as *Langalaka* (T shaped), *Ardha langalaka* (L shaped), *Sarvatobhadra* (Circular), *Gothirthaka* (Half moon), *Kharjura patra* (Serrated)¹⁶ are described for adoption according to the type of fistula.

3. *Lekhana – Scrapping*¹⁷

Lekhana is indicated in diseases like *Upajihvika* (swelling on the tongue), *Granthi* (cyst), *Adhijihvika* (adenoids) *Arshas* (haemorrhoids),

Mandala (patches on skin) and *Mamsonnathi* (hypertrophied muscle).

In wounds which are hard, having thick and round margin, which are burst open with hard and elevated muscles should be scraped. *Lekhana* should be even and uniform, done without leaving remnants, should have the thickness of eyelid, should be done using a sharp instrument. Modern surgery makes use of *Lekhana karma* in dilatation and curettage. Instruments used for *Lekhana karma* are *Mandalagra*, *Karapatra* and *Nakha sasthra*.

4. *Vyadhana - Puncturing*¹⁸

Vyadhana is indicated in disorders like *Bahuvidha sira* (different types of blood vessels), *Mootra vridhi* (hydrocele) *Dakodaram* (ascites). Instruments like *Utpala patra*, *Vrihimukha*, *Ara sastra*, *Vetasapatra* are used for *Vyadhana karma*. *Karna vyadhana* (ear puncture) Piercing of the ear lobe of children using *Soochi* and *Aara sasthra* and measures to manage the complications of improper *Vyadhana* were also explained.

5. *Esana – Probe*¹⁹

Esana is indicated in disorders like sinuses and wounds, with oblique course and foreign body. The word *Esana* means to be searched by introducing probe inside in order to find out the depth of the sinus and internal opening in case of fistula. *Esani sastra* is used for *Eshana karma*. Sinuses, wound with foreign body, those extending in wrong track and having pockets should be probed with soft stalks, hair and finger or probe. Sinuses in the vicinity of eyelid and rectus and those without opening and bleeding should be probed with stalks of *Chuchu* and *Upodaka*.

6. *Aharana – Extraction*²⁰

Aharana is indicated in diseases like *Ashmari* (renal calculi), *Danta mala* (tartar of teeth), *Karna mala* (ear wax), *Moodha garbha* (obstructed labour), *Varchasa nichitham gude* (faeces accumulated in rectum). Instruments used for *Aharana* are *Badisa* and *Danta sankhu*. Urinary stones and varieties, anatomy of urinary bladder, method of extraction by perineal lithotomy, operative complication, post operative wound management are explained in the context of *Asmari chikitsa*.

7. *Visravana – Drainage*²¹

Visravana is indicated in disorders like *Kushta* (skin diseases), *Ekadeshaja sopha* (localised inflammatory swelling), *Palyamaya* (diseases of ear pinnae), *Sleepada* (elephantiasis), *Visha jushta shonita* (poisoned blood), *Arbuda* (tumours), *Upadamsa* (erysipelas), *Granthi* (cyst) etc. Instruments used for *Visravana Karma* are *Soochi*, *Kusapathra*, *Aateemukha*, *Sararimukha*, *Antharmukha* and *Trikurchika*.

8. Seevana – Suturing

Seevana is indicated in disorders caused by *Medas*, incised wounds and well scraped lesions, fresh wounds, those situated in the moving joints²², wounds which are not suppurating, localised in the muscle and having wide opening.²³ *Seevana* is contra indicated in wounds affected with caustics, cauterization or poison, gas gangrene, having blood or foreign body inside the wound²⁴.

Seevana Dravyas

The materials used for *Seevana* are explained in Sushruta Samhita in detail. The suturing materials explained in Sushruta Samhita highly resemble the one which are used in the modern surgery. This shows the knowledge of Sushruta on suturing material at that era.

Sutra (Thread)

Different materials used for the preparation of sutra are *Asmanthala valkala* (fine fibre of *Asmanthaka* bark- *Bauhinia racemosa*) *Shana* (thread of Sana - *Corchorus capsularis*), *Kshouma* (silk thread), *Snayu* (ligament), *Bala* (hair) *Murva* (fibers of *Murva* - *Marsdenia tenacissima*), *Guduchi* (*Tinospora caudifolia*), In *Chidrodara*, anastomosis of intestine was done by clinching the head of black ants is the best example to show the usage of biological substance as absorbable sutures.

Soochi (Needles)

Depending on the site, different types of *Soochi* (needles) are used, like circular type is used in places of *Alpa mamsa* and *Sandhi*, triangular shape in *Bahu mamsa*, semi circular in *Marma*, *Phalakosa* and *Udara*.

Types of Seevana (Suturing)

Different types of suturing like *Vellitaka* (continuous suture), *Gophanika* (blanket suture), *Thunnasevini* (subcuticular), *Riju granthi* (interrupted) are mentioned in *Sushruta Samhita*.

iii. Paschat Karma (Post-Operative)

Acharya Sushruta has given an extensive knowledge about post – operative care. He has mentioned that the patient should be sprinkled with cold water, wound should be pressed all around with finger, gently massaged and washed with *Kashaya*. Then watery discharges wiped with sterile cotton swab and medicated wick should be inserted or covered with *Kalka*. Then it should be dressed with thick pad of gauze, fumigated with analgesic and disinfectant drugs. Then the patient should be admitted to ward and instructions regarding conduct should be given.

Common surgeries mentioned in *Sushruta Samhita* are

Nasa Sandhana (Rhinoplasty)²⁵

Nasa sandhana (rhinoplasty) and other reconstructive surgeries were first mentioned by *Sushruta* in his text. A green leaf of a tree was taken and trimmed it as the shape and dimension of defect of nose. The cut leaf was used to raise the flap of same size and dimensions from the side of the cheek. Free end of the flap was turned towards the nose and apposed on the defect. Two tubes were inserted under the flap to keep the nostrils open. This is considered as a remarkable mile stone in the field of plastic surgery.

Karna Sandhana (Lobuloplasty)²⁶

Acharya Sushruta has advised to perform the reconstructive surgeries of ear lobules in various defects either due to congenital or traumatic reasons. 15 techniques of repair of torn ear lobules have been given by *Acharya*.

Oshta Sandhana (Repair Of Hare Lip)²⁷

Description of repair of deformed lip is given in the same context of *Nasa sandhana*. Procedure is similar to that of *Nasa sandhana*, except the insertion of *Nadi dwaya*. One who knew all the above mentioned procedures was said to be a royal surgeon.

Abdominal Surgeries

Baddha gudodara (intestinal obstruction)²⁸, *Chidrodara* (perforated intestine), *Dakodara* (Ascitis), Accidental injuries to *Asaya* (abdomen) in which protrusion of omentum and its treatment were described. General surgeries like *Vridhhi* (inguinal hernia), *Niruddha prakasa* (phimosis) were also described in *Sushruta Samhita*.

Gynecological and Obstetrical Surgeries

Surgical procedures like Extraction of *Muda garbha* (foetal obstruction), Caesarian section to save baby's life in *Mrutagarbha aharana* and management of *Sthana vidradhi* (breast abscess) were established by *Acharya Sushruta*.

Orthopaedic surgeries

Acharya Sushruta has given good description about bones, its fracture and dislocation. *Acharya Sushruta* has classified *Sandhi muktha*²⁹ (dislocation of joints) into six types and *kandabhagna*³⁰ (fractures) into twelve types and treatment of *Avrana bhagna* (closed fracture), *Savrana bhagna* (open fracture), *Sira kapala bhagna* (fracture of skull) are well explained. Management viz. *Anchana* (traction), *Pidana* (compression), *Samksepa* (immobilization) and *bandana* (bandaging) are mentioned. This classification and description by *Sushruta* is being followed even at present.

Anorectal Surgeries

Surgeries for *Arsas* (haemorrhoids), *Bhagandara* (fistula-in-ano), *Parikartika* (fissure in

ano) are explained by Acharya *Sushruta* in *Sushruta samhita*.

Para-Surgical Procedures

Agni karma (Thermal cautery), *Kshara Karma* (Alkali) *Raktha Mokshana* (Blood letting) which are now considered as para-surgical techniques has described exclusively by Acharya *Sushruta*. Various instruments (*Dahana upakaranas*)³¹ were used for *Agni karma* depending on the site of application for various disorders mainly involving musculo skeletal system. Use of *Kshara* in therapeutics for different ailments such as *Vrana*, *Arshas*, *Bhagandara* and *Raktha mokshana* procedures like *Sira Vyadha*, *Prachana* and with *Jaluka*, *Sringa* and *Alabu* are explained in detail by Acharya *Sushruta*.

Surgical instruments

Acharya *Sushruta* has described 101 types of *Yantras*³² (blunt instruments) and 20 types of *Shastras*³³ (sharp instruments). The unique classification of surgical instruments as *Yantras* and *Shastras* holds good even today. He had also considered the importance of hand as the *Pradhana yantra* (most important) because without it, no operation can be performed.

Concept of *Vrana* (Ulcer)

Acharya *Sushruta* being a surgeon has given great importance to *Vrana* and its *Chikitsa* because for a surgeon knowledge of *Vrana* is very much essential. The *Vrana* or injury involves breakdown of body components and may have one or more of the following seats for occurrence, viz., skin (*Twak*), flesh (*Mamsa*), blood-vessels (*Sira*), ligaments (*Snayu*), bones (*Asthi*) and joints (*Sandhi*), internal organs (*Koshta*) and vital structures (*Marma*). Acharya *Sushruta* has described six varieties³⁴ of *Sadyo Vrana* (Traumatic Wounds) viz., (i) *Chinna* (excised), (ii) *Bhinna* (incised), (iii) *Viddha* (punctured), (iv) *Ksata* (lacerated), (v) *Picchita* (crushed) and (vi) *Ghrista* (abrasion) encompassing almost all parts of the body and their probable causative agent or weapons. Acharya has also classified *Vrana* into *Suddha vrana* (clean wound) and *Dushta vrana* (non healing wound) and sixty different types of management. Acharya *Sushruta* has also elaborately explained about *Dagdha vranas* (burns) and classified it into *Plusta Dagdha* (singeing), *Durdagdha* (blister formation), *Samyak Dagdha* (therapeutic) and *Atidagdha*³⁵ (severe or deep). *Sushruta* has also explained the management of *Dagdha vrana* in detail.

Concept of *Marmas* (vital points)

Acharya *Sushruta* had described 107 number of *Marmas*³⁶ (Vital spots) in the body which causes fatal result on injury, either sudden death or subsequent deformity of organ or body. The anatomical landmark of each and every *Marma* had their degree of fatality is the unique feature of

Sushruta Samhita. *Marma vijñan* is considered as half of the knowledge of *Shalya tantra*.

DISCUSSION

The surgical procedures explained in *Sushruta Samhita* forms the basis for modern surgery. The basics of plastic surgery is an idea developed based on *Sushruta's* description (*Nasa sandhana*, reconstruction of ear lobe). This principles of skin grafting followed by *Sushruta* holds good even today. Hence *Sushruta* is considered as father of surgery. The *Ashta vidha shastra karma* are being implemented in various forms in Modern Surgery even today. *Sushruta* has given clear instruction on surgical procedures but the references are scattered. The *Chikitsa* of *Asthi* and *Sandhi bhagna* was described by *Sushruta* under heading of *Bhagna*. The concept of physical rehabilitation after full recovery from the fracture and dislocation is followed by Orthopaedic surgeons and has now become a new branch known as physio-therapy. The knowledge of alleviating pain during surgery was started by *Sushruta*. The advancement in science and technology has led to the development of branch of anaesthesia. The *Yantras* and *Sastras* are the main tools of the surgeon and *Sushruta* had the knowledge of 101 *Yantras* and 20 *Sastras*. The shape of *Yantras* and *Sastras* are further modernized to compete with the surgery in the modern era. Even today the basic concept and functions of these remain the same. The students were required to practice surgical procedures on vegetables and fruits before attempting the same on live individuals in ancient days but now the same is practiced on dummies. The knowledge of *Marma* is still relevant in present era as surgeons always have to take extra care in these areas, to save these vital points while performing any surgical procedures. Any injury at these places may end up in morbidity or mortality. The above features show that by establishing the co-ordination with allied sciences there would be a better scientific approach of Ayurvedic science.

CONCLUSION

The contribution of *Sushruta* to surgery has laid the foundation for Modern Surgery. Hence *Sushruta* is regarded as "Father of Surgery". The various aspects to be considered before, during and after surgery have been contributed by *Sushruta*. The lack of anaesthesia in *Ayurveda* has been a nail in the wheel for progress and development of surgery. *Sushruta* has given the base for the surgery and opened the door to develop the field. Now it is our duty to uplift this branch of medicine.

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