

RESEARCH AVENUES IN SURGICAL ASPECTS OF SUSHRUT SAMHITA - A REVIEW

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ABSTRACT

In *Ayurveda*, *sushrut Samhita* retains landmark position in the field of surgical texts. The *sushrut Samhita* is an *Ayurvedic* text, by the legendry Acharya Sushruta, foundational to *Ayurvedic* medicine (Indian traditional medicine), with innovative chapters mainly on surgery. In addition to his worldwide known work of historical significance on plastic surgery and cataract surgery, Sushruta also made similar unique contributions on numerous aspects of medicine, such as fracture and dislocations, urinary stones, skin diseases including leprosy, eye disease, paediatric, gynaecology and obstetrics. A very limited work is performed on the various surgical concepts in *Ayurveda*. Therefore, a review conceptual study has been carried out on the various surgical concepts in *Ayurveda*. Outcome of this study explores various research avenues in surgical aspect of *Sushrut Samhita*.

Keywords: *Sushrut Samhita*, *Shalya*, Types of surgical procedures.

INTRODUCTION

The ancient Indian medical science can be traced back from the Vedic period. The Vedas are considered to be the first record of the ancient knowledge and civilization in the world. Out of the four Vedas the maximum description of the medical science is included in the 'Atharvaveda', the penultimate source of *Ayurveda*.

Ayurveda later developed as a separate system of medical knowledge and has given the status of *Up-veda*. The 'fifth Veda' in the next stage of its growth, *Ayurveda* specialized into Eight branches such as *Kaya Chikitsa*, *Shalya Tantra*, *Kaumar Bhri-tya* Etc. and separate treatise were written on the each branch by different authors who were further revised and edited by their disciples and followers.

Among the available literatures three *Samhitas* are currently the chief source of knowledge on *Ayurveda*- Charak, *Sushruta* and *Ashtanga Hridaya*.

The *Sushruta Samhita* was written in the holy city of *Kashi (Varanasi)* sometimes around 1000 B.C. *Sushruta* was primarily a surgeon and recognized as the "The Father of Surgery" in the world.

Aim & Objectives

1. To evaluate, elaborate, discuss and the various surgical concepts of *Sushrut Samhita*.
2. To decode the various hidden surgical procedures of the *Sushruta Samhita* ad co-relate with modern technological steps of surgery

MATERIAL AND METHODS:

All sort of references have been collected and compiled from *Ayurvedic* classics and compiled from *Ayurvedic* classic and available commentaries like – *Sushruta Samhita*, *Bhava Prakasha*, *Chikitsa Sangraha Granth*, *Kashyap Samhita*, *Bhela Samhita* and *Sharangdhara Samhita* etc.

We have also referred the modern textbooks of surgery like Bailey & Love, K.Das, Farquharson's Text book of operative surgery, Primary Surgery Vol-1 (Oxford medical publication) and similar other books and also searched various websites related to surgery.

OBSERVATION

From the study it elucidates this fact that the *Sushruta Samhita* was a 'Text book of surgery' in those periods and were studied by the students of medicine for nearly two thousand years back, much like the medical students of today studied "Bailey and Love's Textbook of Surgery".

The *Sushruta Samhita* is in two parts, the *Purva-Tantra* in five sections and the *Uttara-Tantra*. Apart from *Shalya* and *Shalakyas*, these two parts together encompass the other specialities like medicine, pediatrics, geriatrics, toxicology, aphrodisiacs and psychiatry. Thus, the whole *Samhita*, devoted as it is to the science of surgery, does not fail to include the salient portions of other disciplines too. In fact, *Sushruta* emphasizes in his text that unless one possesses enough knowledge of relevant sister branches of learning, one cannot attain proficiency in one's own subject of study.

The *Samhita* is thus an encyclopedia of medical learning with special emphasis on *Shalya* and *Shalakyas*. The *Sutra-Sthana*, *Nidana-Sthana*, *Sarira-Sthana*, *Kalpa-Sthana* and *Chikitsa-Sthana* are the five sections of the *Purvatantra* containing one hundred and twenty six chapters. Incidentally, the *Ag-nivesa-Tantra* known better as the *Charaka Samhita* and the *Ashtanga Hridaya* of *Vagbhata* also contain one hundred and twenty chapters in all. The *Nidana-*

Sthana gives the knowledge of aetiology, signs and symptoms of important surgical diseases and those ailments, which have a bearing on surgery.

The rudiments of embryology and the anatomy of the human body along with instructions for venesection (cutting of veins), the positioning of the patient for each vein, and protection of vital structures (*Marmas*) are dealt with in the *Sharira-Sthana*. This also includes the essentials of obstetrics. Principles of management of surgical conditions including obstetrical emergencies are contained in the *Chikitsa-Sthana*, which also includes a few chapters on geriatrics and aphrodisiacs. The *Kalpa-Sthana* is mainly *VishaTantra*, dealing with the nature of poisons and their management. The *Uttara-Tantra* contains the specialities, namely *Shalakyas*, *Kaumarabhritya*, *Kayachikitsa* and *Bhutavidya*. The entire *UttaraTantra* has been called *Aupadravika* since many of the complications of surgical procedures as well as fever, dysentery, cough, hiccup, worm infestation, anaemia, jaundice, etc., are briefly described here. The *Shalakyas-Tantra* portion of the *UttaraTantra* contains various diseases of the eye, ear, nose and head. Thus the whole *Samhita* is a comprehensive treatise on the entire medical discipline. On the whole, the entire *Samhita* is a complete work on medicine with special attention to *Shalya* and *ShalakyasTantras*. As a textbook, it is unrivalled in respect of composite teaching of the subject of surgery with reference to all allied branches of medical learning required by a surgeon. It is a forerunner of *Vagbhata's Ashtanga Sangraha*. He had performed many surgeries in those period covering all fields of surgical branches like general surgery, eye, E. N. T., Oro-Dental, pediatrics, obstetrics, Urology, Orthopedics etc. The contribution of *Sushruta* are not only limited to surgical field but also extended upto the anatomy, embryology, gynaecology, obstetrics, pediatrics, toxicology, medicine. Some of the examples of surgical techniques performed by him and other contributions to the surgical fields are narrated in brief here:

Nasa-Sandhana (Rhinoplasty):

The Rhinoplasty and other reconstructive surgeries were first mentioned by the *Sushruta* in his text, and established as a remarkable milestone in the field of plastic surgery. He had taken a green leaf of a tree and trimmed it as the shape and dimension of defect of nose. Then he used the cut leaf to raise the flap of same size and dimensions from the side of the cheek. The free end of the flap is turned toward the nose and apposed on the defect exactly after fresh the edges of the defect. The two tubes were inserted under the flap to keep the nostrils open. The powders of *Pattanga* or *RaktaChandana* (*Pterocarpus santalinus*), *Yastimadhu* (*Glycyrrhiza glabra*) and *Rasanjana* (*Barberis aristata*) was dusted over the wound and covered with the cotton pad. The Sesamum (*Sesamum indicum*) oil was used to soak the pad as it required. When the healing was completed, the flap should be carefully checked. Any excess growth of tissues should be trimmed

Karna-Sandhana (Lobuloplasty):

The *Sushruta* had advised to perform the reconstructive surgeries of ear lobules in the various defects either caused by congenital reasons or traumatic reasons.¹⁵ techniques of repair of torn ear lobules (lobuloplasty⁰¹) had been given by the *Sushruta* even though in the absence of ear lobe by the flap of cheek⁰². The surgeon should tailor the reconstructive technique to suit the specific deformity. For example, when the ear lobe flaps are congenitally absent, a lobe can be created by incising above the level of tragus and turning down the incised flap.

OsthaSandhana (Repair of Hare lip):

The description of repair of deformed lip is given in the same chapter as such as given for the *Nasa-Sandhana*. A surgeon who is expert in the *Nasa-Sandhana* can perform the *Ostha-Sandhana*. The detailed procedure of repair is not clearly quoted or missing in the text⁰³.

Karna-Vedhana (Ear puncture):

The *Sushruta* had described the piercing of the children's ear lobe with a needle or awl on the auspicious

day and time with hymn is known as *Karna-Vedhana Samskara* (custom)⁰⁴.

Establishment of various Surgical Techniques:

He had given various suggestions to make the incision. As per him the incision line should be preferred in the line of hair which heals quickly. The incision should be made in a single stroke and with applying appropriate pressure on the knife to keep the edges sharp of incised tissue. The counter incision or multiple incisions are required where the pus is not properly drained in a single incision. *Sushruta* also discusses certain surgical conditions of ano-rectal region; he has given all the methods of management of both hemorrhoids and fistulae. Different types of incision to remove the fistulous tract as *Langalaka* (T-shaped), *Ardhalangalaka* (L-shaped), *Savatobhadra* (circular), *Gothirthaka* (half moon) and *Kharjurapatraka*⁰⁵ (serrated) are described for adoption according to the type of fistula. *Sushruta* was well aware of the urinary stones, their varieties; the anatomy of urinary bladder along with its relations is well recorded in the chapter '*Ashmarichikitsitopakramah*' (Chapter on urinary stones). Varieties of stones, their signs and symptoms, the method of extraction (by perineal lithotomy), and operative complication were given in detail. He elaborated the details of perineal lithotomy⁰⁶ and post operative wound management which may be the first reference of surgical management of calculus in the history of surgery. Apart from the above, surgery (intestinal sutures) for *BaddhaGudodar* (intestinal obstruction), *Chidrodara* (perforated intestines), accidental injuries to *Aashaya* (abdomen) in which protrusion of omentum occurs are also described along with their management. The operations like couching for cataract, caesarian section to save a baby's life and if the mother dies in the labour and other surgical procedures are established by the *Sushruta* for the first time.

Treatment by *Agni* (Thermal) & *Kshara* (Alkali), *Jaluaka* and Classification of Burns:

The *Sushruta* is the person to give the importance to *Agni*⁰⁷ & *Kshara*⁰⁸ for therapeutical purposes in the form of a separate modality. For various disorders of mainly involving musculo-skeletal system, *Sushruta* advocated the utility of several forms of thermal cauterization by using *Dahana Upakaranas* (tools for *Agni Karma*). He had also elaborated the depth and intensity of burn in his classifications of burn as *PlustaDagdha* (singeing), *Durdagdha* (blister formation), *Samyaka Dagdha* (therapeutic) and *Atidagdha* (severe or deep) and their management. For the first time the symptoms, sign & treatment of *Dhoomopahata* (dyspnoea by smoke) is also described by the *Sushruta*. *Kshara* (Caustic Alkali) utility in therapeutics is a unique kind of its own. As *Sushruta* had discussed various usage forms of *Kshara* in different ailments, like to stop the bleeding, for healing an ulcer, for necrose the (Leeches) are also used as para-surgical procedure in haemorrhoids, for cutting the tract in fistula in ano without injuring Management of *Sadyo Vrana* surgical science for various ailments. The other structures etc. Likewise *Kshara*, the *Agni* & *Jauloka*⁰⁹ on the subject of trauma, *Sushruta* speaks of six varieties of accidental injuries naming (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. As war was the major cause of injury in the past, the name *ShalyaTantra* for this branch of medical science is derived from the *Shala* (arrow), which in fights is used to be lodged in the body of the enemy soldiers. He emphasizes that removal of foreign bodies is fraught with certain complications, if the seat of the *Shala* or *Shalya* be a *Marma*¹⁰ (vital spots). *Asthi-Sandhi Bhagna Chikitsa* (Fracture and Displacement of Bone and its management) *Sushruta* also gives classification of the bones and their reaction to injuries. Varieties of dislocation of joints (*Sandhimukta*) and fractures of the shaft (*Kandabhagna*) are given systematically. He classifies and gives the details of the

six types of dislocations and twelve varieties of fractures. He gives the principles of fracture treatment, viz., traction, manipulation, appositions and stabilization¹¹ the same method is still practiced in the modern orthopaedics, Anatomical Dissection. The *Sushruta* was the first person who had established the preservation of deceased and cadaver dissection¹² in the scientific manner to learn the medical science. For the dissection of cadaver, the use of brushes made of bamboo is shows the highness of his knowledge in the anatomy. Practical Training Before proceeding to surgery on the human being the surgical demonstrations technique of making incisions, probing, extraction of foreign bodies, cauterization either by *Kshara* or *Agni*, tooth extraction, scarification, excisions, trocars for draining abscesses, saws for amputations on various natural fruits, dead woods and clay models had been established by the *Sushruta*. To obtain proficiency and acquiring skill and speed in these different types of surgical manipulations, *Sushruta* had devised various experimental modules for trying each procedure. For example, incision and excision are to be practiced on vegetables and leather bags filled with mud of different densities; scraping on hairy skin of animals; puncturing on the vein of dead animals and lotus stalks; probing on moth-eaten wood or bamboo; scarification on wooden planks smeared with beeswax, etc.

Arrest of Bleeding:

The bleeding occurs just after giving the incision or performing any surgical procedure by sharp instruments or by accidental injuries, either it may be minor or major. To stop or arrest the bleeding *Sushruta* has pointed out four methods to stop the bleeding naming as (i) *Sandhana* (ii) *Skandana* (iii) *Dahana* (iv) *Pachana*¹³. In the *Sandhana* steps he had advised to make the of apposition of the cut edges with stitches, in the *Skandana* to use cold things like snow or ice which causes thickening of blood by coagulation, in the *Dahana* by cauterisation of vessels with *Kshara* (chemicals) or *Agni* (heat), in

Pachana, application of styptic decoctions to contract the vessels locally by application of styptic decoctions. In the loss of blood he had also advised to use the drugs or diet by which we can increase the blood. In the major loss of blood Charaka advises to give the blood of goat or buffalo or deer or cow through oral or rectal route¹⁴.

Concepts of *Vrana*:

The *Vrana* or injury, says *Sushruta*, involves breakdown of body components and may have one or more of the following seats for occurrence, viz., skin, flesh, blood-vessels, sinews, bones and joints, internal organs of chest and abdomen and vital structures. Classically *Vrana* (wound) is the ultimate explosion of the underlying pathological structure. It is, in *Sushruta*'s words, the sixth stage of a continuous process, which starts with *Shotha* (inflammation). *Sushruta* says that in the first stage, the ulcer is unclean and hence it is called as *Dushta-Vrana* (un-healthy wound). By proper management it becomes a clean wound, a *Shuddha Vrana* (clean or healthy wound). Then there is an attempt at healing and is called *Ruhyamana-Vrana* (healing wound) and when the ulcer is completely healed, it is a *Rudha-Vrana* (healed wound).

Eight types of Basic Surgical Procedures:

Sushruta describes eight types of surgical procedures: Excision (*Chedana*) is a procedure whereby a part or whole of the limb is cut off from the parent. Incision (*Bhedana*) is made to achieve effective drainage or exposure of underlying structures to let the content out. Scraping (*Lekhana*) or scooping is carried out to remove a growth or flesh of an ulcer. The extraction (*Aharana*) is carried out to remove the foreign body or tartar of teeth, etc. The veins, hydrocele and ascitic fluid in the abdomen are drained by *Vyadhana* (puncturing) with special instrument. The sinuses and cavities with foreign bodies are probed (*Esana*) for establishing their size, site, number, shape, position, situation, etc. *Sravana* (blood-letting) is to be carried out in skin diseases, *Vidradhis* (abscesses), localized swelling, etc. in

case of accidental injuries and in intentional incisions, the lips of the wound are apposed and united by *Sivana* (stitching).

Suture Materials:

The suture materials of absorbable/non-absorbable and synthetic/ natural were described first time by the *Sushruta*. According to *Sushruta* the bark of *Asmantaka* (*Bauhinia Racemosa*) trees, thread of *Shana* (*Corchorus capsularis*), silk thread, tendon, hair or fibers of *Murva* (*Marsdenia tenacissima*) and *Guduchi* (*Tinosporacardifolia*) are the suture materials. The *Sushruta* had also used the black ants (*Lasius niger*) during the suturing of intestinal anastomosis in the case of *Chidrodera* (intestinal perforation) is probably the first reference of absorbable type of suture material in history of medicine.

Use of Suturing Needles:

The *Sushruta* had used the suturing needles of different caliber for different purposes. These suturing needles were circular, two finger breadths wide and straight, and triangular bodied three-breadths wide. The circular needles which have round body are used at the places where the tissues are thin and in the joints. These needles can be compared to atraumatic needles of contemporary science. Where the tissues are thicker, it should be straight, triangular bodied (cutting) and three finger breadths long. The semi-circular needles are used for the vital spots like testicles and abdominal viscera¹². Different types of Dressing¹³ & Dressing Schedule The *Sushruta* had described the various types of dressing and dressing materials for the first time to cover the wound at different sites of the body. The 14 types of bandages and their applications are the unique features of *Samhita*. They are named either on the basis of their shape or use. These are *Kosha* (sheath) applicable around thumb or fingers, *Dama* (sling), *Swastika* (spica), *Anuvellita* (spiral), *Muttoli* (winding), *Mandala* (circular), *Sthagika* (stump), *Yamaka* (twin bandage), *Khatva* (four tailed bandage), *China* (eye bandage), *Vibandha* (many tailed bandage), *Vitana* (cephalic bandage), *Gophana* (T bandage),

Panchangi (five tailed bandage). During the bandaging the use of cotton to secure the wound from friction is the original theme of *Sushruta* and it is still in practice. The change of dressing at regular interval is the prime thought of *Sushruta* to protect the wound from infection. The period for change of dressing¹⁴ in winter on every 3rd day and in summer season daily was the idea of *Sushruta*⁵⁵.

Management of Pain:

Patients were advised to take food before undergoing surgical procedure in order to withstand the pain during operation. In the old era there were no well established anaesthetic drugs to alleviate the pain during surgery. The *Sushruta* was the first person had used the alcohol to alleviate the pain during surgery. He had also used the *Bhanga* (*Cannabis sativa*) during the surgery, although the use of *Henbane* (*Hyoscyamusniger*) and of *Mohani Churna* (powder) is reported at a later period. Surgical Instruments and their Fabrication with Maintenance of Edges.

The *Sushruta* was the first person who had described the 101 types of blunt (*Yantras*)¹⁵ and 20 types of sharp (*Shastras*¹⁶) instruments and their fabrication by different metallic element chiefly by iron and bronze. The unique classification of surgical instruments like the instruments used to facilitate the surgery known as *Yantra* and while the instruments used directly for the surgical procedures, known as *Shastras*. He had also considered the importance of hand as the most important (*Pradhan*¹⁷) *Yantra*, for without it no operation can be performed. He has not only described the types of *Shastras* but also had given the emphasis on the necessity to maintain the sharpness of edges. So, he had advised to make the *Dharasanthapana* (sharpening) and *Payana* (tempering) at regular interval to perform the surgery hassle free. *Sushruta* was very aware regarding the storage and safety of *Shastras* and had developed the *Shastrakosh* (instrument box or pocket), either of leather or bark. Code of Ethics was for teachers and as well as for students. The model code for the practice of surgery was established by *Sushruta* and he had ad-

vised to take the permission from the king¹⁸ before initiating the medical practice which can be correlated to registration of medicos in today's era. For the first time the ethics for student and teacher were also described by the *Sushruta* in his text.

Description of Marmas (Vital spots):

The *Sushruta* had described 101 numbers of *Marmas*¹⁹ (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 *Marmas* had their degree of fatality is the unique feature of *Sushruta* of its own kind. In the surgical procedures, accidental injuries and in martial art, it plays major role.

DISCUSSION

The surgical procedures given in the *Sushruta Samhita* are in the basic form and still relevant to modern counterpart. The *Nasa Sandhana* (rhinoplasty) was started from the time of *Sushruta* and later on it spread all over the world. The taking of green leaf to 4 measure the raw area of nose to take the exact size of pedicle graft from the adjacent cheek of both the side was the very accurate method to incise the surrounding tissue without wasting any live tissue. *Sushruta* knows the viability of pedicle graft. Above operative procedure is very easy, successful and still relevant in today's era. The methods of *Karna Sandhana* described in *Sushruta Samhita* are very elaborative and cover all types of lobular defect either congenital or traumatic. The *Sushruta* had given the method to reconstruct the ear lobe in absence of ear lobe by the use of pedicle graft taken from cheek. This method of reconstruction is even popular in these days and the recent advancement in the methodology is based on the *Sushruta*'s method. The repair of Hare lip was started from the period of *Sushruta*. As he suggested that there is no need of any tubes as needed in the repair of *Nasa Sandhana*. The detail of repair of Hare lip was not described by the *Sushruta* but as he versed that who is expert in the *Nasa* and *Karna Sandhana* can perform this surgery.

The verse suggests that the surgery for *Ostha-Sandhana* was very popular but for some unknown reason some texts may be missing. The *Karna-Vedhana* given by the *Sushruta* is still very popular amongst *Hindus*.

The method to locate the site of ear puncturing is peculiar. As he suggest, to pierce the ear lobe through '*DaivakritaChidra*²⁰ (a hole created by God) is very particular place for puncturing. At the puncturing of *DaivakritaChidra* there will be no damage to blood vessels, nerves and muscles. To locate this hole, one can direct the ear lobule in front of sunlight and the maximum illumination of light is the confirmation. Instead of sun light, any light source can be used. This is very unique description of *Sushruta* and there are no such type of relevant description is found elsewhere. *Sushruta* knows the every steps of any surgical technique and his visions regarding every aspect were very clear. As he suggests to make an incision in the single stroke²¹ of knife which is still true and good in surgical practice. In the single stroke of knife the very sharp margins of wounds are made which causes perfect approximation of edges and heals quickly with least scar tissue. The *Sushruta*'s view to make the incision in the line of hair²² (Langer's line) is still true and proved, this fact that the incision made in the line of Langer's heals quickly. As *Sushruta* quotes the various types of incisions in the surgery of fistulous tract e. g. *Sarvato-bhadra* (circular), *Lagalaka*, *Ardhalangalaka* and *Chandrardha*.

Due to standardization and wide recognition of *Kshara Sutra*²³ therapy in the fistula in ano, the above incisions are less practiced, and the *Kshara Sutra* therapy dominates other modes of treatment. Less number of recurrence cases and early mobilization of patients in these cases make this therapy gaining popularity and uplifting the glory of *Ayurvedic* surgical science. The *Ardha-Chanrardha* (semicircular) incision used in the abscess or growth situated below the areola of the breast is similar to free hand incision of contemporary science. The ab-

cess which opening lies against the gravity, in such cases *Sushruta* advocates the utility of second or multiple incisions which are in nowadays called as counter incisions. The use of multiple incisions is still relevant in the abscess of parotid gland.

The technique for the perineal lithotomy for the vesical calculus is no more relevant now but the new technique of lithotomy i.e. suprapubic lithotomy²⁴ is the advancement of perineal technique. The extraction of stone from the urinary bladder by pushing the stone upward through inserting the finger in rectum is still helpful in the operation of vesical calculus and suprapubic prostatectomy.

The operation of caesarian section is the modified form of *Moodhagarbha Chikitsa* in which the surgery was performed to save the mother, when the foetus becomes dead. But in the ceasarian section both the mother and child can be saved.

The treatment by the *Kshara*, *Agni* and *Jalauka* are the para-surgical methods for a person who's afraid of surgery as alternative modalities of treatment. The unique role of *Kshara* in the piles²⁵ and well known treatment by *Kshara-sutra* in fistula in ano are later accepted by the one and all. The use of *Agni* for the removal of extra growth of skin and other minor ailments²⁶ was established by *Sushruta*.

The technique to use the *Agni* to stop the bleeding during surgery is the original concept of *Sushruta* which is later modified by the modern scientist to develop in the form of electric cautery. The types of *Sadyo-Vrana* (Traumatic Wound) are the six which are unchanged in the modern text book of surgery. The management of these wounds required immediate attention of surgeon as it is already shown by the *Sushruta*. The *Chikitsa* of *Asthi* and *Sandhi Bhagna* was described by *Sushruta* under the heading of *Bhagna*. He had kept both the *Sandhi Bhagna* and the *AsthiBhagna* (*Kanda Bhagna*) in a single heading. The symptoms, sign are still relevant while their basic principles of management are remained unchanged even these days like traction, manipulation, apposition and stabilization. The newer techniques

have been added in the modern orthopedic surgery but without intervening the basic concepts of *Sushruta's* views. The concepts of physical rehabilitation after the full recovery from the fracture and dislocation are still followed by the modern orthopaedic surgeons. Now this rehabilitation treatment is now becomes a new branch of medical science known as physio-therapy department. For a medico, anatomical knowledge is vital for which he has to depend on dead bodies for dissection.

Sushruta had explained the method of preserving the deceased body and preparation of body before dissection. This ancient method of preservation and dissection depicts that ancient medical science of India is no where lesser to when compared to other systems of medicine. The surgical procedures are to be practiced before going on the live body. This concept of *Sushruta* is still relevant is followed by the modern medical practitioner by performing the surgery on dog and on dummy and natural objects which are having the same features. Even though, before entering in the field of practice, the internship and house job are serving the same purpose. The *Sushruta's* views on the arrest of bleeding are still remained unchanged. Apart from the use of cautery, he explains use of astringent herbs through local and oral administration which is similar to conventional styptic drugs of present era.

The concepts of *Vrana* (ulcer) are remained unchanged. As the *Sushruta* classified it into *Dushta* (unclean), *Shuddha* (clean), *Ruhyamana* (healing) and *Ruhya* (healed). These stages of *Vrana* are clinically proved, which falls in the path of wound healing. As *Sushruta* says that just after the making of wound either by trauma or by surgeon goes under *Shopha* (inflammation) which is required up to some extent for healing. This fact is also appreciated by modern scientists.

The 8 types of surgical procedures like *Chedana*, *Bhedana*, *Lekhana*, *Aharana*, *Vyadhana*, *Sravana*, *Esana* and *Seevana* are the basic of any surgical technique and it is remained unchanged till now. All

surgical procedures are bound by these 8 varieties. There may be conflict on numbers of surgical procedures by some authors but the procedures are unchanged. These surgical procedures are still in use in these days.

The *Sushruta* was aware of different types of suturing materials and suturing needles. As he described the various varieties of suturing material like non-absorbable, absorbable, synthetic and natural. In the operation of *Chidrodara*, the anastomosis of intestine by clinching the head of the black ant is the basic idea of *Sushruta* is the best example of usage of biological substance as absorbable suture material. This is still useful in modified form like in the place of black ant we use the absorbable suture like catgut etc. This signifies the concept of absorbable suture material in gut repair was known to ancient Indian surgeons long back before the invention of catgut etc. The use of various forms of suturing needle in accordance with the depth of the tissues is well known to *Sushruta*. These all facts help us to develop the new technique and devices for the suturing needle like atraumatic needle etc on which further research is expected.

The bandaging of wounds is still relevant to safeguard the wound from the infection, either from the trauma or friction or insects like flies²⁷. The types of materials and dressing are the key part of the post operative care of any surgery or wound. The *Sushruta* had given the indication of type of bandage which is still relevant in modern era on the modern counterpart. The interval to change the dressing of the wound either in the winter or summer is still same as was mentioned in *Sushruta*. The concept of *Sushruta* not to do the bandaging in the wound of *Agni Dagdha*²⁸ is remained same in this modern era. The knowledge of alleviating the pain during the surgery was started from *Sushruta* and later this knowledge flourishes by modern surgeons to establish it as a separate branch of medical science and known as Anesthesiology.

The use of *Pragbhukta*²⁹ (full stomach) in the minor surgery & *Abhuktavata*³⁰ (empty stomach) in major surgery is remained same as earlier to alleviate the pain and to check the vomiting and other complications respectively.

The *Yantras* (blunt instrument) and *Shastras* (sharp instruments) are the main tools of surgeon and the *Sushruta* had the knowledge of 101 *Yantras* and 20 *Shastras*. Even though he was agree with the fact that if the more instruments are required then it can be developed as per need. The shape of the *Yantras* and *Shastras* are further modernized to compete with the surgery in modern era but the basic theme and functions are remained same as before. The classification of instruments in to the *Yantras* (blunt instruments) and *Shastras* (sharp instruments) is the basic concepts of *Sushruta*. No any such type of classification of instrument is found in the modern surgical text books. As per *Sushruta* the hand is the main and important instrument amongst all which hold the key position till date. Without the hand any instrument cannot be held. The tempering and sharpening of edges of *Shastras* are also the view of *Sushruta* which remains unchanged till date. In present time to keep the sharp instruments free from micro-organism and rust, they are kept into the anti-septic solutions or specially designed instruments chambers is the forerunner idea of *Sushruta*. He had even given the specifications for the *Shastra Kosha* (instrument pocket or box) where instruments are to be kept. In today's the model codes for practicing surgery or any other branch of medical science at the particular place registration done by the competent authority is essential from respective state government while in ancient times, the physician has to seek permission from the king. Without the registration no one can practice and if caught may face the legal prosecution. The knowledge of *Marmas* is still relevant in present era as surgeons always have to take extra care to save these vital points while performing any surgical procedure else which it may end up in morbidity or mortality.

CONCLUSION

The techniques of *NasaSandhana*, *Karna Sandhana*, *OsthaSandhana* and other surgical procedures described in the *Sushruta Samhita* are eminently in line with the technical abilities of the times. The para surgical procedures like *Agnikarma*, *Raktamokshana* and *Kshara karma* are gaining popularity nowadays, in the same way other main surgical techniques which are not been tested should be assessed taking due co operation from other system of surgical science. The *Ayurvedic* literatures are preserved in the *Sanskrit* language, and originally in the form of manuscripts written on birch bark; palm leaves or paper. These literatures should be explored which may further nourished the field of surgery and other branches of medical sciences. The versions of *Sushruta Samhita* is itself indicates that these descriptions are in the form of surgical procedures and teaching methods of ancient era. It's the need of the hour to establish various super specialties of *ShalyaTantra* in order to bring back the glory which has lost decades ago. The technical refinements of surgical skill are possible and it should be evolve. *Sushruta* had given the base for the surgery and opened the door to develop the field, now its younger generation's duty to uplift this branch of medicine.

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