

Sushruta Samhita: A Review

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Abstract

Sushruta Samhita describes the ancient tradition of surgery in India and is considered as one of the brilliant gems in ancient Indian medical literature. Sushruta was the famous surgeon of Kashi, known as Banaras. He used to teach and practice around 600 BC and has made significant contributions to various branches of medicine. Sushruta Samhita written by him is the foundation of Indian traditional system of medicine and it contains 186 chapters. Sushruta Samhita is considered as the landmark in the field of surgery and Acharya Sushruta is glorified as "Father of Indian Surgery" "Father of Ancient Plastic Surgery". In this review an attempt has been made to highlight the ancient surgical concepts of Sushruta Samhita which are being practiced even today with same basic principles but after modifications and amendments.

Keywords: Sushruta; Samhita; Shalya.

INTRODUCTION

Sushruta Samhita contains detailed descriptions of way of teaching and practice of surgery by our great ancient surgeon, Acharya Sushruta (fig. 1), who had wide knowledge of surgery which has got relevance even in today's modern practice of surgery and other related surgical and medical branches. Sushruta was the famous surgeon of Kashi, known as Banaras. He used to teach and practice around 600 BC and has made significant contributions to various branches of medicine. Sushruta Samhita written by him is the foundation

of Indian traditional system of medicine and it contains 186 chapters in which he has given description of 1120 diseases, 700 medicinal plants, 64 preparations from mineral sources and 57 from animal sources. He has given precise description of method of dissection, preservation of Cadaver, types of suturing and suture material used, Yantra-Shastra (instruments), minor and major operative procedures, Bhagna (fracture and dislocation), Kaumarbhritya (paediatrics), TwakaVikara (skin diseases), Panchkarma, and many more in addition to his well known work of plastic surgery. Sushruta Samhita is considered as the landmark in the field of surgery and Acharya Sushruta is glorified as "Father of Indian Surgery". He performed surgeries in the era when no diagnostic facilities were available. Probably, it was his wide knowledge of basic science which made him such a versatile surgeon. The list of his contributions is never ending. An English translation of the recension 'Sushruta Samhita' based on original Sanskrit text was edited and published by Kaviraj Kunja Lal Bhishagratna in three volumes. Volume One- Sutrasthanam, Volume Two- Nidanam, *Sharira* and

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Chikitsa, Volume Three- Kalpa and Uttara Tantram. Sushruta took surgery in medieval India to admirable heights and that era was later regarded as "The Golden Age of Surgery" in ancient India. Because of his numerous seminal contributions to the science and art of surgery in India, he is regarded as the 'Father of Indian Surgery' and the 'Father of Ancient Plastic Surgery'. According to him, the one who practices medicine after learning science from a preceptor and engages constantly in recapitulating it, can be called a physician whereas all others are imposters.¹ A complete review of Sushruta Samhita reveals the concepts and contributions of Acharya Sushruta in the field of surgery. Here are some of the contributions of this great surgeon towards the fascinating field of surgery.



Fig. 1: Acharya Sushruta

Technique of training in Surgery

At that time medical education was being inculcated by method of Gurukul system. This science has been handed over in traditional way of teaching through faithful hands that have enlightened the lamp of knowledge one after the other and kept its sacred flame bright from one generation to the next.

Selection of Student

The student was selected entirely on personal merit, irrespective of caste. He should be in Taruna stage (15-30 yrs) having sound physical and mental habits, pleasant manners, retention capacity, humility, forbearance, fortitude, belonging to good family etc.²

- *Upanayanaavidhi (initiation ceremony) and taking oath*

The admission is marked by Bali, Mangala and Homa (prayer, worship and sacrificial offering). Upanayansanskara is performed for this training. In front of oblation fire, guru administers oath in presence of all scholars, enjoining him to absolve from heinous acts of improper affection, miserliness, anger, arrogance, jealousy, discourtesy, to observe clean habits and celibacy, to speak truth, to respect and obey the teacher. The teacher himself also makes promise to discharge his duty consciously.³

- *Curriculum for Study*

After Upanayana Samskar (initiation ceremony), student is introduced to the syllabus he has to carry out. Except 1st, 8th, 14th and 15th lunar days, rare occasions of religious and political importance, rest of the days are considered as working days for the study.⁴ The text is taught slowly according to the capacity of each student. The teacher should instruct them every word, part of a verse or a full verse, according to their ability and make them repeat many times.⁵ All the verses should be explained by the teacher and understood by the student completely.⁶ Theoretical knowledge alone can do nothing without practical knowledge and vice-versa was the thought of Sushruta. Students were therefore provided both theoretical and practical knowledge. Without lethargy the student should devote his entire attention on studies, strictly following the preceptor in order to complete his curriculum. To understand the subject better, one has to study under the specialists, for knowledge of one science alone is not sufficient to have command over it unless it is supported by an insight into as many allied disciplines as necessary. So Sushruta advised to be ever seeking new frontiers of knowledge by studious habits, discussion and perusal of other works on allied subjects.⁷

- *Quality of a Surgeon*

For a successful surgical manoeuvre, the surgeon should have courage, quickness in action, should be non-shaking, non-sweating, (self-confidence and self-command), and should have sharp instruments.⁸ The qualities are alike as Lion's Heart, Eagle's eyes, Ladies finger as mentioned in modern era. For acquiring these qualities practical training is

very essential and for this purpose a number of models were created to learn the procedures before applying them on humans.

- *Yogya (Practical training)*

Sushruta mentions the importance of practical knowledge for a student. A pupil, otherwise well-read, but uninitiated, in the practice (of medicine or surgery) is not competent to take in hand the medical and surgical treatment of disease.⁹ So he introduces the student to the primary techniques in surgical practice. All operative manoeuvre involve one or more of the eight varieties of Ashtavidhashastra karma (intervention) – Chedana (excision), Bhedana (incision), Lekhana (scraping), Vyadhana (puncturing), Eshana (probing), Aharana (extraction), Visravana (draining) and Seevan (suturing).¹⁰ To obtain proficiency, skill and speed in various surgical procedures, Sushruta devised various experimental modules. For example, Bhedana (incision) and Chedana (excision) are to be practised on vegetables and leather bags filled with mud of different densities; Lekhana (scraping) on hairy skin of animals; Vedhana (puncturing) on the vein of dead animals and lotus stalks; Eshana (probing) on moth-eaten wood or bamboo; scarification on wooden planks smeared with beeswax, etc.¹¹

- *Methods of Examination and Approach to Diagnosis and Management*

After obtaining practical training students are taken to bedside for examination of the patient. This is called Vishikha or Karma marga, the procedure for the clinical study. Sushruta has given six means for diagnosing a disease – Shrota (auscultation), Sparsha (palpation), Chakshu (inspection), Jihwa (by tasting), Ghrana (by smelling) and Prashna (interrogation).¹² With the help of above means combined with observation and inference, student will be able to decide the Dosh (causative factor) and Dushya (cellular structure) involved in a disease, whether the disease is nija (intrinsic) or Aagantuja (extrinsic) in origin and in what Kriyakala (stage of disease) the disease is, according to this the management will be decided, whether it needs Shalya karma (surgery), Kshara karma (chemical cauterization) or Agni karma (thermal cauterization).

- *Consent for Performing Surgery*

It has been mentioned that, before undertaking

practice of medicine or surgery, the medical graduate had to obtain the permission of the king, as the head of the state, after satisfying him that the intending practitioner of medicine and surgery had been fully trained and qualified to do so.¹³

- *Augmenting Knowledge*

Sushruta clearly stresses a Physician should augment his knowledge and ingenuity by never abandoning the habit of further study, discussion, learning of allied sciences, expositions in group meetings and seminars.¹⁴ Thus, a surgeon of Sushruta's period was complete in himself, stood independent and confident.

Dissection of Dead body

For dissecting purposes, a cadaver should be selected which has all parts of the body present, of a person who had not died due to poisoning, not suffered from a chronic disease (before death), had not attained a 100 years of age and from which the faecal contents of the intestines have been removed. Such a cadaver, whose all parts are wrapped by any one of Munja (kind of grass – Saccharummunja Roxb.), Valkala (bark – Valerianahardwicki wall / CoelusVettiveroideske Jacob), Kush (kind of grass – Desmostachyabipinnata (L.) Stapf.) and kept inside a cage, should be put in a slowly flowing river and allowed to decompose in an unlighted area. After proper decomposition for seven nights, the cadaver should be removed (from the cage) and then dissected slowly by rubbing it with the brushes made out of any of Usira (kind of grass – Vetiverazizanoides (linn.) Nash), Vala (hairs of tail of animals), Venu (Bambusaarundinaceae wild.).¹⁵

Anatomical Knowledge

The famous Sir Astley Cooper, President of the Royal College of Surgeons, said that 'without dissection there can be no anatomy, and that anatomy is our Polar Star, for without anatomy a surgeon can do nothing, certainly nothing well.'¹⁶

Embryology

Sushruta has described not only the anatomical situations of various structures but he has also given the detailed description right from the cellular structure to the development of various tissues and organs, beginning from intrauterine during description of method of conception. Sushruta mentioned that at the time of intercourse there is liberation of Tej (energy) which along with Vayu stimulates Shukra (spermatozoa) to enter the

vagina, where it joins Artava (ovum). According to him Shukra (sperm) is Somya (cool) and Artava (ovum) is Agneya (warm).¹⁷ When this Agni combines with Soma in Garbhashaya (uterus), it gives rise to the origin and formation of foetus.¹⁸

Gross Anatomy

Garbha (embryo) is divided by VayuBhuta (air), cooked by Tejas Bhuta (fire), AapBhuta (water) moistens it, Prithvi Bhuta (earth) hardens it and AkashaBhuta (space) enlarges it.¹⁹⁻²¹

- Twacha (Skin)²²
- Sushruta gave 7 layers of skin - Avbhasini (Stratum corneum), Lohita (Str. lucidum), Sweta (Str. granulosa), Tamra (Str. spinosum), Vedini (papillary layer), Rohini (reticular layer), Mamsdhara (Adipose layer). First 4 form epidermis and last 3 form dermis.
- Anga & Pratyanga (Body division -Major & Minor parts)²⁰
- Sharira (body) has 6 major parts, called Shadanga - 4 Shakha (extremities), Madhya (trunk) and Shira (head). And Pratyanga (minor parts)
- Ashaya (Internal organs)
- Dhatu (Body tissue)
- Srotas (External openings)²³
Sushruta has given 9 srotas in males - Shravana 2 (ear), Nayana 2 (eyes), Vadana 1 (mouth), Ghrana 2 (nasal openings), Guda 1 (anus), Medra 1 (penis/urethra) and 3 extra for females - Stana 2 (breast) and Artavahasrotas 1 (vaginal).
- (vii) Vascular system The knowledge of circulation of vital fluids through the body was known to Sushruta in 6th century BC itself. He has differentiated the vascular system into vein, artery and lymphatic channels.

» Dhamani (Artery) They are meant for carrying the nutrient material and are 24 in number.²⁴

» Sira (Vein) These are 700 in number²⁵

- Marma (Vital spots) He described 101 number of Marmas (vital spots) in the body which causes fatal result on injury, either sudden death, haemorrhage or subsequent deformity.²⁶
- Netra (Eye)²⁷

Musculo Skeletal System²⁸

- Pesi (Muscles) - According to Sushruta there are 500 muscles in the body

- Kandara (Tendons) - 16 tendons have been described²⁹
- Snayu (Ligaments) - Total 900 Snayu are mentioned in the body
- Mamsarajju (Muscular fascia) - They are 4 in number situated on either side of back.
- Asthi (Bone) - Sushruta classified bones based on dissections as Kapala (flat bones), Ruchakaasthi (teeth), Tarunaasthi (cartilages), Valayaasthi (round bones) and Nalakaasthi (long bones). He gave total 300 bones in the body.
- Sandhi (Joints) - Joints have been classified into 2 - Chalasandhi (movable) and Achalasandhi (fixed). There are total 210 joints in the body - 68 in Shakha (extremities), 59 in Koshtha(trunk), 83 in head-neck.

Yantra (Blunt Instruments) and Shastra (Sharp Instruments) (fig. 2)

Surgery can't be thought of without use of instruments. Surgical instruments are the means of extracting the Shalya (any foreign body or extraneous substance which troubles the body and mind) from its seat or place where it is embedded. Sushruta has given 101 Yantra (used as associates of Shastra) divided into 6 types- 24 Svastikayantra (cruciform instruments), 2 Samdamshayantra (pincers, forceps etc), 2 Talayantra (instruments with flat disc), 20 Nadiyantra (tubular instruments), 28 Shalakayantra (rod like instruments) and 25 Upayantras (accessory instruments). Names of these are given as per their shapes resembling to the animals, birds etc. e.g., Simhamukha (Lion Forceps), Shararimukha (like Sharari bird - Scissor). His Samdamsa Yantras are the first forms of the modern surgeon's spring forceps, dissection and dressing forceps. Diagnostic instruments like Nadiyantra and their principles were first laid down by Sushruta, which took several modifications with advent of technology to attain present form of endoscopes.²⁹ Apart from these Yantra, 20 Shastra have been mentioned which are employed in Shastra karma (main operative procedure) - Mandalagrashastra (round knife, sharp curette), Karpatra (surgical saw), Vridhipatra (bistour), Nakha (nail), Mudrika (finger knife), Utpalapatra (lancet), Ardhadhara (curved lancet), Suchi (surgical needles) Kushpatra (long double edged scalpel), Aatimukha (short scissors), Shararimukha (long scissors), Antarmukha

(curved lancet), Trikurchaka (brush like sharp spike in three sides), Kutharika (surgical axe), Vrihimukha (trochar), Ara (awl), Vetaspatra (scalpel), Badisha (sharp hooks), Dantashanku (teeth scraper), Eshani (sharp probe). For an accomplished surgeon it is essential to gather and keep the necessary equipments ready and

Sushruta has dealt with various instruments, their uses, Guna (properties), Dosha (defects), maintenance of their sharpness and its preservation etc. very well.³⁰ The shapes of Yantra and Shastra are further modified to compete with the surgery in modern era but the basic concept and their functions remain

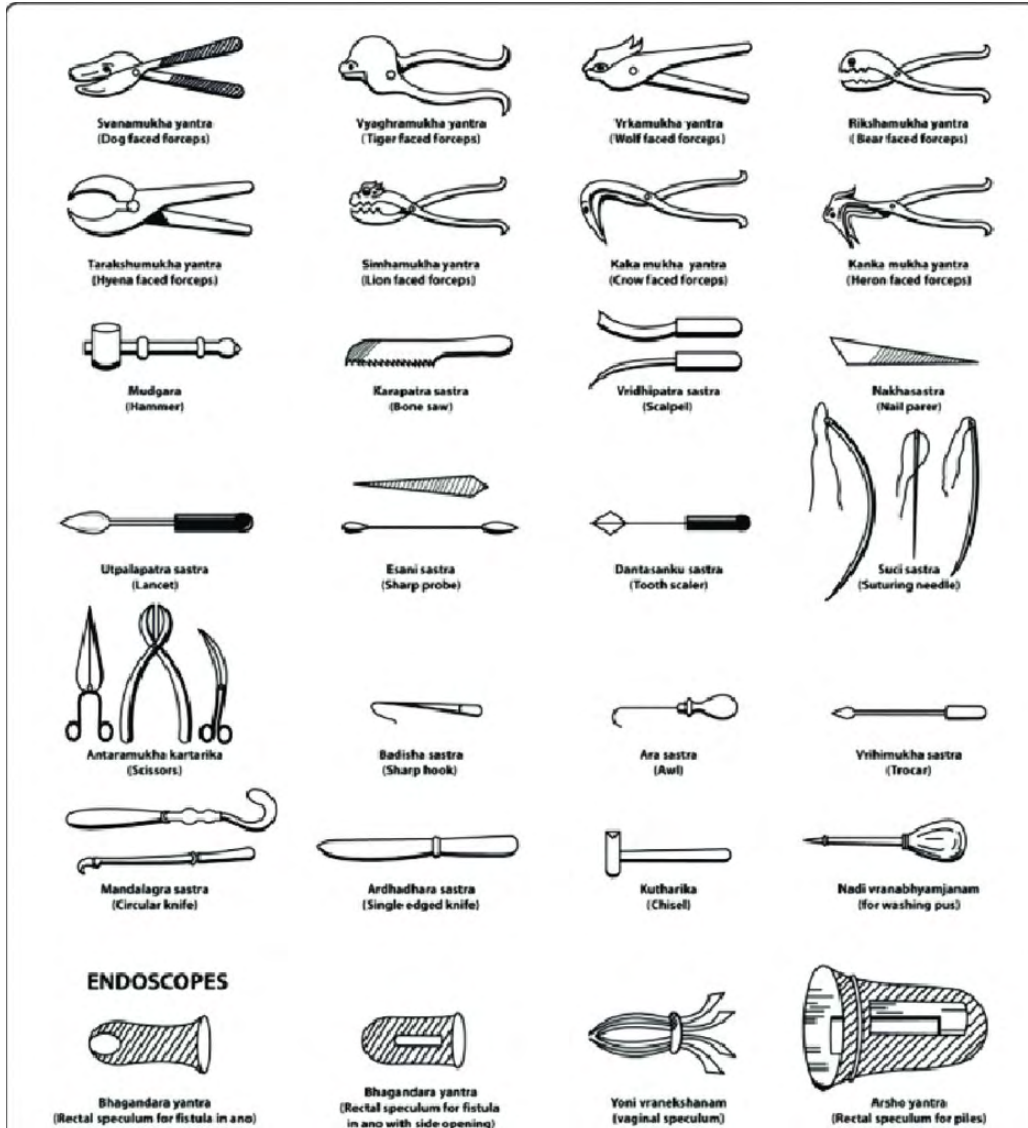


Fig. 2 Surgical instruments from the Sushruta Samhita

the same.

Sterilisation & Antiseptic measures

The instruments advocated for surgical procedures should be heated prior to their use otherwise there is danger of pus formation.³¹ The surgeon should cut short his hair, nails and should wear white sterilized clothes.³²

Sangyahaarana (Anaesthesia)

Sushruta says wine should be used before operation to produce insensibility to pain those having habit of drink wine. He again remarks, it is desirable that the patient should be fed before being operated on those are non-addicted to wine. Those who are addicted to drink and those who cannot bear pain, should be made to drink some strong beverage.

The patient who has been fed, does not faint, and he who is rendered intoxicated, does not feel the pain of the operation.³³

Trividha Karma (Three Operative procedures)

The trividha karma are nothing but the pre-operative, operative and post-operative procedures, a systematic portrayal of surgery. Whichever the surgical procedure may be it has the above said three parts in it.

- **Purvakarma (Pre-operative)**³⁴

Pre-operative means not only related to preparation of patient. Sushruta stresses the importance of collecting all the materials needed during the operative procedure and for postoperative care. He has given a list of appliances required in surgical operations e.g. Blunt Instruments, Sharp Instruments, Leeches, Cotton, Pieces of Cloth, Thread, Leaves, Materials of Bandaging, Honey, Ghee or Clarified Butter, Suet, Milk, Oils, Decoctions, Cold and Hot Water, Iron Pans and other Earthen Vessels; Beddings and Seats, Obedient, Steady and Strong Servants etc.

- **Pradhana Karma (Main Operative procedure)**

This includes mainly Ashtavidha Shastra karma (Chedana, Bhedana, Lekhana, Vyadhana, Eshana, Aharana, Visravana, Seevan). Almost all surgeries performed today by modern surgeon include these eight techniques of Sushruta. He has given Seevan karma in detail with types of sutures, materials used, type of suturing, how to apply suture etc. Seevan Karma (Suturing).³⁵ The threads used may be of silk, cotton, jute, human hair, horse hair, Snayu (tendon), inner bark of tree, tendril etc. The needles may be of straight, round body, straight triangular, curved, half curved, curved triangular etc. The types of suturing are: Rujugranthi (simple interrupted), Anuvellita (simple continuous), Gophanika (blanket sutures), Tunnasevani (lambart, subcuticular) etc. In surgery how skin suturing should be done to avoid the complication is most important. It should not be too long from margin otherwise may be painful and should not be too close from margins otherwise they will cut through.

- **Paschat Karma (Post Operative measures)**³⁶

After the operative procedure, the patient is to be assured. The operative wound is to be cleaned & dressed with Vikeshika (medicine impregnated pad) or proper medicated oil, emulsion, paste or dusting powder etc. The

operative wound portion is to be fumigated with germicidal and air purifier medicines to avoid the pus formation. Raksha karma (protective rites) for patient has been given. The patient is to be kept in Vranitagara (post-operative ward) for ten days as mentioned below. Here Sushruta has given do's and don'ts for the patient, dietary instructions, proper wound management and medication.

Vranitagar (Surgical ward)³⁷

Sushruta directs that there should be a particular room provided for patients who have undergone surgical operation. This room should be a clean house, situated in a wholesome locality, free from dirt sunlight and heavy breeze. The bed of the patients should be soft, spacious, and well-arranged with head towards east and weapons alongside (for protection from enemies, animals etc.) The fumigation of the sickroom with antiseptic preparations such as Ashtangadhupas should be done.

Vrana (Wound)

Vrana is a very important part of our surgical practise and Sushruta has described it in detail alongwith detailed description of its management in his Samhita. He has mentioned two types of wounds i.e. Nija and Aagantuja (accidental injuries) which have their own subtypes and the phases through which a wound goes during its healing. These wounds if neglected become Dushtavrana (contaminated wound) and fail to heal, so to prevent contamination and provide quick wound healing surgeon should understand the nature of Vrana and act accordingly. He has dedicated three chapters of Sutrasthana (chapter 21 to 23) for this purpose. Sushruta has beautifully explained each aspect of Vrana, and its management in two chapters (1-2) of *Chikitsasthana* elaborately.

Bandhana (Bandaging)³⁸

A detailed account of utilization of bandages in post operative care of the wound and in fracture management is noteworthy. After Pradhana karma, the area has to be bandaged with or without medicated dressing. It protects the Vrana from flies, dust, cold, wind etc and thus prevent it from becoming infected. Sushruta has given 14 types of bandaging. He explained different materials that can be used for Bandhana, how to bandage, How much pressure it should exert, when to change the bandage and which type of Vrana not to be bandaged. This knowledge is essential for post operative care of Vrana and its proper healing.

Shalya (Foreign bodies)

At that time the commonest weapon used in wars were arrow, spear, sword etc which used to pierce the body and act as foreign material leading to suffering to the patient. Besides these, stones, seeds, food etc get lodged into orifices like ear, throat and lead to trouble. Shalya means the disease process which brings pain and discomfort in *Sharira* (body) and *Mana* (mind) of the patient, Sushruta has given two types of Shalya - *Sharirik* and *Aagantujshalya* (some of which suppurate if left and some get dissolved/absorbed in body), features of Shalya in different *dhatu*s, methods to diagnose these and their management (15 Shalyanirharanupaya – removal of foreign bodies).³⁹ Features of drowning and its management is also mentioned.⁴⁰

Agni karma (Thermal cauterization)⁴¹

Properly carried out Agni karma obviates the recurrence of disease and conditions resistant to medication, Kshara and Shastra karma are curable by Agni karma. Its indications, contraindications, types, shape of *Dagdha*, features according to site, materials used has been described by Sushruta in detail.

Kshara karma (Chemical/Alkaline cauterization)⁴²

It is the most important measure amongst Shastra and Anushastra; it performs excision, incision etc., arrests three Dosha (causative factors). It is of two types - *Paniya* (internal use) and *Pratisarniya* (external use) and is manufactured in three strengths - *Mridu* (mild), *Madhyam* (moderate) and *Teekshana* (severe). Its preparation, Guna (properties), Dosha (defective factors), indication, contraindication, technique of utilization, features of proper Kshar karma has been explained in detail.

Raktamokshana (Blood letting)

It is very important as it is considered to occupy 50% of entire surgical management. Bloodletting being practiced in world is the contribution of great Sushruta. Two separate chapters (*Jalaukavacharan* and *Siravedha*) are devoted for the bloodletting in patients with detailed description of whole procedure, indications, complications, their management^{43,44} Now a days plastic surgeons are using *Jalauka* (leech) for proper acceptance of graft. In case of post trauma hematomas and in ischemic cases leech application has been reported very useful.^{45,46}

RaktaSandhana (Hemostasis)⁴⁷

Sushruta has given four steps to control excessive bleeding occurring after *Siravedhan* (puncturing of vein) - *Sandhana* (joining the edges of the wound by use of astringent drugs), *Skandhan* (promoting

clotting by use of cold), *Pachana* (styptics by use of ash, alkali etc.) and *Dahana* (cauterisation). *Kashaya* (Astringents) unites the wound edges, *himm* (cold) makes the blood clot, *bhasma* (ash) adheres there and closes the wound and *daah* (thermal cauterization) constricts the vessel thereby stopping the bleeding.

Shotha (Inflammation)⁴⁸

It is a localized swelling characterized by an augmented size, even or uneven elevation, situated in skin and underlying tissues, having accumulation of Dosha (causative factor), arising in any part of the body and different from *Granthi* (cyst/lipoma), *Vidradhi* (abscess) and *Alji* (cervical lymphadenitis). It is of 6 types depending on Dosha (*Vataja*, *Pittaja*, *Shleshmaja*, *Sannipataja*, *Shonitaja*) and *Aagantuja* (external factor) and has 3 stages - *Aam*, *Pachyaman* and *Pakvashotha*. Sushruta even gave its pathogenesis- without *Vata* there is no *Ruja* (pain), without *Pitta* there is no *Paka* (ripening), without *Kapha* there is no *Puya* (pus); hence during the stage of ripening of *Shotha* all doshas are involved. *Vitiated Pitta*, takes control of *Vata-Kapha* and causes ripening of *Rakta*, this is the second opinion. Sushruta has given the 7 principles of its management - *Vimlapana* (softening by kneading with fingers), *Avsechana* (blood letting), *Upnaha* (warm poultice), *Patana* (incision), *Shodhana* (cleaning), *Ropana* (healing) and *Vakritapahama* (removing the abnormalities). He even mentioned complications of inadvertent incision in *Aam* and *Pakvavranashotha*.

Vidradhi (Abscess)⁴⁹

The abscess which is ripe and bulged should be cut open. The knife should be inserted in the direction of hairs avoiding vital spots, vein, ligaments, joints, bones, arteries and go deep till the pus is seen, then knife is taken out at once and quickly. In broad swellings another incision may be given at a distance of 2 or 3 *Angula* (finger breadth) in between.

16. DagdhVrana (Burns)⁵⁰

Acharya Sushruta has described burns caused by hot liquid or solid. These are of 4 types - *Plushta* (1st degree burn), *Durdagdha* (2nd degree burn), *Samyagdagdha* (3rd degree burn), *Atidagdha* (4th degree burn). Later he gave more varieties of burns depending on source - *Dhoomophata* (inhalation injury), *Atapadagdha* (heat stroke), *Ushnavatadagdh* (sun stroke), *Sheet varshanildagdh* (cold injury), *Indravajradagdh* (burn due to lightening). The pathogenesis of burns is also mentioned - *Agni* (fire) causes

vitiating of Rakta, there is aggravation of Pitta also at same speed. Both possess same Veerya, Rasa and Dravya so Pitta undergoes Vidaha and lead to severe burning sensation, formation of blebs, thirst and fever. The management of each variety is given separately and also indicated resistance of bandaging in burn injuries.

Ophthalmic Surgery

Among seventy six ophthalmic diseases, fifty one are surgical. The mode of operation which is to be performed in each case has been elaborately described.

Anorectal disorders

Sushruta has described elaborately Arsha (haemorrhoids) and Bhagandara (fistula-in-ano), their definition, causes, classification, clinical features, treatment etc. In addition, he has also mentioned about Charmakeel (anogenital warts), Sanirudhaguda (anal stricture), Gudabhramsa (rectal prolapsed), Parikartika (fissure-in-ano) etc.

Ashamri (Urinary calculus)⁶⁰

Sushruta has given special attention towards Ashmari particularly in urinary bladder and has given details of its etiology, pathogenesis, classification, signs and symptoms, complications which resemble today's description.

Swellings

All kind of swellings, generalized or localised; Shotha (edema), Granthi (cyst/lipoma), Arbuda (tumour), Gulma (abdominal Swelling/tumors), Udavarta (abdominal distension due to flatulence) etc. find a place in Sushruta's work along with aetiology, symptoms, prognosis and management - medical or surgical whatever needed.^{61,62}

Bhagna (Fractures and Dislocations)

The major part of surgery was indeed concerned with trauma and its management. Fall, compression, blow, sudden muscle contraction/throw, animal bite etc. lead to Asthibhagna which is of two types - Kanda bhagna (fractures, 12 subtypes) and Sandhimukta (dislocation, 6 subtypes).⁶³ The twelve types of Kanda bhagna include a wide range from greenstick and hairline to compound and comminuted fractures. Signs, symptoms of each and prognosis have been mentioned.⁶⁴

Detailed management of these has been given with 4 basic principles - Aanchan (traction), Peedan (manipulation), Sankshepa (optimum position for fixation) and Bandhan (immobilization by splints

and bandaging) which is nowhere less than the contemporary orthopaedic practice. He has even described the management of each bone fracture and dislocation separately. In compound fractures local treatment of wound is specified and many formulations cleansing are recommended for the promotion of healing. Bhagnaropana (healing of fracture) is considered good if there is no swelling, no shortening, no elevation (bony prominence) and capable of all activities comfortably.⁶⁵

Sandhana karma (Plastic surgery)⁶⁶

In old days one of the royal punishment was to cut away the ear lobules, nose etc. Indian surgeons have applied their techniques for correcting such deformities by shifting the skin flap to reform the nose, ear and lips, whose detailed description is given by Sushruta. He explained Rhinoplasty, classification of mutilated ear lobe defects and techniques for repair of torn ear lobes (15 different types of otoplasties), cheek flap for reconstruction of absent ear lobe, repair of accidental lip injuries and congenital cleft lip. He also gave enough importance for adequate blood supply as well as perfect haemostasis in graft bed suggesting Sushruta to be the originator of plastic surgery.

Method of Otoplasty⁶⁶ - Sushruta advised to perform reconstructive surgery of ear lobules in various defects caused by trauma or congenital reasons. He gave 15 techniques for repairing Karna (ear). Appropriate technique is decided i.e. excision, scrapping, puncturing etc., blood of ear is then examined for vitiating or non vitiating of Dosha and ear is washed accordingly. Incision is made and Affected parts are joined together, neither too high nor too low and not irregular and then sutured after the bleeding stops.

Method of Rhinoplasty and Oroplasty⁶⁶ - A leaf of tree should be taken and cut to the shape of nose, this is placed on the cheek and cheek muscle is cut to same size; raising a flap of it and maintaining the connection with live muscles. Flap is placed quickly on mutilated nose after scrapping it then suitable bandage is tied inserting 2 tubes into the nose. After union has healed, the flap is cut at its half length allowing the remainder intact. Similar procedure is followed for oroplasty except insertion of the tubes. Rhinoplasty was one of the great highlight of Sushruta's surgery. The construction of a new nose brought him fame as the originator of plastic surgery. The famous Indian Rhinoplasty (reproduced in the October 1794 issue of the Gentleman's Magazine of London) is a modification of Rhinoplasty described by Sushruta. Even today pedicled forehead flap is referred to as the Indian flap.⁶⁷

Koshthabhedha (Abdominal injuries)

Sushruta gave description of abdominal injuries also.⁶⁸

Stri and Prasutirog (Gynaecology and Obstetrics)

Sushruta was the first to mention caesarean section done frequently these days. He also mentioned surgical management of intrauterine deaths.⁶⁹

CONCLUSION

Sushruta Samhita is a beautiful composition of Acharya Sushruta with sequential arrangement and detailed description of the topics in form of verses. The influential nature of the Sushruta Samhita is supported by anatomical knowledge and description of surgical procedures in it and by the creative approaches that are held true till today. Acharya Sushruta has covered every branch of medical science but has given more emphasis on surgery. He has covered every topic related to surgery right from the dissection, anatomical consideration to the description of diseases and management which are being used with same basic principles in today's surgical era with modification and amendments. Instead of research work done till date, there are many hidden facts in the text which can be further explored. Because of his deep routed knowledge and wonderful contribution towards the field of surgery, he is respectfully known as "Father of Indian surgery" and "Father of Ancient Plastic surgery".

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