

ANCIENT INDIA'S CONTRIBUTION TO SURGERY

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Diseases and ailments have affected humanity since time immemorial. The response of humanity to treat disease and, on occasions to find its cause has been synonymous with the evolution of an organizing society, however ancient and culturally primitive. Thus medicine, as we know today, is as old as man and must have therefore evolved with the first awakening of human consciousness. It is not surprising that the antiquity and the rich tapestry of the ancient Indian society has been associated with seminal contributions to the history of medicine in general and specifically with the development of surgical theory, practice and ethics.

For convenience, the timeline of ancient India extends from the prehistoric period, through the Indus and Saraswati civilizations, the Vedic periods, the rise of Jainism and Buddhism, the Mauryan period up to the 5th century AD.

From the ruins of Harappa and Mohenjodaro, the evidence of a medical system practice can be traced. The Harappa people used plant drugs, animal products and minerals. It is also apparent that water supply and sanitary drainage was well established.¹

The difficulties in establishing chronology and authorship

Many factors contribute to the incertitude regarding details of the historicity of surgical practice, its origin and authorship. For centuries it was the custom for teaching to be carried out by word of mouth; the texts, in this process would be greatly modified and altered, being committed much later on to writing upon leaves and barks, which being perishable, were readily destroyed not only by the climate but also by frequent foreign invasions.

The philosophy that it was immodest to ascribe a treatise to one individual would explain why most of the older texts have never been ascribed to a definitely historically recognizable individual. Thus statements and authorships have often been ascribed to mythical personages or Gods, probably in an attempt to resonate the underlying message.^{2,3}

Hindu mythology and medicine: Dhanvantari - the mythical god of Surgery

The venerable state of the art of healing was enhanced by myths and legends; Brahma, the Creator of the universe, evolved Ayurveda by meditation and imparted it to Daksha Prajapati, who in turn taught the Ashwini Kumars (twin sons of the Sun Gods). Lord Indra, the celestial ruler, learnt it from Ashwini Kumars and in turn passed on the knowledge to many rishis such as Sage Bharadwaja (Guru of Atreya) and King Divodasa Dhanvantari of Kasi.

The God Dhanvantari - the “Patron Saint of Surgery - is nowhere mentioned in the Vedas; he is a later creation of the epic and puranic mythology. According to the epic legends, at the time of the churning of the ocean of milk by devas and asuras, Dhanvantari emerged out of the waves carrying amrita or the elixir of life. Medical knowledge was passed down to, amongst others, Divodasa Dhanvantari who in years to come, became a renowned teacher in the art of surgery and imparts this subject to his disciples (Anpadhenava, Vaitarana, Aurabhra, Panskalavata. Karavirya, Gopuranksita and Susruta) at Kasi (Varanasi). Divodasa Dhanvantari was later elevated to divinity of classical medical wisdom. Susruta, one of the disciples, attained great proficiency in surgery and in time came to be known as the “Father of Indian Surgery”⁴

The Vedic Period

Before the advent of writing, the ancient wisdom of healing was a part of the spiritual tradition of the Sanatana Dharma or Vedic religion. We find the roots of modern medicine in the earliest known texts of ancient India, the Vedas, which are at least 6000 years old. In the Rig Veda (prior to 3100 BC), there are hymns which record 86 achievements of Ashwini Kumar, the forerunner of the art of healing. Thus we note in the Rig Veda that legs were amputated with the application of prostheses [note the copper prosthesis applied to the amputated thigh of King Visala (Rv.1.163. 9 and Rv.1.116.15)], that injured eyes were removed and arrow shafts extracted from limbs and torso. There is also evidence of tracheostomy being undertaken in ancient India; the Rig Veda mentions:

“the bountiful one, who, without ligature, can cause the windpipe to reunite when the cervical cartilages are cut across, provided they are not entirely severed”

In the next Vedic era of Yajurveda, there is a mention of ligating bleeder (mutraveda), the passing of a catheter (bran chikitsa), treatment of an ulcer and the interference with a gravid uterus (garbhaveda).

In the Atharvaveda, there is reference to the technique of surgery and a description of surgical instruments.⁵

The primacy of the science and practice of medicine was considered of such importance that they were termed the Ayurveda and were considered to be the 5th and last of the Vedas. Ayurveda is said to have its origin in the Atharvaveda compiled sometime during 1000BC. Surgery formed one of the eight specialities of Ayurveda and was known as Salya-tantra.⁶

The Samhita Period

The Vedic period was followed by the Samhita (*compendium*) period; at this period (about the 7th – 8th century BC), Indian civilization showed signs of a new evolution of ethics, rational thinking and conscience that threatened the prevailing religions of custom and magic.⁷ Profound intellectual turmoil and thinkers ushered the era of scientific method that prompted the transformation from magico-religious medicine to rationalist medicine.

The legacy of this transformation is evident in the scope and practice of surgery that is encapsulated in Sushruta Samhita (compendium) recorded between 800 - 600 BC. Given the incertitude of the surgical historicity and authorship in ancient India, it is presently unclear what the Samhita as originally written by Susruta was like; the present form is considered to be a recession or rather a recession of recessions made by Nagarjuna around 200 BC.

Notwithstanding these hiatuses in chronology and authorship, it is acknowledged that the Susruta Samhita generally reflects the surgical practice during the Samhita period. It also represents a centuries old practice presented in the context of rationalist medicine; of the available ancient Indian medical text, it is one of the oldest.

The Susruta Samhita represents arguably the zenith of ancient India's medical and surgical system. It provides a historical window into a school of professionalized surgical practice over 2000 years ago, during when it almost certainly represented the most advanced school of surgery in the world. The Susruta Samhita was followed by other medical treatises that served as the foundation for the practice of rational medicine that followed in ancient India.^{2, 8}

“.....and it was doubtless one of the best developed medical systems of antiquity”

and

*“..... the surgical art of India is doubtless **sui generis** and does not bear any traceable resemblance to the contemporary surgical practice of any other country”*

Ilza Veith⁹

Susruta

The historicity of Susruta is unclear; it is mentioned that he taught surgery at the eastern University of Benaras on the banks of the river Ganges. A disciple of the Dhanvantari school, the Mahabharata mentions Susruta as the son of the great saint Viswamitra. It is apparent that Susruta had no desire of abandoning the Vedas and pushing an independent science. An accomplished surgeon, philosopher and above all a great teacher, his compilation of the Susruta Samhita, a monumental treatise of seminal value, established him as arguably the brightest jewel in the history of surgery in the ancient and medieval period.¹⁰

“All in all, Susruta, must be considered the greatest surgeon of the medieval period”

Whipple AO, 1963¹¹

The highly respected authority on the life and practice of Susruta, KK Bhishagratna, writes;

“to Sushruta may be attributed the glory of elevating the art of handling a lancet or forceps to the status of a practical science....”

Susruta Samhita ¹²

The Susruta Samhita has been divided into 6 volumes (stanas), including the so-called appendix, dealing with the different aspects of surgery. The Susruta Samhita states that surgery is the most ancient and honored branch of Ayurveda that is capable to effect immediate cure. A *magnum opus*, its comprehensiveness possibly rivals current day medical books; it includes the fundamental concepts of surgery, knowledge about herbs and drugs, diagnosis, physiological and embryological aspects, therapeutics, poisons and science of nutrition. Treatment of subjects such as paediatrics, ophthalmology, geriatrics, reproduction and virility and comment on social hygiene are outlined. A whole volume is devoted to the study and treatment of ailments through psychotherapy. By going through this Samhita, every subject is classified and explained in a scientific manner. A classification in the form of groups, sub-groups, divisions and sub-divisions was outlined. Such classification was possible only because of the practical experience, close observation and logical interpretation of disease.

The 6 divisions of the Susruta Samhita are the following:

- i sutrasthana - comprises 46 chapters; deals with basic doctrines
 - surgical instruments
 - procedures of surgery
 - training methods
 - duties of army surgeon
 - evolution of disease
 - classification of disease
 - properties of different foods
 - characteristics of drugs
- ii nidanasthana - comprises 16 chapters; deals with pathology of surgical disease
 - fistula
 - chronic skin disease
 - urinary tract disease
 - abdominal swellings
 - genital disease
 - diseases of oral tract
 - dental disease
- iii sarirasthana - comprises 10 chapters; describes the cosmic origin of life
 - embryology and anatomy with emphasis on organs of surgical importance
 - vascular system and bodily fluids
 - care of the pregnant and new born
- iv cikitsasthana - comprises 40 chapters; deals with treatment of surgical disease
 - rejuvenation
 - therapies like emesis, purgation, enema, inhalation, nasal medication, mouth gargles
- v kalpasthana - comprises 8 chapters; deals with toxicology
 - poisoning of foods and drink
 - vegetable and mineral poisoning
 - animal poisoning
 - snake venom and bites

- rabies
- insect poisons and their treatment
- vi uttaratantra - comprises 66 chapters; the largest section of the Susruta Samhita, it is believed to have been added to the original text by Nagarjuna. Deals with the following:
 - diseases of the eye, ear and of the nasal passages
 - diseases of the head and diseases of the female organs
 - various kinds of fever
 - malignant tumours
 - heart diseases
 - jaundice
 - haemorrhages
 - epileptic fits, asthma, insanity, hygiene rules, etc

Being fundamentally a surgical treatise, the Susruta Samhita lays more emphasis on practical training. Susruta insists that the enormous amount of oral training should be balanced by practical efficiency.

“He who knows theory only but is not so good in practical work, gets bewildered on being confronted with a patient, in the same way as a coward feels on the battlefield”
Susruta Samhita 1. 3. 48¹³

The scope and nature of Susruta’s Surgery ¹²

Susruta devoted his whole life to the pursuit of surgery and excelled in his surgical teaching.; he classified all surgical operations into eight different kinds, as follows:

- Aharya - extraction of solid bodies
- Bhodya - excising
- Chedya - incising
- Esya - probing
- Lakhya - scarification
- Sivya - suturing
- Vedya - puncturing
- Visravaya – evacuating fluids

A total of 13 types of alcoholic decoctions and soporific agents such as henbane (*Hyoscyamus niger*) and Indian hemp (*Cannabis indica*), opium were used as anaesthetic agents (in addition to tying down the patient!).

Surgical instruments

Susruta provided painstaking details of the manufacture, maintenance and the indications for usage of at least 125 surgical instruments. Surgical instruments were made from iron or substituted for by substance where iron would be unavailable. The range of instruments included various shapes of scalpels, bistouries, lancets, scarifiers, swas, bone-nippers, scissors, trocars and needles. There were also blunt hooks, loops and forceps as well as catheters, syringes, rectal speculums and bougies. Figure 1 illustrates

the range of instruments as described by Susruta. Significantly it is emphasized that the surgeon's hands are the most important instrument of all!

The surgical instruments described were either blunt (*yantra*) or sharp (*asatra*). The blunt instruments numbered 101 and, according to shape and size, were divided into 6 groups:

- i *svastika* (forceps) - 24 varieties
 - measure 18 fingers in length
 - 'mouths' made to resemble those of lions, tigers, wolves, hyenas etc
- ii *sandamsa* (tongs) - 2 varieties
 - measure 16 fingers in length
- iii *tala* (picklock like) - 2 varieties
 - measure 12 fingers in length
- iv *nadi* (tubular or syringe like) - 20 varieties
 - for enemas, injections into urethra, the bowels, vagina, uterus
 - inspection and aspiration of secretions in bodily passages
- v *salaka* (bougies or rods) - 28 varieties
 - serve as probes or directors
- vi *upa* (accessory) - 25 varieties
 - include substances such as rope, braided hair, silk thread, bark and inner skin of trees, linen, oval shaped pebbles, a hammer, a magnet etc

The cutting or sharp instruments numbered 24. The *mandalagram* and *karapatram* were used for incising and scraping; the *vrddhipatram*, *nakhasatram*, *mudrika* and *utpalapatram* for incising and excising.

The *kusapatram*, *suci*, *timukhan*, *sararimukhan*, *trikurcakam* and *antarmukham* were used for exudation or expression of secretions; the *kutharika*, *ara*, *vrihimukham* and *vetasapatram* were used for puncturing.

The *badisa* and *danta-sanku* was used for extracting solid foreign bodies.

The *esani* served as a probe that searched the course of pus.

Suturing was undertaken by the *suci* (*needle*)

Needles and sutures

Three types of needles were use

- i round needle to the length of 2 fingers width
- ii triangular body (tri-hedral) needle to the length of 3 fingers width
- iii semi-circular or bow-shaped

The suture material used included thin cotton thread, fibers of Indian hemp, plaited horse hair, strips of leather, animal sinew and goat gut.

The care of instruments was emphasized; caustics, alkali, oil, heat and water were advocated to temper and clean instruments. Instruments were stored in special boxes. The

commendable features in an instrument are underscored by the emphasis on its sharpness, the ease of grip, shape and edges that are not jagged.

“ An instrument, well-shaped, fitted with a convenient handle and capable of (literally) cutting a hair in two and made according to measures laid in the Sastras, should be alone used in a surgical operation”

The scope and nature of surgery

The surgery practiced in ancient India has been universally lauded for its scope of practice, innovation, meticulousness of technique. Whilst the practice of surgery in those days can by no means compare to the exciting developments in current practice, the remarkable contributions made by our surgical ancestry were of seminal value. The timing of surgical intervention and the need to individualize surgical judgment was stressed by Charaka, the medical counterpart of Susruta:

“ Circumstances arise sometimes, depending upon the part affected, age and general condition.....and the severity of the disease, when a recommended procedure become contraindicated and a prohibited method of treatment becomes indicated”

Charaka Samhita VII 2. 23. 26 ¹⁴

The spectrum of surgery included the following:

Orthopaedic trauma

In the absence of radiology a useful and logical method of determining the types of fractures by clinical evaluation evolved. Skeletal injuries were classified into 2 broad categories, dislocation of joints and fractures. Treatment was by traction and counter-traction, circumduction and other manipulations; acceptable reduction was confirmed by comparison to adjacent side

A variety of bandages and splints were available for immobilization. Management of compound fractures outlined as well as the role of physiotherapy

General trauma

Wounds were classified as incised, punctured, lacerated and contused. Lacerations were sutured; an insight to the potential of wound sepsis and contamination is demonstrated in the following excerpt:

“ Dust, hair, nails, loose bone pieces and other (foreign) matter, when found in the wound (before closure), should be removed, because if they are not removed, they produce extensive suppuration and different types of pain”

Susruta Samhita 25. 18. 19 ¹⁵

Skill in extracting foreign bodies was carried to a great height with the magnet being used under specified circumstances.

The importance of blood and of timeous fluid replacement (by an identical substance to that which has been lost) was mentioned.

“ in a case of quick loss of fluid, immediate replacement restores the balance and stabizes the patient ”

Charaka Samhita 1. 23. 31 ¹⁶

“ Best treatment of any lost substance is replacement by an ideal expander”

Susruta Samhita 1 .15 .10 ¹⁷

Haemostasis was stressed and methods of stopping bleeding outlined; cautery was mentioned, as was the ligation of blood vessels using hemp fibers. ¹⁰

The surgical incision ¹⁸

Emphasis was placed on the qualities of an incision:

“.....it should be of adequate length. Extensible, having regular and uniformly cut edges, having all the layers cleanly incised and should be independent”

Susruta Samhita 1. 5. 8

The correct technique of incising was outlined (swiftly in one stroke!) as well as the direction of the incision:

“ The incision should be made in the direction of the hairs”

Susruta Samhita 1. 5. 7

“.....oblique in the following regions – eyebrow, cheek, temple, forehead, eyelid, lip, gum, axilla, belly and groin”

Susruta Samhita 1. 5. 13

Laparotomy ^{10, 20}

The abdomen was entered by a short incision below the umbilicus slightly to the left of the midline. Laparotomy was undertaken for the removal of intestinal concretions or other obstructions and perforations, an injunction well ahead of contemporary surgical practice. Hippocrates (460 – 370 BC) and Galen some six centuries later considered intestinal perforations invariably fatal. It is also a matter of interest to note that from the time of the Susruta Samhita until the last century, the only cause of intestinal obstruction known in Western practice was a strangulated hernia. ¹⁹

In the Susruta Samhita, the treatment of penetrating intestinal wounds was clearly described. In the case of disembowelment, the protruded bowel is carefully examined for injury, anointed with ghee and honey and returned into the peritoneal cavity in its natural position. Lacerations of the intestine were ingeniously repaired with living Bengal black ants that were used to approximate the bowel edges; these ants were then decapitated so that the bowel approximation was maintained. Following anointment with ghee, milk and honey, the bowel was returned to the peritoneal cavity.

Urological surgery ^{21, 22}

The management of urethral strictures was effected by repeated dilatation using “a tube open at both ends made of iron, wood or shellac ... lubricated with clarified butter and gently introduced into the urethra.....thicker and thicker tubes should be duly introduced into the urethra every third day.... As an alternative, an incision should be made into the lower part of the penis, avoiding the *Sevani* (*raphe of the perineum*) and it should be treated as an incidental ulcer”

The pathogenesis and management of urinary calculous disease was outlined. The several varieties of urinary calculi were detailed as were the dietary indiscretions that prompted their development.

The initial management prescribed included diet modifications, fluids, alkalis and instillations.

The technique of the then pioneering surgery of perineal vesicolithotomy was outlined:

“A physician should have recourse to surgical operations in cases where.....the aforesaid drugs prove ineffective..... the umbilical region should be pressed down with a closed fist so that the stone comes within the reach of the operator. The surgeon should then introduce into the rectum the second and third fingers of left hand duly anointed and with the nails well pared. The fingers should be carried upwards towards the raphe of the perineum so as to bring the stone between the rectum and the penis where it should be so firmly pressed as to look like an elevated tumour an incision should be made on the left side of the raphe of the perineum and of sufficient width to allow the free egress of the stone. Special care should be taken in extracting the stone so that it will not break into pieces or leave any broken particles behind, however small, as they would in such a case be sure to grow large again’

The value of the Sitz bath as we know today, was well appreciated. Thus following “the extraction of a stone, the patient should be made to sit in a cauldron full of warm water and be fomented thereby. In doing so the possibility of an accumulation of blood in the bladder will be prevented; however if blood should be accumulated therein, a decoction of the *Kshira-tree* should be injected into the bladder with the help of urethral syringe” ²³

Plastic surgery

The spectrum of plastic surgery operations undertaken during ancient India included the reconstruction of the cut nose by cheek flap, repair of cut ear lobes, repair of cut lip and skin grafting. In addition there were guidelines on wound care, wound healing and a classification of burns. ^{24, 25}

Accidental burns were classified into 4 categories depending upon the tissues burnt:

- i 1st degree - partial epidermal
- ii 2nd degree - dermo-epidermal
- iii 3rd degree - whole skin thickness

iv 4th, 5th and 6th degree - fatty and muscle layer

It was recognized that special kinds of burns (asphyxiation by flames, sun stroke, frost bite and chilblain, burns by extremely hot objects, burns by lightning) required specialized treatment.

The rhinoplasty procedure represents arguably the acme of ancient India's contribution to surgery. The amputation of the nose was not uncommonly undertaken during ancient India as a form of judicial punishment. Thus, reconstruction of the nose, must have been widely undertaken during that era. The use of the pedicle flap in the rhinoplasty technique forms a fascinating chapter of surgical history. The credit for being the first to conceive and execute operations involving the use of pedicle flaps goes to the surgeons of ancient India. The Susruta Samhita contains the first record of the use of pedicle flaps in the world literature. The technique described was revived much later by the Italian surgeon Tagliacozzi. It is acknowledged that technique spread from India to Arabia and Persia and from there to Egypt and Italy by the 15th Century. The first description in the English literature appeared in The Gentleman's Magazine and the Historical Chronicle in 1794.^{26, 27}

In the Sustruta Samhita, the rhinoplasty technique is described as follows:²⁹

“The leaf of a creeper, long and broad enough to fully cover the whole of the severed or clipped off part, should be gathered. A patch of living flesh, equal in dimension to the preceding leaf should be sliced off from the region of the cheek. After scarifying the severed nose with a knife, the flesh is swiftly adhered to it. Insert two small pipes in the nostrils to facilitate respiration and to prevent flesh from hanging down. The adhesioned part is dusted with the powders of pattanga, yashtimadhukam and rasanjana pulverized together. The nose should be enveloped in karpasa cotton and several times sprinkled over with the refined oil of pure sesamum. When the healing is complete and parts have united, remove the excess skin.”

It is remarkable that even then the accurate cutting and suturing of the flap, haemostasis and maintenance of airway was emphasized. The following description of Susruta is considered appropriate:

“.....there shines the unmistakable picture of a great surgeon. Undaunted by his failures, unimpressed by his successes, he sought the truth unceasingly and passed it on to those who followed. He attacked disease and deformity definitely, with reasoned and logical methods. When the path did not exist, he made one.”

Frank McDowell, 1977²⁸

Ear lobes, due to the use of heavy ornaments, often get considerably expanded and ultimately sunder. Fifteen methods of joining these cut-up ear-lobes were described. For these plastic operations, skin was harvested from the cheek, turned back, and appropriately sutured on the affected ear-lobe.

Ophthalmic surgery

Seventy six different diseases of the eye were outlined, 51 of which required surgical treatment.

Conditions such as dacryocystitis, lacrimal fistula, hordeolum, trachoma, glaucoma and conjunctivitis were described with their treatment; 5 types of pterygium were described.¹⁰ Different varieties of cataracts were described. Susruta is credited to having pioneered the technique of removing cataracts by a method of couching.³⁰

Clearly the undertaking of ophthalmic surgery required a comprehensive understanding of the eye anatomy; it was appreciated that the angle of reflection is equal to the angle of incidence, and that the same ray which impinges upon the retina serves the double purpose of illuminating the eye and the external world, and is in itself converted into the sensation of light!

Neurosurgery

The neurosurgical interventions during ancient India include trepanation and the removal of intracranial mass by Jivaka (physician to the Lord Buddha) and the accomplishments documented in the Susruta Samhita,³¹ It is mentioned that:

“In 927 AD two surgeons trephined the skull of a Hindu king, and made him insensitive to the operation by administering a drug called samohini”

Dr Will Durant, 1937³²

Treatment of neuralgia by the section of the supraorbital nerve was undertaken when medical treatment proved unhelpful.

“The ancient Indian surgeons also mentioned a cure for neuralgia, analogous to the modern cutting of the fifth nerve above the eyebrow...”

Sir Willian Hunter (British Surgeon 1718-1783)

Other surgical procedures

The other procedures undertaken during this period included:

- excision of tumours and lymph nodes, the raw surfaces being applied with arsenic to prevent recurrence
- limb amputations; precise directions were outlined. The use of prosthesis has been alluded to
- hernia repair
- hydrocoeles were treated by aspiration
- ano-rectal conditions such as fistulo-in-ano and haemorrhoids were excised; rectal prolapse was recognized and treated
- dental extractions and tonsillectomy
- drainage of abscess with precise directions for incising in various parts of the body

The surgical process

Each surgical procedure was a phased process of three periods namely, the pre-operative, operative and the post-operative period. Each period had well described measures.

In the pre-operative period, the emphasis was to be forewarned of any problems that may be encountered during surgery. To this end emphasis was placed to bring the patient to as ideal a state of health as possible to prevent post-operative complications. Some of the measures undertaken included restriction of diet, softening by anointing, fomentation, internal administration of medicated oils and emesis and purgation.

For the surgeon it is stressed that:

“First of all one should consider his own merits as to whether he is capable of performing that particular work or not”

*Charaka Samhita 111. 8. 86*³³

and, furthermore that:

“All forms of treatment should be done only after full consideration of the intensity of the disease, the general condition of the patient and his digestive and metabolic powers”

*Susruta Samhita 1. 39. 10*³⁴

The operating theatre was a separate room, free from contamination, direct sunlight and air currents. The theatre is fumigated with the vapours of white mustard, bdellium nimba leaves and resinous gums of Sala trees, etc, which foreshadows the antiseptic theory of modern times. Surgical instruments necessary for the operation should be available in the theatre, thoroughly cleaned, heated and sterilized, ready for use.

Theatre etiquette included the emphasis on asepsis and antisepsis, care in the use of instruments and adherence to surgical principles such as the quality of incision, suturing technique, haemostasis and fluid replacement.

The post-operative care was undertaken in a facility well equipped, well arranged and *“attended upon by sympathetic and affectionate friends and relatives, who should also be good conversationalists”*. Detailed follow up regarding post-operative sedation administration, appropriate bandaging, antiseptic fumigation, dietetics and rest was advocated.

Surgical training and ethics

The training of doctors, the code of ethics and practice in ancient India hold a salutary position in the history of medicine. These high ideals are emphasized in the following excerpts of the Caraka Samitha:

“Those who trade their medical skills for personal livelihood can be considered as collecting a pile of dust, leaving aside the heap of real gold”

*Charaka Samita V1. 1. 4. 59*³⁵

and,

“He, who regards kindness to humanity as his supreme religion and treats his patients accordingly, succeeds best in achieving his aims of life and obtains the greatest pleasures”

Charaka Samiha V1. 1. 4.62³⁵

Prospective medical students were carefully selected, in the light of the noble expectations of the profession. Students were expected to study for six years before being allowed to practice the art of healing. At the onset of training, a solemn injunction was delivered to the student. Chronologically preceding the Hippocratic oath, the student had to

“.....renounce lust, anger, greed, ignorance, vanity, selfishness, envy, rudeness, miserliness, falsehood, sloth and all other acts that bring a man to disrepute. At the proper time, you must clip your nails and trim your hair, and put on the saffron robe of the student. You must live the truthful, disciplined life of a student and obey and respect your teacher. At rest, asleep or awake, at meals, at study and in all your acts, at all times you must be guided by my instructions. All actions should be pleasant and beneficial to me, otherwise your knowledge and study will be ineffective and you will never achieve fame. If I act unjustly towards you even when you obey me totally and faithfully carry out my instructions, may I incur sin, and may my knowledge, rendered futile, never be displayed or come to fruition”.

The initiation of a surgical student and his training in the various techniques was emphasized. In a manner that is analogous of the current workshops on surgical techniques, students were expected to hone surgical skills as follows:

*“....the art of making specific forms of incisions should be taught by cuts in the body of a pushpaphala (a kind of gourd), watermelon, cucumber... the art of making cuts in an upward or downward direction should be similarly taught. The art of making excisions should be practically demonstrated by making openings in the body of a full water-bag, or in the bladder of a dead animal.....the art of scraping should be instructed on a piece of skin on which the hair has been allowed to remain. The art of venesection should be taught on the vein of a dead animal, or with the help of a lotus stem. The art of probing....on worm eaten wood, or a bamboo.....the art of extracting by withdrawing seeds from the kernel of a vimbi or jack fruit, as well as by extracting teeth from the jaws of a dead animal. The act of secreting or evacuatingon the surface of a shalmali plank covered with a coat of bee’s wax, and suturing on pieces of cloth, skin or hide. Similarly the art of bandaging or ligaturing should be practically learnt by tying bandages round the specific limbs and members of a full-sized doll of stuff linen. The art of tying up a karnasandhi (severed ear lobe) should be practically demonstrated on a soft severed muscle or on flesh, or with the stem of a lotus lily. The art of cauterizing, or applying alkaline preparations should be demonstrated on a piece of soft flesh; and lastly the art of inserting syringes and injecting enemas into the regions of the bladder or into an ulcerated channel, should be taught by asking the pupil to insert a tube into a lateral fissure of a pitcher, full of water, or into the mouth of a gourd”.*³⁶

The anatomy and pathology as the basis of surgery was emphasized. In the Susruta Samhita it is stated that

“only he can be considered an expert (surgeon) who is well versed in the practical and descriptive anatomy. Therefore, one should start the procedures (of surgery) after clearing away the doubts by actually seeing (the surgical anatomy concerned) and

consulting (the appropriate literature)".³⁷ The surgeon was counselled to value the role of other branches of science. The importance of anatomical knowledge has been mentioned. To this end :

"...one should listen to the lectures given by specialists of that branch, as it is not possible to include all branches of science in one subject"

Susruta Samhita 1. 4. 6³⁸

furthermore,

"In order to broaden your knowledge and outlook, you should study the subject regularly, take part in scientific debates and discussions, observe the allied sciences and take training from specialists of those branches".

Susruta Samhita 1V. 28. 28³⁸

The influence of ancient India on surgical practice

It is generally acknowledged that ancient India developed a medical system that was independent of parallel civilizations, particularly the Hellenic civilization. There is ample evidence that Indian medicine, especially its surgery, had a development independent of the Greeks.^{10, 39, 40, 42} Thorwald comments:

"Greek medicine, including that variety of it called Hippocratican, had produced nothing in the field of surgery that could remotely compare with the striking ideas of Shushruta". There is further comment that there was nothing in Greek medicine from which Susruta's ideas were borrowed and that, "in many instances there was nothing that corresponded to them before the Middle Ages of Europe"¹⁰. Indeed, Royle opines that Hippocrates borrowed much of his *materia medica* from the Hindus!⁴¹. Neuburger⁴⁰ comments "...that Greek medicine adopted Indian medicaments and methods, which is evident from the literature".

Indian medicine had a great influence on Arabic medicine; up to the 7th century AD Indian surgeons and physicians were respectfully appointed in Baghdad. Translations of the Samhita in Arabic were undertaken. Indian medical textbooks were popular in China; a Chinese text composed in 455 century AD is derived from Indian texts.

Sir William Hunter, British surgeon, comments that Arab medicine was founded on translations from Sanskrit treatises and that European medicine up to the 7th century was based on the Latin version of the Arabian translations.^{42, 44}

With respect to the contemporary Egyptian medicine it has been suggested that Indian surgery was far superior in practice; in terms of therapeutics and hygiene, it is suggested that both ancient civilizations were equally ranked.⁴³

The fundamental principle of surgery laid by ancient Indian surgeons holds good even in the present era, even though technical advances have made current surgery highly sophisticated. With all its refinements and sophistication, modern surgery could yet benefit from the simplicity of inferences drawn and the procedures employed in ancient India. In the light of the profanation of the medical science and its commercialization today, we can draw great inspiration from the code of practice, nobility of profession and service to humanity exhibited by the ancient Indian surgeons.

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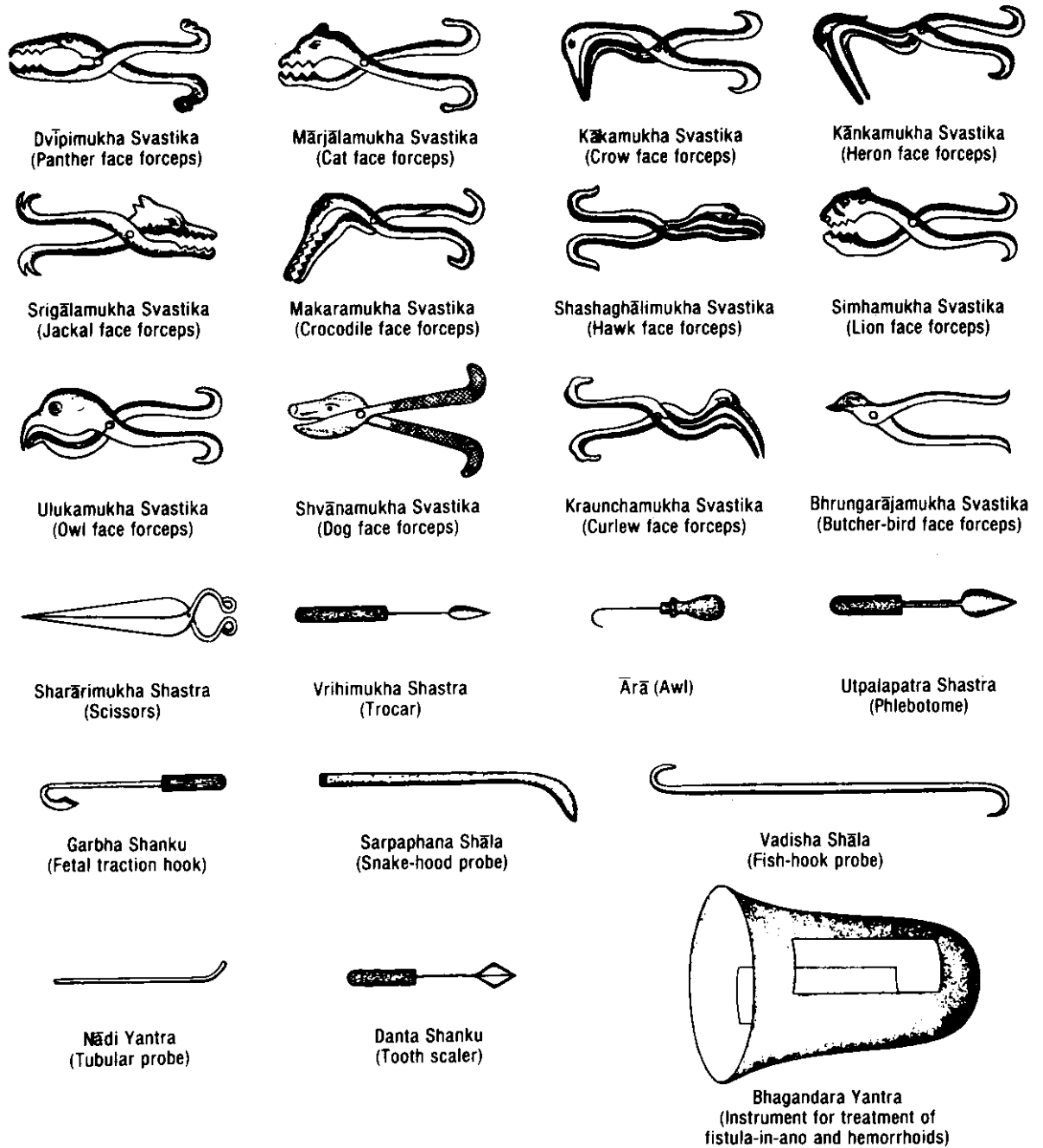


FIG. 1. Different varieties of surgical instruments as described by Shushruta. Redrawn from The Surgical Instruments of the Hindus, With a Comparative Study of the Surgical Instruments of the Greek, Roman, Arab and the Modern European (sic) Surgeons. Vol. II. By G. N. Mukhopādhyāya. Calcutta: University Press, 1913.

FIGURE 1
Spectrum of instruments described in the Susruta Samhita