Ancient Origins of Surgery: India’s Susruta

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Abstract:

The Golden Age of surgery in Ancient India is attributed to the ingenious works of Susruta, a surgeon belonging to a period between 800 and 600 B.C. Susruta practiced and taught the art of surgery at the eastern University of Banaras on the banks of the River Ganges. His writings cover six branches of medicine, including ophthalmology. Susruta and his contemporaries, by virtue of their brilliant medical treatises, were instrumental in effecting the demise of the long practiced magicoreligious medicine of ancient India. *Susruta Samhita* (treatise on surgery by Susruta) was followed by many other medical treatises and laid a solid foundation for the practice of rational medicine that flourished in ancient India for centuries. Susruta was probably the first surgeon to raise the status of surgery to the highest level of the healing arts. Bhishagratna, an authority on Susruta, says “To Susruta may be attributed the glory of elevating the art of handling a lancet or forceps to the status of a practical science…”
Key Words:
Susruta, Ayurvedic Medicine, History of Susruta – India, History of Ophthalmology – India, Ancient Indian Medicine

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I. Introduction

Hindu medicine attracted the attention of Western Scholars at an early period of Indic studies. Prior to J.F. Royle’s essay on the antiquity of Hindu medicine, London 1837, which was the first book of Hindu medicine published in Europe, H.H. Wilson, the great pioneer of Sanskrit philology, succeeding W. Jones and H.T. Colinbrook, introduced Hindu medicine to the forum of Western Science through an essay “On the medical and surgical sciences of the Hindus” in 1823. T.A. Wise’s commentary on Hindu system of medicine (1845) provided the first complete survey. The earliest specimens of Indian medicine contained in the hymns of Atharva Veda are available in W.D. Whitney’s translation.

The three classical encyclopedias of the medical wisdom (Charaka, Susruta and Vagbhata) have also been translated. Besides the contributions of A.F.R. Hoernle, P.Cordier, M. Bloomfield and others on this history of Hindu Medicine, there is the outstanding monograph by Julius Jolly, Indische Medizin which treats with equal mastery both the philological and medical aspects of the subject.
Other authors, such as Johnston-Saint\textsuperscript{9} have also suggested that the development of modern medicine may have stemmed from more than just the Greek or Roman cultures.

“Our system of classical education had already given us an apparent beginning for all the arts and sciences. A disproportionate part of our education was devoted to ancient Rome and Greece where we learnt all about Apollo and Aesculapius and in Greek history we came to Hippocrates. Here we had got a founder of medicine all ready for us and that there might have been anyone before him, few of us were disposed to inquire.”

While the Greek and Roman contributions are both undeniable and important, perhaps a better understanding of India’s role in the development of modern medicine would add another dimension of accuracy to our picture of medical history.
II. Surgery’s Golden Age: Susruta

“It is interesting that while in Hindu medicine, cataract was defined by Susruta as opacity due to derangement of the intraocular fluid, subsequent history is full of fantasies and prejudices concerning its nature.”

Duke Elder 4

“All in all Susruta must be considered the greatest surgeon of the pre-medieval period.”

Whipple 24

The Golden Age of Surgery in ancient India is attributed to the ingenious works of Susruta, a surgeon belonging to a period between 800 and 600 B.C. Susruta practiced and taught the art of surgery at the University of Banaras, on the banks of the River Ganges.1 His monumental treatise on Surgery, the Susruta Samhita (treatise by Susruta), established him as the Father of Indian Surgery, and the first surgeon to systematize surgery by dividing it into separate fields.17 He is known as the originator of plastic surgery, cataract operation, laparotomy, and vesical lithotomy.
A. Before Susruta

The history of medicine in pre-Susrutian India goes back to remote antiquity. Muthu places this period between 4000 and 900 B.C. The earliest documents of Indian medicine are found in the Vedas, or books of knowledge, the oldest sacred books of Hindu religion. These form the basis of their religion as well as the foundation of their social and political institutions. These are compiled in Sanskrit, one of the earliest languages, between 3000 and 1000 B.C. This era is referred to as the Vedic period, during which the four Vedas, namely Rigveda, Samaveda, Yajurveda, and Atharvaveda were compiled. Ayurveda (Ayur = Life, Veda = Knowledge) is the name given to the art of healing, which is an integral part of Artharvaveda. Hindus believed the Vedas to be of divine origin. Most of the early Vedic medicine was compiled in Atharvaveda, and it was an amalgam of religion, magic and empirical elements. Vedic priests were aware of the connection between dropsy and cardiac problems. Atharvaveda describes internal parts of the human body with an enumeration of the nerves, veins and arteries. It also describes the heart, spleen, liver and various disquisitions on the formation and growth of the fetus. The long period of Atharvavedic medicine was replaced by the period of rational medicine around 1000 B.C.
B. Rational Medicine

The period between the seventh and first century B.C. saw an immense change in the thought process all over the ancient world: Greece, China, Mesopotamia, and India. In each of these widely separated centers of civilization, there was evidence of an advance in speculative thought.

Charaka, another legend of Ayurveda, compiled a medical treatise known as Charaka Samhita, which is acclaimed as the finest document of the creative period of ancient Indian medicine (600 B.C. to 200 A.D.). Charaka’s eight branches of medicine translated into Arabic were well known in Arabia. However, there is no written word “che” in Arabic. Translators therefore interpreted the name in different ways, resulting in some confusion.

Avicenna, for example, referred to Charaka as “Scirak,” and Rhazes, who preceded Avicenna, called him “Scarak,” whereas one of the earliest Arabian authors, Serapion, mentioned Charaka as “Zarch.” Because there were so many forms of the names, many scholars assumed it was a different person, or overlooked it altogether. Even Sprengel, who was familiar with Charaka’s work, failed to recognize the significance of the name when it was translated differently. As Royle points out, “Schark Indus, a Rhazeo citatus plane ignotus.” (Charaka of India, though quoted by Rhazes was plainly passed over without comment or examination.)
C. Susruta’s Treatise

Susruta begins his Samhita with an allegorical description of the beginning of medical teachings, but quickly gets into some very practical suggestions about how a medical student should be selected, how he should be initiated, and the oath he should take (which is strikingly like the oath of Hippocrates). He also sets forth quite plainly the qualifications of a physician about to enter practice – rules of personal and of professional conduct singularly parallel to those of today. Susruta also urged upon his students continual practice, and outlined many ways for them to perfect their skills before using instruments on patients. His philosophy is well expressed in Samhita: “A physician well versed in the principles of the Science of Medicine (Ayur-veda) but unskillful in his art through want of practice, loses his wit at the bedside of his patient, just as a coward… On the other hand a physician, experienced in his art but deficient in knowledge, is condemned by all good men as a quack, and deserves capital punishment at the hands of the king. Both of these classes of physicians are not to be trusted, because they are inexpert and half educated. Such men are incapable of discharging the duties of their vocation, just as a one-winged bird is incapable of taking flight in the air… A physician well versed in the principles of surgery, and experienced in the practice of medicine, is alone capable of curing distempers, just as only a two-wheeled cart can be of service in a field of battle.”
Susruta’s treatise on surgery, *Susruta Samhita*, is divided into six parts, covering all branches of medicine, including hygiene, midwifery, ophthalmology, toxicology, psychosomatic ailments and materia medica.

Rhazes repeatedly quotes Susruta as the foremost authority on surgery.13

Unfortunately, the original manuscript of the *Samhita* has not survived. Only copies of copies and revisions of revisions exist today. The *Samhita* was translated into Arabic before the end of the eighth century A.D., and was named Kitab-I-susrud by Abillsaibial. *Samhita* was translated into Latin by Hessler,7 into English by Hoernle, and into German by Muller in the nineteenth century.

The first six parts of *Samhita* are about surgery, which Susruta considers the first and foremost branch of medicine. He states:

“Surgery has the superior advantage of producing instantaneous effects by means of surgical instruments and appliances. Hence, it is the highest in value of all the medical tantras (scientific works). It is eternal and a source of infinite piety, imports fame and opens the gates of Heaven to its votaries. It prolongs the duration of human existence on earth and helps men in successfully fulfilling their missions and earning a decent competence, in life.”2

In the *Samhita*, Susruta also describes teaching methods and rules for surgeons, along with selections and uses of instruments and medicines. Susruta described and used one-hundred one blunt instruments and twenty
sharp instruments, which “should have an edge so fine that it should divide the hairs on the skin.” (Fig 1) The measurements of each instrument are specified, and he stresses that they be made of good and pure iron. Susruta’s use of caustics and alkalis to clean the instruments and special wooden box to store them is noteworthy.

The *Samhita* also contained information about the weather’s relationship to health and about post-operative procedures. It describes diseases, removal of extraneous substances, and treatment of wounds and ulcers. Thirteen types of alcoholic drinks are described for administration as anesthetic before and during the operation. The great highlight of Susruta’s surgery was however, the operation of rhinoplasty. The making of a new nose has captured the imagination of the medical world and made him well known as the originator of plastic surgery.\(^{17}\) (Fig 2) Amputation of the nose and ears was a common punishment for adultery. Reconstruction of the nose was effected by bringing down flaps from the forehead and fastening the edges with pure wax or with sutures of linen or animal hair.
III. Ophthalmology

Susruta devotes eighteen chapters to seventy-six different diseases of the eye, of which fifty-one require surgery. Susruta is said to be the first surgeon to have performed surgery on cataracts. Different varieties of cataracts are described, along with the technique of depression method of couching by the anterior route.

According to Susruta, the eye, which “resembles the teat of a cow,” is composed of five basic elements: the solid earth (Bhu) form muscles, heat (Agni) is in the blood that courses in its veins/arteries, air (vayu) forms the black part (iris/pupil), the fluid element (Jala) forms the lucid part (vitreous), and the void (Akasa) forms the lacrimal ducts/sacs for discharge of secretions. Anatomically, he outlines five subdivisions (Mandala) of the eye: eyelashes (Pakshma-mandala); eyelid (Vartma-mandala); sclera/cornea (Sveta [or Sukla] – mandala); choroid (Krishna-mandala); and pupil (Drishti-mandala), which “looks like a hole and is the size of a Lentil seed.” Sandhis represent the “joints” where the mandalas bind or connect. An example of a disease involving one of the Sandhis is blepharitis (Krimi-granthi): “a swelling (granthi) characterized by itching at the joining of the eyelashes with the eyelid.”

Medical treatment for these ocular conditions was formulated according to which component of the Dosha was predominantly abnormal. Matured clarified butter (ghee), breast milk, and Saindhava Salts were
frequently used, in addition to plants and meats in the form of eye drops
(Aschyotanta, made by folding and squeezing materials through a piece of
silk,) salves (Anjana), snuffs (Nasya), and fumigation (Dhuma). Additionally,
linen-soaked bandages, venesections, soothing measures (Tarpana), and
emetics/purgatives were employed.

As one would expect in a region so close to the equator, ocular
conditions sensitive to ultraviolet light, such as cataract and pterygia, were
common maladies. In addition to the techniques of cataract extraction,
Susruta describes such modern concepts as antisepsis, anesthesia, and
postoperative care.

Many stages of pterygium (Arman) are described as distinct diseases.
Once medical treatment with the topical drops and salves was exhausted,
surgical excision of the inflamed pterygium was considered. Though
instrumentation and perioperative medicinals have changed, the following
excerpts illustrated a technique quite similar to those used today:

“Perioperatively the eye is irritated with saindhava salt and soaked with a
warm compress. The patient faces the surgeon while sitting and is asked to
look at the outer corner of his affected eye. The lids are held wide apart and
the pterygium is secured with a hook and held with a threaded needle. This
is then excised at its base with the mandalagra instrument. The root of the
Pterygium should be pushed asunder from the cornea and then removed.
Postoperatively the area is rubbed with a compound made up of various
salts, fomented and bandaged for three days. This will recur if not properly excised.”

Treatment of TRICHIASIS (pakshma-kopa) was also a common procedure. This may have been secondary to widespread trachoma in the subcontinent during this era. The following description has been likened to the Jaeschearlt procedure used by oculoplastic surgeons in modern times.

“After being treated with sneha (a special diet) the patient sits facing the surgeon. An excision in the shape and size of barleycorn should be made in the eyelid horizontally parallel leaving two parts below the eyebrow and one part above the eyelashes. The surgeon should then suture up the two edges with horse’s hair. After suturing honey and ghee should be applied. A piece of linen should be tied around the forehead and the horse’s hair sewing up operated part should be attached thereto. The sutures are removed once there is adhesion of the two edges. If this does not succeed, cauterization of the upper lid or complete epilation should be performed.”

Susruta’s work also included what may be the first record of extracapsular cataract surgery. The following is a translation from Sanskrit: (GD Singhal, Banaras Hindu University)\textsuperscript{21}
**The operative procedure**

In neither too hot nor too cold a weather, the patient should be subjected to oleation and sedation therapies. He should then be made to sit and positioned properly after which he should be asked to fix his gaze towards his own nose continuously. Then the intelligent surgeon should hold a barley-shaped *salaka* instrument between the thumb, middle finger and index finger of his right hand and should open the eyes and puncture the eyeball properly with confidence towards the temporal canthus avoiding two parts of the white of the eye from the cornea. The puncture should be made neither too high nor too low, nor at the sides and saving the network of veins. It should then be directed towards the natural orifice. The surgeon should operate with his right hand on the left eye and with his left hand on the right eye. The proper puncturing is recognized by the production of a (typical) sound and by the out-flow of a drop of liquid.

As soon as the puncture has been done, the *salaka* should be held firmly in proper position while the eye should be irrigated with human milk and fomented with *vata*-pacifying leaves from outside irrespective of the *dosa* being stable or mobile. Then (the substance of) the lens should be punctured and scraped with the point of the *salaka* and the patient should be made to blow out violently the *kapha* which has accumulated in the lens after closing the nostril of the opposite side.
IV. Historical Context

A. Susruta’s Lifetime:

Susruta’s time has long been a controversial subject among many medical historians. The date has never been definitely set for lack of direct evidence. The disputes of historical Susruta have not yet been settled because of the reluctance of ancient Indians in documenting history. Because Hindu cultural belief is that time is a continuum, without beginning or end, historical events are not typically used to measure the passage of time. In addition, the spoken word played a larger role than writing in transmitting information from one generation to the next, so few historical documents exist. Sigerist\(^2^{0}\) pointed out that the oral tradition is more highly cultivated in India than in any other country and that even the Buddhist canon was transmitted orally long before it was written down. In Ancient Indian history, the birth of Gautama the Buddha and the invasion of India by Alexander are possibly the only two undisputed chronological sequences from which Indian historical dates can be determined.

One of the most important documents in the connection with ancient Indian medicine is the Bower Manuscript (Fig 3), which is housed in the Oxford University Library.\(^8^{8}\) It was found in eastern Turkestan in 1890 and is named after the man to whom it was sold. Hoernle edited this document critically and placed its origin around the fifth century A.D. The fact that
Susruta’s name is mentioned in this document places him before the fifth century A.D., according to Hoernle.

According to Hindu scriptures, Susruta was the son of Saint Visvamitra, a contemporary of Rama who is the hero of the ancient Hindu epic Ramayana. Another epic, Mahabharata also mentions Susruta as the son of Visvamitra. Sir William Jones, an authority on ancient Indology, places the subjugation of India by Rama about the year 2000 B.C., and this would seem to place Susruta around 1800 B.C. According to other scholars, this period is too remote and whether or not Susruta was Visvamitra’s actual son is questioned.

It is important to understand a common Hindu custom in which every Hindu traces his ancestry, ‘Gothra’ to an ancient Saint. In recitations of Sanskrit hymns, the ancestral saint is referred to as “father”. Therefore Mukopadhyaya suggests that Susruta might have been a descendent of Saint Visvamitra and not his son. Hessler, in his Latin translations of Susruta Samhita, assigned the appearance of Samhita to a remote period of Indian history – the beginning of which is lost in the immensity of time and the end of which is known to be about 1000 B.C.

Because many later Vedic Hymns are ascribed to Susruta, it follows that he must have flourished during the latter part of the Vedic age, which would place him around 1000 B.C. Hoernle contends that a larger portion of the Atharvaveda admittedly belongs to a period as early as 1000 B.C., since the
hymn in question is included in the older portion. Johnston-Saint suggests that Susruta was a contemporary of Buddha (600 B.C.) because of the style of language used. After a thorough study of the subject, Wise concluded that Susruta Samhita was prepared very early, probably from the third to the ninth century B.C., as evidenced by the ancient form of construction of the Sanskrit language used in the manuscript.
B. Hindu or Hellenic

No discussion of Indian medicine is complete without discussing the medicine in ancient Greece. The question of who borrowed medical knowledge from whom has always been a stimulating topic. Filliozat, a French Sanskritist, while discussing communications between Greece and India states “We see that sure paths and intermediaries i.e., Greeks in the service of the Persians, being the functionaries of the Achaemenians, who dominated both the Greek and the Indian lands, and may be Indians also, were there for assuring scientific communications between India and Greece before Alexander….. This is the explanation of why there are, between Indian and Greek medicines, so very particular and precise similarities which are not easy to ascribe to chance.”

On the contrary, a small school of medical historians is of the opinion that the East contributed nothing whatsoever to ancient medicine and that Hellenic influence dominated the medical practice in ancient India and other Arabic countries.

Johann Hermann Bass, the German medical historian, went so far as to assert that Susruta had been none other than Hippocrates. The name, he argued, had been confounded with Socrates in the Indian tenets and finally transmitted as “Susruta.” Bass saw proof of his thesis in the fact that Susruta’s birth place was given as Kasi, an old name for Banaras. That was
obviously a distortion of the name of the Greek island of Kos. Commenting upon this apparently distorted version, Gordon observes, “How one clever enough to read Hippocrates in the original and reproduce it in his own language could mistake the name of Socrates for Hippocrates surpasses one’s imagination.”

Gordon concludes that Indian medicine, especially its surgery, had developed in ancient times, most probably independent of Greek medicine. Thorwald, following his detailed discussion of Indian medicine, asserts that Greek medicine, including that variety of it called Hippocratian, had produced nothing in the field of surgery that could remotely compare with the striking ideas of Susruta. Royle, one of the earliest authorities on Indian medicine, gives evidence that Hippocrates borrowed much of his materia medica from the Hindus. Wise, another scholar in Ancient Indology, says it is to the Indians that we owe the first system of medicine. Neuberger concluded “Greek medicine adopted Indian medicaments and methods which is evident from the literature.” As to the relationship between Indian and Arabic medicine, it is well documented that works by Susruta and Charaka were translated into Arabic.

The doctrine of three humors, which at first sight might be held to be definitely Greek, is in close connection with the Samkhya System of the three Gunas or constituents; moreover one of the humors, wind, is already known
in *Atharvaveda*, and the *Kaucika Sutra* is alleged by the comment, perhaps with justification, to have recognized the doctrine of three: wind, bile and phlegm.
C. Pathways of Influence

During Indian medicine’s creative period, Hippocrates Heraclide, the Greek physician, was rising in eminence on the island of Kos in the Aegean Sea. This island lies close to Cnidia in western Asia Minor. While the island of Kos is now Greek, then it was an offshore Asian island. Greeks had settled in Cnidia long before Christian era, and even in the Seventh Century B.C. some form of medical school existed in Cnidia.

Cnidia was accessible to the ancient Indians, who possibly exchanged scientific thoughts with Cnidians and the later Greek settlers, of Asia Minor. The Cnidians influenced the Greek medical school of Kos. It seems likely that some books of the Corpus Hippocraticum were written by the physicians from Cnidia, which was even more celebrated for medical teaching than Kos, until the rise of Hippocrates.¹⁶
IV. Conclusion

“Whether the priority is to be conceded to the Greeks, the Pelasgians, or the Hindus is a question requiring great research and not less impartiality, to determine.”

Royle\textsuperscript{18}

It is unfortunate that an Eurocentric education may have limited our views of medical history. Perhaps we could all benefit from a broader outlook. The work of Susruta, detailed here, provides only one aspect of a much larger picture that remains to be studied and documented. Part of this research will ultimately involve separating Indian contributions from those of Greek and other ancient cultures. Even though these cultures evolved separately, borrowing and sharing among them inevitably occurred. Even before we determined these details, it is important to begin to acknowledge what we already know about Ancient India’s role in defining the practices and principles of modern medicine.
Figures

Figure 1. Surgical Tools

Susruta described and used one hundred one blunt instruments and twenty sharp instruments. This drawing details several of the principle cutting instruments. From: Wise, TA: Hindu System of Medicine, London, Smith Elder & Co., 1845, p. 169.
Figure 2. First Rhinoplasty

Susruta originated practice of rhinoplasty. This engraving from the Gentleman’s Magazine, 1794, was the first published record of that procedure. From: LM Zimmerman and I Veith: Great Ideas in History of Medicine, Williams & Wilkins Co., 1961, p.66.
Figure 3. Bower Manuscript

A single page (front and back) of the Sanskrit document known as the Bower Manuscript, which is housed in the Oxford University Library. The document is inscribed on birch bark, and was discovered in East Turkestan in 1890. Its significance lies in the fact that it mentions Susruta, and is thought to have originated as early as the fifth century A.D.
References:


