

Review Article

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“SUSHRUTA’S SURGICAL INSTRUMENTS (YANTRA AND SHAstra) AND THEIR MODERN COUNTERPARTS: A HISTORICAL AND COMPARATIVE REVIEW”**Dr. Abhay Gandhi¹****AFFILIATIONS:**

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ABSTRACT

Background: The Sushruta Samhita contains one of the most detailed descriptions of surgical instruments from the ancient world. Sushruta described 101 blunt instruments (Yantra) and 20 sharp instruments (Shastra), many named after the animals or objects they resemble, together with principles of instrument design, maintenance and surgical training. **Objective:** To review Sushruta’s classification of surgical instruments, his principles of instrument quality and surgical training, and to compare his instruments with their modern counterparts. **Methods:** Narrative and comparative review of Sushruta Samhita, Sutra Sthana 7 to 9, and historical literature on Sushruta and the evolution of surgical instruments. **Results:** Sushruta classified blunt instruments into six groups: Swastika (cruciform forceps), Sandamsha (tongs), Tala (flat instruments), Nadi (tubular instruments), Shalaka (rods) and Upayantra (accessories), and considered the hand the most important instrument. He described 20 sharp instruments for eight surgical procedures, including scalpels, saws, scissors, needles, hooks and probes. He specified the qualities of good instruments, their sharpening and storage, and prescribed practice on models (Yogya) before operating on patients. Many of his instruments correspond in form and function to modern forceps, specula, catheters, probes, scissors, saws and needles. **Conclusion:** Sushruta’s instrumentarium reflects a systematic, function-based approach to surgical tools and training that anticipates modern principles. Study of these instruments is valuable for surgical history and for teaching Ayurvedic surgery.

KEYWORDS: Sushruta; Yantra; Shastra; surgical instruments; history of surgery; Yogya; simulation training; Shalya Tantra

INTRODUCTION

The history of surgery is closely linked to the history of surgical instruments. Instruments reflect the procedures surgeons performed, their understanding of anatomy and their technical skills^[1]. Ancient Egyptian, Greek, Roman and Indian sources describe surgical tools, but few texts provide as systematic an account as the Sushruta Samhita.

Sushruta, often called the father of surgery^[2,3], is credited with a comprehensive surgical text that describes surgical procedures ranging from cataract couching and lithotomy to reconstructive rhinoplasty^[4-6]. Central to his surgical system is a detailed classification of instruments according to their form and function, with careful attention to quality, maintenance and training.

This review summarises Sushruta's description of surgical instruments and surgical training, compares them with modern instruments, and considers their relevance to modern teaching of Ayurvedic surgery.

METHODS

The primary source was Sushruta Samhita, Sutra Sthana 7 (Yantra Vidhi), 8 (Shastravacharaniya) and

9 (Yogyasutriya), with Sutra Sthana 5 and 25 for surgical procedures^[7], compared with the early complete English translation by Bhishagratna^[8]. Historical literature on Sushruta and on the evolution of surgical instruments was identified through PubMed and Google Scholar. This is a narrative and comparative review.

YANTRA: BLUNT INSTRUMENTS

The hand as the chief instrument

Sushruta states that the hand is the most important of all instruments, because all other instruments depend on it^[7]. This emphasis on manual skill remains central to surgical training.

Purposes of Yantra

Blunt instruments are used to extract foreign bodies (Shalya) lodged in the body, and for examination, drainage, holding, retraction and other supporting functions^[7]. Sushruta lists 24 actions of Yantra, including extracting, pulling, pushing, lifting, compressing, dilating and cleaning.

Classification

Sushruta describes 101 blunt instruments in six groups^[7]:

Animal-faced instruments

Table 1: Classification of blunt instruments (Yantra) and modern parallels

Group	Number	Description	Modern parallels
Swastika Yantra	24	Cruciform forceps with two arms crossed at a pivot, many with animal-shaped tips (for example, Simhamukha, lion-mouth; Kankamukha, heron-beak)	Hinged forceps, artery forceps, foreign body forceps
Sandamsha Yantra	2	Tong-like instruments, with or without a hinge	Dissecting forceps, tissue forceps
Tala Yantra	2	Flat instruments with one or two blades, like a fish's palate	Ear scoops, flat extractors
Nadi Yantra	20	Tubular instruments, open at one or both ends, of various lengths	Specula, proctoscopes, catheters, cannulas, syringes
Shalaka Yantra	28	Rods of various shapes, some with hooked or cotton-tipped ends	Probes, sounds, dilators, applicators
Upayantra	25	Accessory instruments and materials such as thread, bandages, leather, magnets, fire and alkali	Sutures, dressings, magnets for foreign body removal, cautery

Sushruta notes that many Swastika forceps are named after animals and birds whose mouths they resemble, such as the lion, tiger, wolf, hyena, crow, heron and hawk^[7]. The choice of animal reflects the

shape and grip of the instrument tip and suggests a design approach based on observing natural forms suited to particular tasks. The Kankamukha (heron-beak) forceps, for example, with its long, narrow

jaws, was considered the best for extracting deeply lodged foreign bodies, comparable in function to modern long, fine-tipped forceps.

Nadi Yantra and endoscopy

Nadi Yantra include tubes for examining and treating the rectum (Arsho Yantra for haemorrhoids, with a window for viewing and applying Kshara), the urethra and vagina, for drainage of fluids, for blowing medicated smoke, and for wound irrigation^[7]. The Arsho Yantra, a tube with a lateral opening through which haemorrhoids could be seen and treated, is a clear precursor of the slotted proctoscope.

SHAstra: SHARP INSTRUMENTS

The eight surgical procedures

Sushruta describes eight surgical procedures (Ashtavidha Shastra Karma): Chhedana (excision), Bhedana (incision), Lekhana (scraping), Vedhana (puncturing), Eshana (probing), Aharana (extraction), Visravana (drainage) and Sivana (suturing)^[7]. Sharp instruments were designed to perform these procedures.

The twenty sharp instruments

Sushruta lists 20 sharp instruments, named after their shape or the objects they resemble^[7]. Examples include:

Table 2: The twenty sharp instruments (Shastra) and their modern parallels

Instrument	Description	Main use	Modern parallel
Mandalagra	Round-tipped knife	Scraping and excision	Curette, round blade
Karapatra	Saw-edged instrument	Cutting bone	Bone saw
Vridhipatra	Broad-bladed knife	Incision and excision	Scalpel (large blade)
Nakhashastra	Nail-like knife	Fine excision, extraction	Small scalpel
Utpalapatra	Lotus-leaf-shaped blade	Incision and excision	Scalpel
Shararimukha	Scissor-like instrument	Cutting	Scissors
Kutharika	Small axe-like instrument	Puncturing bone or vessels	Osteotome
Vrihimukha	Rice-grain-tipped instrument	Puncturing	Trocar, lancet
Suchi	Needles of different shapes	Suturing	Surgical needles
Badisha	Hook	Holding and extraction	Surgical hook, retractor
Eshani	Probe	Exploring sinuses	Surgical probe
Trikurchaka	Three-pronged instrument	Scarification	Scarifier
Dantashanku	Dental instrument	Tooth extraction	Dental elevator

Needles and sutures

Sushruta describes three types of needles: round needles for areas with little muscle and over joints, triangular (three-edged) needles for fleshy areas, and curved needles for the abdomen and vital areas^[7]. He describes suture materials from plant fibres, hair, tendon and silk, and several suturing techniques. This differentiation of needle shapes by tissue type parallels the modern distinction between round-bodied, cutting and curved needles.

Qualities of good instruments

Sushruta specifies that instruments should be made of good-quality iron or other metals, be well shaped, have a good grip, have sharp and well-finished edges without defects, and be appropriate in size^[7]. He describes faults to avoid, such as blunt edges, roughness or crookedness. He also describes

different methods of tempering (Payana) the edges with alkali, water or oil depending on whether the instrument is to cut bone, flesh or vessels, and recommends storing instruments in wooden boxes lined with cloth to protect their edges.

Substitutes for sharp instruments (Anushastra)

Sushruta lists substitutes for sharp instruments for use in patients who fear the knife or when instruments are unavailable, such as bamboo bark, crystal, glass, sharp stones, nails, Kshara, fire and leeches^[7]. This shows flexibility in surgical practice and anticipates the use of chemical and thermal methods.

YOGYA: TRAINING BEFORE SURGERY

Sushruta insists that a student should not operate on a patient until trained on models^[7]. He describes specific exercises:

Table 3: Yogya: surgical skills and practice models

Skill	Practice model
Incision and excision	Gourds, melons, cucumbers
Scraping	Hairy skin of animals
Puncture	Veins of dead animals, stalks of water lily
Probing	Hollow stalks, bamboo
Extraction	Seeds from fruits, teeth from dead animals
Drainage	Silk-cotton tree fruit filled with wax
Suturing	Cloth, leather
Bandaging	Model human figures
Cauterisation and caustics	Pieces of flesh
Catheterisation	Pitchers filled with water, gourd mouths

This programme of graded practice on models before operating on patients is strikingly similar to modern simulation-based surgical training, which is now recognised as essential for developing technical skills safely^[9,10].

SPECIALISED INSTRUMENTS

Ophthalmic instruments

For cataract (Linganasha), Sushruta describes couching, in which the opaque lens is displaced from the visual axis using a needle-like instrument called Jabamukhi Shalaka, introduced through the sclera near the limbus^[6,7]. He specifies the site of puncture, the position of patient and surgeon, and post-operative care. This procedure, one of the earliest described eye operations, used a specialised fine instrument whose design reflects close attention to ocular anatomy.

Dental and ENT instruments

Sushruta describes instruments for extracting teeth (such as Dantashanku and forceps), scraping dental deposits and treating diseases of the mouth, nose and ear, including fine Shalaka for applying medicines and removing foreign bodies from the ear and nose^[7]. These anticipate dental elevators, ear scoops and nasal forceps.

Instruments in obstetrics

Sushruta describes the management of obstructed labour and the use of hooks and other instruments in the removal of a dead foetus (Mudhagarbha)^[7]. These descriptions are of historical interest; modern obstetric practice has entirely different methods and safety standards.

CLEANLINESS AND CARE OF

INSTRUMENTS

Sushruta emphasises cleanliness in surgery. He advises that the operating room be clean and fumigated, that the surgeon have short nails and clean clothes, and that instruments be cleaned and kept sharp and stored properly^[7]. He recommends fumigation of the wound and the room with aromatic and antimicrobial substances such as mustard, neem leaves and resins to protect wounds (Rakshavidhana). While these practices predate the germ theory of disease, they reflect an empirical understanding that contamination impairs wound healing.

Modern surgery has formalised these principles through sterilisation, aseptic technique and structured safety protocols. For example, the WHO surgical safety checklist, which includes confirmation of instrument sterility and counts, reduced complications and mortality in a multinational study^[11]. Teaching Sushruta's emphasis on preparation and cleanliness alongside modern safety protocols can reinforce a culture of safety among Ayurvedic surgery students.

COMPARISON WITH THE EVOLUTION OF MODERN INSTRUMENTS

Many of Sushruta's instruments have counterparts in Greek and Roman surgery and in later European surgery, and some forms, such as forceps, specula, probes and scalpels, have remained recognisable for thousands of years^[1]. Modern instruments differ in materials (stainless steel and titanium), precision manufacturing, ergonomic design, single-use options and sterilisation methods. Minimally invasive surgery has introduced entirely new categories, such as laparoscopic and robotic instruments.

Nonetheless, the functional logic of Sushruta's classification, organising instruments by what they do (holding, extracting, examining, cutting, puncturing, suturing), remains the basis of how surgical instrument sets are organised today.

RELEVANCE TO MODERN AYURVEDIC SURGICAL EDUCATION

Study of Sushruta's instruments has several benefits for students of Shalya Tantra:

1. **Historical understanding:** it shows the depth of surgical knowledge in ancient India and places Ayurvedic surgery within the global history of medicine.
2. **Functional thinking:** classifying instruments by function helps students understand the principles behind modern instrument design.
3. **Simulation training:** Sushruta's *Yogya* provides a culturally rooted rationale for simulation laboratories in Ayurveda colleges.
4. **Ethics and safety:** Sushruta's emphasis on quality instruments, skill and preparation aligns with modern patient safety principles.

At the same time, students must be trained in modern instruments, asepsis and surgical techniques. Sushruta's instruments should be taught as historical and conceptual foundations rather than as tools for current practice.

DISCUSSION

Sushruta's description of surgical instruments is remarkable for its scope, systematic classification and attention to design, quality and training. His recognition of the hand as the chief instrument, his functional classification, his specification of needle types by tissue and his insistence on practice on models before operating on patients all anticipate principles that modern surgery has developed independently.

Historical interpretation should be cautious. The *Sushruta Samhita* was compiled and revised over centuries, and its dating remains debated among historians^[12,13]; and the exact forms of many instruments are known only from textual descriptions and later reconstructions, not from archaeological finds. Modern illustrations of Sushruta's instruments are reconstructions based on interpretation. Claims that Sushruta anticipated specific modern instruments should therefore be made carefully.

CONCLUSION

Sushruta's 101 Yantra and 20 Shashtra, organised by form and function and supported by principles of quality, maintenance and simulation-based training, represent one of the most sophisticated surgical instrumentaria of the ancient world. Many correspond in function to modern forceps, specula, probes, scissors, saws and needles. Their study enriches surgical history and provides a valuable foundation for teaching Ayurvedic surgery.

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