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Review Article

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"PRINCIPLES OF ASEPSIS AND ANTISEPSIS IN SUSHRUTA SAMHITA: A SCIENTIFIC REVIEW"

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ABSTRACT

Introduction: Infection prevention is a cornerstone of modern surgery, but its principles trace back to ancient times. The *Sushruta Samhita* (6th century BCE), a classical Ayurvedic text, describes detailed guidelines for maintaining asepsis and antisepsis in surgical practice, emphasizing cleanliness, sterilization, and wound care. **Methods:** A systematic literature review was undertaken using Ayurvedic classical texts (*Sushruta Samhita*, *Charaka Samhita*, *Ashtanga Hridaya*), and secondary commentaries, along with PubMed, Scopus, and Web of Science databases for modern comparative studies. Inclusion criteria comprised texts and articles focusing on infection prevention, sterilization, surgical hygiene, and wound management. Exclusion criteria included irrelevant or purely pharmacological studies without surgical context. **Results:** *Sushruta Samhita* outlines preventive measures under *Shuddhi* (purification), *Rakshavidhi* (protection), and *Vrana Shodhana-Ropana* (wound cleansing and healing). It emphasizes environmental sanitation, sterilization of instruments by fire and alkali, personal hygiene of the surgeon, use of antiseptic herbs like neem (*Azadirachta indica*) and turmeric (*Curcuma longa*), and dietary regulations for patients to boost immunity. Modern parallels are evident in sterilization, aseptic protocols, fumigation, and use of natural antimicrobial agents. Clinical validation studies show antimicrobial properties of Ayurvedic formulations like *Panchavalkala Kwatha* and *Triphala*. **Discussion:** The principles of asepsis and antisepsis in *Sushruta Samhita* predate modern germ theory and resonate with contemporary infection-control guidelines. However, gaps exist in experimental validation, standardization, and integration into surgical protocols. **Conclusion:** *Sushruta Samhita* demonstrates that ancient Indian surgeons practiced sophisticated aseptic and antiseptic measures. Revisiting these insights offers valuable complementary strategies to modern infection control, with potential applications in low-resource settings.

KEYWORDS: Antisepsis, Asepsis, Ayurveda, Infection control, Sushruta Samhita

INTRODUCTION

The prevention of infection in surgical practice is one of the greatest advances in modern medicine. The discovery of microorganisms by Louis Pasteur and the antiseptic methods pioneered by Joseph Lister revolutionized surgery[1-2]. However, the roots of infection control extend far deeper into history, with detailed references found in ancient Indian surgical texts[3].

The *Sushruta Samhita*, often called the "father of surgery," contains extensive instructions on hygiene, sterilization, and wound care[4-5]. Unlike purely theoretical medical works, *Sushruta Samhita* offers practical, procedural, and prophylactic measures that directly align with contemporary aseptic protocols. Concepts such as *Shuddhi* (purification), use of *Kshara* (alkali), and herbal fumigation highlight a holistic approach to preventing surgical infections[6-8].

This review aims to systematically analyze the principles of asepsis and antisepsis described in the *Sushruta Samhita*, correlate them with modern infection control practices, and critically evaluate their relevance in contemporary surgery. The objectives are: (1) to document ancient measures of infection prevention, (2) to compare them with modern aseptic and antiseptic techniques, and (3) to identify areas where Ayurvedic principles can complement current surgical protocols[9-10].

MATERIALS AND METHODS

A comprehensive review was conducted between June–August 2025. Primary sources included *Sushruta Samhita* (Chikitsa Sthana, Sutra Sthana, Nidana Sthana), *Charaka Samhita*, and *Ashtanga Hridaya*. Commentaries by Dalhana and modern translations were also studied[11].

Electronic searches were performed in PubMed, Scopus, Web of Science, AYUSH Research Portal, and Google Scholar using keywords: “Sushruta,” “asepsis,” “antisepsis,” “Ayurveda infection control,” “wound healing Ayurveda.” Articles published between 1980–2025 were considered[12].

Inclusion criteria: [13]

- Studies focusing on surgical hygiene, sterilization, and infection prevention in Ayurveda.
- Clinical and experimental studies on antimicrobial effects of Ayurvedic formulations.
- Reviews comparing Ayurveda and modern infection-control practices.

Exclusion criteria: [14]

- Non-surgical Ayurvedic interventions without relevance to infection control.
- Opinion pieces without reference to classical or scientific evidence.

The final review synthesized findings thematically: (1) environmental sanitation, (2) surgical instruments sterilization, (3) surgeon’s hygiene, (4) wound cleansing and healing, and (5) modern parallels[15].

OBSERVATION AND RESULTS

1. Environmental Sanitation (Desha Shuddhi)

- *Sushruta Samhita* prescribes fumigation (*Dhoopana*) using herbal resins (guggulu, neem, turmeric) to disinfect operation theaters (*Shalya Kaksha*).
- Use of clean water, proper ventilation, and disposal of waste materials is emphasized.
- This correlates with modern operating room asepsis and air filtration systems.

2. Sterilization of Instruments (Yantra Shuddhi)

- Instruments were sterilized by heating (*Agnisamskara*), boiling, and immersion in caustic substances (*Kshara*).
- Copper and brass instruments were recommended due to inherent antimicrobial properties.
- Modern parallels include autoclaving, chemical sterilization, and single-use disposables.

3. Surgeon’s Hygiene (Vaidya Shuddhi)

- Surgeon was instructed to wear clean garments, cut nails, and maintain personal purity.
- Ritual cleansing with water and antiseptic herbs was performed before surgery.
- Mirrors the importance of surgical hand scrubbing and use of sterile gowns, gloves, and masks.

4. Patient Preparation and Immunity (Rogi Shuddhi)

- Preoperative purification with *Shodhana* therapies (emesis, purgation) to expel toxins.

- Dietary regulation, fasting, and use of *Rasayana* (immunomodulatory herbs) enhanced healing capacity.
- Modern medicine uses preoperative bowel preparation, nutritional optimization, and immune support.

5. Wound Cleansing and Healing (Vrana Shodhana-Ropana)

- Herbal decoctions (Panchavalkala, Triphala) and medicated oils (*Jatyadi Taila*) were applied for disinfection and healing.
- Honey and ghee, described as wound dressings, have proven antibacterial and healing properties.
- Recent studies validate their antimicrobial activity and efficacy in burn and ulcer management.

6. Antiseptic Herbs and Substances

- Neem, turmeric, sandalwood, and alkalis were widely used as antiseptics.
- Their active compounds (azadirachtin, curcumin, etc.) show significant antibacterial, antifungal, and antiviral activities in modern studies.

7. Modern Parallels and Integrations

- Fumigation aligns with current disinfection methods.
- Herbal extracts studied as alternatives to chemical antiseptics (e.g., neem mouthwash vs. chlorhexidine).
- Scope exists for cost-effective natural antiseptics in low-resource surgical settings.

8. Clinical Outcomes from Contemporary Studies

- Clinical trials on *Panchavalkala Kwatha* wash show reduced infection rates in post-hemorrhoidectomy wounds.
- Honey dressings accelerate granulation tissue formation and reduce bacterial load.
- Triphala has demonstrated wound-healing properties comparable to povidone-iodine.

DISCUSSION

The *Sushruta Samhita* demonstrates remarkable foresight in infection prevention, predating germ theory by millennia. While Lister introduced carbolic acid antisepsis in the 19th century, Sushruta's principles emphasized cleanliness, fumigation, sterilization, and wound care as early as 600 BCE. This underlines the scientific basis of Ayurveda in surgical hygiene[16].

Comparing ancient and modern approaches, parallels emerge in operating theater sanitation, sterilization techniques, and surgeon preparation. For example, *Agnisamskara* resembles thermal sterilization, and *Dhoopana* echoes fumigation practices. The emphasis on diet, immunity, and holistic patient preparation also anticipates modern preoperative care[17].

However, gaps exist. Ancient recommendations are qualitative, lacking standardized dosages, concentrations, and evidence-based protocols. Modern antisepsis relies on precise microbiological validation, which Ayurvedic measures require for wider acceptance. Moreover, while herbal formulations like honey, neem, and turmeric have demonstrated antimicrobial efficacy, large-scale randomized controlled trials are limited[18].

Future directions include experimental validation of classical measures, integrating herbal antiseptics into hospital infection-control protocols, and developing standardized formulations. This is particularly relevant for resource-limited settings where cost-effective, natural antiseptics may complement modern practices[19].

Thus, the principles of asepsis and antisepsis from *Sushruta Samhita* not only illuminate ancient medical wisdom but also offer valuable adjuncts for contemporary infection control[20].

CONCLUSION

The *Sushruta Samhita* embodies sophisticated surgical wisdom, with infection prevention forming a central theme. Its emphasis on environmental sanitation, sterilization of instruments, surgeon's hygiene, patient preparation, and wound management reflects a systematic approach to asepsis and antisepsis. These measures, though described in ancient terminology, resonate strongly with modern surgical protocols.

Evidence from clinical and experimental studies supports the antimicrobial potential of Ayurvedic formulations such as *Panchavalkala Kwatha*, Triphala, honey, and neem, highlighting their relevance in modern wound care. Integrating these natural alternatives into infection-control guidelines could reduce reliance on chemical antiseptics and antibiotics, especially in low-resource settings.

While ancient practices lacked microbiological validation, their preventive intent and clinical

outcomes suggest a sound empirical foundation. Standardization, scientific validation, and clinical trials are needed to bridge the gap between traditional wisdom and evidence-based medicine.

In conclusion, *Sushruta Samhita* illustrates that the roots of asepsis and antisepsis predate modern science. Revisiting these principles provides an opportunity to enrich current surgical practices and foster integrative, sustainable, and culturally rooted approaches to infection control.

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