



Research Article

Recent Advances in Shalya Tantra: An Ayurvedic Perspective

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Abstract

Shalyatantra, one of the eight principal branches of Ayurveda, represents the ancient science of surgery established by Acharya Sushruta. It includes operative surgery, para-surgical procedures, trauma management, wound care, fracture management, and reconstructive techniques. During the past two decades, Shalyatantra has undergone remarkable advancement through scientific validation of classical procedures, technological innovation, and integration with modern surgical sciences. Procedures such as Ksharasutra, Agnikarma, Ksharakarma, and Jalaukavacharana have demonstrated encouraging clinical outcomes supported by increasing scientific evidence. Recent developments in wound healing, regenerative medicine, minimally invasive surgery, digital technologies, biomedical engineering, and perioperative care have further strengthened the role of Ayurvedic surgery. This review summarizes the historical evolution, recent advances, clinical evidence, technological innovations, and future prospects of Shalyatantra while emphasising the need for high-quality clinical research and global standardization of Ayurvedic surgical practices.

PSV MKendra +1

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KEYWORDS: Shalyatantra, Ayurveda Surgery, Sushruta, Ksharasutra, Agnikarma, Ksharakarma, Jalaukavacharana, Integrative Surgery, Wound Healing.

1. INTRODUCTION

Shalyatantra is one of the eight branches of Ayurveda dealing with surgical and para-surgical management of diseases. The term Shalya denotes foreign bodies or pathological tissues requiring removal, whereas Tantra refers to systematic scientific knowledge. The discipline is principally based on the Sushruta Samhita, which is regarded as one of the earliest comprehensive surgical treatises in the world.

Acharya Sushruta described more than 300 surgical procedures and 120 surgical instruments together with detailed principles of wound management, fracture treatment, rhinoplasty, cataract surgery, anorectal surgery, urinary stone surgery, haemostasis, asepsis, and postoperative care. Many of these principles remain relevant in contemporary surgical science. Recent scientific interest has focused on validating these procedures through evidence-based clinical research and translational studies. Ksharasutra therapy has become one of the best-studied Ayurvedic para-surgical interventions, while Agnikarma, Ksharakarma, and Jalaukavacharana continue to gain wider clinical acceptance. □

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2. Aim

To critically review the recent advances in Shalyatantra and evaluate their scientific relevance, clinical applications, and future prospects from an Ayurvedic perspective.

3. OBJECTIVES

- To review the classical foundations of Shalyatantra.
- To summarise recent scientific advances in Ayurvedic surgery.
- To evaluate evidence supporting Ksharasutra, Agnikarma, Ksharakarma, and Jalaukavacharana.
- To assess integration of Shalyatantra with modern surgical science.
- To identify future research priorities.

Historical Background of Shalyatantra

Shalyatantra occupies a distinguished place among the eight branches of Ayurveda. Acharya Sushruta systematically described pre-operative (Purva Karma), operative (Pradhana Karma), and post-operative (Paschat Karma) care. He classified surgery into the Ashta Vidha Shastra Karma—Chedana, Bhedana, Lekhana, Vedhana, Eshana, Aharana, Visravana, and Sivana.

The Sushruta Samhita also documents more than 120 surgical instruments (Yantra and Shastra), detailed anatomical knowledge, fracture management, rhinoplasty, wound care, anorectal surgery, and trauma management, reflecting the advanced status of ancient Indian surgery. □

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Recent Advances in Shalyatantra

Advances in Ksharasutra Therapy

Ksharasutra therapy is the most scientifically validated para-surgical procedure in Ayurveda for the management of fistula-in-ano. Standardization of medicated thread preparation, quality control, gamma sterilization, and improved

pharmaceutical processing have enhanced its safety and reproducibility. Clinical studies demonstrate low recurrence rates, preservation of anal sphincter function, and satisfactory wound healing compared with selected conventional procedures. Current research also explores modified herbal coatings and advanced imaging for better treatment planning. PSV MKendra +2

Advances in Agnikarma

Agnikarma is a therapeutic cauterization technique primarily indicated in painful musculoskeletal disorders. Standardized metallic probes, temperature-controlled devices, and infrared thermal monitoring have improved procedural precision. Clinical studies suggest beneficial effects in plantar fasciitis, osteoarthritis, cervical spondylosis, and chronic pain conditions through pain reduction, improved circulation, and functional recovery.

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Advances in Ksharakarma

Ksharakarma employs alkaline herbal preparations for haemorrhoids, warts, sinus tracts, and localized lesions. Pharmaceutical standardisation and quality assurance have improved consistency and clinical outcomes. Studies indicate reduced bleeding, shorter operative time, and lower recurrence in appropriately selected cases.

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Jalaukavacharana (Medicinal Leech Therapy)

Medicinal leech therapy has regained importance because of its anti-inflammatory, anticoagulant, and analgesic effects. Modern applications include chronic venous insufficiency, diabetic ulcers, osteoarthritis, reconstructive surgery, and difficult wounds. Improved infection-control measures and standardized protocols have enhanced clinical acceptance.

Advances in Vrana (Wound) Management

Ayurvedic wound management integrates Vrana Shodhana and Vrana Ropana using formulations such as Jatyadi Taila, Madhu, Ghrita, Haridra, and Nimba. Contemporary advances include herbal hydrogels, collagen-based dressings, nano-formulations, and bioactive wound-healing materials that promote angiogenesis, collagen synthesis, and epithelial regeneration. These innovations show encouraging results in diabetic ulcers, chronic wounds, and postoperative wound care. PSV MKendra +1

Integration with Modern Surgical Science

Modern imaging modalities including ultrasonography, CT, MRI, Doppler imaging, and endoscopy have improved diagnosis and treatment planning in Ayurvedic surgery. Operation theatre protocols, anaesthesia, asepsis, minimally invasive techniques, and electronic clinical documentation have strengthened patient safety and research quality. Digital technologies, artificial intelligence, and simulation-based surgical education are emerging as valuable tools for future Shalyatantra practice. Regulatory reforms have also expanded

structured surgical training for qualified postgraduate Ayurvedic surgeons. International Journal +2

4. DISCUSSION

Recent scientific evidence indicates that Shalyatantra has evolved into an evidence-informed integrative surgical discipline. Ksharasutra possesses the strongest clinical evidence among Ayurvedic surgical procedures, while Agnikarma, Ksharakarma, and Jalaukavacharana continue to demonstrate encouraging outcomes in selected clinical settings. However, further multicenter randomized controlled trials, international standardization, and translational research are essential for broader global acceptance.

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Future Perspectives

Future development of Shalyatantra should focus on:

Standardisation of Ayurvedic surgical procedures.

Multicenter randomised controlled clinical trials.

AI-assisted surgical planning.

Regenerative medicine and tissue engineering.

Development of innovative herbal biomaterials.

Global collaborative research.

Digital surgical education and simulation.

Evidence-based clinical practice guidelines.

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5. CONCLUSION

Shalyatantra continues to represent one of the most scientifically promising branches of Ayurveda. Integration of classical surgical knowledge with evidence-based biomedical science has significantly enhanced its clinical relevance. Procedures such as Ksharasutra, Agnikarma, Ksharakarma, and Jalaukavacharana, together with advances in wound healing and modern surgical technology, provide a strong foundation for integrative surgical care. Continued research, international collaboration, and standardized clinical protocols will further establish the global role of Shalyatantra. □

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