

Uttar Basti Nadi Yantra: Rooted Fundamentals of Endoscopic Instrument Innovation in Urology: A Critical Review

Yogeshkumar R Meghani¹, Snehal R. Sonani²

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Abstract

Urology has seen significant advances in instrumentation, such as cystoscopes, ureteroscopes, dilators, and catheters now a days. These innovations have contributed to the shift towards minimally invasive procedures, resulting in reduced patient discomfort, faster recovery times, and improved outcomes. It has been found in Ayurveda texts that there are some basic design models and ideas which can be modify and can be used for new innovations. So, it should be accepted as a fact that all the instruments were originally rooted in ancient Ayurveda texts and were used for innovation in specification i.e. 'Uttar Basti Nadi Yantra' and 'Uttar Basti Netra' which were used to make passage to the urogenital tract from outside. Here, Ayurveda gave concepts to make a hollow passage to lumen of inner urogenital organs. By the development of new era, this design got modification, and used for minimal invasive techniques. Final judgement can be made by observation of fundamentals used for instrument development. Endoscopic urinary instruments have the same design module with modification of attached light source and catheters are modified 'Uttar Basti Netra' having hollow lumen which is used for drainage of urine or application of antibacterial solutions in the bladder. So, these instruments have basic fundamentals of hollow pathway to inner urogenital organs which is said in Ayurveda classical texts. So, this paper gives a highlight of original concepts of urology instrument and how its modification took place by the ages. So, Ayurveda does lay a foundation of principles and knowledge that has influenced the development of medical instruments over time.

Keywords: Uttar Basti Nadi Yantra; Uttar Basti Netra; Urology; Endoscopic Instruments; Catheters.

INTRODUCTION

The field of urology, which deals with the diagnosis and treatment of disorders and

Author Affiliation: ¹Lecturer, Department of Shalya Tantra, Institute of Teaching and Research in Ayurved, Jamnagar, Gujarat 361008, India, ²Assistant Professor, Department of Shalya Tantra, G J Patel Institute of Ayurvedic Studies & Research, New Vallabh Vidyanagar, Anand 388345, Gujarat, India.

Corresponding Author: Yogeshkumar R Meghani, Lecturer, Department of Shalya Tantra, Institute of Teaching and Research in Ayurveda, Jamnagar 361008, Gujarat, India.

E-mail: yogs4yogs@gmail.com

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diseases of the urinary system, has seen significant advancements in instrumentation over the years. These instruments are used in a variety of diagnostic and treatment procedures. But it's important to note that the specific instruments used depend on the condition being treated and the procedure being performed. Urologists and healthcare professionals make use of these instruments based on the individual patient's needs and the best course of treatment. Majorly used instruments can be enlisted as various types of scope i.e., cystoscope, ureteroscope, dilators, catheters etc. Here, mostly used instruments are hollow flexible, non-flexile or tubular structure made by various material i.e., latex, polyurethane or silicone which helps to make

passage from outside to inside of urology tract without damaging urology tract inner lining.

Generally, these instruments are used for multi purposes according to the rapeutical or diagnostical need. Here, only concept is to introduce a hollow tube/structure which can either ease or can make an accessory outlet pathway to the inner urology organs. This fundament was originally rooted in ancient Ayurveda Texts, which is described under chapter 'Yantra' by Acharya Sushruta. He had given details about the various instruments and equipment to do the surgical and para surgical procedures. Designs and concepts for its therapeutic and diagnostic uses are well described under this chapter. In this review, only endoscopic urology instruments were focused and reviewed for its fundamentals and design.

In Hinduism (Indian) culture, Ayurveda was well developed science and still being used by its principal in many examinations, conservative treatments, para surgical procedures, surgeries. Similarly, "Uttar Basti Nadi Yantra" which is mainly indicated for the Uttar Basti in various urinary conditions (*Mootraghata*) is basic idea for the development of innovation of endoscopic instruments in urology.

This review will be comprised of critical decoding of such fundamentals given in Ayurveda texts and used for innovation nowadays in specification of endoscopic urology instruments.

METHODOLOGY

Modern i.e. textbook of ward procedures as well Ayurvedic classical text i.e. Sushruta Samhita, Charak Samhita etc. were analyzed critically and conceptual writing has been carried out thoroughly.

History of Urology - Endoscopic Instruments:

The history of endoscopic instrument innovation in urology is marked by significant advancements in visualization, flexibility, and minimally invasive techniques. Here are some key milestones:

1. *Introduction of the Cystoscope:* In the late 19th century, the rigid cystoscope, a tube like instrument, was developed for direct visualization of the urinary bladder. Initially made of metal or glass, these rigid cystoscopes allowed limited examination and had a higher risk of trauma.
2. *Development of the Flexible Cystoscope:* In the early 20th century, the flexible cystoscope was introduced, which revolutionized urological

endoscopy. The use of flexible fiberscope technology, coupled with advancements in lighting systems, allowed for better visualization and safer examination of the bladder and urethra.

3. *Fiber-Optic Illumination:* In the 1950s, fiber optic illumination was incorporated into endoscopes. Thin glass fibers enabled the transmission of light, improving visualization during urological procedures. This innovation greatly enhanced the clarity and brightness of the images seen through the endoscope.
4. *Ureteroscopy Advancements:* Ureteroscopy, the examination and treatment of the ureters, also saw notable innovations. The introduction of smaller diameter flexible ureteroscopes in the 1980s allowed for easier navigation through the urinary tract, reducing patient discomfort and improving the success rate of procedures.
5. *Miniaturization and Improved Optics:* Advancements in miniaturization and optics have played a crucial role in the evolution of endoscopic instruments. Smaller and more maneuverable scopes, coupled with improved image quality and high definition imaging, have enhanced diagnostic accuracy and therapeutic capabilities.
6. *Laser Technology:* The advent of laser technology in urology brought about significant changes in endoscopic procedures. Laser lithotripsy, which uses laser energy to fragment urinary stones, revolutionized the treatment of kidney stones. Laser fibers can be used through endoscopes to precisely target and break up stones, minimizing the need for open surgery.
7. *Robotic Assisted Endoscopy:* The introduction of robotic systems in urology, such as the da Vinci Surgical System, has allowed for more precise and controlled endoscopic procedures. Robotic assisted platforms enable enhanced dexterity, three dimensional visualization, and improved ergonomics for surgeons performing complex urological surgeries.

These innovations in endoscopic instruments have contributed to the field of urology's shift towards minimally invasive procedures, resulting in reduced patient discomfort, faster recovery times, and improved outcomes. Continued advancements and refinements in endoscopic technology continue to shape the future of urological procedures.

Ayurveda Concepts

Ayurveda literature comprised of various basic fundamentals which needed to be utilized in practical aspect as well needs modification according to convenience. Many elaborations or advancements have taken place in modern science with the help of physics. Similarly, some advancements which are very famed now a days are basically rooted in Ayurveda text or may be its practical version is made from Ayurveda concepts.

Textual classical reference of 'Nadiyantra' with special reference to *Uttar Basti Nadi Yantra* and *Uttar Basti Netra* are enormously root of recent advancement of endoscopic or hollow tube like instruments of urology.

Uttarbasti Nadi Yantra is described under *Nadi yantra* i.e., *Arsh*, *Bhagnadar*, *Vrana* etc. Critics of Shusruta Samhitasay that *Uttar Basti Nadi Yantra* had two openings *Ubhayato Mukh*. And '*Uttar Basti Netra*' is an applicator for the urogenital tract.

Here, *Nadi Yantra*s categorized under four according to utilization:

1. *Shalya Undhharanarthe* (removal of foreign body).
2. *Rog Darshmarthe* (Visualization of disease).
3. *Achushanarthe* (Extraction).
4. *Kriya Saukaryarthe* (For easy procedure), where as *Basti Netra* is classified according to its structure i.e. for female and for male.

Features of 'Uttar Basti Netra':

1. *Male Basti Netra*: Length 14 *Angula* (measured by patients own finger), It should be shaped like the stalk of a Malati flower (in girth) and Bladder opening should be the passage of a mustard seed. Several authorities hold that the length of the pipe should be equal to that of the penis (of the patient). There should be (two) *Karnikas* (protrusions) in the middle part of the *Netra* (pipe) in the case of a male.
2. *Female Basti Netra*: In the case of a female patient, however, the *Karnikas* should be placed above a space of four fingers (from its end). The whole pipe should be ten fingers in length and should be made to suit the urethral channel (of the patient) with an aperture sufficient to allow *mudga* pulse to pass through it.

Usage of Basti-Netra:

- *Vaginal douche or injection (Basti)*: The pipe of the *Uttar Basti* should be introduced to the extent of four fingers only into the vaginal canal.

Two fingers only of the entire length of the pipe should be inserted into the channel of the urethra in the case of an adult woman, whereas, in the case of a young girl of tender years, the pipe should be introduced to the length of one finger only. Here it should be noted that these measures are to be determined by the standard of the patient's own fingers.

Acharya Dalhan had mentioned that '*Uttar Basti-Netra*' and '*Uttar Basti Nadi yantra*' are the same instruments which are used to make passage towards urogenital tract from outside.¹

Here are some references which includes usage of *Uttar Basti Netra* or *Uttar Basti Nadi Yantra* directly or indirectly. (Table 1)

Table 1: Ayurvedic classical references of Uttar Basti with its utility in Sushrut Samhita

Usage of Uttar Basti-Nadi Yantra	Reference
<i>Shalya Undhharanarthe</i>	
<i>Ashamri Nirharan</i>	<i>Su.Chi.7/27</i>
<i>Ashmari Nirharan or Rakta Nirharan</i>	<i>Su.Chi.7/34</i>
<i>Rakta Gulma Chikitsa</i>	<i>Su.U.41/21</i>
<i>Rog Darshmarthe</i>	
No reference found	
<i>Achushanarthe</i>	
<i>Aartav Shuddhi</i>	<i>Su. Sha.2/12</i>
<i>Uttarbasti retention</i>	<i>Su.Chi.37/117</i>
<i>Kriya Saukaryarthe</i>	
<i>Mutradosha Chikitsa</i>	<i>Su.U.58/50</i>
<i>Mutaghata, Mutra dosha, Ashmari Vrana, Aartav dosha</i>	<i>Su.Chi.1/110</i>
Blood mixed urine treatment	<i>Su.U.58/52</i>
<i>Vataj Mutrakruchh Chikitsa</i>	<i>Su.U.59/18-19</i>
<i>Pittaj Mutrakruchha Chikitsa</i>	<i>Su.U.59/21-22</i>
<i>Basti Daha Chikitsa</i>	<i>Su.Chi.37/123-124</i>
Various indications	<i>Su.Chi.38/125-126</i>

Abbreviation: **Su.**-Sushurta Samhita; **Chi.**-Chikitsa Sthana; **U.**-Uttar Tantra; **Sha.**-Sharir Sthan.

Correlation of Ayurveda and modern concepts of endoscopic instruments:

Similarity or conceptual affection can be seen between Ayurveda yantra and modern instruments which indicate fundamentals has been carried out from Ayurveda texts only. Some correlation has been displayed in Table 2.

So, Modern urology instruments i.e. Cystoscope, Ureteroscope, Urinary endoscope and various

Table 2: Correlation of feature of Basti-Netra or Nadi-Yantra with Modern instruments

	Ayurveda concepts	Modern correlation
Instruments Design	<p><i>Basti-Netra:</i> Different models for male and female according to length of urethra.</p> <p><i>Nadi Yantra:</i> Length and diameter should be according to pathway. Hollow lumen like structure with two openings</p>	<p><i>Cystoscope, Ureteroscope:</i> Various length and diameter according to need.</p> <p><i>Catheters:</i> Various diameters for male and female. Hollow lumen like structure with two openings</p>
Instruments Usage	<p><i>Mainly used in 4 ways (Nadi yantra)</i></p> <ol style="list-style-type: none"> 1. Extraction of foreign body 2. Easy application or Procedures 3. Drainage or suction 4. Visualization of internal path-ologies <p><i>Usage of Basti- Netra:</i></p> <ol style="list-style-type: none"> 1. Application of medicated drugs in the lumen for the treatment 	<p><i>Cystoscope (Up to bladder) & Ureteroscope (Up to Ureter):</i></p> <ol style="list-style-type: none"> 1. Visualization of internal pathology up to bladder 2. Minimal invasive procedure 3. Extraction of small foreign body <p><i>Catheters:</i></p> <ol style="list-style-type: none"> 1. Urinary drainage in case of retention 2. Bladder wash
Complications	Pranidhan Dosha: Kshat, Raktasrava, Pain ⁱⁱ	Improper handling: Severe pain, Bleeding, or trauma to internal mucosa

type of catheters can be justified here to have developmental roots in Ayurveda.

DISCUSSION

Ayurveda is a scientific clinical manual practiced since era. Ayurveda owns scientifically evaluated data which can be blindly followed for the treatment module. No changes in its fundamentals depict its higher impact or value in clinical science. But modern clinical science has made various advancements with the help of physics fundamentals. It has also recognized the value of certain concepts from Ayurveda. Several aspects of Ayurveda have been explored and incorporated into modern clinical practices and research as well. Ayurveda literature also says that instruments can be developed according to need and essentiality by using basic fundamentals. So, baseline analysis can be implicated that these all fundamentals of physics as well modern technologies are based on Ayurveda concepts which were told ages ago.

Talking about the field of instruments, it is indispensable in medical science as they enable healthcare professionals to diagnose, treat and monitor patients. These instruments range from simple handheld devices to sophisticated devices. In the urology, Instruments play a crucial role, which focuses on the diagnosis and treatment of disease and conditions of the urinary systems.

Design and usage of instruments: Table 2 had

shown similar basic design of Ayurveda and modern urology instruments. It has also described usage of various size modules according to the patients. So, here main fundament is to develop an instrument with hollow structure with two openings, from which clinician can perform a procedure, can drain the content, extract foreign body, or can have vision from that lumen inside the cavity. In case of visualization, Ayurveda had mentioned that proper natural light source can be used for the same. Here, usage of natural light source is indicated because of the lack of electricity at that period. But Modern science has developed endoscopic urinary instruments with same design module with attached light source.

And urinary catheters have same fundamentals which carried two opening and hollow lumen which is used for drainage of urinary or application of antibacterial solutions in the bladder. Which is exactly said in the chapter of '*Nadi Yantra*' and its usage. Ayurveda had not directly mentioned urinary drainage by '*Basti Netra*' or '*Nadi yantra*', But it is self-understood that if there is urine accumulation and not coming from its own pathway then it will become Sharir Shalya for the human body³. So, here, retained urine is *Sharir Shalya* and it can be extracted using Nadi-Yantra as mentioned in its usage.

Measurement of *Basti Netra* and its feasibility for application: There are various sizes available according to need in male and female patients. Same

concepts have been said in classical Ayurveda text that lumen and diameter of the instruments should be according to patient's own measurement and length of the instruments should be according to area at which level clinician wants to work or have a vision.

Similarity and its reasoning: Advancements are based on main fundamentals, which further on added by a feather era by era as per convenience and feasibility. So, here also fundamentals are rooted in Ayurveda for the development of endoscopic urinary instruments. Further addition or advancements are added to the element as per need of era. So, it can be said that evaluation of endoscopic urinary instruments are rooted in Ayurveda fundamentals.

CONCLUSION

Ayurveda, an ancient system of medicine does not directly mention or provide detailed descriptions of the instruments used in modern medical science, it does lay a foundation of principles and knowledge that has influenced the development of medical

instruments over time.

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