The Art of Cystolithotomy: Sushruta's Enduring Influence on Bladder Stone Surgery

Shreeram. P. A
PG Scholar, Department of Shalya Tantra, Sri Jayendra Saraswathi Ayurveda College and Hospital, Chennai, Tamil Nadu, India

Abstract:
Analyzing Sushruta's technique from a modern perspective, this paper explores his detailed surgical approach to cysto-lithotomy, particularly the removal of bladder stones. Sushruta's methods, rooted in ancient Ayurvedic principles, are examined alongside contemporary surgical practices to highlight their relevance and evolution. Notably, the potential complication of efferent fiber injury during surgery, as described by Sushruta, leads to acute urinary retention and an inability to voluntarily void. This condition, known today as motor paralytic neurogenic bladder, results from disrupted motor innervation, impairing bladder function. By comparing these historical and modern understandings, the paper aims to bridge the gap between ancient wisdom and modern medical advancements.The process begins with careful preparation, including the application of pressure and lubrication to mobilize the stone into a palpable position. The surgical approach involves a precise incision near the perineal raphe to facilitate stone extraction, ensuring careful management of surrounding anatomical structures to prevent complications such as urinary fistulas, bladder rupture, and damage to the urethra. The use of specialized instruments, like the Agravakra (curved forceps), is recommended for stone removal, and attention is given to minimizing the risk of stone fragmentation and recurrence. For females, the incision is directed cephalad to avoid injury to the uterus, while in males, particular care is required to protect the trigonal region of the bladder. Postoperative management includes catheterization, effective drainage techniques, and the use of a decoction from latex trees to clear residual fragments and blood from the bladder. Additionally, the paper emphasizes the importance of preserving vital pelvic structures, including the hypogastric nerve and pelvic plexus, to avoid long-term complications such as urinary retention, retrograde ejaculation, and impotence. By following these rigorous procedures, the lithotomy aims to ensure safe removal of the calculus while minimizing the risk of postoperative morbidity and preserving urinary and sexual function.

Keywords: lithotomy, stone removal, Ayurvedic surgery, perineal incision, bladder, pelvic anatomy, postoperative care, hypogastric nerve, pelvic plexus.

Procedure for Cysto-lithotomy:

Upon preparing the patient, begin by gently massaging the left side of the umbilical region, ensuring adequate lubrication. Subsequently, apply firm, directed pressure with the fist just below the umbilicus, thereby aiding the stone to descend into the palpable region. Simultaneously, the lubricated index and middle fingers should be introduced into the rectum and guided beneath the perineal raphe. With meticulous manipulation, the stone should be coaxed between the rectum and the base of the penis.

The bladder must be kept in a state of tension and distension, which serves to obliterate any natural folds. With deliberate pressure applied via the fingers, the stone will become sufficiently prominent, resembling a palpable mass or tumor.[1]

Pradhana Karma (Principal Surgical Step):

Once the stone has been adequately mobilized, an incision, approximately the size of the stone, should be made approximately one barley-width lateral to the perineal raphe on the left side. Some practitioners, for reasons of technical convenience, may prefer to make the incision on the right side. However, it is crucial to take precautions to prevent the stone from fracturing during the procedure. Any residual fragment left behind will serve as a nidus for the formation of new calculi, which can lead to the recurrence of symptoms. Therefore, it is essential to ensure the complete and thorough removal of the entire calculus, utilizing instruments such as the *Agravakra* (curved forceps) or their equivalents, to prevent such complications.[2]

In females, given the close anatomical proximity of the uterus to the posterior aspect of the urinary bladder, the incision must be directed cephalad. A deviation from this approach may result in the formation of a urinary fistula (*MutrasraviVraṇa*), with ensuing complications. In males, care must be taken to avoid injury to the *Mutrapraseka* (trigonal region of the bladder), as such an injury could result in the leakage of urine.[3]

The incision should be confined to the precise location necessary for stone extraction, and it is crucial to avoid inadvertent damage to the bladder. In cases where the bladder is inadvertently punctured, the prognosis is poor, and the likelihood of healing is diminished. It is universally acknowledged that cases of bladder rupture, particularly in patients with preexisting calculi, rarely result in successful recovery.In cases where there is excessive extravasation of urine, leading to potential complications such as infection or tissue damage, it becomes imperative to manage the drainage effectively. To mitigate these risks, Sushruta has recommended the use of *PushpaNetra* (the stalk of the lotus) as a conduit to facilitate urinary drainage. This is accomplished by utilizing a supra-pubic incision, already made for the removal of the calculus, through which the urine is diverted. This technique ensures proper drainage, preventing the accumulation of urine in the surrounding tissues and thereby minimizing the risk of further complications.[4]

In the course of the procedure, inadvertent injury to the urethra may occur, particularly in the proximity of the bladder neck or the perineal region. Such injuries, if not promptly addressed, can result in significant complications, including urinary retention, extravasation, and the formation of urinary fistulas. To mitigate these risks, Sushruta advocates for immediate catheterization of the urethra, ensuring continuous drainage of urine and minimizing the potential for further harm to the injured tissues.

Once the bleeding has been adequately controlled and the immediate post-operative phase has stabilized, a delayed repair of the urethral injury may be performed. This approach, which involves a careful and deliberate reconstruction of the urethral integrity, allows for optimal healing conditions, minimizing the risk of chronic complications such as stricture formation or incontinence. The catheter serves as a temporary but vital measure, facilitating the safe restoration of normal urinary function while the surgical site heals.

Once the stone has been removed, the patient should be placed in a warm sitz bath to facilitate healing and prevent further complications such as hemorrhage or infection. In the event that the bladder fills with blood postoperatively, irrigation should be performed through a catheter using a decoction derived from the latex trees, as such a solution is known to rapidly expunge both blood and residual stone fragments from the bladder.

As stated in the classical verse: *"The decoction of the latex trees, administered through a catheter, expels both stone and blood from the bladder swiftly and efficiently."*

This method ensures that the bladder remains clear and free from further obstructions, facilitating optimal postoperative recovery.

During the surgical procedure, meticulous care must be taken to avoid injury to the delicate structures in the pelvic region, including the urinary passages, seminal ducts, testicular cords, perineal raphe, vagina, rectum, and urinary bladder. Any inadvertent damage to these anatomical structures can result in significant and life-threatening complications.

Injury to the urinary passages, for instance, may lead to a catastrophic accumulation of urine within the bladder, resulting in severe distention and, if left unaddressed, death due to septic shock or renal failure. Similarly, damage to the seminal ducts may precipitate either fatal consequences or, at the very least, irreversible impotence, depending on the extent of the injury.

Injuries to the testicular cords can lead to the loss of erectile function, often resulting in permanent impotence. Likewise, trauma to the vagina or perineal raphe may cause significant pain and discomfort, complicating the recovery and potentially leading to chronic pain syndromes if not properly managed.[5]

Thus, it is imperative that these vital structures are handled with the utmost precision and care during the surgical approach to prevent both immediate and long-term morbidity or mortality.

During the surgical procedure, extreme caution must be exercised to prevent injury to the critical neural and anatomical structures of the pelvic region, including the urinary and seminal passages, testicular cords, perineal raphe, vagina, rectum, and the urinary bladder. Damage to the intricate network of nerves that innervate these organs can lead to severe functional impairments and significant morbidity.

Discussion:

Injury to the **hypogastric nerve**, which originates from the T11 to L2 spinal segments, has significant implications for both urinary and sexual functions. This nerve plays a critical role in the autonomic regulation of the bladder, particularly in the control of the **internal urethral sphincter** and bladder relaxation. Disruption of its function can result in **urinary incontinence**, a condition historically described by the ancient physician **Sushruta**. The hypogastric nerve is responsible for maintaining the closure of the internal urethral sphincter and promoting bladder storage through the inhibition of detrusor muscle contraction. Injury to this nerve can thus lead to a loss of bladder storage control, resulting in involuntary urine leakage.[5]

In cases where the efferent fibers are damaged during surgery, it can result in acute urinary retention, characterized by the inability to voluntarily void urine. This condition, described by Sushruta in this context, is considered to be a form of neurogenic bladder dysfunction. From a modern medical perspective, this complication is referred to as *motor paralytic neurogenic bladder*. It occurs due to the disruption of motor innervation, leading to a loss of bladder contractility and subsequent difficulty in urination.[6]

Conclusion:

Sushruta's contributions to the practice of **cystolithotomy** laid the groundwork for treating bladder stones in ways that still resonate with modern urology. His detailed accounts of the surgical procedure, along with how to manage patients before and after surgery, show just how advanced ancient surgical methods were. Many of these principles continue to shape surgical practices today.

In his work, **Sushruta Samhita**, Sushruta showed an early understanding of how bladder stones form and how to treat them effectively. His use of specialized instruments and techniques not only made stone removal possible but also highlighted the importance of understanding the anatomy and ensuring patient safety during surgery.

Today, while technology has advanced and refined stone-removal methods, the fundamental principles Sushruta emphasized — such as minimizing harm to surrounding tissues, focusing on the patient's well-being, and grasping the causes behind bladder stones — continue to guide urologic surgery.

In the end, Sushruta's approach to **cystolithotomy** is a clear reminder of the lasting value of ancient medical knowledge. It's a bridge between tradition and innovation

that still holds relevance in modern times. Revisiting these early techniques can offer fresh insights for today's urologists, especially in areas where access to modern technology may be limited, but where these timeless methods still have a meaningful place in patient care.

1) Susruta, Susrutasamhitha, edited by Vaidya Jadavaji Trikamji Aacharya and Narayan Ram Acharya 'Kavyatirtha'. Chikitsasthana.Ch.7, Ver 3-4. Reprint, 2015 edition, Varanasi: Choukhambha Sanskrit Sansthan, Kashi Sanskrit series 316; 2015. P.435.
2) Susruta, Susrutasamhitha, edited by Vaidya Jadavaji Trikamji Aacharya and Narayan Ram Acharya 'Kavyatirtha'. Chikitsasthana.Ch.7, Ver 3-4. Reprint, 2015 edition, Varanasi: Choukhambha Sanskrit Sansthan, Kashi Sanskrit series 316; 2015. P.435.
3) Susruta, Susrutasamhitha, edited by Vaidya Jadavaji Trikamji Aacharya and Narayan Ram Acharya 'Kavyatirtha'. Chikitsasthana.Ch.7, Ver 31-36. Reprint, 2015 edition, Varanasi: Choukhambha Sanskrit Sansthan, Kashi Sanskrit series 316; 2015. P.436-37.
4) Susruta, Susrutasamhitha, edited by Vaidya Jadavaji Trikamji Aacharya and Narayan Ram Acharya 'Kavyatirtha'. Chikitsasthana.Ch.7, Ver 31-36. Reprint, 2015 edition, Varanasi: Choukhambha Sanskrit Sansthan, Kashi Sanskrit series 316; 2015. P.436-37.
5) Wein, Alan J.; Kavoussi, Louis R.; Partin, Alan W.; and Peters, Craig A., "Campbell-Walsh Urology: 4-Volume Set (10th Ed.) page no-611 2012
6) Lapides J, Diokno AC, Silber SJ, Lowe BS. Clean intermittent selfcatheterization in the treatment of urinary tract disease. J Urol1972;107:458.