Introduction:

The Sushrutasamhita is one the three main texts of Ayurveda, the original Indian system of medicine. Prior to the beginnings of Islamic incursion from 1000 AD onwards, the Ayurvedic system was essentially Hindu, though there is evidence of interchange with other cultures, mainly Arab and Greek (4, 8).

The exact date of compilation of the Sushruta is unknown. In its primitive form, it was probably composed in the fifth or sixth century before Christ. Its present form dates from the 1st to the 4th century after Christ (4, 8), and the most well-known redaction, that by Dallhana, seems to be of the 11th to 13th century AD.

The present communication deals with the theories of causation, description of symptoms and suggested surgical treatment of urinary stones as is to be found in the Sushrutasamhita, the source of the translations are indicated within parentheses with the section, chapter and verse(s) being put in that order. The Sanskrit texts of Ghanekar and Shastri (5, 7) have been used.

The ancient Indians, who composed the Sushruta inhabited the region that today is represented by northwestern India, Pakistan and eastern Afghanistan. Then, as now, urinary stones were very common in this area and preoccupation with this disease is therefore understandable.

Divisions of the Sushruta:

The Samhita is divided into six major sections — Sustrasthanam (Su), Nidanasthanam (Ni), Sharirasthanam (Sh), Chikitsasthanam (Ch), Kalpasthanam (Ka) and Uttaratantram (Ut). Each section is subdivided into chapters and each chapter contains a number of verses, or less commonly short prose sections. Except for the Kalpasthanam, all the other sections discuss some aspect of urinary stones.

Sushrutian physiology:

The concept of health and disease is based on the balance of three Doshas or primal forces and blood. These are — Vayu (wind), Pitta or Agni (fire, bile) and Kapha or Shleshma (phlegm, mucus). These forces are as much philosophical concepts as physiological and their functions difficult to comprehend (4). They will
not be discussed further here. However, the terms will be used to elucidate the Sushrutian view of the causes of stone formation.

**Sushrutian anatomy:**

The importance of dissection and a knowledge of anatomy is emphasised in the Sushruta (Su 3/47-53 : Sa 5/59-62). Most of the anatomical descriptions of the urinary system are to be found in the Sharirasthanam, though relevant surgical anatomy is discussed elsewhere.

The kidneys (VRKKA) are only mentioned (Sa 4/30) and their relationship to the ureters seems to have been ignored. Two channels (Shrotas) constantly carry urine to the bladder as rivers drain into the sea. They have thousands of openings too fine to see as their origin and issue from between the stomach and the intestines. Whether in sleep or awakening the bladder fills with urine as a new earthen pitcher fills through its lateral fine pores when placed in water (Ni 3/18-24). According to the Sharirasthan (Sa 9/6, 7), of the 24 ducts (Dhamani), 14 course downwards — two of these carry urine into the bladder.

The bladder (Mutrasaya, Mutravasti), is shaped from the essence of blood and Kapham (phlegm) and is shaped by Pittam (bile) and Vayu (wind) (Sa 4/26-29). It is one the seven receptacles (Asaya) of the mal body — (eight in women) (Sa 5/8). Two urine carrying ducts have their roots in the bladder and the penis (Sa 9/11,12) — this probably refers to the ureters (auth.). The urethra is one of the nine bodily channels (Shrotas) to the exterior (Sa 5/10). It is termed Mutranal and Mutramani elsewhere (Ut 55/15).

**Cause of bladder stone formation:**

(Renal and ureteral stones are not recognised in the Sushruta — all further discussion is therefore of bladder or urethral stones.)

(Sleshma or Kapham is the lubricating principle of the organism.) Derangement of Kapham (phlegm) is the essential cause of stone formation though other factors may have an important influence (Ni 3/2). Bladder stones are termed Asmari (rock) when large and Sarkara (gravel) when fine. Kapham is normally carried into the bladder. If the internal channels are not kept clean or unwholesome food is eaten, the mixture of deranged Kapham and urine forms stones (Ni 3/3). Asmaris form in the same fashion as the precipitate that occurs after some time when even clear water is kept in a new pitcher. Vayu and Agni (Pittam) act in conjunction with Kapham into the bladder urine and produce stones just as Vayu and the fire of lightning act together to form hailstones from rainwater (Ni 3/26).

(Vayu is the motive force of the organism.) When acting properly, Vayu produces normal urinary flow from the bladder. When the flow of Vayu is reversed or obstructed many urinary and seminal diseases and Asmari occur (Ni 3/27-28). Repressing the desire to urinate obstructs Vayu and causes a disease called Mutraghata which is urinary retention not due to stone though the symptoms are similar (Ut 55, 58/19). Vayu, Pitta and Kapha enter the bladder in the same way as urine, and when deranged form stones (Ni 3/24). Apart from the three types of bladder stones due to Vayu (Vatasmari), Pitta (Pittausmari) and Kapha (Kaphasmari), concretions of semen (Sukrasmari) form a subsidiary type of bladder stone (Ni 3/16). These are due to coitus interruptus or excessive coitus (Ni 3/16, Ut 55/15).

Bladder stones are particularly common in children as they sleep during the day, eat unwholesome food and as their bladders have small capacity and poor
musculature. Stones in children are easily extracted with instruments (Ni 3/11).

Appearance of different types of stones:

The Sleshmasmari (due to deranged Kapham) is white with a smooth surface and is as large as a hen’s egg. The Pittajasmari (due to deranged Pittam) is hard, large and reddish, yellowish or honey-colored. The stones due to deranged Vayù (Vatasmari) are dusky, very hard, uneven in shape or with a spiky exterior (Ni 3).

Treatment of Asmari and Sarkara:

General considerations — general principles of surgical treatment are dealt with in the Sutrasthananam. Specifics of treatment are to be found in the Chikitsas-thananam.

Asmari is a dangerous and (potentially) lethal disease. Recent disease can be treated medically, surgery is needed in the chronic state (Ch 7/3).

Medical treatment — In the early stages the administration of oily substances (Sneha) with food or externally by bladder irrigation (see later) and massaging (Kheda) can cure Asmari (Ch 7/4). Various herbal mixtures, special diets, and medications made with herbs, minerals and excreta of animals are described for the cure of stones produced by the derangement of specific doshas (Ch 7/5-26).

Surgical treatment (if oils, alkalis, astringents, milk or bladder irrigations fail), then the stone must be cut out (Ch 7/27). Surgery is the worst (most radical, most dangerous) treatment, as even in the hands of the experienced surgeon operations are not certain to be successful (Ch 7/28). As the patient is sure to die if not operated upon and the outcome of operation is uncertain, the surgeon should take permission to operate from the authorities (Ch 7/27).

The patient should be appropriately prepared and arrangements for operation be made as described in the Agropaharaniya section (Su 5) (1, 3). The patient should be reassured. If he is strong and unafraid, the upper part of his body should be placed on the lap of a person seated on a platform at the height of the knee and facing east. The patient’s waist should rest on a cloth cushion. His knees and elbows should be flexed and tied together with strips of cloth or rope. The hypogastric region should be rubbed well with oil and strong pressure applied with the closed fist on the left side of the hypogastrium to make the stone descend. The surgeon should then introduce the second and third digits of his left hand into the rectum of the patient. The nails should have been pared and the fingers coated with oil. With the fingers in the midline (of the rectum) the stone should be pulled down with careful pressure to present as an elevated swelling between the rectum and the penis (Ch 7/30). (It would appear that the aim was to get the stone into the urethra and remove it from there.

On pulling down the stone, if the patient faints, his neck elongates (i.e., his head rolls to one side) his eyes have a vacant stare and he becomes like dead, attempts at removing the stone should be abandoned as the patient would then die. Otherwise extraction may be done (Ch 7/30).

the seam (Sibani) (the median perineal raphe). Some experts recommend a the seam (Sibani) (the median perineal raphe — auth.). Some experts recommend right-sided incision if needed for ease of extraction — and its lenth should be appropriate to the size of the stone. Care is needed to see that the stone is not broken or crushed while the incision is being made. If even a small piece is
retained it will later enlarge in size. All stones should therefore be extracted with an instrument with a recurved tip (Agrabakra yantra) (Ch 7/33)(1).

In women (the fingers of the surgeon should be in the vagina) the uterus is next to the bladder — therefore the incision should not be too deep as a urinary fistula may result. In men, a urinary fistula may result if the bladder is injured. Wounds of the bladder caused by other causes than lithotomy, or two incisions made into the bladder for removal of stones, do not heal. A bladder incision for lithotomy heals if postoperative measures are properly carried out and if the quantity of urine is increased (Ch 7/33-34).

Surgical errors to be avoided:

At the time of operation carefully avoid damaging the following — the ureters, the vasa deferentia, the female organs, the spermatic cords, the urethra, the perineal raphe, the rectum and the bladder. Injury to the bladder (? ureter) causes dribbling of urine or death with the bladder filling with urine. Injury to the vasa deferentia or the spermatic cords causes death, sterility or impotence. Injury to the female genitals or the perineal raphe causes excruciating pain. The results of injury to the bladder or the rectum are extremely grave and are detailed in the section on Marmas or vital points (Ch 7/36).

Postoperative management:

After lithotomy the patient should sit in a tub filled with warm water to keep the bladder from filling with blood. If the bladder does fill with blood it should be irrigated with the extract of the Ksheerabrksha using a catheter shaped like the stem of a flower (Pushpanetra). The alkali from the (extract of the) Ksheerabrksha clears the bladder of stone and blood (Ch 17/33-34).

The patient should be fed rice and molasses to clear the urinary passages. Honey and clarified butter should be applied to the incision after warm water soaks. The patient is to eat two daily meals of barley cooked in materials that purify urine and mixed with warm clarified butter. For ten days thereafter a diet of well-cooked soft rice mixed with large quantities of milk and molasses will keep the blood and urine pure and the wound moist. For ten more days sour fruits and soup made from the meat of wild animals should be given. The patient should be carefully massaged with oily and watery applications for ten more days (Ch 7/35).

Care of the incision — The wound should be washed with the extract of Ksheerabrksha and anointed with a levigated paste based on a mixture of sesamum and honey (Kalka) containing various botanicals (Rodhra, Madhuka, Manjistha, Pundari). The same mixture with added turmeric is to be massaged into the wound. Collections of blood in the bladder should be removed by irrigation with a catheter. If micturition does not become normal (? persistent urinary leakage — auth.) after seven days, the wound may need to be cauterised. Once micturition is normal, the bladder should be irrigated with watery and oily extracts of sweet and astringent substances (Anubashana and Asthapana vasti) (Ch 7/35).

Stones in the urethra:

These should be extracted through the (normal) passage. If this is not possible, the urethra is to be incised and the stone removed with a hook-shaped instrument
(Badisha yantra) (1). For a year after the complete healing of the wound, the following activities are to be avoided — riding on horses or elephants, lifting heavy weights, swimming, climbing mountains, sexual intercourse and heavy lifting (Ch 7/35).

Summary:

The Sushrutasamhita bears surprisingly detailed instructions on the surgical management of bladder stones. While lithotomy was recognised as being a dangerous expedient or be resorted to when everything else had failed, the details of the operative technic bears ample testimony to the operation being performed with hopes of success. Even with limited, and sometimes erroneous, ideas of the anatomy and physiology of the urinary tract and of the causes of stone formation, the technics and management described sound familiar even today!

REFERENCES

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