

Urolithiasis from the point of view of the head physician of Ottoman emperors: Ahi Ahmed Çelebi



Ayşe Balat¹, Ahmet Acıduman²

¹İstanbul Aydın University, Medical Faculty, Department of Pediatric Nephrology & Rheumatology, İstanbul, Turkey

²Ankara University, Medical Faculty, Department of Medical History and Ethics, Ankara, Turkey

Corresponding Author: Professor Ayşe Balat, MD

İstanbul Aydın University, Medical Faculty, Department of Pediatric Nephrology&Rheumatology, İstanbul, Turkey

GSM: +90 0533 372 12 82; Fax: +90 212 979 50 45; E mail: ayse.balat@aydinunivsitehastanesi.com.tr

ABSTRACT

Ahi Ahmed Çelebi was a famous Turkish physician in 16th Century. He was the head physician of Bayazid II, Yavuz Sultan Selim, and the Magnificent Suleiman. He had worked extensively on urolithiasis and published his first work as a pamphlet in “*Risala al-Kilya wa’l-Mathana*”.

Interestingly, most of his observations regarding the etiology of calculus had great similarity to our present knowledge, especially about dietary habits. He said that “*it is prevalent among the people of the upper class. The reason is the people of this class have much comfort and much eating and drinking, which are important factors in stone formation*”.

He explained details of etiological factors, the organs that stones may appear, the symptoms of kidney/bladder stones, prophylactic and curative precautions against urolithiasis, and a few surgical methods. He had been describing some tools used for stucked stones. He mentions about *Keyvan Bey* who suffering from sticking bladder stone, and *invented an apparatus, which is used on himself*. Ahi Ahmed Çelebi described it with details; *it was a pivot like silver bore containing holes on it, like on flutes. When the sensation to urinate occurs, he inserted this apparatus from its thinner end through the urethra, and push the calculus a little behind. Then, he withdraw the apparatus after successful voiding conducted through holes, like a urinary catheter used today*. He also mentioned from an instrument, like a *lithotriptor*.

Five centuries ago, while some observations and suggestions overlap with current knowledge, some treatment methods seem to be based entirely on experimental observations.

KEYWORDS: Ahi Ahmed Çelebi, History, Urolithiasis, *Risala al-Kilya wa’l-Mathana*

Introduction

Ahi Ahmed Çelebi was a famous Turkish physician in the 16th Century. He was the head physician of Bayazid II, Yavuz Sultan Selim, and the Magnificent Suleiman who were Ottoman emperors in rising period. He worked extensively on urolithiasis since it was also common at that times, and wrote his experiences as a pamphlet in “*Risala al-Kilya wa’l-Mathana*”, and dedicated it to Bayazid II (1-3). He has been explaining his own observations/experiences as well as mentioning from the works of local and foreign medical researchers.

This pamphlet contains *ten headings*. Interestingly, most of his observations regarding the etiology of calculus had great similarity to our present knowledge, especially about dietary habits. For example, in the introduction, he said that “*Especially it is prevalent among the people of the upper class. The reason is the people of this class have much comfort and much eating,.. In the formation of calculus these are important factors*”(1-3).

We will discuss Ahi Ahmed Çelebi’s work and recommendations about urolithiasis and compare some of them to our current knowledge.

Heading # 1 (Calculi may be seen in whom, and why?)

He explained main etiological factors in urolithiasis with details; in boys up to the time of adolescence, in obese, and also in asthenic types. It occurs in bladder of boys, and in the kidneys of adults, and fat type persons. It is rarely formed in the urinary bladder of women because of the free vesical neck and short urethra. The calculi is formed in persons eating too much (meat, raw fruits, bitter orange, large fish meat, all sea bird meat, all roast meats, garlic, onion, starchy sweeties, etc...) (1-3).

Today’s data also stress the male preponderance for kidney stone disease both for pediatric and adult cases (4). It has been well known that obesity is one of the common cause of kidney stone disease, mostly because of increased sodium and fructose intake, and decreased intake of calcium and water together with increasing use of antibiotics (4). Probably the similar eating habits were the responsible factors at that time too, except the use of antibiotics. The listed foods above are rich in protein and cause urinary acidification, therefore facilitates the calcium oxalate formation, while raw fruits and bitter orange are the source of fructose. This was a great

observation during that period, without knowing the chemical ingredients of them.

One of the surprising data from today demonstrated that lower percentile body weight children had their first clinical stone events significantly earlier than upper percentile or normal body weight peers (5), that is similar to Ahi Ahmed Çelebi's observation for asthenic types.

His observation for females as '*rarely formed in the urinary bladder of women because of the free vesical neck and short urethra*', may be true for more easily passage of stone, while current data have shown the male–female ratio is now close to 1:1 (4), because of different variables including body mass index, hyperinsulinemia, and hypertension (6).

Heading #2 (where do lithiasis exist in the human body)

This heading contains informations about the organs in which stones may appear, mainly in kidneys and the urinary bladder. He also mentions from the discourses of Rhazes (calculus may be seen in large intestines, muscle, joints, and tumors), and Galen (observation of a person with pneumonia, splitting stone like particles, similar to bladder stone, while coughing) (1-3).

Heading #3 (Symptoms of kidney and bladder stones)

Symptoms and clinical findings of kidney and bladder stones have been described in detail under this heading. He stresses that pain or heaviness in the loins, or acute pain like bodkin piercing into the flesh is belong to renal calculi. He describes the location of calculi according to the pain types; if these pains spreads from the loins into the direction of thighs, this indicates that the calculi descended into the lower urinary tract. If the pains decrease for a while, this means that the calculi has fallen into the bladder (1-3).

It has been well-known that stone formation is the result of a complex interaction between genetic and environmental factors including different pathways for various stones in urinary tract (4). Although environmental factors has changed during the centuries that may affect the incidence and also the chemical composition of urinary tract stones, calcium oxalate stone formation is still common in kidneys, followed by uric acid or struvite, while most of bladder stones are ammonium acid urate and uric acid stones (7). Each stone has a special color and consistency. Ahi Ahmed Çelebi mentions from a *correlation between nature/color of urinary sands and location of calculi*; the yellowish and dryish sands originate from the kidneys, while white and gray sands originate from the bladder. The sands coming from bladder show that the stone is soft, otherwise, it is hard. Although the color of stone/calculi may give some information to an experienced clinician about the type of stone, it is difficult to say its type exactly without analysis. Detailed notes mentioned above demonstrate his great observation and experience.

He also refers to the relationship between clinical findings and stone size; bladder is a large organ and stones in it mostly do not cause pain. However, if urinary bladder calculi is large and tortous, the patient often feels pain in groins, urinates with difficulty and has feeling for urination after miction. Males with bladder stones feel pain in the penis neck during walking, and the pain goes away if they lie down. If bladder stone is small, it may move to the bladder neck, and prevents urination (1-3).

All of these detailed descriptions are typical examples of, "*from symptoms to diagnosis*".

Heading #4 (Preventive and curative medicine for kidney and bladder stones)

Under this heading, he suggests firstly to avoid the main factors facilitating stone formation, and later describes the methods of elimination; avoid to eat the above mentioned foodstuffs, avoid overeating (he refers to the benefits of eating regular meals), and make exercise. For the expulsion of calculus; sedatives, laxatives (to eliminate the substance(s) helping the stone formation), moderate exercise before meals, massage on hands and feet, regular sitting baths... (1-3). All of them would help to remove the stone from its place and facilitates its excretion by muscle relaxation.

Heading #5 (What is the disease, the causes, symptoms, and its treatment)

He tried to explain the causes of diseases according to "*Humoral Pathology Theory*", and stated that the deterioration of the humoral balance in the body by endogenous or exogeneous reasons may damage the organ. Therefore, the reason of stone formation is the bad temperament of kidney and bladder.

He especially emphasizes heat and cold exposures of kidney. Drinking hot wine, eating warming herbs and meals, wearing warm clothes warm the kidneys, and the urine of those persons is reddish, dark yellow and has a pungent smell. He notes that these patients may have thirsty feeling, frequent urination, burning during urination, and sometimes high body temperature. If the problem is warming of the kidneys; he suggests resting, drinking beverages (purslane/cucumber juice, yoghurt), eating cooked green grapes, barley meal prepared with green grapes and Tamaricus Indica, etc.), and some herbal mixtures to apply on the kidneys (1-3).

He says that if the problem is cold (because of sitting or sleeping in cold places, eating cold meals and cold fruits, drinking cold sherbets with empty stomach, etc); a mixture of cinnamon, essences of walnut, sour almond, and pistachio together with the gravies of a lamb head and a pigeon would be beneficial. He also suggests to eat chickpeas gravy, chicken, a good sized two year old male mutton cooked with cumin and cinnamon, and also roasted sparrow, etc (1-3).

Under this heading, there are also brief suggestions for kidney disorders which may be caused by excessive blood, phlegm and bile, as the cause of disease.

Heading #6 (Treatment of stones caused by various constitutional disturbances)

Under this topic, there are detailed descriptions to eliminate the kidney stones, resulted of several constitutional disturbances, such as warm and cold. Treatment recommendations such as sitting baths prepared with violet leaves, several herbal drugs and correct dietary habits were mentioned. He suggested some exercise to heat the body, and horse riding, going up and down the stairs to throw out the calculus from the kidneys into the bladder. If the calculus stops in somewhere in the kidneys, hot and sharp medicaments had been suggested, such as increasing urine volume with herbs, and dissolvent solutions, and oils facilitating the movement of stones (1-3).

Heading #7 (The preparation and instructions of several drugs)

It has been seen that he preferred not only herbals, also a few animal products in the treatment of calculi. He mentions

from the preparation of some remedies; scorpion oil and ash, and the drying method of goat blood, etc., and the use of them. He referred that they would be effective to expel the calculi from kidney and bladder (detailed in the 10th Heading) (1-3).

It seems difficult to explain the action mechanism(s) of these materials on calculi, since they mostly look like an observational experience.

Heading #8 (Medications to expel the calculi, and instruments for stuck calculi)

He says that if there is a wound in an organ because of passing and/or stuck stones, it would be painful. Interestingly, he describes the place of wound according to urine color; when the urine is bloody, the wound is at or below the kidney, but, if the blood comes first, the wound is in the bladder or below it. In this case, he suggests to take blood from vena basilica to prevent swelling of the organs (a solution for increased blood according to Humoral Pathology Theory). He mentions from the treatment of wound with a variety of medications that can be applied to bladder by a kind of tube, "a water throwing tool" as was told in Turkish (1-3).

If a large stone comes to the bladder neck and causes severe pain and obstruction, he describes a movement suggested by Sayyid Ismail Jorjani to push it back: someone holds the patient lying down with two feet up position, and shakes several times. Thus, the stone is attempted to fall into the bladder. If the stone does not go back, he suggests sitting baths with several herbs, medicines and some tools used for stuck stones in urinary tract. He describes the urinary catheter, used in Europe at that time, both for urination and application of some drugs into the bladder via this catheter. Interestingly, he mentioned from one of the Beys of the Sultan, named as *Keyvan Bey*, suffering from sticking bladder stone, and did not get any benefit from available treatment modalities, *invented an apparatus, and used it on himself*. Ahi Ahmed Çelebi described this apparatus with details. He noted that "it was a pivot like silver bore containing holes on it, like on flutes. When the sensation to urinate occurs, he inserted this apparatus from its thinner end through the urethra, and push the calculus a little behind. Then, he withdraw the apparatus after successful voiding conducted through holes", like a urinary catheter used today. He also mentioned from an instrument, like a simple lithotripter; "He also ordered a pair of pincers in steel, with their ends like pivots and the rive of the pincers at the root of the pivot. The pincers could open considerably by a slight movement at the other end. One day he inserted the pincers through the urethra into bladder. When it touched the calculus they opened the pincers without giving much suffering to the patient. In this way the pincers got hold of the calculus and crushed it, so its pieces came out with urine. That was the end of the calculus trouble in the patient" (1-3).

As it has been known, Hippocrates was extremely cautious about surgical intervention for bladder stones and did not recommend surgery. Two centuries after Hippocrates, bladder stones were broken by open surgery (Ammonius and Alexandre). They were grabbing the stone and breaking it with a sharp-tipped tool (1). It is noteworthy that a catheter and a simple lithotripter is firstly invented by a patient, *Keyvan Bey*, and applied on his own, *3 centuries before European had done*. Because, Santorius mentioned from such a tool firstly in 1726, and Civiale used it as suggested by Fournier in 1824 (1).

Heading #9 (Removal of bladder calculus by surgery)

He explains that if the stone is too big and does not crumble with the applied treatments, there is no other way but, to extract it from bladder. A few surgical curative methods had been briefly described under this heading. He strongly suggests to consider mainly the size of the stone, the length of the stone (caution should be needed during manipulation) and the pain sensitivity of the person during the surgery (1-3).

It has been emphasized that special care should be taken in children under 10 years old, in young people (he stressed that phlegmonous swelling was common in that age group, and drugs used for phlegmonia are contradictory to drugs used for wounds), and people over 60 years of age. His notice about drug interactions is appreciable, and an important experience for that time. He also highlighted the pain stamina during surgery and said that "the more pain the patient has suffered, the greater the strength of pain resistance during surgery" (1-3).

Heading #10 (Therapeutic and preventive drugs for kidney and bladder calculi)

The precautions and other drugs had been discussed with details in previous headings. He says that *rumex acetosa* cooked with wine, seeds of *Asparagus officinalis* mixed with honey, boiled water of black chickpeas break up the stone into small pieces, while sitting bath of boiled daisies would help to remove the stone. He also mentions from *Agropyrum repens*, *Althaea Officinalis* L. to cure stones that the diuretic, antiinfective and antiinflammatory effects of them have been well known beginning from Hippocrates. He suggests the use of *Althaea Officinalis* L. and *Linum Usitatissimum* seeds and the extract of pistachio tree as sedatives (1-3).

Besides of herbs, he mentions from a few mines for bladder calculi, such as *Hajar al-yahūd* stone described as *Sons of Israel's olive* (should be crushed and drunk with a little water), and diamond as described by İbn-i Sina (helps the fragmentation of stone in bladder) (1-3).

He suggests to eat full consistency cooked wheat bread (with *Nigella sativa* seeds), chickpeas, onion, and several meats cooked with almond or olive oils. He recommends to eat some fruits every morning, such as figs, peanuts, red grapes with extracted seeds, sugar cane, sugar cheese, sugar almonds, bitter almonds. He notes that mint, celery, cucumber, chickpea water, pickle/pickle vinegar, melon and water consumed on an empty stomach would be useful for prevention of stones (1-3).

Detailed analysis of these foods (the fruits mentioned above and onion) show that they are rich in potassium, and pickle/pickle vinegar, grape berries are one of the main sources of citric acid, while mint, wheat bread, *Linum Usitatissimum*, almond, pistachio, sugar cane all rich in magnesium, that they are important factors in prevention of urinary tract stones.

Interesting ones from his experiences are camel blood for bladder stone, earthworm with wine for kidney stone, meat of a bird like a sparrow with gray color, manure of the pigeon fed with broad beans, scorpion ash, etc. (1-3).

Conclusion

This pamphlet that Ahi Ahmed Çelebi shared his experiences in detail and wrote it in Turkish, has guided the physicians over generations. Every symptom of calculi has been described step by step, with detailed prescriptions including

the amount of used material and preparation methods. Although some treatment methods seem to be based entirely on experimental observations, it is noteworthy that detailed observations and experiences about the urinary system stones five hundred years ago resemble current knowledge.

One of the most striking part of this pamphlet is; a catheter and a simple lithotripter is firstly invented by a patient, *Keyvan Bey*, and used on his own, 3 centuries before European had done.

REFERENCES

1. Erkun S. Ahî Ahmed (1948) Son of Kemaleddin. A Pamphlet on Urinary Calculus in the Kidneys and the Bladder. İsmail Akgün Matbaası, İstanbul, pp 44-78.
2. Âkil Muhtar (Özden AM) (1916) Hekîm Âhî Çelebi ve Fâ'ide'i Hasât Risâlesi. Dârülfünûn Tıp Fakültesi Mecmûası 2(2-3):110-113; 184-188.
3. Kahya E (1996) Onbeşinci yüzyılda yaşamış hekimlerimizden Hekimbaşı Âhî Çelebi. Erdem 9(25): 293-342.
4. Edvardsson V (2016) Urolithiasis in children. In: Avner ED, Niaudet P, Yoshikawa N, Emma F, Goldstein SL (eds) Pediatric Nephrology, Springer-Verlag Berlin Heidelberg, pp. 1821-1868.
5. Kieran K, Giel DW, Morris BJ, Wan JY, Tidwell CD, Giem A, et al (2010) Pediatric urolithiasis—does body mass index influence stone presentation and treatment? J Urol 184 (4 Suppl): 1810–1815. doi:10.1016/j.juro.2010.03.111
6. Seitz C, Fajkovic H (2013) Epidemiological gender-specific aspects in urolithiasis. World J Urol 31(5): 1087- 1092. doi: 10.1007/s00345-013-1140-1
7. Ribeiro da Silva SF, Leite da Silva S, De Francesco Daher E, de Holanda Campos H, Bruno da Silva CA (2010) Composition of kidney stone fragments obtained after extracorporeal shock wave lithotripsy. Clin Chem Lab Med 48(3): 403-404. doi:10.1515/CCLM.2010.079