

## ORIGINAL ARTICLE

### Female Genital Tract Anomalies Treatment through Surgery in *Avicenna's Canon of Medicine* (980–1037 CE)

#### Abstract

Persian scientists of ancient times made a significant contribution to the field of surgery. Among them, Avicenna (980–1037 CE) provided the most detailed presentation of surgical procedures. The present paper aimed to review *Avicenna's* great medical encyclopedia, *Canon of Medicine*, on *ratqā* (a female genital tract anomaly) related to gynecologic diseases. *Avicenna* was familiar with different causes of female genital tract anomalies. He described their signs, symptoms, natural courses, treatments and outcomes. He also noted that surgery was the only treatment of imperforate hymen or any type of vaginal agenesis. He elaborated interestingly on the operation instruments, patient positioning before operation, and the operation method, complications, post-operative and follow-up care. Although many surgical procedures described were previously mentioned by his Persian, Arab, Greek or Indian predecessors, he extended their comments and techniques in many ways, which shows that he not only pointed out related theories but practiced them himself.

**Key words:** History of medicine, *Avicenna*, Surgery, Genital tract anomaly, Gynecology

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### An Introduction to the History of Surgery in Persia

The history of surgery in ancient Persia dates back to the fourth millennium BC. Archaeologists have found a skull that is known to be 'the first evidence' of brain surgery being performed in *Shahr-e Sukhte* (Burnt City), an important city of prehistoric era in Iran. It is the skull of a thirteen-year-old girl affected by chronic hydrocephalus<sup>1, 2</sup>.

In the Zoroastrians' (religion of ancient Persia, 1000 BC) holy book, three main groups of physicians are introduced: surgeons (*kareto baēšaza* in the Avestan language means a physician's act of cutting a part of the patient's body by a scalpel for treatment); psychiatrists (*mānsrspan* *baēšaza*) and physicians treating patients with herbal medicines (*urvarō baēšaza*). This shows that surgery was a separate field of medical science in ancient Persia<sup>3</sup>.

Another evidence of surgery in ancient Persia is the report of the cesarean delivery of *Rostam*, a Persian hero, in *Ferdowsi's Shahnameh*, known to be based on the actual lives of the kings<sup>4</sup>. The time span (550-330 BC) mentioned in texts by *Ferdowsi* belongs to 1000 years later. In the mentioned surgery, a combination of cannabis and camphor was given to *Rostam's* mother at his birth by a Zoroastrian.

Through Islamic era, many scientists were raised in Iran, following the focus Islam gave to science<sup>5</sup>. *Rhazes* (d. 925 CE)<sup>6</sup>, *Haly Abbas* (d. 982 CE)<sup>7</sup>, *Avicenna* (d. 1037 CE)<sup>8</sup>, and *Jorjani* (d. 1137 CE)<sup>9</sup> were the most popular Persian physicians who described multiple surgical techniques in their manuscripts in Islamic age.<sup>10</sup> In Persian medicine, there are three methods of treatment; food therapy, drug therapy and hand-mediated therapy (a part of which is surgery)<sup>11</sup>. The approach to diseases was to treat the patients step by step through these three methods, respectively. It means if a patient could be treated by change in diet and life style, the physician would not use the drugs, and if he could be treated by drugs, they did not use surgery. But in special cases, such as structural anomalies, Avicenna and other expert physicians recommended surgery as the only treatment<sup>12</sup>.

Among Persian scholars, Avicenna presented the most detailed accounts in most of cases. In the current study, a part of his great medical encyclopedia, the *Canon of Medicine*, on gynecological diseases entitled *ratqā'* (female genital tract obstruction) from the original Arabic text was reviewed<sup>13</sup>.

### Historical Perspective

*Avicenna* was not the first physician who was familiar with female genital anomalies and their surgical treatments. Aristotle was also familiar with imperforate vagina. Surgical

- 1- Dabbagh et al., 2014: e15363.
- 2- Dehesh et al., 1975: 377-82.
- 3- Zargaran et al., 2013: 2002-4.
- 4- Dabbagh et al., 2010: 584.
- 5- Wujastyk et al., 2007: 237-42.
- 6- Heydari et al., 2015: 9-22.
- 7- Heydari et al., 2014: 1161-2.
- 8- Heydari et al., 2013: 101-12.
- 9- Zarshenas et al., 2012: 2764-5.
- 10- Ahmadi et al., 2013: 22-5.
- 11- Kiani et al., 2019: e88925.
- 12- Iranikhah et al., 2016: 192-3.



techniques for female genital obstruction were described by *Celsus* (1st century CE), *Soranus* (1st century CE), *Galen* (2nd century CE), *Aetius* (4th century CE), and *Paulus Aegineta* (7th century CE) with minor differences previously<sup>14</sup>.

During the first century CE, *Celsus* described the imperforate hymen surgery procedure<sup>15</sup>:

*"If it is from birth, a membrane obstructs the vagina; if from an ulcer, it is filled up with flesh. In the membrane, an incision must be made into lines crossing each other, in the form of the letter X, great care being taken not to wound the urinary passage; and in a straight line; then taking hold of it with a hook, to cut off a small habenula from the orifice of the vagina. Then, a strap of lint is dipped in vinegar and put over the operated organ. On the third day, the lint is removed, and the wound is covered like other wounds. And when it begins to heal, it is suggested that a leaden pipe carrying a cicatrizing medicine be introduced until the wound is cicatrized."*

*Galen* mentioned that he used a "scalpellus" to incise an imperforate hymen, and *Aetius* describes the same procedure taken by *Paulus Aegineta*<sup>16,17</sup>.

*"When the obstruction was caused by a membrane, it was cut, and the margins of the incision were prevented from adherence using suitable materials. If a fleshy tumor obstructed the vaginal canal, it was dissected, and the parts were separated by a piece of sponge or cloth."*

*Paulus Aegineta* explained after examining the area, he excised the membrane with a scalpel and patched the vagina<sup>18</sup>.

*"Having ascertained the cause, either from its being obvious to the sight, or by introducing the speculum, if it be a simple adhesion only, it may be separated by a straight incision, made with a scalpel, for operating upon fistulose. But if it is an obstruction, having transfixed the connecting body, whether it be membrane or flesh, with hooks, we stretch it and divide with a scalpel for fistulose; and having stopped the hemorrhage with such applications as are desiccative without being stimulant, we have then recourse to such medicines as promote cicatrization, applying a priapus-shaped tent covered with some epulotic medicine, in those cases especially in which the operation is performed upon a part not very deep-seated, in order that the parts may not unite again. And the phiraus which is formed at the mouth of the uterus is operated upon in the same manner."*<sup>19</sup>

*Rhazes* also described the imperforate hymen in "*Al-Havi*" in a chapter on *ratqā* and mentioned that the only treatment is surgery<sup>20</sup>. (Figure 1)

*"If the excess flesh is grown out of the vagina, put a tape on each labia and stretch them so that the flesh emerges. Then*

13- Ibn Sina, 2005.

14- Aegineta, 1844.

15- Ricci, 1950.

16- Ricci, 1950.

17- Jones, 2012: 223.

18- Raffensperger, 2014.

19- Ricci, 1950.

20- Rhazes, 2000.



remove it with a knife. Put a wool lint soaked in oil and wine on it. On the third day, make the patient sit in honeyed water. Then put an ointment to heal wound. If the excess flesh is grown out of the cervix, bring in a hooked lancet and grasp the flesh; after that, cut the flesh completely after the labia is stretched well. Apply a woolen bandage soaked in wine on it and put some ointment on it to heal the wound. Then, insist on the patient having sexual intercourse.”

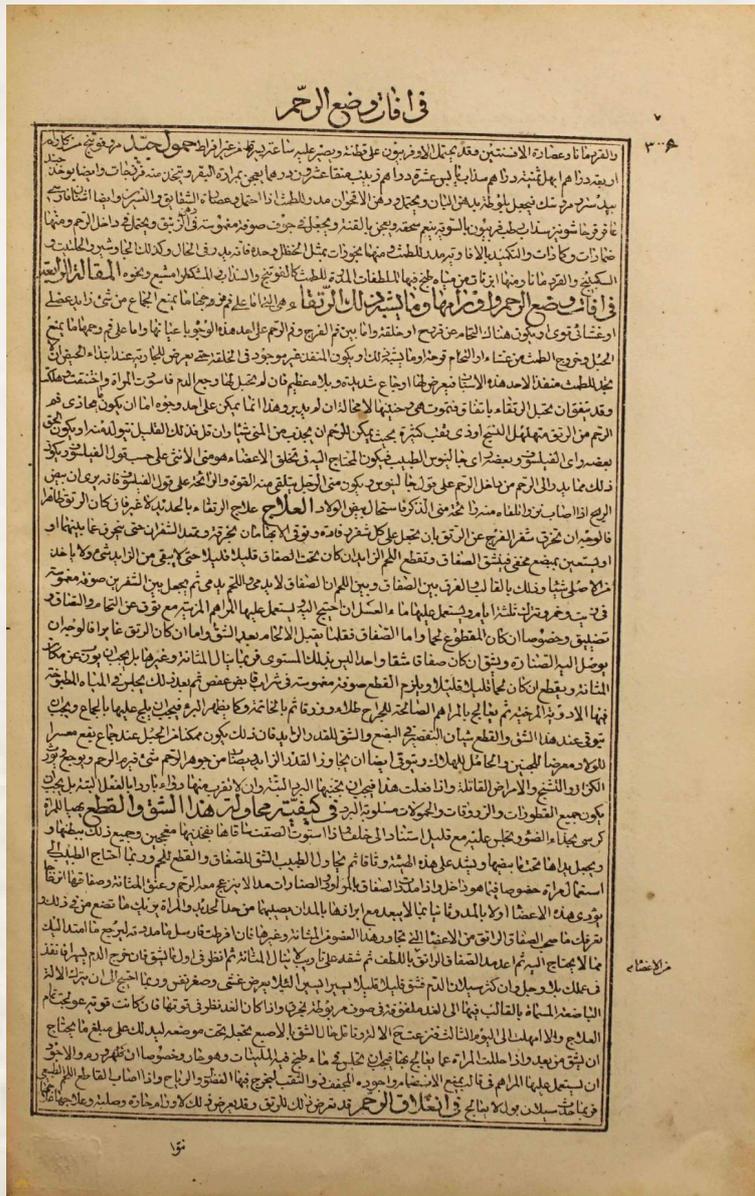


Figure 1. Al-ratqā (vaginal agenesis) “, from the Canon of Medicine by Avicenna (980–1037 CE) kept in Iran Parliament Library, record number: 1181397.

As it was mentioned, ancient physicians did the procedure of imperforate hymen surgery in an almost similar way with

minor differences. As we will see, the procedure explained by Avicenna is also similar, except he added some other points to the previous techniques.

### **Avicenna and His Description of a Gynecological Surgical Procedure**

The most prominent physician of the Islamic Golden Age, *Avicenna*, also known as *Ibn Sina* was born in Afshaneh, a city near Bokhara (in old Persia) in 980 CE. His medical encyclopedia, *Al-Qanun fi al-Teb (The Canon of Medicine)* was translated to Latin by *Gerard of Cremona* in the 12<sup>th</sup> century CE and became one of the most renowned medical references in the world, being used in Europe until the 16<sup>th</sup> century<sup>21</sup>. Avicenna rejected many of his predecessors' theories and introduced some innovative ones<sup>22</sup>.

It is interesting to read a description of a gynecological surgical procedure presented more than one thousand years ago. This is a part of *Canon of Medicine*. Avicenna was familiar with imperforate hymen, different types of mullerian agenesis and cervical stenosis, as different causes of genital tract anomaly. He explained their symptoms, natural courses, treatments and outcomes. He also identified surgery as the only treatment of imperforate hymen, and the distal and proximal types of vaginal agenesis. He extensively described operation instruments, patient positioning before operation, the procedures to be taken, complications, as well as post operation and follow up care. He also talked about "probing" as a treatment of cervical stenosis. Here are some parts of the original text on surgical treatment for gynecological anomaly.

At first he described preoperational positioning:

*"A chair is prepared for the woman next to the light, and she sits there, leaning backwards slightly. When she is seated, bind her calves to her spread-out thighs, and all these to her abdomen. Put her hands under her knees. Tighten her in this position with straps."*

Then he proceeded with the main phase:

*"If the vaginal blockage is visible, the labia of the vagina should be split from the blockage. A pad is placed on each labia while the surgeon's thumbs are protected by a cloth. The labia are stretched until they split. A thin lancet is used. The membrane with any excess flesh under it is cut away gradually until a full removal is done. Nothing must be removed from the main flesh. This is done with a sharp instrument. The difference between the membrane and the excess flesh is that the membrane does not bleed while the excess flesh does. Then, a woolen bandage soaked in oil and wine is placed between the*

21- Ghaffari et al., 2015: 173-7.

22- Mobli, 2015: 21-35.



*labia and left for three days. If needed, honeyed water can be put on it. Also, oil-soaked ointments are applied on it, but care should be taken that the wound does not close up, stick, or become narrow. This is especially when the flesh itself is cut, for the membrane rarely closes again once it is split. If the blockage is positioned deep in the vagina, it should be reached with a hooked lancet. If it is the membrane, one should make a single, oblique incision. The surgeon may cut the bladder or other areas, and when it is the flesh, then one must cut it gradually.”*

After the detailed discussion of the technique, the post-operative care comes as follows:

*“Keep the incision with a woolen pad soaked in coagulant and astringent wine. After that, the patient sits in cooked, softening medicines. Then, it is treated with ointments applied both internally and externally, which can heal wounds. When the wound heals, one must insist on the patient having sexual intercourse.”*

Discussion on the potential complications of the suggested technique is another interesting part of his presentation. The complications may occur during child birth or just after the operation:

*“When cutting and splitting in this way, one must be careful of two things: cutting too little, and splitting too much. This is because they make conception possible after sexual intercourse, but may bring difficulties on childbirth, putting both the fetus and mother at risk of death.*

*One must also be careful not to be excessive so that the essential part of the womb be cut and become inflamed and painful, leading to tetanus, convulsions and fatal diseases. If the surgeon cuts the main flesh, incurable incontinence may result. If there is a non-stop flow of blood, the surgeon should only cut the area gradually and gently in order not to cause faint and breathlessness.”*

### **Discussion**

The development of science and the art of surgery was based on the work of scientists from various civilizations throughout the history. Pre- and post-Islamic Persian scholars made a significant contribution to this development. Among these physicians, *Avicenna* may be the best known.

Imperforate hymen was a known disease since the 1<sup>st</sup> century and was treated by surgery. *Avicenna* elaborated on the disease in a chapter of his book “*The Canon of Medicine*” and mentioned that its only treatment is surgery.

He described the phases of the surgery and post-operation care in details with a focus to possible complications during



and after the surgery. He divided the imperforate hymen surgery procedure into two types based on the depth or the visibility of hymen. In the visible type, the hymen is cut with a lancet and removed until no excess flesh remains. In the deep type, however, a hooked lancet is used to make an oblique incision in the membrane, or the flesh is cut gradually.

Nowadays, the current practice of imperforate hymen surgery is to make a stellate incision through the hymenal membrane (incision at the 2-, 4-, 8-, and 10-clock time positions) and then excise each quadrants of the hymen. After that, the mucosal margins are approximated with fine delayed-absorbable suture<sup>23</sup>.

Clearly, the only differences between the current treatment of imperforate hymen with the one explained by *Avicenna* are minor. In modern surgical practice, two oblique (instead of a single oblique) incisions are made in the hymen and then sutures other than tampons are applied to prevent the margins of the hymen to stick to each other again.

Like many other surgical procedures, *Avicenna* added multiple tips to the previous imperforated hymen surgical practice. Detailed description of preoperational positioning, potential complications and post-operative care are among these points. They all show that he not only studied and presented theories on these procedures but also worked on them in practice.

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23- Jones et al, 2015.



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