



## Cauterization in the Work of Ibn Al Qaf Masihi (1233-1286 AD)-Medical Heritage of 13<sup>th</sup> Century

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### Abstract

*Kayi* (cauterization) involves the branding of non-healing lesions or any body part with hot metals, oils, drugs or hot water. *Kayi* is prescribed in ancient Greco-Arabian medicine for treating a wide range of ailments including infections, cancers, dislocations and disorders of temperament. Ibn al-Qaf Masihi was a thirteenth century physician-surgeon who provided a comprehensive understanding into cauterization, its methodology and clinical applications. His treatise, *Kitāb al 'Umda Fī Ṣanā' t al-Jarrāḥ* contains an extensive account of operative procedures, instruments and case reports on many surgical procedures including *kayi*. According to him, *kayi* is best done in spring season if there is no emergency, iron should be preferred for cautery over gold, and treatment by *kayi* should be attempted only if medicines are ineffective and proper evacuation of morbid humors has been carried out. Masihi advised cauterization of the head, face, neck, chest, abdomen and over affected lesions comprising of a total of 44 conditions including apoplexy, sciatica, delicate structures like eye in epiphora, nose etc.

**Keywords:** *Kayi*; *Ilāj bil Yad*; *Mikwāh*; Cautery; Cauterization

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## Introduction

Ever since the inception of medicine as a system in the time of Hippocrates (460-377 BC), and even before him, there had been certain instances where medicines would entirely fall short; or the recovery would be too slow to protect the patient from harmful effects of the disease. Surgery came as the savior in these circumstances, by entirely removing the damaged part, correcting the morbid tissues, clearing infected or dead tissue etc. Although advised to be employed as the last resort, *'Ilāj bil Yad* (surgery) is of invaluable significance in the practice of medicine [1]. Primitive surgical processes involved trephining of skulls, arterial bleeding, branding with metals etc, which may appear improvising to the inexperienced reader, but a careful critical observation reveals the clear understanding and rational explanations in some of the surgical processes considered a challenge even in the modern world. Not surprisingly, the ancient physicians and surgeons were able to treat war injuries including artillery and gun-metal wounds; corrected fractures and congenital deformities and even record these as case reports and chapters, all by 1500 BC; hence it was not in vain. In the later years, more sophisticated surgeries such as operations on eyes, brain and spine were also carried out [2]. *Kayi*, or cauterization is perhaps the most intriguing of all surgical treatments, which, in its primitive form, often incites a bit of consternation for the nature of its application; especially to the modern reader. *Kayi* is widely prescribed in classical Greco-Arabian

literature and involves the branding of morbid organs or tissues with hot metals, oils, or corrosive drugs to burn out parts of tissues, skin or entire organs with an instrument known as *mikwāh* (cautery) [3]. *Kayi* is said to be the best method for correcting *faṣād-i-mizāj* (abnormality of temperament) in cases where the temperament is predominantly *bārid* (cold) and is not corrected with medicines. It can be used for removing morbid humors and can prevent the spread of sepsis. If disease-causing humors are in excess, it helps in desiccation and protects healthy organs, also *kayi* is the best treatment for removal of dead or gangrenous tissue, malignant tumors and control of haemorrhage, especially arterial in origin [4]. *Kayi* was employed in a wide range of diseases from head to toe, and practiced by most renowned scholars of Greco-Arabian medicine like Ibn Sina (Avicenna, 980-1035 AD), Ibn Rushd (Averroes, died 1198), Razi (Rhazes, 865–925 AD), Ibn al-Qaf Masihi (1233-1286 AD), Abul Qasim Al-Zahrawi (Abulcasis, 936-1013 AD) and many more [3]. In this review we present comprehensive overview of the concept and science of cauterization in Masihi's famous doctrine, *Kitāb al 'Umda Fī Ṣanā'at al-Jarrāh*.

## Ibn al-Qaf Masihi and his contributions

Ibn al-Qaf, whose original name was Amīn-ad-Daula Abu-'l-Farağ ibn Ya'qūb ibn Ishāq Ibn al-Quff al-*Karaki*, was an Arab physician born in 1233 AD in Jordan, known as Al-Karak in that period, symbolized by the suffix '*karaki*' in his name. Christian by religion, he is famously known as Ibn al-Qaf Masihi

(Masihi is the Arabic term for Messiah, meaning Christ). He was one of the rare scholars who made a mark in both surgery and medicine, worked as the royal physician and surgeon in both Jordan and Damascus; and also authored several books on medicine [5]. His most famous work is *Kitāb al 'Umda Fī Ṣanā't al-Jarrāh*, a treatise on surgery which contains twenty chapters, each with several sections. The theoretical and practical aspects of various surgeries, general surgery, surgical instruments, methods of placing incisions, and types of surgical dressings, reduction of fractured and dislocated bones, swellings and malignant growths have been described in extensive detail. About the book, one of his teachers Ibn Abi Usaiba mentioned in his own famous treatise, 'this book contains every information that a surgeon may need, and no other book is required after this [6]. The chapter on cauterization in the book is divided into six sections, the first one deals with the general aspects of *kayi*, and the subsequent chapters summarize the clinical applications of the procedure. The most important contribution of this book towards cauterization and surgery as a whole is that it deals with the practical application of the procedure, and is derived extensively from the author's own experiences. The book is translated into Urdu and published by the name of *Kitāb al 'Umda Fil Jarāhat* by Central Council for Research in Unani Medicine, an apex body of Research in Unani Medicine under Ministry of AYUSH, Govt. of India [7]. Intriguingly, perhaps owing to the risky nature

of treatment and its intense effects, *kayi* was advised with caution, often as a last resort in certain diseases. According to Masihi, *kayi* may be done only if two conditions are fulfilled, (i) it is ascertained that complete *tanqiya* (evacuation) has been carried out and (ii) drugs have proved ineffective. Clinically, *kayi* may be (i) essential or (ii) elective/optional. In the first situation, *kayi* may be done anytime. Conversely, if *kayi* is not essentially required immediately, then the ideal season for the procedure is spring [7]. In accordance with Zahrawi, he also stated that although gold is preferred by many scholars for cautery, but iron has certain advantages over it:

- (i) The colour of heated gold cannot be accurately used to determine if the temperature for cauterization has been reached. On the other hand, red hot iron aptly reflects the hot temperature required for cauterization.
- (ii) Gold also cools down sooner than iron, which may disrupt the procedure.
- (iii) Gold softens on heating and cannot be used to exert the required pressure for the effects to reach deeper structures. It may also bend or break under pressure.
- (iv) Unani scholars also believe that iron strengthens the membranes and organs, however there is no such effect by gold [7,8].

### **Clinical applications of *kayi* (cauterization) in *Kitāb al 'Umda Fī Ṣanā't al-Jarrāh***

The clinical applications of *kayi* as described by Masihi are summarized in the table 1.

**Table1:** Clinical applications of kayi described by Ibn al-Qaf Masihi

Case No.	Disease/ Condition	Method of cauterization
<i>Kayi</i> on the head – may be done in nine conditions:		
1.	If <i>raḡūbat</i> and <i>barūdat</i> (cold and wet temperament) persist for a long time in the head and respiratory manifestations such as catarrh start appearing, also associated with symptoms like toothache, hypersomnia and <i>ṣudā'-i-bārid</i> (headache due to cold temperament) etc, then <i>kayi</i> is recommended.	<i>Iṣlāh-i-ghiza</i> (correction of diet) should be done, alongwith <i>munḍij and mus-hil</i> (concoctive and purgative) therapy to maximum possible extent. Purgative pills and <i>Ayārij</i> may also be used. If these are ineffective, then <i>kayi</i> is done.  First, shave the head of the patient and keep him sitting cross-legged with hands kept on the chest. Then, to pin-point the exact site of <i>kayi</i> , keep your wrist over the root of his nose and flatten your hand over it. The point where your middle finger ends is the point where <i>kayi</i> is to be done. Mark this spot with suitable ink. Then heat the rod which is to be used. Zahrawi has recommended the <i>Mikwāh zaytūniyah</i> (Olivary Cautery) made of iron for this <i>kayi</i> . According to Majusi, this rod is shaped like the seed of fruit of olive.  After cautery, cover the wound for three days with cotton dipped in saline water; after that, dressing should be done with cotton dipped in <i>ghee</i> (clarified butter) till the scab is cleared. Then apply <i>mulḥim</i> (cicatrizant) ointments [7].
2.	<i>Shaqīqah muzmin</i> (chronic migraine) which is not relieved by diet correction, purgatives, <i>naṭūl</i> (irrigation therapy) may be treated with <i>kayi</i> .	First <i>tanqiya-i-dimāgh</i> (excretion of morbid humors from brain) should be done, then shave the hair on temples and heat the <i>mikwāh sakkīniyya</i> (edged cautery) till it is white hot and place on the area. Care should be taken not to affect the muscles, arteries and motor nerves in the area.  If the pain is not relieved after the first session, the <i>kayi</i> should be done again on the centre of scalp, till the underlying bone is visible.
3.	<i>Sakta</i> (Apoplexy) which is not relieved by purgatives and gargles. <i>Kayi</i> should be done only after it is ascertained that the morbid humors have been expelled completely.	After shaving the head, <i>kayi</i> should be done with <i>mikwāh sakkīniyya</i> (edged cautery) on four sides of the scalp and on one point in the centre, till the underlying bones are exposed.
4.	If <i>Sakta</i> (Apoplexy) remains after <i>taqiya-i-badan</i> (expulsion of morbidities from the body) and <i>tanqiya-i-dimāgh</i> (expulsion of morbidities from the brain), then <i>kayi</i> is prescribed.	First shave the head, then cauterize the head at three points on each frontal prominence. The wound is dressed as described above.
5.	<i>Ṣara'</i> (Epilepsy)- If epilepsy is caused due to <i>balgham</i> (phlegmatic humor) and not relieved by medicines, then <i>kayi</i> may be employed.	First shave the head, and cauterize on the occiput and both frontal prominences with olivary cautery is prescribed.
6.	Melancholia-which is caused by <i>balgham</i> (phlegmatic humor) and not relieved by medicines.	Cauterization should be done on the centre of scalp and both frontal prominences with olivary or edged cautery.  If melancholia is caused due to <i>sawda</i> (black bile), make a loaf with flour dough which is about one finger thick and stick it over the head. Then heat <i>ghee</i> (clarified butter) to a temperature tolerable to skin, and insert it into the dough. It is kept in place till the <i>ghee</i> solidifies. Then wash it in <i>ḥammām</i> (tukish bath) with decoction of <i>khaṭmī</i> ( <i>Althaea officinalis</i> Linn., decoction of seed) and barley flour with scrubbing action.

7.	Epiphora	If not treated with medicines, then cauterize the temples and centre of head with olivary cautery. The temples should be cauterized in horizontal direction, and care should be taken to prevent haemorrhage.
8.	Cataract (in initial stage)	After dietary correction and <i>mundij-mushil</i> (concoctive-purgative) therapy, <i>mun-aqqi-i-dimāgh</i> (brain cleansing) drug should be given. Then <i>kayi</i> should be done as described under epiphora.
9.	Leprosy-caused by <i>balgham</i> (phlegmatic humor) which has converted to <i>sawda</i> (black bile), or if <i>sawda</i> itself is the causative factor; is best treated by <i>kayi</i> .	After proper <i>tanqiya</i> (expulsion of morbid humors), <i>kayi</i> is done on five points on the head-one on the centre of scalp, second on the frontal area at the hairline, two on both frontal prominences and one on the occiput. <i>Kayi</i> should be deep enough to expose the bones. Additionally, <i>kayi</i> is also advisable on the spleen (one point), nose-tip, both cheeks, two points on dorsal vertebra, both knees, shoulders, elbows, both sides of chest, epigastrium and pelvis. It is suggested that cauterization may be done on each joint of the body.
<i>Kayi</i> on the face - may be done in four conditions:		
10.	<i>Natn al-anaf</i> (Ozena)	Ozena is usually not relieved by <i>istifrāgh</i> (excretion of morbid humors). In such cases, <i>kayi</i> should be done on both <i>hājib</i> (eyebrows), near the scalp hair with olivary cautery.
11.	Otalgia caused by cold exposure. It may be <i>sādah</i> (without involvement of humors) or <i>māddī</i> (associated with humoral excess)	<i>Kayi</i> may be done with cautery named <i>Nuqtah</i> (punctuate cautery) around the ear [7]. Some authors have recommended that <i>kayi</i> should be done on ten points around the ear [8].
12.	<i>Laqwah istirkhāt</i> (Deviation of face due to flaccidity of the facial muscles)	If medicines are ineffective, <i>kayi</i> is done with edged cautery which is bent at the leading edge. <i>Kayi</i> should be done on three points on the affected side-above the ear near the hairline, below the ear and at the angle of the mouth.
13.	Cracked/ Dry lips	A small edged cautery should be heated and touched on the affected area momentarily.
<i>Kayi</i> on the mouth and neck – may be done in four conditions:		
14.	Sinus/ Fistula in mouth	<i>Kayi</i> is necessary if medicines have proved ineffective. Cauterization should be done with a cautery suitable to the width and depth of the fistula. Then cauterize two or three times over the affected area.
15.	Loosening of teeth	The cautery should be placed inside a hollow metal tube or catheter and cauterize the affected gum. Afterwards, mouthwash should be advised with saline water. This cures <i>istirkhā-e-litha</i> (laxity of gums).
16.	<i>Khanāzīr</i> (scrofula)	For long standing scrofula, <i>kayi</i> should be done with olivary cautery. The cautery should be heated and pressed till it affects upto the depth of the swelling. Afterwards, leave it undressed for three days following which it should be dressed with cotton dipped in <i>ghēe</i> to clear the burnt tissues. Later on, dressing is done with <i>mulhim</i> (cicatrizant) ointments.
17.	Hoarseness of voice or bronchial asthma	If these are caused due to <i>ghalīz</i> (viscid) humors, then cauterization should be done with <i>mikwāh mismāriyah</i> (nail/ boat shaped cautery) near the nostrils upto half of the depth of skin. Then cauterize on the lowest part of cervical vertebra. Then pour salt water over the area.
<i>Kayi</i> on the chest and abdomen – may be done in thirteen conditions:		
18.	<i>Su'āl muzmin</i> (chronic cough)-caused by collection of <i>balghami</i> (phlegmatic) fluids in the lungs	<i>Kayi</i> should be done with <i>mikwāh mismāriyah</i> in the supra-clavicular fossa and at one point at the mid of line joining the nipples.

19.	<i>Shūṣa</i> (pleurodynia)	A finger-long root of <i>zarāwand ṭawīl</i> ( <i>Aristolochia rotunda</i> ) is taken and dipped in olive oil. Then it is burnt and the fire extinguished. <i>Kayi</i> is done with this hot root on: <ul style="list-style-type: none"> <li>a) Inner ends of both clavicles</li> <li>b) Lateral to both jugular veins</li> <li>c) Lateral aspect of chest in the 5th inter-costal space.</li> <li>d) In the centre of anterior chest wall</li> <li>e) Epigastrium</li> <li>f) Interscapular region</li> <li>g) Both infra-scapular region</li> </ul> All these cauterizations should be superficial and limited upto the skin.
20.	<i>Inkhīla</i> '-i- ' <i>Aḍud</i> (Dislocation of humerus)	If it is caused due to <i>raṭūbāt-i-muzliqa</i> (humors which cause gliding/ slipping), the dislocation reoccurs with moderate activity.  After reduction of the joint, ask the patient to lie down in prone position or over the healthy side. Then pinch the skin over the affected shoulder and cauterize with <i>mikwāh dāt al ṣafūdayn</i> (two-pronged cautery) till it penetrates the raised skin. Then the joint should be immobilized.
21.	<i>Barūdat and raṭūbat</i> (cold and moist temperament) of stomach	If medicines are ineffective, then cauterize with <i>Mikwāh mismāriyah</i> below epigastrium, both lumbar regions (so that the three points make a triangle) and at umbilical region.
22.	<i>Barūdat and raṭūbat</i> of liver	Place the patient in supine position. Cauterize with <i>mikwāh sakkīniyya</i> and cauterize on the <i>sharāsīf</i> (epigastrium), mid point on the line joining epigastrium and elbow and at the point where elbow touches the abdomen, in that order. The cauterization should not affect the abdominal viscera.
23.	<i>Istisqā-i-zīqqī</i> (ascites)	<i>Kayi</i> should be done with <i>Mikwāh mismāriyah</i> at four points around the nose, one on the epigastrium and one on the back at the opposite of this point. The cautery should affect upto the skin, after the procedure, the wound should be left open.
24.	<i>Riyāḥ-i-ghalīd</i> (dense/ un-excreted gaseous morbidities) in spleen	Heat <i>mikwāh sakkīniyya</i> till it is red hot. Then place the patient in supine position and cauterize on 3-4 points on the spleen. The cauterization should not be deep.
25.	Chronic diarrhoea	If it is caused by <i>barūdat and raṭūbat</i> (cold and moist temperament), then cauterize over the epigastrium in round shape. Then cauterize on 4 points around the umbilicus, if the collected humors are excessive, then place two more cauterizations on the lumbar region.
26.	<i>Barūdat</i> (cold temperament) of kidneys	Cauterize with <i>Mikwāh mismāriyah</i> over both lumbar areas.
27.	<i>Istirkhā</i> (atonicity) of bladder	Cauterize with <i>Mikwāh mismāriyah</i> at the lowest part of stomach above pelvic region, both sides lateral to umbilicus and one on the lower back.
28.	<i>Su-i-Mizāj Bārid raṭab</i> (abnormal cold and moist temperament) of uterus	Cauterization should be done similar to <i>Istirkhā</i> of bladder
29.	<i>Fatq</i> (Hernia)	The patient should be kept empty stomach for one day and laxatives should be given to clear the intestines. Then place him in supine position and cauterize with a circular cautery over the area so that the burn reaches the third layer of skin. Movements should be restricted for forty days; also, heavy diet, hectic activity etc should also be not allowed.



30.	Fistula-in-ano	First clear the fistula of pus etc, then heat the cautery and insert upto the end of the fistula, so that the damages tissues surrounding it are destroyed.
Miscellaneous-There are fourteen other conditions where <i>kayi</i> may be prescribed:		
31.	<i>Sarṭān</i> (cancer)	First <i>tanqiya</i> (expulsion of morbid humors) should be done. Then cauterize all around the circumference of cancer with a circular cautery. The cauterization should be deep enough to affect to the root of the lesion. Some scholars have also prescribed <i>kayi</i> on the centre of the growth.
32.	<i>Baraṣ</i> (leukoderma)	Complete <i>tanqiya</i> should be done before <i>kayi</i> . Then cauterize all over the lesion upto the whole depth of skin. After that, dressing should be continued with a flax fiber (linen) dipped in a mixture of <i>ārad-i-masūr</i> ( <i>Lens culinaris flour</i> ), <i>Roghan-i-gul</i> ( <i>Rosa damascena</i> oil), <i>barg-i-bārtang</i> ( <i>Plantago major</i> leaf), pigeon blood and bat blood (in equal quantities) till recovery.
33.	<i>Khadar</i> (numbness)	<i>Kayi</i> should be done over whole of the affected area. In this case, <i>kayi</i> is used as a means of <i>tanqiya</i> .
34.	<i>Ākilah</i> (cancrum, corroding ulcer)	<i>Kayi</i> should be done with a small <i>mikwāh mismāriyah</i> around the cancrum, till all the affected area is cleared. The wound should be left for three days. Thereafter, apply powdered sulphur mixed in olive oil. Later, apply <i>munbit-i-laḥm</i> (cicatrizant) ointments.
35.	<i>Dubailah</i> (cold abscess)	<i>Kayi</i> helps in maturing of a cold abscess. After <i>tanqiya</i> , cauterize on two points beside the abscess, and leave the wounds undressed.
36.	<i>Tha'īl</i> (warts)	After <i>tanqiya</i> , cauterize with a spike-shaped cautery into the depth of the wart till it comes out.  Another method prescribed for cauterization of warts is with hot water. For thi purpose, encircle the wart with a metal catheter and press hard till it penetrates the surrounding skin. Then fill the catheter with hot water and leave for a few hours till the wart comes out.
37.	<i>Nazf-ul-dam shiryānī</i> (Arterial haemorrhage)	For controlling arterial haemorrhage, press the artery with the index finger and then insert an olivary cautery into the artery at the cut end. The size of cautery should be compatible with the lumen of the artery. Keep it in place for about an hour till the ends are burnt and adhered.
38.	Chills due to <i>ḥumma-i-ruba'</i> (quartan fever)	In this condition, <i>kayi</i> should be done with olivary cautery on all lumbar vertebrae and one point each on chest and epigastrium.
39.	<i>Buthūr balghamī</i> (pustules with phlegmatic predominance)	If these are not relieved with medicines, then cauterize each pustule lightly. <i>Zarāwand</i> root may also be used for cauterization as in S. No. 19.
40.	<i>Ḥadaba</i> (kyphosis)	<i>Kayi</i> is effective in initial stage of the disease. After <i>tanqiya</i> , a circular cautery which is as wide as the vertebra is taken and cauterization is done over the affected area.
41.	Coxalgia due to <i>balghamī</i> (phlegmatic) humors, in case there is a chance of dislocation	Take a circular cautery of the size of <i>ḥuqq-al warik</i> (acetabulum) and cauterize so that it affects up to the depth of the joint. Alternatively, cauterization may be done on four points around the acetabulum.
42.	Low backache due to trauma or <i>balghamī</i> wastes	After complete <i>tanqiya</i> , place longitudinal cauterizations on three sites over the affected area with <i>mikwāh mismāriyah</i> .

43.	<i>Niqras</i> (gout)	First <i>tanqiya</i> should be done, then cauterize all around the affected joint with olivary cautery.
44.	Sciatica	<p>This may be done in four ways:</p> <ul style="list-style-type: none"> <li>• If the pain is not referred to lower extremities, then cauterization should be done over lumbar vertebra</li> <li>• <i>Kayi</i> is also recommended at three sites—first below the acetabulum, second over the knee and third above the lateral malleolus in the regions where musculature is present.</li> <li>• A special type of cautery is described for this purpose. The cautery consists of two concentric spheres, the outer one of which has a diameter of about half palm-span, and the inner one is separated by about a thumb-length. Both the spheres should be attached to each other and have vents to let out gases etc. <i>kayi</i> should be done with this cautery over the acetabulum and left for three days, after which ghee is applied to the wound. It should be kept open so that the morbid matter is expelled through suppuration. Then apply cicatrizants.</li> <li>• Cauterization may also be done with hot water. For this purpose, a specially designed vessel having two concentric circular bowls attached to each other is placed on the acetabulum and pressed hard. Then fill it with hot water till the area is scalded. Then remove the vessels and wash with plain water (not cold) and apply old stored <i>ghee</i>. This will create a wound which helps to expel the morbid matter [7].</li> </ul>

## Conclusion

Dynamism is the very essence of any science, most importantly in the subject of medicine; because developments in medicine lead to a better health, which is necessary for thriving in all other fields. The art and science of *kayi* has also undergone tremendous changes ever since its inception. Nonetheless, the ancient physicians deserve to be credited for every progress made hence; as the conceptualization and fabrication has indeed paved the way for recent researches. The study of cauterization reveals a fascinating account of how a simple branding by a hot metal could be used as an effective cure in a wide range of ailments. Although not widely employed in contemporary medicine with the same concepts, the humble cautery still remains an important mode of treatment in some disorders like warts, where

other treatments are usually in-effective; and as the rescuer in surgical processes to control haemorrhages. Advances in physics have led to development of more sophisticated instruments like galvanocautery which permits precise and easy application. With sophisticated treatments and medications available in the recent times, the need for hot-metal branding rarely arises. Still, the fact remains that the medicine of today has developed within the lines prescribed by ancient physicians, and many of the prescribed treatments continue to provide healthy living even in the present era.

## Conflicts of Interest

None.

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