

Zeitschrift: Acta Tropica
Herausgeber: Schweizerisches Tropeninstitut (Basel)
Band: 29 (1972)
Heft: 3

Artikel: Haematuria parasitaria and urinary calculi : early indications from Africa
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DOI: <https://doi.org/10.5169/seals-311799>

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Haematuria Parasitaria and Urinary Calculi Early Indications from Africa

REINHARD HOEPLI *

Haematuria parasitaria, due to infection with *Schistosoma haematobium* was well known since antiquity in Africa, especially in Egypt, and also occurred in Mesopotamia. Early indications are given in the following.

S. haematobium favours the formation of urinary calculi as observed especially in Lower Egypt. Evidently other factors likewise play a rôle, as for example in Upper Egypt and in South Africa where *S. haematobium* also occurs, urinary calculi are more rare.

In the second part of this paper urolithiasis, in as far as it is connected with *S. haematobium* infection, is briefly discussed.

Early indications of haematuria

Papyri

Prescriptions for treatment of haematuria are given in several papyri, for example in No. 49 of the Ebers papyrus, in prescription No. 165 of the papyrus No. 3038 of Berlin, furthermore in Nos. 187 and 188 of the same papyrus and possibly in No. 38 of the London medical papyrus (British Museum No. 10059). The last one does not mention blood but is included in a small series of prescriptions against bleeding.

Notes on papyri

The medical papyri so far known date from the 12th to the 20th dynasty, ca. 2000–1090 B.C. We give some details about those papyri mentioned in the present study:

The Ebers papyrus was written at about 1550 B.C.; the Hearst medical papyrus is slightly younger, it contains many duplications of prescriptions mentioned in the Ebers papyrus. The Berlin medical papyrus No. 3038 goes back to ca. 1300 B.C. The London medical papyrus (British Museum No. 10059) was written at ca. 1350 B.C.

* The author wishes to thank Prof. Dr. R. Geigy, Director of the Swiss Tropical Institute for his permission to use the library of the Institute for the present study. He also thanks Mrs. B. Begelsbacher-Fischer und Mr. Giulio Cemin in Basle for their help and valuable suggestions.

These papyri are in parts derived from very much older sources (for details see GRAPOW 1955).

Schistosoma eggs in mummies

The cause of haematuria was evidently *Schistosoma haematobium* infection which existed in ancient Egypt as proved by Sir Armand RUFFER in 1910. He found in two mummies of the twentieth dynasty (1200–1090 B.C.) a large number of calcified eggs of *Schistosoma haematobium* situated for the most part among the straight tubules of the kidneys.

$\bar{a} \ A \ \bar{a}$

$\bar{a} \ a \ \bar{a}$ is mentioned 50 times in four papyri: 28 times in p. Ebers, 12 times in p. Berlin, 9 times in p. Hearst and once in the London papyrus.

There is not yet a general agreement whether $\bar{a} \ a \ \bar{a}$ with haematuria as characteristic symptom was simply *Schistosoma haematobium* infection as JONCKHEERE 1944 and others assumed, or whether it represented a parasitic disease due to various helminths as GHALIOUNGUI 1963 believes. The latter author mentions two important objections to the simple identification of $\bar{a} \ a \ \bar{a}$ with schistosomiasis: In the first place the absence of any reference to haematuria in the 50 prescriptions that mention $\bar{a} \ a \ \bar{a}$; in the second place it is to be doubted that Egyptians performed autopsies sufficiently detailed to discover *Schistosoma haematobium*.

If the verminous origin of $\bar{a} \ a \ \bar{a}$ according to GHALIOUNGUI is accepted, patients might have been affected not only with schistosomiasis but also with infection by ancylostoma, ascaris, enterobius and tapeworms which would be easily seen and to which the disease might be attributed.

Haematuria known besides in Egypt also in Assyria and Babylonia

Haematuria was well known in Egypt and also in Mesopotamia where *S. haematobium* likewise occurred. An Assyrian Kudurru, a boundary stone, kept in the Louvre is inscribed with a curse which threatens with haematuria those who move the stone (STICKER, 1929; CONTENAU, 1938).

Reports on haematuria from the conquest of the Arabs to modern times

Giovanni di Carignano, mentioned in documents of 1311 and 1314, gave in his Genuese planisphere a narration of the crossing of the

Sahara from Sidjilmassa to Oualata by Berbers. He obtained his information from a Genoese merchant who lived in Sidjilmassa. The Berbers transported goods and silver by camel caravans. The voyage lasted 40 days and during this time they could not have any food or water, except what they carried with them on their camels. Sometimes the heat was so great, when the sun was in the Zenith, that they discharged urine with blood (CHARLES DE LA RONCIÈRE, vol. I, p. 113, 1925).

Haematuria is mentioned by a number of writers. There are reports by Arabic authors and by physicians who were employed in Portuguese settlements on the African coast in the sixteenth and seventeenth centuries which mention discharge of blood in the urine.

During the invasion of Egypt by Napoleon I, haematuria was frequently observed among the French troops (RENOULT, 1808). It was supposedly caused by 'excessive faulty' perspiration in the hot climate of Egypt (compare the just mentioned statements by DE LA RONCIÈRE). The causative organism, *S. haematobium* was not yet known at that time. It is somewhat surprising that LARREY, the famous Chief of the Army Medical Service of Napoleon I, does not mention the frequent haematuria of the French troops in his great work (1812–1817).

Toward the middle of the nineteenth century, PRUNER, 1849, and GRIESINGER, 1854, who were teaching medicine in Cairo, mentioned haematuria. BILHARZ, in 1851, discovered *Schistosoma haematobium*.

Haematuria in African Folklore – Examples from Sierra Leone

In the central part of Sierra Leone, the Kpa Mende area, old people call haematuria (due to schistosomiasis) 'red gonorrhoea'. People believe that haematuria is transmitted to males and females by evil spirits whenever people take a bath outside their house at night or bathe in streams and rivers during day-time. These evil spirits supposedly hate to see naked people and punish them by giving them 'red gonorrhoea'.

In the eastern part of Sierra Leone, in the Kono area, people believe that they get haematuria from their streams and rivers, the water having been poisoned by witch doctors.

Another opinion, prevalent in the Temne area, the northern part of the country, is that 'red gonorrhoea' is produced when the water of infected streams enters the male and female sexual organs. To prevent the disease they apply a 'T' shaped country cloth as a bandage. There is the belief that people suffering from 'red gonorrhoea' contaminate the water.

Haematuria regarded as male menstruation

Haematuria was apparently familiar to the fellaheen in Egypt for a very long time. It started usually with their boys at the time of puberty and in consequence was regarded as male menstruation indicating sexual maturity.

Covers of the penis – Karnata, Condom

Covers of the penis, especially of the glans, were widely used in various parts of Africa for different purposes from ancient times. In Egyptian inscriptions the name 'Karnata' is used for penis covers.

'Condom', according to RICHTER, 1911, has a Persian origin. It has to be added that some authors do not agree with Richter's explanation.

STÉPHEN-CHAUVET, 1936, gives illustrations of covers of the penis in different shape from Togo, from the Zulus and from the Bassari of former French Guinea. He also reproduces prehistoric wall paintings from Southern Rhodesia and from Tassali des Ajjers (Sahara) showing protective covers of the penis in different shape. Penis covers 'Karnata' were used by the ancient Egyptians already at very early periods. Some of the Egyptian Karnata were of considerable size, possibly as protection in war (see illustration 1).

NAVILLE, 1900, illustrates a small statue with Karnata of basalt or porphyry, about 6,000 years old, and gives pictures of people with Karnata, dating from the nineteenth dynasty. QUIBELL, 1898, illustrates an ivory statuette of a prisoner with a cover of the penis.

PFISTER, 1913^a, pointed out that G. MASPERO in his History of Egyptian Art (G. MASPERO, *Ägyptische Kunstgeschichte*, übers. von STEINDORFF, 1899) shows on a column in the temple of Denderah a representation (four times) of the God Bes with a cover of the penis somewhat similar to a modern condom. In this special case the purpose of the cover is not evident, but one may assume that it should give protection against haematuria.

BLANCHARD, 1904, reported that the Zulus of Rhodesia believe that haematuria was caused by some animal which enters the urethra while the person was in infected water. Therefore, before going into the water, they applied a ligature around the penis or used a kind of protective cover made of fine grass fibers (illustration in BLANCHARD's publication).

As mentioned before, penis covers in different shape were used in different parts of the world for various purposes. Indians in the Amazon basin of Brazil, for example, use penis covers against the Candirú. 'Candirú' is the collective name given to certain small catfishes of the Amazon river and its tributaries which have the habit of entering the urethra of man and the vulva of woman bathers, particularly if they micturate while in the water (GUDGER, 1930; HOEPPLI, 1933).

Impotentia praecox

PETRIE, 1903, from Zanzibar and PFISTER, 1911, from Cairo mention a surprisingly high percentage of impotentia praecox in cases of haematuria parasitaria.



Fig. 1. Human figure with Karnata, ivory, pre-dynastic. From: J. E. QUIBELL 'Hieraconpolis', Part I, pl. VIII, No. 3. London 1900.

Impotentia virilis in young men with schistosomiasis may be caused by various ways, for example following changes at the colliculus seminalis, at the pars prostatica urethrae and by prostatitis. One has furthermore to consider the occasional changes of the penis with resulting mechanical impotence.

Urinary calculi

General remarks

Urinary calculi may have very different causes. In our present study we concentrate on urolithiasis in connection with schistosomiasis.

Schistosoma haematobium infection favours the formation of urinary calculi, which may become an additional cause of haematuria. PFISTER, 1911, found *Schistosoma* eggs in the urine in 80–85% of patients with urolithiasis. As pointed out by several authors, the formation of urinary calculi in schistosomiasis is due to inflammation and other pathological processes in the bladder-wall and occasionally in the ureters and the kidneys. As a rule they are not simply formed around eggs, although eggs have been observed in a number of stones.

So far one could not satisfactorily explain why urinary calculi are comparatively very frequent in Lower Egypt but more rare in Upper Egypt and South Africa where schistosomiasis likewise occurs¹.

The frequency of urinary calculi varies in different races. They are very rare in negroes (PRUNER, 1847; GELFAND, 1961). BURROWS, 1910, found among hospital patients in Sierra Leone only three cases within ten years.

A useful bibliography of Egyptian urolithiasis has been compiled by PFISTER, 1913^b, pp. 362–370.

We give a few examples of reports on urolithiasis and authors mainly from Africa.

Reports on early urinary calculi from Egypt

ELLIOT SMITH, 1905, found among bones of a skeleton a large vesical stone about 7,000 years old in Al-Amrah in Upper Egypt. It was described in detail by SHATTOCK, 1905.

SHATTOCK, 1905, described furthermore four renal stones from a skeleton of the 2nd dynasty.

RUFFER, 1921, described three vesical calculi from a predynastic skeleton.

¹ A possible explanation may be found in the comparatively smaller number of negroes in the population of Lower Egypt.

Greek and Roman authors

Hippocrates and Galen knew stones of the urinary bladder. CELSUS, who lived in the reign of Tiberius, gave in the seventh book of his 'De medicina' a description of lateral lithotomy. Meges of Sidon, ca. 25 B.C., used a special knife and applied a semilunar incision. He practised in Rome. Ammonius of Alexandria 3rd century B.C. was called 'Lithotomos', as he was the first to break up stones in the bladder.

Persian and Arabic writers

After the muslim conquest of the Near East, North Africa and Spain, Persian and Arabic physicians developed further treatment of urinary lithiasis.

Besides outstanding famous authors, some of whom are mentioned below, there were during the medieval time and even until fairly recently numerous professional 'stone cutters', 'Steinschneider' in Europe, North Africa, Egypt, Arabia, Syria, Persia and India.

Famous Persian and Arabic authors who were dealing with lithotomy

Note

The sections in the work of the authors quoted in the following dealing with lithotomy and lithotripsy have been translated into French with the original Arabic text by P. DE KONING, 1886 and 1903 (see bibliography).

Rhazes – Abu Bakr Muhammad Ibn Zakariya al Razi, a Persian, died 923–24.

His main work is al Hawi = Continens (Continens of Medicine). His smaller likewise famous work is Kitab al tib Almansuri. Liber medicinalis ad Almansorum. Urolithiasis and Lithotomy are described in detail in the 23rd book of the Continens.

Ali Abbas (Haly Abbas) Ali ibn Abbas al Majusi, a Persian, died 994–95.

His main work is: al Maliki = Liber regius.

Avicenna Abû Alî al Husayn ibn Abdallâh ibn Sina, a Persian, 980–1037.

His main work is: El Kanun, Fi't – tib = Canon medicinalis.

Abulcasis or Abul-Qasim, Alshahravius, Arab born near Cordova, died ca. 1013.

The most important of Arabic surgical writers.

His main work is: *al Tasrif*. The surgical section has interesting illustrations. He used for women operation through the vagina. Lithotripsy is described in the medical part of *al Tasrif*.

Extraction of urinary calculi without incision of the bladder
Description by Prospero Alpini

The usual method of removing stones from the urinary bladder was by median or lateral incision through the perineum. A method used by Arabic physicians without incision was described by Prospero ALPINI (1553–1617) from Egypt (ALPINI 1591).

Prospero ALPINI went to Cairo with the Venetian consul Giorgio Emo in 1580 and remained with him in Cairo for three years (ONGARO, 1963). He was interested besides in medicine and botany also in the general cultural aspects of the Egyptians. After his return to Italy he published: *De Medicina Aegyptiorum*, *De Plantis Aegypti* and *Rerum Aegyptiarum libri IV*.

The extraction of urinary calculi by the Aegyptian physicians is described in *De Medicina Aegyptiorum*, liber tertius, cap. XIV, 1591. The technique consisted essentially in a very considerable dilatation of the urethra.

One of the two methods described by ALPINI is in brief as follows: One uses several bougies of different size made of an elastic cartilaginous material. First the bougie with the smallest diameter is introduced into the urethra until it has reached the collum vesicae. Then by blowing into the bougie, it is dilated as much as possible and a larger one is introduced and likewise blown to a maximum diameter; a third and eventually a fourth still larger one may be added in the same way. The patient is placed in a convenient position and by introducing a finger into his anus, the stone is pushed towards the collum vesicae and into the internal opening of the largest bougie. Then by releasing the compressed air, the bougies retract, and when removed carry the stone with them. If it is a soft stone, it is occasionally broken. Stones of even the size of an olive could be removed by experts in this way.

Addendum

In the Hippocratic Oath it is stated that physicians should not cut persons labouring under the stone, but should have this to be done by men who are practitioners in this work.

In the present study we have dealt with authors and lithotomy only in connection with schistosomiasis in Africa.

We like to add that in the *Sushruta Samhita* (ca. A.D. 500) a method of lithotomy by incision of the bladder has been described in great detail.

PROSPERI
ALPINI
DE MEDICINA AEGYPTIORVM,
LIBRI QVATVOR.

IN QVIBVS MVLTA CVM DE VARIO
mittendi sanguinis vfu per venas, arterias, cucurbitulas, ac scari-
ficationes nostris inusitatas, deq; inustionibus, & alijs chyrgi-
cis operationibus, tum de quamplurimis medicamentis apud
Aegyptios frequentioribus, elucescunt.

*QVAE CVM PRISCIS MEDICIS DOCTISSIMIS,
olim notissima, ac peruulgatissima essent, nunc ingenti artis medicae
iactura à nostris desiderantur.*

AD ILLVSTRISSIMVM ET SAPIENTISS.
Senatorem ANTONIVM MAVROCENVM, Supre-
mum VENETAE Reipub. Consiliarium.



VENETIIS, M D XCI.

Apud Franciscum de Franciscis Senensem.

Fig. 2. Title page of 'De Medicina Aegyptiorum' by FROSPERO ALPINI. First edition, Venice 1591.

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Summary

Haematuria parasitaria, a characteristic symptom of *Schistosoma haematobium* infection, was well known in antiquity in Mesopotamia and Egypt, as it is mentioned on an Assyrian Kudurru, a boundary stone and in several Egyptian medical papyri.

As the causative organism of the disease, *S. haematobium* was only discovered in 1851, there were no correct ideas about the infection and no prophylactic measures could be applied.

Due to the erroneous assumption that the causative agent of haematuria entered through the external opening of the urethra, covers of the glans penis were used since ancient times as a protective measure.

Covers of the penis were applied not only in Africa but also in other parts of the world for various purposes for example in the Amazone region of Brazil as protection against the candidú.

Haematuria played a rôle in African folklore and led the Egyptian fellaheen to the erroneous conclusion that the discharge of blood in the urine of their boys at the time of puberty was a kind of male menstruation which indicated sexual maturity.

The formation of urinary calculi was favoured by *Schistosoma haematobium* infection and added to haematuria. Other factors besides schistosomiasis evidently played also a rôle in the formation of urinary calculi as they were comparatively frequent in Lower Egypt but were more rare in Upper Egypt and South Africa where *S. haematobium* likewise occurs. In general urinary calculi are very rare in negroes.

In the present study early Greek, Roman, Persian and Arabic authors are mentioned in connection with lithotomy and lithotripsy.

The method of removing stones from the urinary bladder without incision which was described from Cairo by PROSPERO ALPINI (1591) is briefly outlined. It consisted essentially in a gradual great dilatation of the urethra.

Zusammenfassung

Haematuria parasitaria, ein charakteristisches Symptom der *Schistosoma haematobium*-Infektion war im Altertum in Mesopotamien und Ägypten wohlbekannt, es wird erwähnt auf einem assyrischen Grenzstein (Kudurru) und in verschiedenen ägyptischen medizinischen Papyri.

Die Ursache der Krankheit, *S. haematobium*, wurde erst 1851 entdeckt, es bestanden daher keine richtigen Vorstellungen über den Infektionsweg, und vorbeugende Maßnahmen konnten nicht angewandt werden.

Infolge der falschen Vorstellung, daß die Ursache der Haematuria auf einem Agens beruhe, das durch die äußere Öffnung der Urethra in den Körper eindringe, wurden Schutzkappen der glans penis schon seit sehr alten Zeiten als vermeintlicher Schutz verwandt.

Penisfutterale wurden nicht nur in Afrika, sondern auch in andern Weltteilen zu verschiedenen Zwecken benutzt, zum Beispiel im Gebiet des Amazonasstromes in Brasilien zum Schutz gegen Candirú.

Haematuria spielte eine Rolle in der afrikanischen Volkskunde und veranlaßte die ägyptischen Fellachen zu der irrigen Schlußfolgerung, daß die Entleerung von Blut im Harn ihrer Knaben zur Zeit der Pubertät eine männliche Menstruation darstelle, die Geschlechtsreife ankündige.

Die Bildung von Harnsteinen wurde durch *Schistosoma haematobium*-Infektion begünstigt und trug zu einer vermehrten Haematurie bei. Andere Faktoren neben Schistosomiasis spielen in der Bildung von Harnsteinen offenbar gleichfalls eine Rolle, da sie in Unterägypten verhältnismässig häufig sind, dagegen seltener in Oberägypten und Südafrika, wo *S. haematobium* gleichfalls vorkommt. Im allgemeinen sind Harnsteine bei Negern verhältnismässig sehr selten.

In der vorliegenden Arbeit werden frühe griechische, römische, persische und arabische Autoren angeführt in Verbindung mit Lithotomie und Lithotripsie.

Die Methode, Steine aus der Harnblase zu entfernen, ohne Einschnitt der Blasenwand, die von Cairo durch PROSPERO ALPINI (1591) beschrieben wurde, ist kurz dargestellt. Sie bestand im wesentlichen in einer langsamen hochgradigen Erweiterung der Harnröhre.

Résumé

Un symptôme caractéristique de l'infection par *Schistosoma haematobium*, *Haematuria parasitaria*, était bien connu dans le passé en Mésopotamie et en Egypte. Il est signalé sur une borne assyrienne (Kudurru) et sur divers papyri médicaux égyptiens.

L'agent pathogène de la maladie, *S. haematobium*, ne fut découvert qu'en 1851. Aussi, dans les anciens temps, n'avait-on aucune idée sur le mode d'infection de la maladie et par conséquent des mesures prophylactiques étaient-elles impossibles à prendre.

A la suite de fausses croyances, qui voulaient que l'agent infectieux pénétrât dans le corps par l'ouverture externe de l'urètre, les hommes utilisaient depuis très longtemps des capuchons protecteurs placés sur le gland de penis.

L'usage d'étuis péniers, dans des buts divers, était répandu non seulement en Afrique mais encore dans d'autres parties du monde, comme par exemple dans le bassin de l'Amazone au Brésil pour se protéger du Candirú.

L'hématurie jouait son rôle dans les croyances populaires. Aussi les fellahs égyptiens croyaient-ils faussement que l'apparition de sang dans les urines de leurs garçons, au moment de la puberté, représentait une menstruation masculine et annonçait la maturité sexuelle.

La formation de calculs urinaires était favorisée par la présence d'une infection à *Schistosoma haematobium*; elle entraînait une hématurie plus grande. D'autres facteurs que la Schistosomiasis jouaient vraisemblablement aussi un rôle lors de la formation de calculs urinaires, car si ce phénomène est relativement fréquent en Basse-Egypte, il est plus rare en Haute-Egypte et en Afrique du Sud où *S. haema-*

tobium existe également. En général, la formation de calculs urinaires est proportionnellement rare chez les Noirs.

Dans le présent travail, on cite les auteurs grecs, romains, perses et arabes en rapport avec la lithotomie et la lithotripie.

La méthode pour éloigner les pierres de la vessie, sans incision de la paroi, telle qu'elle fut décrite au Caire par PROSPERO ALPINI (1591), est résumée ici. Elle consiste principalement en un lent et puissant élargissement des voies urinaires.