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Contribution of Computed Tomography to the Diagnosis of Urinary Lithiasis in a West African University Hospital

Some Milckisédek Judicaël Marouruana[1*], Tankoano Aïda Ida[2], Ouedraogo Pakisba Ali[1], Tonde Kouka François Dassis[1], Kindo Bassirou[1], Zanga Soré Moussa[3], Ouedraogo Nina-Astrid[4], Bamouni Yomboé Abel[5]

[1]Department of Medical Imaging, Ouahigouya Regional University Hospital, University of Ouahigouya, Ouahigouya, Burkina Faso
[2]Department of Medical Imaging, Souro Sanou University Hospital, Nazi Boni University, Bobo Dioulasso, Burkina Faso
[3]Department of Medical Imaging, Charles de Gaulle University Paediatric Hospital, Joseph Ki Zerbo University, Ouagadougou, Burkina Faso
[4]Department of Medical Imaging, Bogodogo University Hospital, Joseph Ki Zerbo University, Ouagadougou, Burkina Faso
[5]Workers' Health Office, Joseph Ki Zerbo University, Ouagadougou, Burkina Faso
Email: ojrad@scirp.org

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Abstract

Introduction: Urinary lithiasis is defining as a condition characterized by the formation of concretions in the kidneys or urinary excretory tract. We aimed to study professional practice in CT urinary lithiasis at CHUYO. **Materials and method:** This was a descriptive cross-sectional study with retrospective data collection covering 3 years from January 2017 to December 2019. **Results:** In general, it was noted that CT scans in our environment provide all the elements needed by urologists to diagnose urinary lithiasis and its impact on the urinary system. However, there are shortcomings, particularly in terms of the accuracy of the shape and density of the stones in the CT scan reports, which does not make it easier for urologists to decide on treatment. **Conclusion:** Computed tomography plays a major role in the diagnosis and therapeutic management of urinary lithiasis, and its use needs to be improved in our context.

Keywords

Computed Tomography, Urinary Lithiasis, Diagnosis, CHUYO

1. Introduction

Urinary lithiasis is defined as a condition characterized by the formation of concretions (stones) in the kidneys or urinary excretory tract [1]. Urinary tract infections and certain risk factors such as dietary habits, particularly a high-salt diet, a diet containing excess protein, poor hydration, a sedentary lifestyle, certain medications, and environmental factors play a significant role in the development of certain lithiasis diseases [2]. Urinary lithiasis is a public health problem because of its frequency, complications, and the high cost of treating it. It is widespread throughout the world, with prevalence ranging from 7% to 13% in North America, 5% to 9% in Europe, and 1% to 5% in Asia [3]. In Burkina Faso, one study found a prevalence of 12.52% [4].

Computed tomography (CT) plays a fundamental role in the diagnosis, treatment, and follow-up of urinary lithiasis, particularly in mapping the lithiasis, looking for complications, and determining the chemical composition of the stones, which determines the therapeutic decision (medical or surgical). The information provided by abdominal CT or urocomputed tomography should help the urologist decide whether to treat the patient medically or surgically. This study aims to answer the question of whether the radiologist provides the CT scan with all the information needed by the urologist to manage the patient with urolithiasis.

2. Materials and Methods

Our study took place in the Radiology Department and the Urology-Andrology Department of the CHU Yalgado OUEDRAOGO. It was a descriptive cross-sectional study over a 03 year from January 2017 to December 2019. Data collection was retrospective.

The target population consisted of all patients at the CHU-YO who were referred to the Radiology, Urology-Andrology, and Laboratory departments of the CHU-YO during the study period for symptoms of urinary lithiasis. The study population consisted of all CT scan report forms, clinical records, and biochemical test report forms of patients found to have urolithiasis. All cases of urolithiasis diagnosed by CT during the study period were included in the study (exhaustive sample of cases). Cases of urolithiasis diagnosed by other means not involving CT were excluded.

The variables studied were epidemiological, clinical, CT scan (topography, side affected, number of stones, density, shape of stone, and impact on the urinary tract), biochemical, and therapeutic. To assess the critical role of computed tomography (CT) in diagnosing urinary lithiasis, we used qualitative (shape of stone) and quantitative (density) variables.

The data were collected using a data collection form, based on CT scan and biochemical test report forms. At the Radiology Department, we consulted the CT scan reports. At the Urology-Andrology Department, we used the patients' clinical records. These clinical records also included the results of the biological tests performed.

We obtained permission from the hospital to conduct our study. During the study, we had access to data relating to CT scans, biochemical tests, and patients' clinical records. The confidentiality of the information collected was respected.

Microsoft Word office software was used for text entry. The tables and figures were created using Microsoft Excel office software. Data were captured and analyzed using epi info software version 7.1.3.3.

We performed a descriptive analysis of the variables collected in the form of proportions.

3. Results

3.1. General Information

During the study period, the prevalence of urinary lithiasis was 1.4%. The average age was 39, with extremes of 2 and 74. Male patients accounted for 71.80% and female patients for 28.20%, giving a sex ratio of 2.53.

3.2. Clinical Data

The reasons for consultation varied. Table 1 shows the frequency of urinary lithiasis according to the reasons for consultation.

3.3. CT Scan Data

Lithiasis was found all along the urinary tract. The topography was specified in all cases. Table 2 shows the distribution of urinary calculi according to their topography.

The right side was the most affected, accounting for 51.5% of cases, followed by the left side (36.3%) and both sides (12.2%).

The shape of the stone was specified in 18 cases, but not in the other 81. The distribution of urinary calculi according to their shape is shown in Figure 1.

The density of the stones was specified in 50 cases and not specified in 149 cases. Table 3 shows the distribution of urinary lithiasis according to density.

The impact of the stones on the urinary tract was specified in all cases. Of the 99 patients, 58.5% had a complication. These were mainly ureterohydronephrosis with a frequency of 30.3% followed by hydronephrosis (18.1%).

Table 1. Distribution of urinary lithiasis according to the reason for consultation.

Reasons for consultation	Frequency (n)	Percentage (%)
Renal colic	28	28.3
Lower back pain	27	27.3
Haematuria	02	02
Other	42	42.4
Total	99	100

Table 2. Distribution of urinary lithiasis according to the topography of the lithiasis.

Topography	Frequency (n)	Percentage (%)
Caliciel	95	47.73
Pyloric	36	18.09
Pyelocalic	02	01
Pyeloureteral junction	05	02.51
Lumbar urethra	16	08.04

Continued

Ureteral iliac	03	01.5
Pelvic urethra	30	15.07
Bladder	12	06.03
Total	199	100

Table 3. Distribution of urinary lithiasis according to density.

Density	Frequency (n)	Percentage (%)
Uric acid	08	04
Magnesium ammonium phosphate	06	03
Calcium oxalate dihydrate	05	02.5
Cystine	03	01.5
Undetermined	28	14
Not specified	149	75
Total	199	100

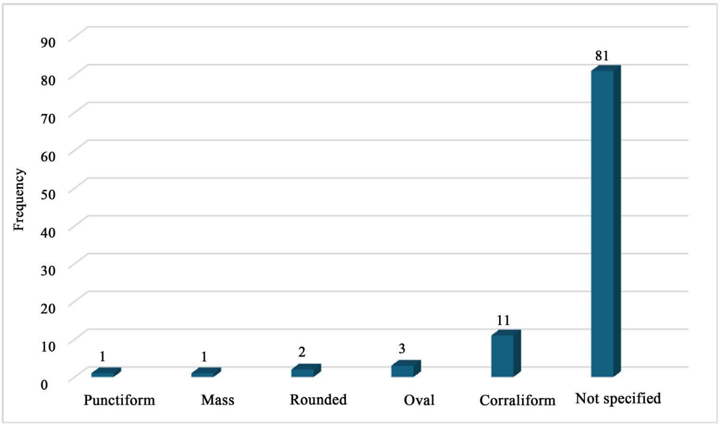

Figure 1. Distribution of urinary calculi according to form.

3.4. Therapeutic Data (Figures 2-4)

Of the 99 patients, 10 had micro calculi, which were eligible for medical treatment. Treatment depended on age, associated complications, and the type and size of the stone. The remaining 89 patients were treated surgically.

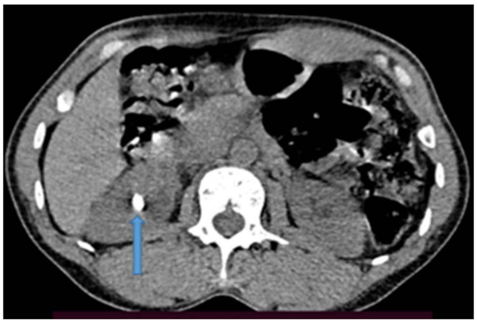

Figure 2. Uro-CT in axial section without injection of contrast medium, parenchymal window: non-obstructive right renal lithiasis (arrow).

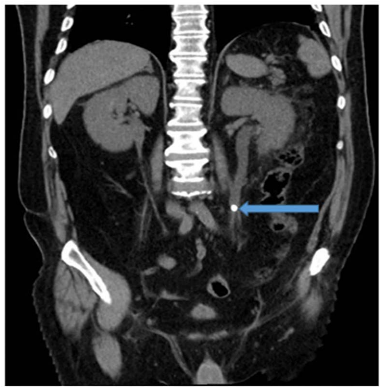

Figure 3. Coronal reconstruction CT scan without injection of contrast medium, parenchymal window: left ureteral lithiasis with dilatation of the upstream lumbar ureter (arrow).

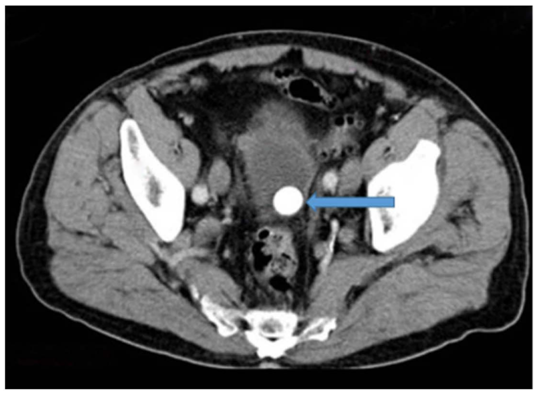

Figure 4. Uro-CT in axial section without injection of contrast medium, parenchymal window: bladder lithiasis (arrow).

4. Discussion

4.1. General Information

The prevalence of urinary lithiasis in our series was 1.4%. Ondziel *et al.* [5] in Brazzaville found a hospital prevalence of 4.64%. This relatively difference could be explained by the large variability in the size of the samples studied, the duration, location, and type of study.

There was a predominance of males, with a sex ratio of 2.53. These results are comparable to those reported by Kaboré *et al.* [4] in Ouagadougou with a male predominance (65.7%), comparable to those reported in Brazzaville (59.1%) [5] and Tunisia [6] (60.7%). This could be explained by the length of the urethra in men, whereas the shortness of the female urethra and the power of the urinary jet means that women can eliminate their stones more easily. However, other authors such as Joual [7] and Antoine [8] believe that there is no gender predominance.

4.2. Clinical Data

In our study, urinary lithiasis was revealed in most cases by pain of the renal colic type (28.2%). These results are like those of Kaboré *et al.* [4] and Mohamed [9] who found frequencies of 32% and 20.7% of renal colic respectively in their series. In contrast, Odzebe *et al.* [10] highlighted acute retention of urine as the main reason for consultation. This could be explained by the fact that the clinical manifestation of urinary lithiasis is linked to the topography of the stone in question.

4.3. CT Scan Data

CT revealed a predominance of urinary calculi of caliceal topography (47.7%), followed by calculi of pyelic topography (18%). Our results are similar to those of Ondziel *et al.* [5] and Alaya *et al.* [6] who reported a higher incidence in the upper urinary tract with frequencies of 83.8% and 48.6% respectively. They are also like those of Peru [11] who found 51.6% caliceal lithiasis and Van-Kote [12] who in France detected 50% caliciolithiasis. This predominance of caliceal localization could be explained by lithogenesis.

The right side was the most affected, accounting for 51.5% of cases, followed by the left side (36.3%) and both sides (12.2%). Our results are like those of Kanté [13] who found that the right side was most affected (50%), followed by the left side (40.9%) and bilateral involvement (9.10%).

The shape of the stone was not specified in 81.82% of cases andits density not specified in 75% of cases. This could be due to the inexperience of the interpreter and insufficient communication between radiologists and urologists on the essential elements to include in the report. This poses a problem in the management because knowledge of these characteristics influences the type of treatment. The lack of precision can lead the urologist to carry out invasive treatments that could have been avoided.

Of the 99 patients, 58.5% had a complication. These were mainly ureterohydronephrosis with a frequency of 30.3% followed by hydronephrosis (18.1%). In Mali, Cissé [14] detected hydronephrosis in 60% of cases and ureterohydronephrosis in 6.87% of cases. Mohamed [9] also found hydronephrosis in 75.9% of cases in Morocco.

4.4. Therapeutic Data

Our study found 10.10% of non-obstructive micro lithiasis less than 6 mm in size, which was managed medically. Surgical treatment was used in 89.90% of cases.

Fielding *et al.* [15] in a study of 100 CT scan files of ureteral calculi, 71 were eliminated spontaneously, and 29 required treatments by endo-urological intervention, extracorporeal lithotripsy, laser lithotripsy, or a combination of these three therapies. They concluded that tomodensitometry can predict the spontaneous expulsion of certain stones.

5. Conclusions

Computed tomography plays a very important role in the diagnosis and treatment of urinary lithiasis. Evaluation of CT practice in our setting has shown that CT reports generally provide useful diagnostic information for the urologist. However, they are incomplete when it comes to making treatment decisions. There are shortcomings in the accuracy of the shape and density of the calculi, which are decisive factors in the choice of medical or surgical option.

A prospective follow-up cohort study in collaboration with urologists could be used to study the indications for treatment, considering the results of the CT scan.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Daudon, M., Traxer, O., Lechevallier, E. and Saussine, C. (2008) Épidémiologie des lithiases urinaires. *Progrès en Urologie*, **18**, 802-814. https://doi.org/10.1016/j.purol.2008.09.029

[2] Roy, C., Grenier, N. and Tuchmann C. (1997) Radiologie de la lithiase urinaire. *Radiologie Et Imagerie Médicale*: *Génito-Urinaire-Gynéco-Obstétricale-Mammaire*, **34**, 22-30.

[3] Sorokin, I., Mamoulakis, C., Miyazawa, K., Rodgers, A., Talati, J. And Lotan, Y. (2017) Epidemiology of Stone Disease across the World. *World Journal of Urology*, **35**, 1301-1320. https://doi.org/10.1007/s00345-017-2008-6

[4] Kaboré, F.A., Kambou, T., Zango, B., Ouattara, A., Simporé, M., Lougué, C., Lechevalier, E. and Karsenty, G. (2013) Épidémiologie d'une cohorte de 450 lithiases urinaires au CHU Yalgado Ouédraogo de Ouagadougou (Burkina Faso). *Progrès en Urologie*, **23**, 971-976. https://doi.org/10.1016/j.purol.2013.04.014

[5] Opara, A.O., Odzébé, A.W.S., Atipo, A.O., Mouss, R.B., Dimi, Y., Okomiko, D.O., Otilibili, J. and Bouya, P.A. (2019) Lithiase du haut appareil urinaire: aspects épidémiologiques, diagnostiques et thérapeutiques à propos de 240 cas au centre hospitalo-universitaire de brazzaville. *Health Sciences and Disease*, **20**, 60-63.

[6] Alaya, A., Hellara, I., Belgith, M., Nouri, A., Hellara, W., Neffati, F., Saad, H. and Najjar, M.F. (2012) Stone Composition in the Central Coast Tunisian Population. *Progres en Urologie*, **22**, 938-944. https://doi.org/10.1016/j.purol.2012.07.010

[7] Joual, A., Rais, H., Rabii, K. and Elmrmim, B. (1990) Épidémiologie de l'appareil urinaire. *Radiologie Et Imagerie Médicale: Génito-Urinaire-Gynéco-Obstétricale-Mammaire*.

[8] Antoine, B. and Moulonguet, A. (1976) Manuel des maladies des reins et des voies urinaires. Masson, Paris, 297-312.

[9] Benchouk, M. (2019) Imagerie de la lithiase urinaire: Attentes de l'urologue pour une meilleure prise en charge. Doctoral Dissertation, Thèse de Doctorat en Medicine, Université Cadi Ayyad, Marrakesh.

[10] Odzebe, A.S., Bouya, P.A., Berthe, H.J. and Omatassa, F.R. (2010) Open Surgery of the Urinary Tract Calculi at the University Hospital of Brazzaville: Analysis of 68 Cases. *Mali Medical*, **25**, 32-35.

[11] Pérou, A. (2003) Apport de l'imagerie dans le diagnostic de la lithiase Urinaire.

Thèse de Médecine, Universite des Sciences des Techniques et des Technologies de Bamako, Bamako.

[12] Van Kote, G., Lottmann, H., Biserte, J., Villar, F., Lacombe, A. and Fremond, B. (1999) Lithotritie urinaire de l'enfant: Étude multicentrique du Groupe d'Études en Urologie Pédiatrique (GEUP). *Annales d'Urologie*, **33**, 308-314.

[13] Kanté, D. (2014) Prise en charge de la colique néphrétique dans le service d'urologie du CHU Gabriel Touré. Thèse de Médecine, Universite des Sciences des Techniques et des Technologies de Bamako, Bamako.

[14] Cissé, B. (2020) Apport de l'imagerie dans le diagnostic des lithiases de l'appareil urinaire dans le service de radiologie de l'hôpital Hangadoumbo Moulaye TOURE de Gao. Doctoral Dissertation, Universite des Sciences des Techniques et des Technologies de Bamako, Bamako.

[15] Fielding, J.R., Silverman, S.G., Samuel, S., Zou, K.H. and Loughlin, K.R. (1998) Unenhanced Helical CT of Ureteral Stones: A Replacement for Excretory Urography in Planning Treatment. *American Journal of Roentgenology*, **171**, 1051-1053. https://doi.org/10.2214/ajr.171.4.9762995