

PARTICULATE ECHOES WITHIN THE BLADDER: DOES THIS FINDING CORRELATE WITH URINARY TRACT INFECTION?

ORINA PARTICULADA: ¿SE CORRELACIONA CON INFECCIÓN URINARIA?

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SUMMARY

Introduction: Urinary tract infection (UTI) is a common disorder in the emergency department, requiring timely diagnosis and appropriate management to avoid potential complications. Urinalysis is used in the emergency department for diagnosis. Renal and urinary tract ultrasound is used to rule out complications and anatomic variants that may predispose to UTI, yet not for diagnosis, considering that a urinary tract infection is better identified on the basis of clinical and laboratory findings. **Objective:** To determine whether particulate echoes found on urinary tract ultrasound correlate with urinary tract infection. **Methods:** Descriptive analysis of variables such as age, initial diagnosis and final diagnosis of patients presenting to the emergency department between January and May 2010. The relationship between the variables was determined and the operational characteristics (sensitivity, specificity, predictive values and likelihood ratios) were established. **Results:** Seventy per cent of the patients with UTI were older than 65 years; 56.5% of patients with a finding of particulate echoes in the bladder on ultrasound had urinary tract infection; and 34% had a urinary tract infection but did not show particulate echoes. **Conclusion:** Particulate echoes within the bladder are frequent in ultrasound reports and they should be correlated with urinalysis results in order to rule out a UTI. However, in the literature, this finding is not considered as an indication of infection. In our case series, particulate urine had low specificity and intermediate sensitivity, indicating that this finding is not an adequate diagnostic criterion for UTI.

RESUMEN

Introducción: La infección de las vías urinarias (IVU) es una entidad frecuente en los servicios de urgencias que requiere diagnóstico y manejo oportuno para evitar posibles complicaciones. En su diagnóstico, el uroanálisis es el estudio empleado en urgencias. La ecografía de vías urinarias se utiliza para descartar complicaciones y variantes anatómicas que predispongan a IVU y no para el diagnóstico de la entidad, que se hace fácilmente con la clínica y los hallazgos de laboratorio. **Objetivo:** Evaluar si el aspecto particulado de la orina identificado en la ecografía de vías urinarias se relaciona con IVU. **Métodos:** Se realizó un análisis descriptivo de variables como edad, diagnóstico inicial y diagnóstico final, determinando su relación y estableciendo características operativas (sensibilidad, especificidad, valores predictivos y razones de probabilidad). **Resultados:** El 70% de los pacientes con IVU eran los mayores de 65 años; el 56,5% de los que presentaban orina de aspecto particulado en la ultrasonografía tenían IVU y el 34% no presentaba orina particulada en el ultrasonido y cursaban con IVU. **Conclusión:** En el ultrasonido es frecuente el reporte del aspecto particulado de la orina. Ello

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sugiere correlación con uroanálisis por parte del radiólogo para descartar IVU; sin embargo, la literatura no refiere este hallazgo como indicativo de infección. En esta serie de casos, la orina particulada presenta baja especificidad y sensibilidad intermedia, lo cual indica que el hallazgo de “orina particulada” en el ultrasonido no es criterio diagnóstico de IVU.

INTRODUCTION

Urinary infections are a common condition in the general population and they are therefore a frequent cause of visits to the emergency department. Ultrasound is customarily requested as part of the work-up in these patients. It has been noted that particulate urine is frequently reported on abdominal and urinary tract ultrasounds conducted on patients in the emergency department at our healthcare facility and that radiologists consequently suggest a urinalysis in order to rule out urinary tract infection (UTI).

Nevertheless, upon reviewing the literature on this subject, we were not able to gather sufficient information that supports this finding as a parameter for infection. For this reason, we decided to perform a study to determine the values of operating characteristic curves (sensitivity, specificity and diagnostic tests) employing high-definition ultrasound equipment.

METHODS

A diagnostic test study was conducted, in which 112 patients that arrived at the emergency department at our healthcare facility between January and May of 2010, and because of their presenting symptoms were requested an abdominal of urinary tract ultrasound as well as a urinalysis, were randomly selected. The images were acquired on a Toshiba Xario ultrasound system with 3.5- 5 MHz transducers. The ages of the selected patients ranged from 20 days to 89 years and both genders were included. Subgroups for age were arranged into those patients under the age of two years, older children, young adults and older adults.

The main finding that was analyzed was the presence or absence of particulate urine (Figures 1 and 2) on the ultrasound images and its correlation with a confirmed UTI diagnosed by a positive urinalysis according to the criteria established by the Colombian Society of Urology in their *Guidelines for Urinary Infection*.

Apart from the demographic variables that were analyzed, other factors that were evaluated included the initial and final diagnoses, and the findings on ultrasound. In the majority of cases the initial diagnosis was UTI, followed by abdominal pain, gastroenteritis, febrile syndrome and urolithiasis. The final diagnoses were mainly UTIs, followed by gastrointestinal pathology, other genitourinary system conditions apart from UTIs, and respiratory illnesses.

The statistical evaluation began with a descriptive analysis of the demographic variables of the population, including gender and summary, central tendency and dispersion measurements for the continuous variable of *age*. For the categorical variables such as recoded age, initial diagnosis, final diagnosis and ultrasound findings, frequency and percentage measurements were calculated.

Furthermore, contingency tables were designed for the categorical variables. These tables included cross tabulations for age and initial diagnosis, gender and initial diagnosis, gender and final diagnosis, gender and other findings on ultrasound, and age and final diagnosis. Confidence intervals (CI) of 95% were calculated for the described proportions.

The operating characteristics (sensitivity, specificity, predictive values and likelihood ratios) were defined for the presence of particulate urine on ultrasound for the diagnosis of UTIs. The standard of reference was a urinalysis positive for infection and the confidence interval was calculated

at 95%. The prevalence established in the study was used to calculate the pretest and posttest probabilities.

In order to process the information a database was constructed using Excel[®]. The SPSS version 15 statistics program was employed to encode the variables and to produce the descriptive statistics, including the contingency tables for the cross tabulation of variables with their respective percentage and frequency distributions. The Epidat version 3.1 program was used to calculate the confidence intervals for sensitivity, specificity and predictive values. Furthermore, a review on urinary infections, their findings on ultrasound and the diagnostic value of particulate urine in UTI was conducted.

RESULTS

Evaluation of 112 patients with an age minimum of 20 days and maximum age of 89 years was performed. The average age was 32 years with a standard deviation (SD) of 24.

The patients were divided according to age in four subgroups: 9.8% of patients were under the age of two years, 17.9% were between the ages of 2 and 15 years, the greatest percentage of patients (59.8%) were between 16 and 65 years of age, and 12.5% were older that 65 years (Tables 1 and 2).

Table 1. Median age of 32 years with SD of 24.12

	N	Minimum	Maximum	Median	Deviation
Age	112	20 days	89 years	32.149	24.1295

Table 2. Classification of age groups

Age (years)	Frequency	Percentage	Accumulated percentage
< 2	11	9.8	9.8
2-15	20	17.9	27.7
16- 65	67	59.8	87.5
> 65	14	12.5	100
Total	112	100	

Exactly 73.2% of patients were female and 26.8% were male (Table 3).

Table 3. Gender distribution

Gender	Frequency	Percentage	Valid percentage	Accumulated percentage
Female	82	73.2	73.2	73.2
Male	30	26.8	26.8	100
Total	112	100	11	

Out of the patients that received an ultrasound and urinalysis, 48.2% had an initial diagnosis of abdominal pain, followed by UTI (40.2%), fever of unknown origin (6.3%) and then gastroenteritis and urolithiasis.

Other findings during ultrasound evaluation included bladder wall thickening (9.8%), followed by pyelocaliceal dilatation (8%), increased renal echogenicity (6.3%), increased kidney size (3.6%), and lithiasis and an enlarged prostate were each seen in three patients (Table 4).

Table 4. Additional ultrasound findings

Other findings on ultrasound	Frequency	Percentage
Bladder wall thickening	11	9.8
Increased kidney size	4	3.6
Increased renal echogenicity	7	6.3
Pyelocaliceal dilatation	9	8.0
Lithiasis	3	2.7
Enlarged prostate	3	2.7
None	75	67.0
Total	112	100

The final diagnosis in the evaluated patients was mainly UTI (49.1%), followed by gastrointestinal pathology (33%), no definite diagnosis (12.5%) and one single case of respiratory illness (Table 5).

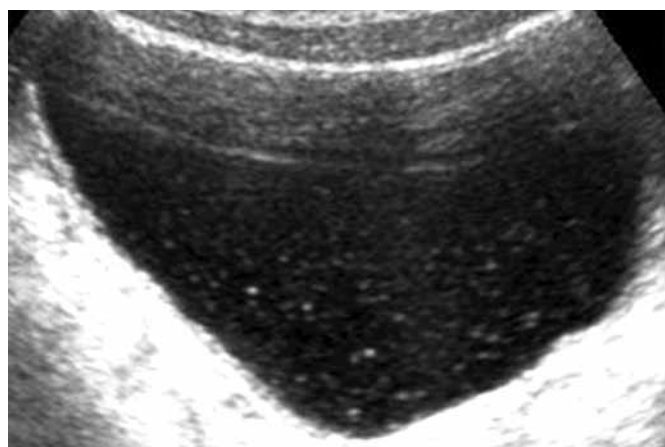


Figure 1. Transverse ultrasound image. This image shows a bladder with thin walls, no intraluminal lesions and slightly particulate urine content.

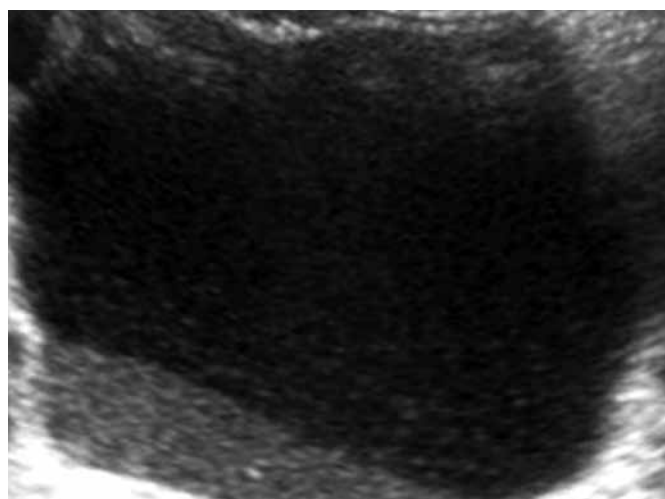


Figure 2. Transverse ultrasound image. A thin-walled bladder is shown with marked urinary sediment formation and without intraluminal lesions.

Table 5. Final diagnoses

Final diagnosis	Frequency	Percentage
Urinary tract infection	55	49.1
Gastrointestinal pathology	37	33
Genitourinary pathology	5	4.5
Respiratory illness (pneumonia)	1	0.9
No definite diagnosis (abdominal pain, fever of unknown origin)	14	12.5
Total	112	100

With regards to age, the most prevalent initial diagnoses in patients under the age of two years were UTIs and abdominal pain. The proportion of patients with fever was considered to be insignificant (95% CI: 0.2- 41.2).

The main initial diagnosis for the patients between the ages of 2 and 15 years was abdominal pain (65%). For the patients between 16 and 65 years of age the most common initial diagnosis was abdominal pain (49.3%), then UTI (40.3%). Due to the sample used in this study, it is important to consider the amplitude of the confidence intervals: there were three cases of fever, two of gastroenteritis and two of urolithiasis, with a 95% CI that crosses one.

Of the patients with UTI as their final diagnosis, 81.8% were women, a result considered to be statistically significant (95% CI: 70.7-92.9%). Gastrointestinal conditions were diagnosed in 37 patients, 62.2% of which were females and 37.8%, males (95% CI: 45.1-79.1).

With respect to gynecological conditions (reproductive system), four cases were diagnosed in women and there was one reported case of urolithiasis in a man, a percentage considered to be of low significance given the amplitude on the confidence interval. A single case of respiratory illness (pneumonia) was reported in a woman. No final diagnosis was reached in 14 of the cases, 64.3% of which were women and 35.7% were male (Table 6).

Table 6. Final diagnosis by gender contingency

Variable: Final diagnosis	Gender Female [n (%)]	Gender Male [n (%)]	CI 95% Female
UTI	45 (81.8)	10 (18.2)	(70,7-92,9)
Gastrointestinal conditions	23 (62.2)	14 (37.8)	(45,1-79,1)
Gynecological conditions (dysmenorrhea)	4 (80.0)	1 (20.0)	(28,3-99,4)
Respiratory illnesses (pneumonia)	1 (100.0)	0	
No definite diagnosis (abdominal pain, fever of unknown origin)	9 (64.3)	5 (35.7)	(35,1-87,2)
Total	82 (73.2)	30 (26.8)	

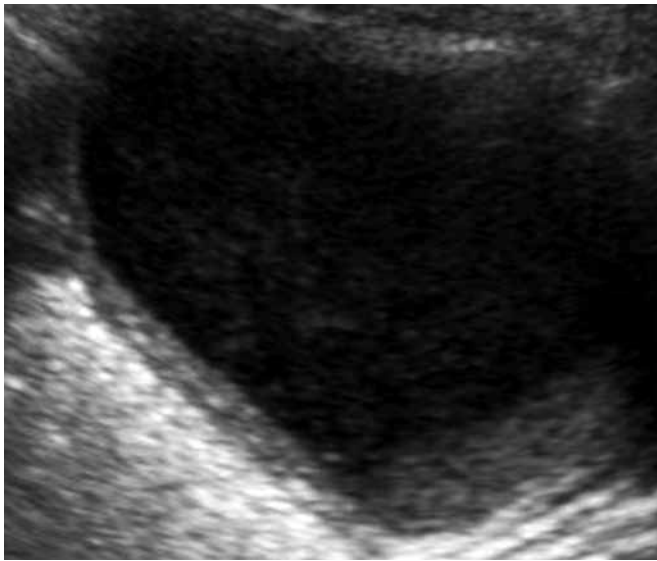


Figure 3. Transverse ultrasound image. Thickened and trabeculated bladder walls are seen with particulate urine content within.

Of the patients that presented thickened bladder walls as another ultrasound finding (Figure 3), 81.8% were women (95% CI: 48.2-97.7). All the patients (100%) that showed an increased kidney size were women, with a wide interval (39.7-100). With respect to the increased renal echogenicity, 51.7% of the patients with this finding were women and 42.9% were male, which constitutes insignificant data (95% CI: 18.4-90.1). Of the cases where pyelocaliceal dilatation was observed, 88.9% were females and 66.7% of cases with lithiasis were males (Table 7).

Table 7. Contingency of other findings seen with ultrasound by gender

Other findings on ultrasound	Gender		CI 95% Female
	Female [n (%)]	Male [n (%)]	
Bladder wall thickening	9 (81,8)	2 (18,2)	(48,2-97,7)
Increased kidney size	4 (100,0)	0	(39,7-100)
Increased renal echogenicity	4 (57,1)	3 (42,9)	(18,4-90,1)
Pyelocaliceal dilatation	8 (88,9)	1 (11,1)	(51,7-99,7)
Lithiasis	1 (33,3)	2 (66,7)	(0,8-90,5)
Enlarged prostate	0	3 (100,0)	
Total	82 (73,2)	30 (26,8)	

According to patient age group, the final diagnosis in those under the age of two years was UTI in 45.5% and gastrointestinal pathology in 54.5% of cases. For patients between 2 and 15 years of age, 55% presented gastrointestinal illness, 30% had a UTI and 10%, gynecological conditions. For those between the age of 16 and 65 years, the most common final diagnosis was UTI in 50.7% of cases, followed by gastrointestinal conditions in 25.4%. It is of note that a striking number

of patients did not receive a definitive diagnosis (19.4%). In patients above the age of 65 years, 70% had a final diagnosis of UTI (Table 8).

Table 8. Age by final diagnosis contingency

Age	Final diagnosis UTI [n (%)]	Final diagnosis Gastrointestinal pathology	Final diagnosis Pathology	Final diagnosis Respiratory pathology (pneumonia) [n (%)]	Final diagnosis No definitive diagnosis (abdominal pain, fever of unknown origin) [n (%)]
< 2	5 (45.5)	6 (54.5)	0	0	0
2-15	6 (30.0)	11 (55)	2 (10.0)	1 (5.0)	0
16-65	34 (50.7)	17 (25.4)	3 (4.5)	0	13 (19.4)
>65	10 (71.4)	3 (21.4)	0	0	1 (7.1)
Total	55 (49.1)	37 (33.0)	5 (4.5)	1 (0.9)	14 (12.5)

Particulate urine on ultrasound with a urinalysis positive for UTI was observed in 56.5% of patients. A urinalysis positive for UTI without particulate urine on ultrasound was seen in 43.5% of the cases. Absence of particulate urine and UTI was detected in 65.1% of patients and 34.9% did not present particulate urine on ultrasound, but had a UTI at the time of evaluation (Table 9).

Table 9. Contingency of particulate urine by urinalysis results

Particulate urine	Urinalysis Positive	Urinalysis Negative	Total
Yes	39	30	69
	56.5%	43.5%	100.0%
	72.2%	51.7%	61.6%
No	15	28	43
	34.9%	65.1%	100.0%
	27.8%	48.3%	38.4%
Total	54	58	112
	48.2%	51.8%	100%
	100.0%	100.0%	100%
	48.2%	51.8%	100%

Table 10. Patients with particulate urine on ultrasound and UTI diagnosis according to age group

Age (years)	Frequency	Percentage
< 2	5	9.5
2- 15	6	11.0
16- 65	33	61.0
> 65	10	18.5
Total	54	100.0

Table 11. Patients with particulate urine on ultrasound and UTI diagnosis by gender and age group

Age (years)	Male	Female
< 2	1	4
2-15	0	6
16- 65	4	29
> 65	5	5
Total	10	44

Particulate urine on ultrasound holds a sensitivity of 72.22% for the diagnosis of UTI. In other words, out of 100% of patients with UTI, 72.22% will present particulate urine on an ultrasound examination. This ultrasound finding has a specificity of 48.28%, which means that 48.28% of individuals without UTI with urinalysis results that are negative for infection, will have particulate urine on ultrasound. The positive predictive value for particulate urine is 56.52%, therefore, the probability that a patient may have a UTI with a ultrasound positive for particulate urine is 56.52%.

The negative predictive value for this finding is 62.12%, which signifies that the probability that a patient does not have a UTI when the ultrasound results are normal is 62.12%. The accuracy of the test is 59.82%, which implies that the percentages of all the results of the test, both positive and negative, are correct. The positive likelihood ratio was 1.40. This result means that the presence of particulate urine on ultrasound is 1.4 times more likely to be seen in patients with UTI than without.

The negative likelihood ratio was 0.58, which indicates that the probability of presenting an ultrasound without particulate urine is 0.58 times more likely in patients without UTI (Table 12).

Table 12. Operating curve values

	Value	95% CI
Sensitivity (%)	72.22	(59,35-85,09)
Specificity (%)	48.28	(34,55-62,00)
Positive predictive value (%)	56.52	(44,10-68,94)
Negative predictive value (%)	65.12	(49,71-80,52)
Positive likelihood ratio	1.40	(1,04-1,88)
Negative likelihood ratio	0.58	(0,35-0,95)
Prevalence (%)	48.21	(38,51-57,91)
Validity index (%)	59.82	(50,30-69,35)

Pretest probability: 48.2%. The pretest probability in this investigation is based on the prevalence results obtained from this said study and it corresponds to 48.2%.

Pretest odds: 0.92. The pretest probability was calculated based on the likelihood ratio. This value is for a positive test (ultrasound examination with particulate urine).

Posttest odds: 1.28.

Posttest probability: 0.56 or 56%. If particulate urine is seen on ultrasound, we go from a pretest probability of 48.2% for UTI diagnosis to a posttest probability of 56%. This value is for a negative test (ultrasound examination without particulate urine).

Posttest odds: 0.278

Posttest probability: 0.21 or 21%. With a negative result for particulate urine on ultrasound we go from a pretest probability of 48% to a posttest probability of 21% of not having a UTI.

DISCUSSION

UTIs are considered a common condition. At least 50% of women will have had an episode of UTI in her lifetime. This is the most prevalent cause of infections in patients receiving home health services and is the most common source of bacteremia in older adults.

UTIs are more frequently seen in patients with structural abnormalities (complicated infections) in comparison to those with functional disturbances of the urinary tract (uncomplicated infections) (3-5). UTIs are the main reason for seeking medical care and for hospitalization in patients of different age groups. In our population urinary infections were proven to be the most frequently observed initial and final diagnosis.

In over 95% of cases, UTIs are caused by a single bacterial species, the majority of which are Gram-negative bacteria that originate from the intestine and are inadvertently introduced into the perirurethral area. Consequently the infection begins in an ascending manner.

In the general pediatric population the most commonly isolated bacteria is *E. coli* (75-90%). Other frequently encountered microorganisms include *Klebsiella* sp., *Proteus* sp., *Pseudomonas* and *Citrobacter* (8-10). In recurrent infections, especially those that occur in patients with structural abnormalities, there is a significant increase in the presence of species such as *Proteus* sp., *Pseudomonas* sp., *Klebsiella* sp. and *Enterobacter* sp. The most commonly implicated Gram-positive pathogens include *Streptococcus faecalis* and *Staphylococcus epidermidis* (5%-15%) (11-13).

The criteria used to determine that a urinalysis is positive for infection is the presence of five or more leukocytes per field, ten or more leukocytes per cubic millimeter, any bacteria with or without Gram staining properties, any value of leukocyte esterase and a positive nitrite test. The existence of these parameters warrants a complementary urine culture.

Current evidence reveals that the true value of the urinalysis lies in its negative predictive value, given that the absence of these criteria virtually rules out the presence of a UTI. The standard of reference for this diagnosis continues to be the urine culture, and to date no other test has proven to provide greater diagnostic performance.

A UTI is generally a clinically apparent illness that is confirmed by means of urinalysis and urine culture. Diagnostic images are not customarily required in order to establish or confirm its presence (15). The role that diagnostic images play in the evaluation of UTIs is that of discovering possible structural or anatomical abnormalities that may be treated in order to prevent further recurrences and in turn, lower morbidity. The aim of ultrasound evaluation in this population is to evaluate the morphological characteristics of the kidneys, determine the presence of vesicoureteral reflux (VUR), a condition that may facilitate the ascent of infection from the bladder to the kidneys, identify stones and detect signs of urinary obstruction (16-18).

One must keep in mind that a single imaging modality does not sufficiently resolve every question that arises due to a UTI. Furthermore, some authors currently challenge the use of ultrasound if it were not for its greatest advantage, the fact that it is a technically non-invasive modality that does not require exposure to ionizing radiation (19-21).

In general, images are not necessary for the diagnosis and treatment of acute pyelonephritis. In uncomplicated cases the ultrasound examination is usually normal. Nevertheless, in approximately 20% of cases, ultrasound may be able to detect the presence of generalized renal edema attributable to congestion and inflammation (22, 23). This edema is defined as an increase in renal longitude (>15 cm) or an enlargement of the affected kidney (at least 15 cm) with respect to that of the contralateral side (24, 25).

The sonographic examination of the kidneys and urinary tract in real time is a non-invasive procedure that is widely available, easy to perform and that has turned into an indispensable tool in the urological assessment of patients. The use of ultrasound in the evaluation of the lower urinary tract is variable and includes the detailed observation of the morphologic characteristics of both the bladder walls and its content. In addition, ultrasound allows for the quantification of postmictional residue, the detection of intraluminal lesions, as well as stones, masses and bladder wall diverticulae.

The recommended technical parameters for a transabdominal examination are the use of transducers with frequencies that range from 3.5 to 5 MHz in order to allow adequate penetration of the tissues without sacrificing the quality and resolution of the images. Also, the evaluation of the bladder can be performed via a transvaginal, transrectal or transurethral approach.

The bladder is located in the pelvis and appears as a rounded or spherical structure that is lined by thin walls. Its content, under normal circumstances, is predominantly anechoic. The bladder wall is a smooth, well-defined, linear structure, with a normal thickness of 3 mm when distended and 5 mm when empty. The structural appearance of the bladder varies according to the amount of liquid or urine inside it, the position of the patient and the orientation of the transducer. In children the average thickness of the wall is approximately 2 mm.

The sonographic findings consistent with UTI are an increase in kidney size, either in a global or focal manner, loss of the normal corticomedullary differentiation and the presence of hypo or hyperechoic areas in the renal parenchyma (16, 19, 26). Thickening of the epithelium that lines the pyelocaliceal system or ureter can be seen in infection (pyelitis) and in VUR. One may also identify the dilatation of the collecting system in the absence of causes for obstruction. This finding is caused by the release of bacterial endotoxins, which are capable of inhibiting the normal peristaltic movement of the ureter, which ultimately leads to the development of hydroureter and hydronephrosis.

The use of color Doppler can help to better identify cases of pyelonephritis by making areas of poor or absent perfusion more apparent (27-29). These hypoperfused areas reflect the presence of vasculitis or vasoconstriction of the peripheral arterioles associated with bacterial infection.

Ultrasound is also able to detect complications related to urinary infections such as renal and perinephric abscesses, xanthogranulomatous pyelonephritis and renal stones. Abscesses may be single or multiple and may be the result of pyelonephritis or hematogenous dissemination of a distant infection. Small renal or perirenal abscesses can be difficult to identify on gray-scale images, while larger abscesses present as hypoechoic accumulations that are well circumscribed and contain internal echoes.

The sonographic findings of lower UTIs have not been described as frequently. What little bibliographic evidence exists reports limited findings related to cystitis including particulate content or presence of fine echoes within the bladder, thickening of the bladder wall, and air

within the bladder walls or lumen. Various clinical conditions have been associated with the development of urinary sediment such as nephritic and nephrotic syndrome, acute tubular necrosis and drug-related crystalurias.

With nephrotic syndrome, urine takes on a particulated appearance due to the elimination of lipids and casts by the kidneys. Occasionally, this condition may present with hematuria as well. On the other hand, leukocyturia and the elimination of renal tubule epithelial cells are the abnormalities that predominate in nephritic syndrome. Necrotic tubular epithelial cells, tubular fragments and cylindruria are seen in acute tubular necrosis. Furthermore, particulate urine is also found in patients that consume acyclovir, indinavir, amoxicillin and ciprofloxacin due to drug-related crystalurias.

Other common causes of urinary detritus are clinical conditions that lead to urinary stasis, including obstructive uropathies such as neurogenic bladder, prostatic hyperplasia, prostatitis, bladder neck contracture, prostate, bladder or urethral cancer, phimosis or meatal stenosis, and pregnancy (32-35).

Neurogenic bladder refers to the loss of normal bladder function due to a partial damage to the nervous system. This condition may cause the bladder to become hypoactive, in which case it may not efficiently contract and therefore may not empty completely. On the other hand, the bladder may also develop an increased activity, where the contractions occur more frequently and at a greater rate. When the micturition process becomes dysfunctional, urine may present detritus.

Pregnant women develop urinary stasis due to decreased muscular tone in the bladder and compression of the bladder and ureters caused by the enlarged uterus. In our population, 39 patients (56.5%) presented particulate urine on ultrasound and a urinalysis positive for infection, 30 patients (43.5%) with this finding did not have a diagnostic confirmation of UTI, 15 patients (34.9%) had a urinalysis positive for infection but did not present particulate urine on ultrasound, and 28 patients (65.1%) did not present either finding.

With these results in mind, we established that particulate urine as a criterion for UTI has a sensitivity of 72%, a specificity of 48%, a positive predictive value of 56%, and a negative predictive value of 65%, with a CI of 95%. A pretest probability was projected at 48.2% and a posttest probability of 56%.

Particulate urine on ultrasound is a finding that has proven to have a low specificity and intermediate sensitivity, as seen in our population of patients with UTIs, as well as gastrointestinal and genitourinary pathologies. In addition, it was an absent finding in some patients that presented UTIs with urinalyses that were positive for infection. Wachsborg and colleagues (46) concluded that particulate urine detected by ultrasound was a normal finding, not indicative of urinary infection, and that was currently more easily identified due to the employment of high-resolution transducers used during transvaginal ultrasound.

CONCLUSIONS

The particulated appearance of urine is frequently mentioned in radiology reports of ultrasounds performed on patients that arrive at the emergency department because of abdominal symptoms. In the current study, this particular finding showed a low specificity and intermediate sensitivity for the diagnosis of UTIs. For this reason, this sign should not be considered a reliable indicator of infection because it can be present secondary to the numerous conditions already mentioned in this article.

It is important to point out that the low specificity this finding has is due to the fact that other illnesses such as nephritic and nephritic syndrome, acute tubular necrosis, drug-related crystaluria and clinical conditions that lead to urinary stasis, such as prostatic hyperplasia, pregnancy and neurogenic bladder, present similar findings.

A larger sample size could be employed in future investigations in order to improve the confidence interval. This modification would be helpful to determine if significant differences exist between the variables present in this study and in order to conduct a study with crossed variables as well.

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