

DETECTION RATE OF URETER STONES WITH US: RELATIONSHIP WITH GRADE OF HYDRONEPHROSIS

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SUMMARY

The aim of this study was to investigate the relation of hydronephrosis grade and the detection rate of ureteral stones with ultrasonography and call attention to the value of a careful sonographic study of these patients. Sonographic reports of 184 ureteral stones that has been followed in our clinic during 2000-2001 is evaluated. The detection rate of ureteral stones with US was 65.9 %, 78 % and 95 % for grade 1, 2 and 3 hydronephrosis respectively. US, as a noninvasive modality, is useful for detection of ureteral stones, with high detection rates in patients with grade 2 and detection rates comparable to spiral CT in grade 3 hydronephrosis.

Key Words: Hydronephrosis, Ultrasound, Ureteral Stone

ÖZET

Ultrasonografinin Üreter Taşlarını Saptama Oranı: Hidronefroz Düzeyiyle İlişkisi

Ultrasonografi (US) ile üreter taşlarının saptanmasında düşük tanılabilirlik oranları bildirildiğinden, üreter taşı şüphesi olan hastalar diğer görüntüleme yöntemlerine yönlendirilmektedir. Bu çalışmanın amacı, üreter taşlarının US ile saptanma oranlarının hidronefroz düzeyiyle ilişkisini inceleyerek, bu grup hastalarda dikkatli bir sonografik incelemenin değerine dikkat çekmektir. 2000- 2001 yılları süresince kliniğimizde tedavi ve takibi yapılan 184 üreter taşının US bulguları değerlendirmeye alınmıştır. US' nin üreter taşlarını saptama oranı grade 1 düzeyinde hidronefrozda %65.9, grade 2 düzeyinde %78, grade 3 düzeyinde ise %95 dir. US, üreter taşlarını saptama oranları, grade 2 hidronefrotik böbreklerde yüksek, grade 3 hidronefrotik böbrekli olgularda ise spiral BT'ye karşılaştırılabilir düzeyde olan, noninvaziv ve kullanışlı bir yöntemdir.

Anahtar Kelimeler: Hidronefroz, Ultrasonografi, Üreter Taşı

Patients with renal colic are traditionally evaluated with intravenous urography (IVU) (1). In recent years, due to the reported high sensitivity and specificity, spiral computerized tomography (CT) is accepted as the best diagnostic modality for ureteral stones (1, 2). However, ultrasonography (US) is still used as a noninvasive and universally available modality (2). But, as US is considered to be of limited value in demonstrating ureteral pathology, patients

with a suspect of ureteral stone are generally directed to other imaging modalities instead of US (3-5). In many articles it has been reported that US has nearly 90% sensitivity in obstructed collecting systems (3, 6, 7). We aimed to determine the correlation between the hydronephrosis grade and the success rate of US for detecting ureteral stones, in order to determine the effect of hydronephrosis on stone detection rate.

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Materials and Methods

172 patients (58 women, 114 men, age; 18-85 years) with 184 ureter stones have been evaluated in our department during a two year period. The ultrasonographic findings of all patients are noted in which the ureteral stone diagnosis is confirmed by IVU, spiral CT or intraoperatively. As this is a retrospective study, only confirmed ureteral stones are included, so there are no false (+) and true (-) groups and only the detection rates are calculated.

US examinations have been performed by the same radiologist with a SSA 250A Toshiba system using a 3.5 MHz abdominal probe.

The grade of hydronephrosis is classified as follows; mild pelvicalyceal system (PCS) dilatation: grade 1, moderate PCS dilatation without parenchymal loss: grade 2, severe PCS dilatation with parenchymal thinning: grade 3 hydronephrosis (8).

The localizations of ureteral stones are classified as; proximal ureter if between the ureteropelvic (UP) junction and iliac cross, iliac cross localized, distal ureter if between the iliac cross and ureterovesical (UV) junction and UV junction localized.

The cases haven't been classified up to acute or chronic obstruction, only hydronephrosis grade in the presence of an ureteral stone is evaluated.

Results

US detected 136 of 184 (73.9 %) ureteral stones. In the grade 1 hydronephrotic group; US detected 60 of 91 (65.9 %) ureteral stones. The stones which could not be detected with US were localized at; 51.6 % (n: 16) distal ureter, 25.8 % (n: 8) proximal ureter, 19.3 % (n: 6) iliac cross and 3.3 % (n: 1) UV junction.

In the grade 2 hydronephrotic group; US detected 57 of 73 (78 %) ureteral stones. The stones which could not be detected with US were localized at; 56.25 % (n: 9) distal ureter, 25 % (n: 4) proximal ureter, 18.75 % (n: 3) iliac cross.

In the grade 3 hydronephrotic group; US detected 19 of 20 (95 %) ureteral stones. The

stone which could not be detected with US was localized at distal ureter.

The detection rates of US does not show statistically significant difference between grade 1-2 and grade 2-3 hydronephrosis ($p > 0.05$), but there is statistically significant difference between grade 1 and 3 hydronephrotic groups ($p < 0.05$).

Of the 48 stones that could not be detected by US; 54.17 % (n: 26) was located at distal ureter, 25 % (n: 12) proximal ureter, 18.75 % (n: 9) iliac cross and 2.08 % (n: 1) UV junction.

Discussion

Until recent years the preferred diagnostic modality for the patients with suspect of ureteral stone was IVU (1). But, as intravenous contrast medium is used and patients are exposed to radiation, search for new diagnostic modalities has continued and spiral CT with its nearly 100 % sensitivity and ability to also detect extraureteral pathologies, has been accepted as the gold standart modality (1,2, 9). Spiral CT is less invasive than IVU as it doesn't require contrast medium, however patients are exposed to more ionizing radiation than IVU, during spiral CT (10).

As US is radiation free and doesn't require contrast medium, it is the modality of choice for the initial evaluation, especially for children and pregnant women (1, 11). Furthermore, it is inexpensive, universally available, has acceptable sensitivity and specificity and is not effected by the renal functions (2, 3, 5).

Sensitivity of US for ureteric stones has been reported to be 37- 64 % in different articles, but it has also been reported that these rates rises to 74- 95 % in obstructed collecting systems (1, 4, 5, 6, 7). Sommer et al reported that they had high success rates for detecting ureteral stones by US when there is minimal hydronephrosis and that the false (-) rates are higher if there is no hydronephrosis (12). So one can mention that as the grade of hydronephrosis rises, the detection rate of ureteral stones with US also rises. In our study, 136 of 184 ureteral stones are detected by US, giving a detection rate of 73.9 %. When we

evaluate the cases in our study up to the grade of hydronephrosis, it is seen that the detection rate of US rises from 65.9 % in grade 1 to 78 % in grade 2 and 95 % in grade 3 hydronephrosis. The detection rate of US between grade 1 and 3 hydronephrotic groups shows a statistically significant difference ($p < 0.05$). The 95 % detection rate in grade 3 hydronephrosis is close to spiral CT but 78 % in grade 2 hydronephrosis is clearly less (1). Spiral CT has reported to have 91- 95 % sensitivity and 95-100 % specificity for detecting ureteral stones in different articles (1, 2, 13). Yılmaz et al reported that CT was found to be the best modality for depicting ureteral stones with an accuracy of 95 %, while IVU had 66 % and US 45 % accuracy values (13). But Patlas et al found US and spiral CT equally sensitive in detection of ureteral calculi with 93 % and 91 % sensitivity respectively (2). In one study, IVU could not depict 58 % of calculi that were depicted by spiral CT (14). Several investigators reported US as a good alternative to IVU with sensitivities of 95-100 % for the detection of urinary tract obstruction, however other studies suggested less US sensitivities of 74- 85 % for ureteral stone detection (3, 4, 6, 7). In Sheafor's study, the sensitivity of US for direct depiction of ureteral stones was significantly lower than that of CT (61 %- 96 % respectively) (1). But none of these studies had classified the value of imaging methods up to the grade of hydronephrosis. Thus the reported low values of US for detecting ureteral stones may be related to nonobstructed or low grade hydronephrotic kidneys. Our results also suggest that the detection rates rises from 65.9 % to 95 % with the increase of hydronephrosis grade.

It is reported that, acute obstructions may not cause dilatation of collecting system and there is

no clear correlation between hydronephrosis grade and ureteric dilatation (9, 15). In our study, we focused just on the grade of hydronephrosis and didn't evaluate the ureteral dilatation and as the cases which are hydronephrotic but without ureteral dilatation are included in our study group, our detection rates decreases, but even so, this comparable detection rate with spiral CT is achieved in grade 3 hydronephrosis.

Saita et al determined the success rates of US according to the localization of the stone and they reported success rates of 82.2 % in the proximal and 68 % in the distal ureter (16). In our study, the rate of ureteral stones that couldn't be detected by US was 54.17 % in distal ureter, 25 % in proximal ureter, 18.75 % in iliac cross and 2.08 % in UV junction. Our results are in agreement with Saita and we have determined that the stones located in the distal ureter (between the iliac cross and the UV junction) are the most difficult to visualize by US because of intestinal artefacts. The detection rate of US for this location is 55.5 % in grade 1, 70 % in grade 2 and 75 % in grade 3 hydronephrosis in our study.

In summary, stones located in the distal ureter, or in the ureters of grade 1 or 2 hydronephrotic kidneys are more difficult to detect with US, but US has high success rates comparable to spiral CT for detecting ureteral stones in grade 3 hydronephrosis. US, as a noninvasive modality, must be the first imaging choice for suspect of ureteral stones and when hydronephrosis is seen, a careful US examination must be done to evaluate the ureters before directing patient to spiral CT. Spiral CT can be reserved only for cases which US fails to provide information.

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