ΑΜΦΙΣΒΗΤΩΝΤΑΣ ΤΑ GUIDELINES ΤΗΣ ΛΙΘΙΑΣΗΣ

Η Αμφισβήτηση!

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Αναπληρωτής Καθηγητής Ουρολογίας
Δημοκριτείου Πανεπιστημίου Θράκης

ΔΕΝ ΥΦΙΣΤΑΤΑΙ ΟΙΑΔΗΠΟΤΕ ΣΥΓΚΡΟΥΣΗ ΣΥΜΦΕΡΟΝΤΩΝ

Guidelines on
Urolithiasis

C. Türk (chair), T. Knoll (vice-chair), A. Petrik,
K. Sarica, A. Skolarikos, M. Straub, C. Seitz

1. METHODOLOGY

1.3 Evidence sources

Searches were carried out in the Cochrane Library Database of Systematic Reviews, Cochrane Library of Controlled Clinical Trials, and Medline and Embase on the Dialog-Datastar platform. The searches used the controlled terminology and the use of free text ensured search sensitivity.

Randomised controlled trial strategies were based on Scottish Intercollegiate Guidelines Network (SIGN) and Modified McMaster/Health Information Research Unit (HIRU) filters for RCTs, systematic reviews and practice guidelines on the OVID platform and then translated into Datastar syntax.

There is a need for ongoing re-evaluation of the current guidelines by an expert panel. It must be emphasised that clinical guidelines present the best evidence available but following the recommendations will not necessarily result in the best outcome. Guidelines can never replace clinical expertise when making treatment decisions for individual patients - also taking personal values and preferences/individual circumstances of patients into account.

1. METHODOLOGY

1.4 Level of evidence and grade of recommendation

References in the text have been assessed according to their level of scientific evidence (Table 1.1), and guideline recommendations have been graded (Table 1.2) according to the Oxford Centre for Evidence-based Medicine Levels of Evidence (1). Grading aims to provide transparency between the underlying evidence and the recommendation given.

Table 1.1: Level of evidence (LE)*

Level	Type of evidence
1a	Evidence obtained from meta-analysis of randomised controlled trials.
1b	Evidence obtained from at least one randomised trial.
2a	Evidence obtained from one well-designed controlled study without randomisation.
2b	Evidence obtained from at least one other type of well-designed quasi-experimental study.
3	Evidence obtained from well-designed non-experimental studies, such as comparative studies, correlation studies and case reports.
4	Evidence obtained from expert committee reports or opinions or clinical experience of respected authorities.

* *Modified (1).*

When recommendations are graded, the link between the level of evidence and grade of recommendation is not directly linear. Availability of RCTs may not translate into a grade A recommendation when there are methodological limitations or disparity in published results.

Absence of high-level evidence does not necessarily preclude a grade A recommendation, if there is overwhelming clinical experience and consensus. There may be exceptions where corroborating studies cannot be performed, perhaps for ethical or other reasons, and unequivocal recommendations are considered helpful. Whenever this occurs, it is indicated in the text as "upgraded based on panel consensus". The quality of the underlying scientific evidence must be balanced against benefits and burdens, values and preferences and cost when a grade is assigned (2-4).

The EAU Guidelines Office does not perform cost assessments, nor can it address local/national preferences systematically. The expert panels include this information whenever it is available.

Table 1.2: Grade of recommendation (GR)*

Grade	Nature of recommendations
A	Based on clinical studies of good quality and consistency addressing the specific recommendations and including at least one randomised trial.
B	Based on well-conducted clinical studies, but without RCTs.
C	Made despite the absence of directly applicable clinical studies of good quality.

**Modified from. (1).*

2. CLASSIFICATION OF STONES

Urinary stones can be classified according to size, location, X-ray characteristics, aetiology of formation, composition, and risk of recurrence (1-4).

2.1 Stone size

Stone size is usually given in one or two dimensions, and stratified into those measuring up to 5, 5-10, 10-20, and > 20 mm in largest diameter.

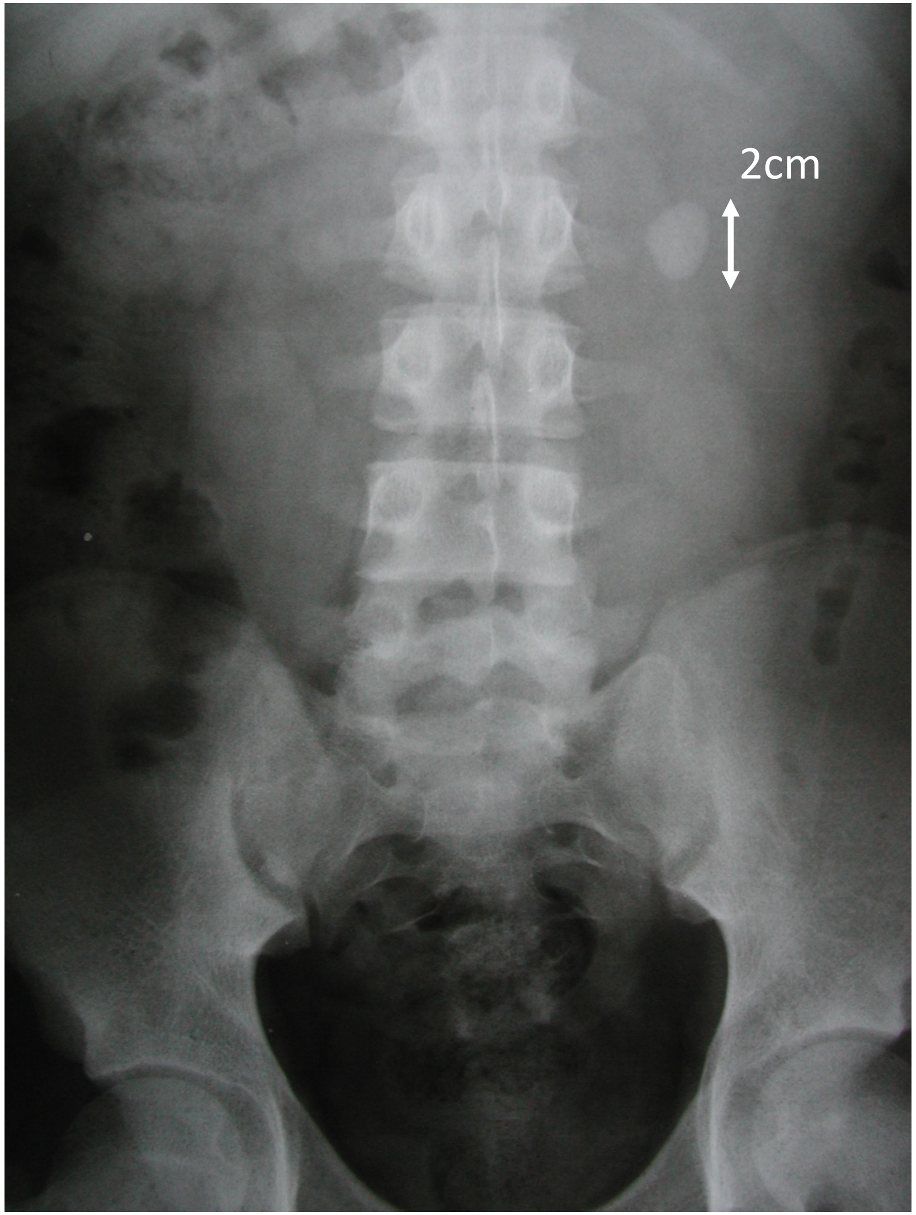
2.2 Stone location

Stones can be classified according to anatomical position: upper, middle or lower calyx; renal pelvis; upper, middle or distal ureter; and urinary bladder. Treatment of bladder stones is not discussed here.

2.3 X-ray characteristics

Stones can be classified according to plain X-ray appearance [kidney-ureter-bladder (KUB) radiography] (Table 2.1), which varies according to mineral composition (3). Non-contrast-enhanced computer tomography (NCCT) can be used to classify stones according to density, inner structure and composition, which can affect treatment decisions (Section 6.3.4) (2,3).


2cm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28 Mar 2008
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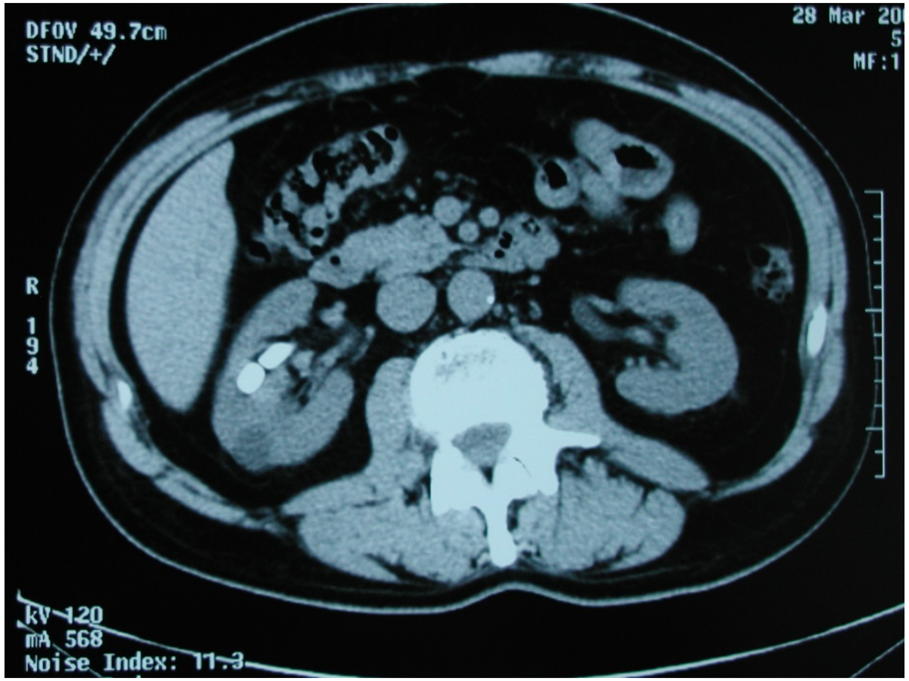
Large Body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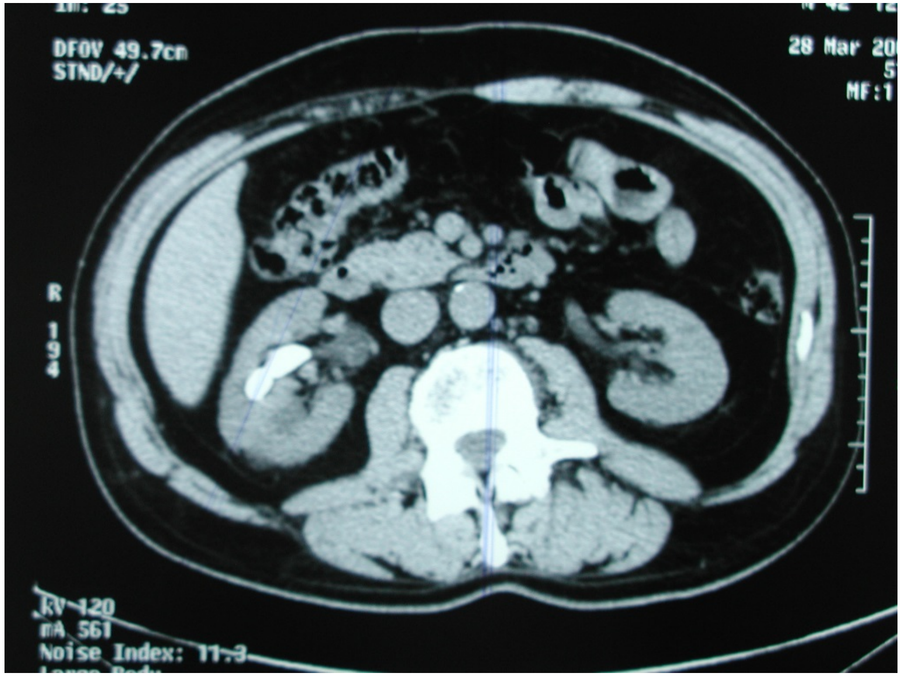
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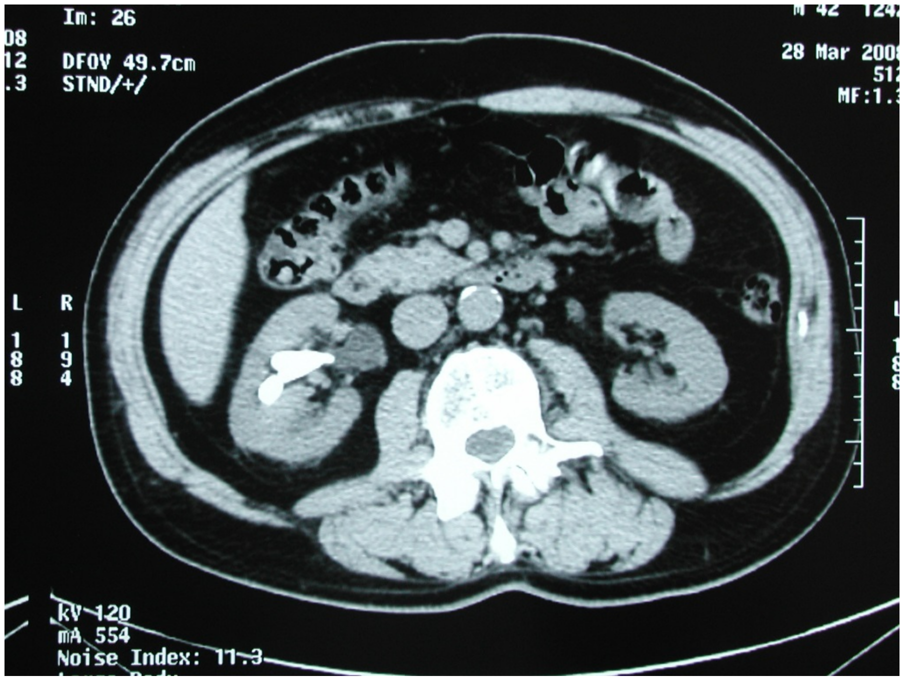
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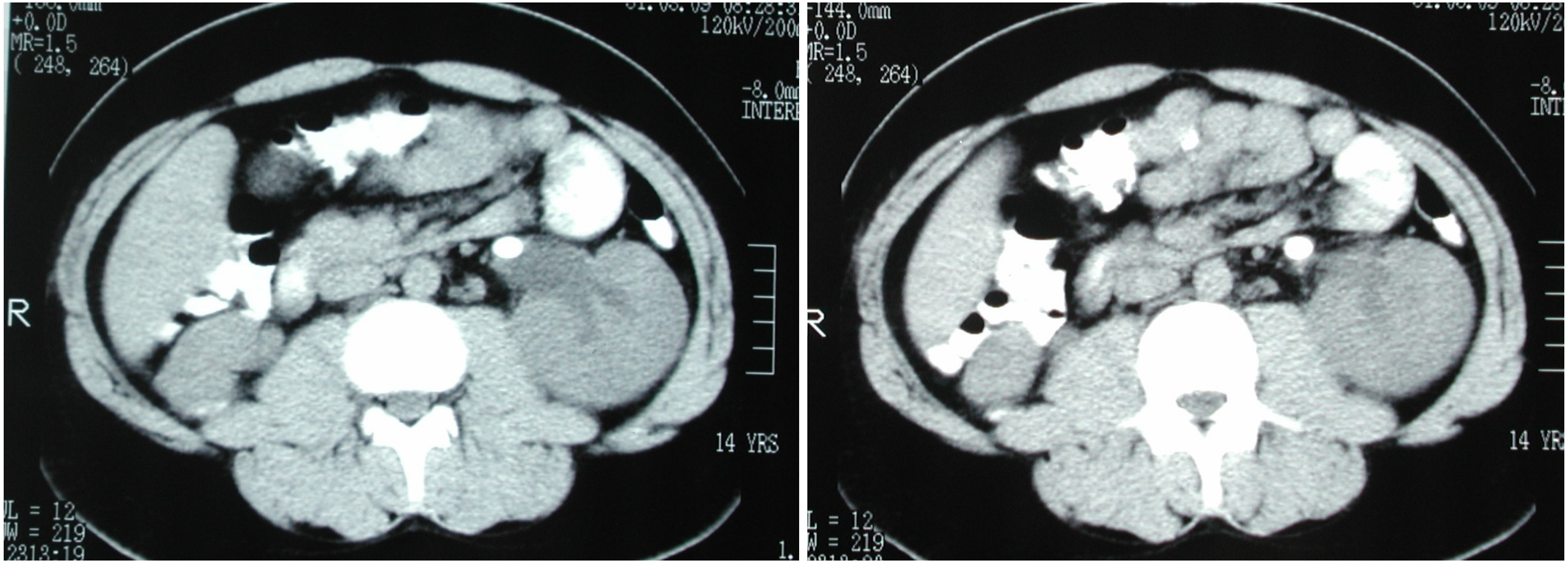

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(248, 264)
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INTER
R
14 YRS
W = 219
-144.0mm
+0.0D
MR=1.5
(248, 264)
120kV/2
R
14 YR
W = 219

2. CLASSIFICATION OF STONES

2.4 Aetiology of stone formation

Stones can be classified into those caused by: infection, or non-infectious causes (infection and non-infection stones); genetic defects (5); or adverse drug effects (drug stones) (Table 2.2).

Table 2.2: Stones classified by aetiology*

Non-infection stones
• Calcium oxalate
• Calcium phosphate (including brushite and carbonate apatite)
• Uric acid
Infection stones
• Magnesium ammonium phosphate
• Carbonate apatite
• Ammonium urate
Genetic causes
• Cystine
• Xanthine
• 2,8-dihydroxyadenine
Drug stones

*See section 11.4.2

3. DIAGNOSIS

3.1 Diagnostic imaging

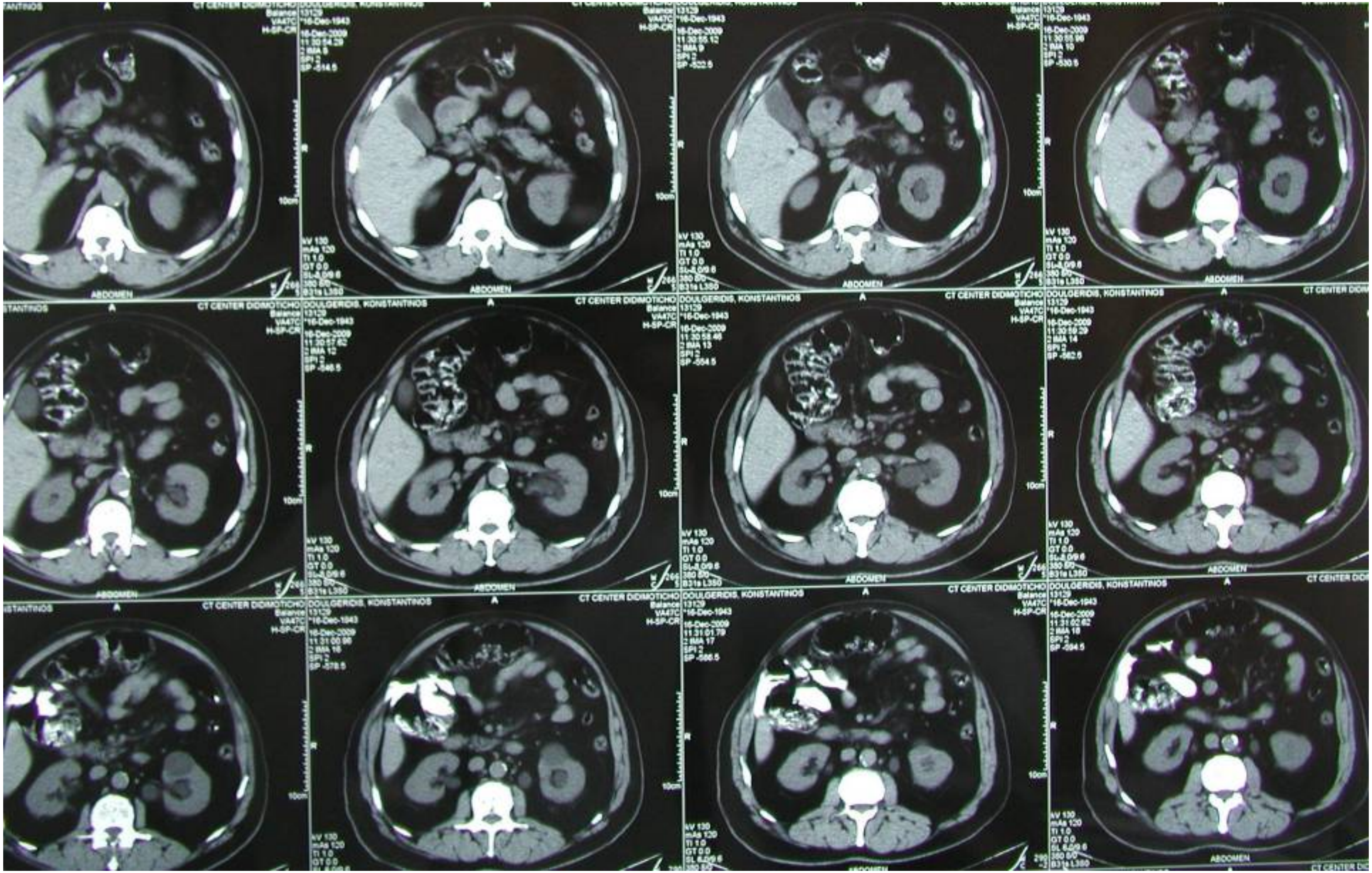
Patients with urinary stones usually present with loin pain, vomiting, and sometimes fever, but may also be asymptomatic. Standard evaluation includes a detailed medical history and physical examination. The clinical diagnosis should be supported by appropriate imaging.

If available, ultrasound (US) should be used as the primary diagnostic imaging tool, although pain relief, or any other emergency measures should not be delayed by imaging assessments. US is safe (no risk of

3.1.2 Evaluation of patients for whom further treatment of renal stones is planned

Recommendation	LE	GR
A contrast study is recommended if stone removal is planned and the anatomy of the renal collecting system needs to be assessed.	3	A*
Enhanced CT is preferable because it enables 3D reconstruction of the collecting system, as well as measurement of stone density and skin-to-stone distance. IVU may also be used.		

* *Upgraded based on panel consensus.*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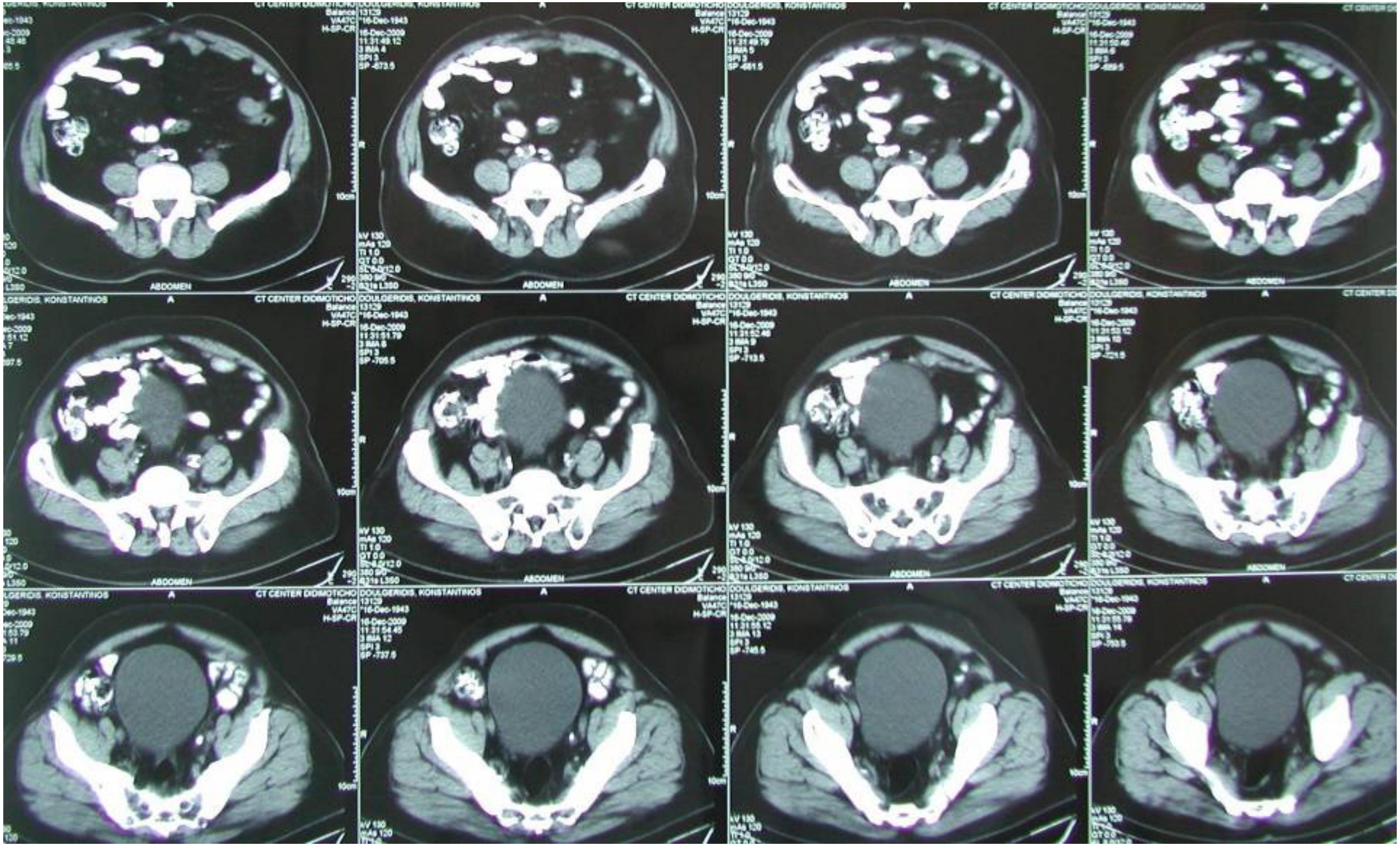
B31s L350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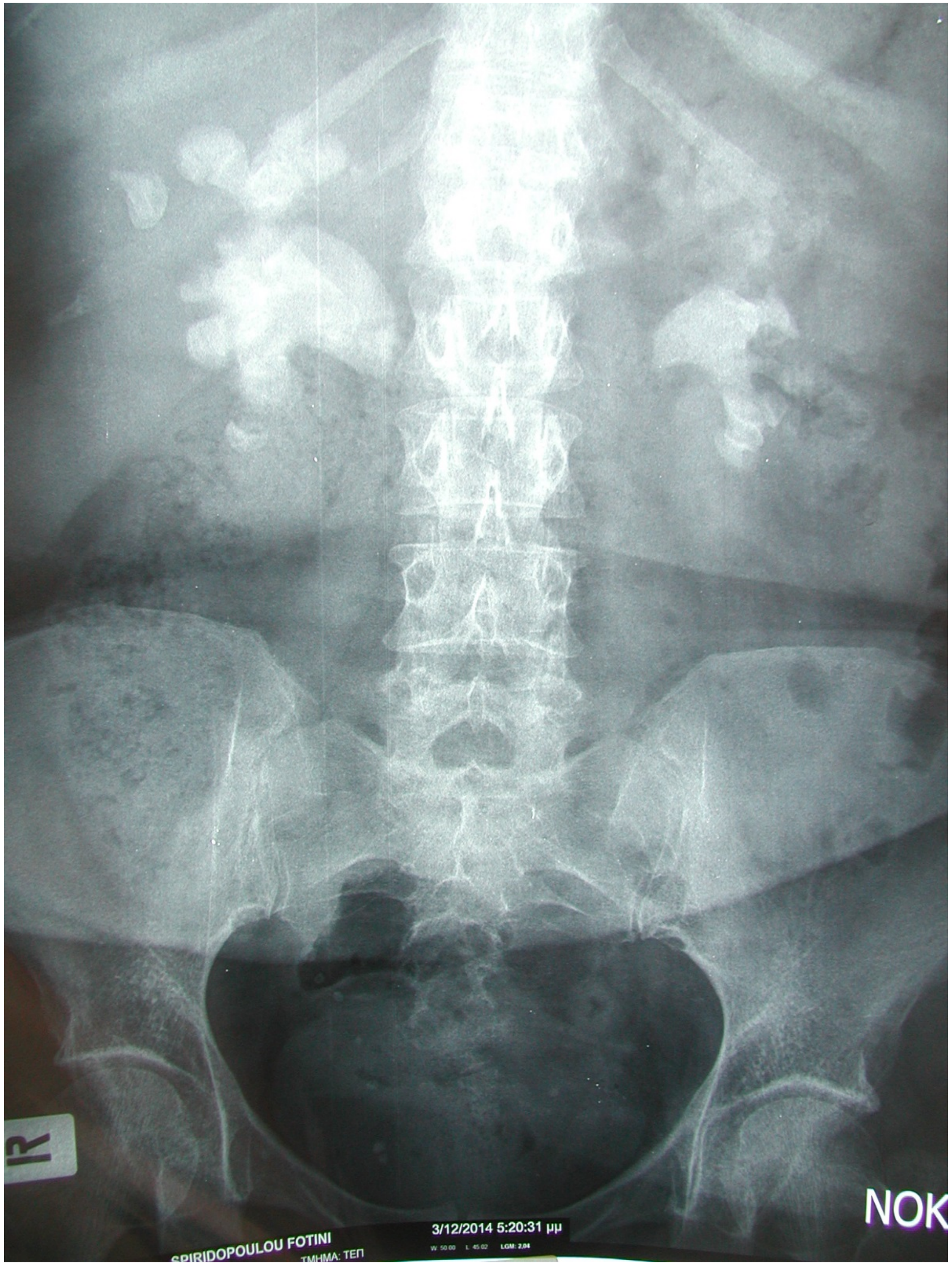
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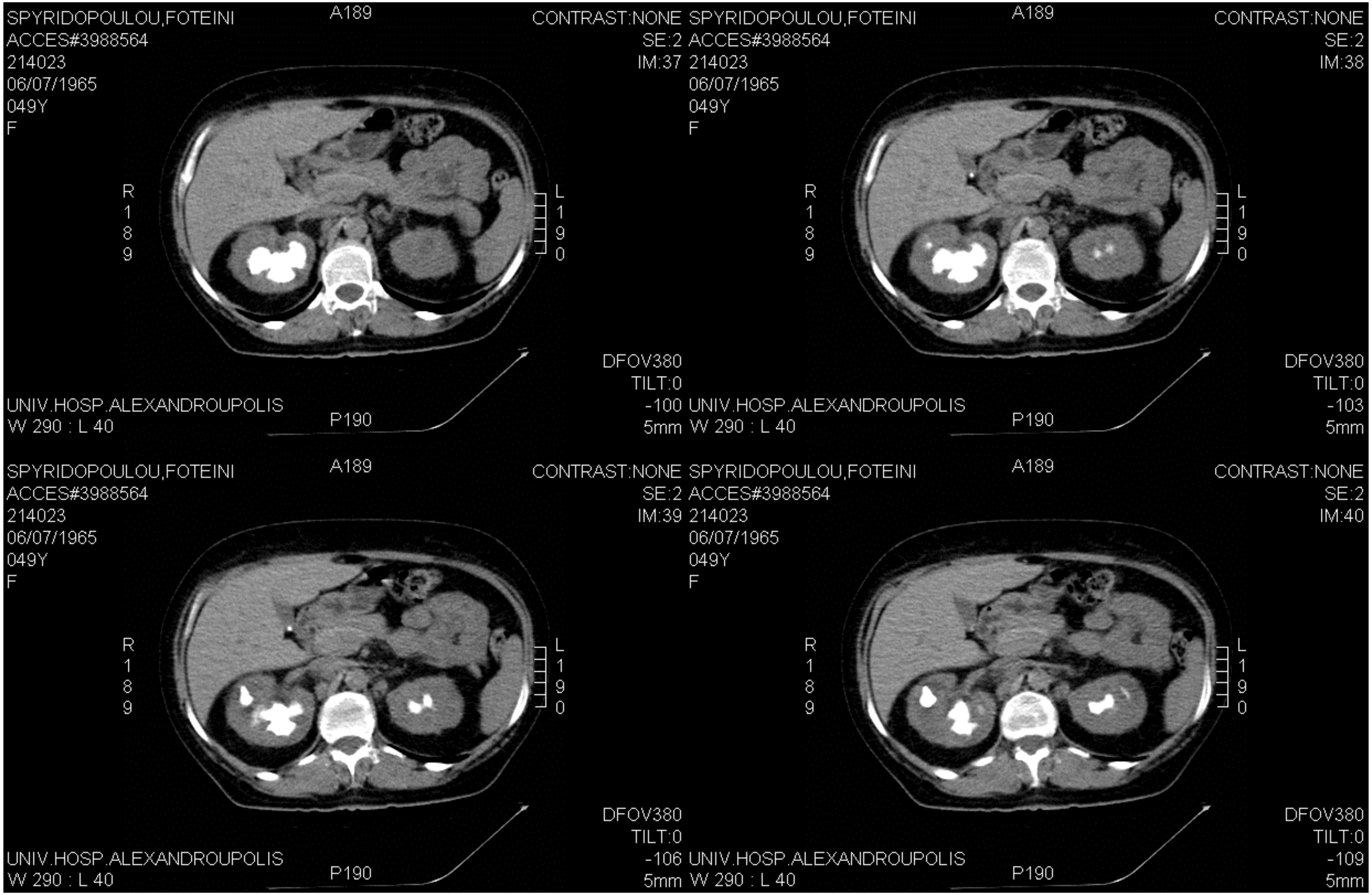
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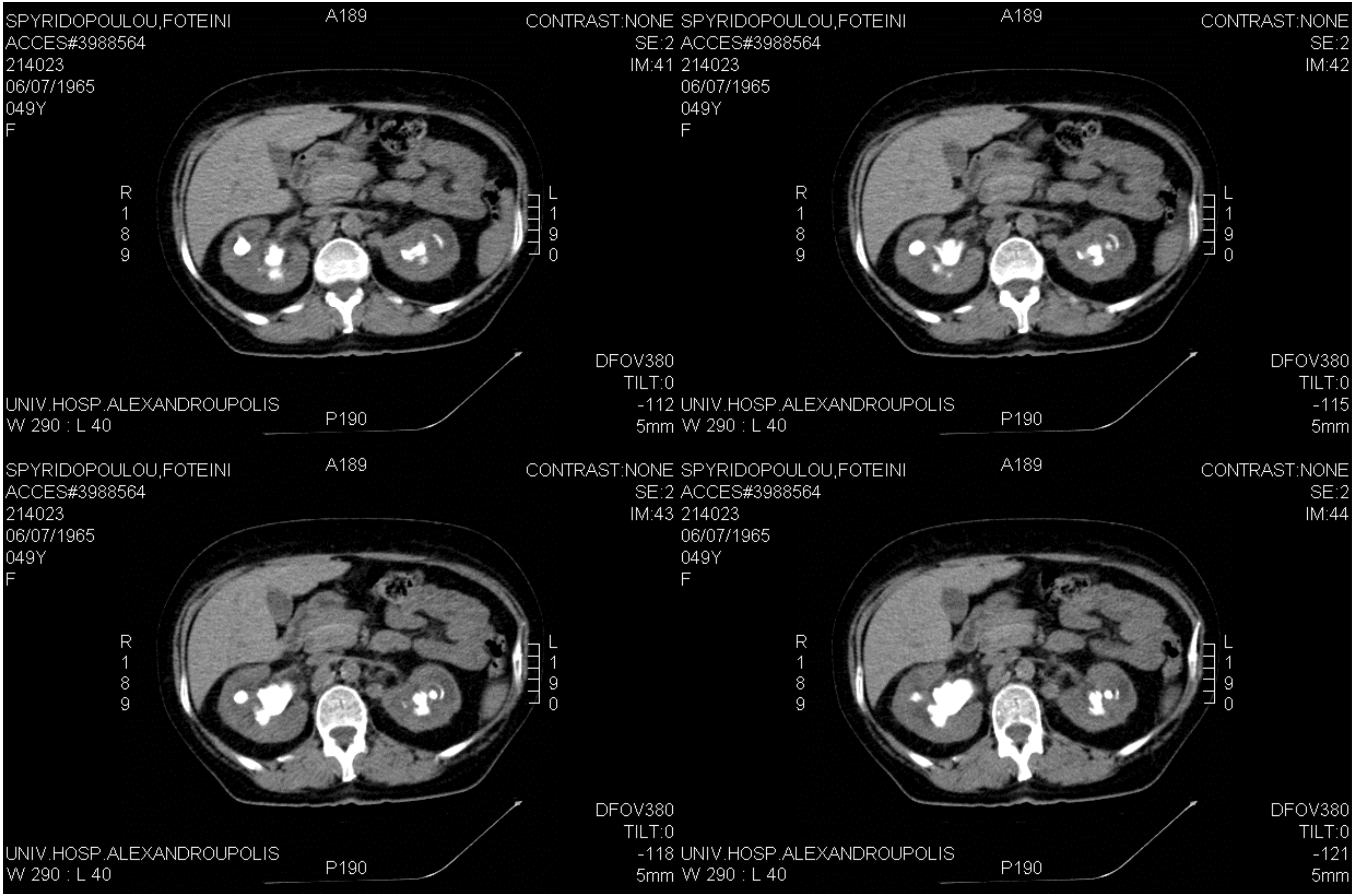
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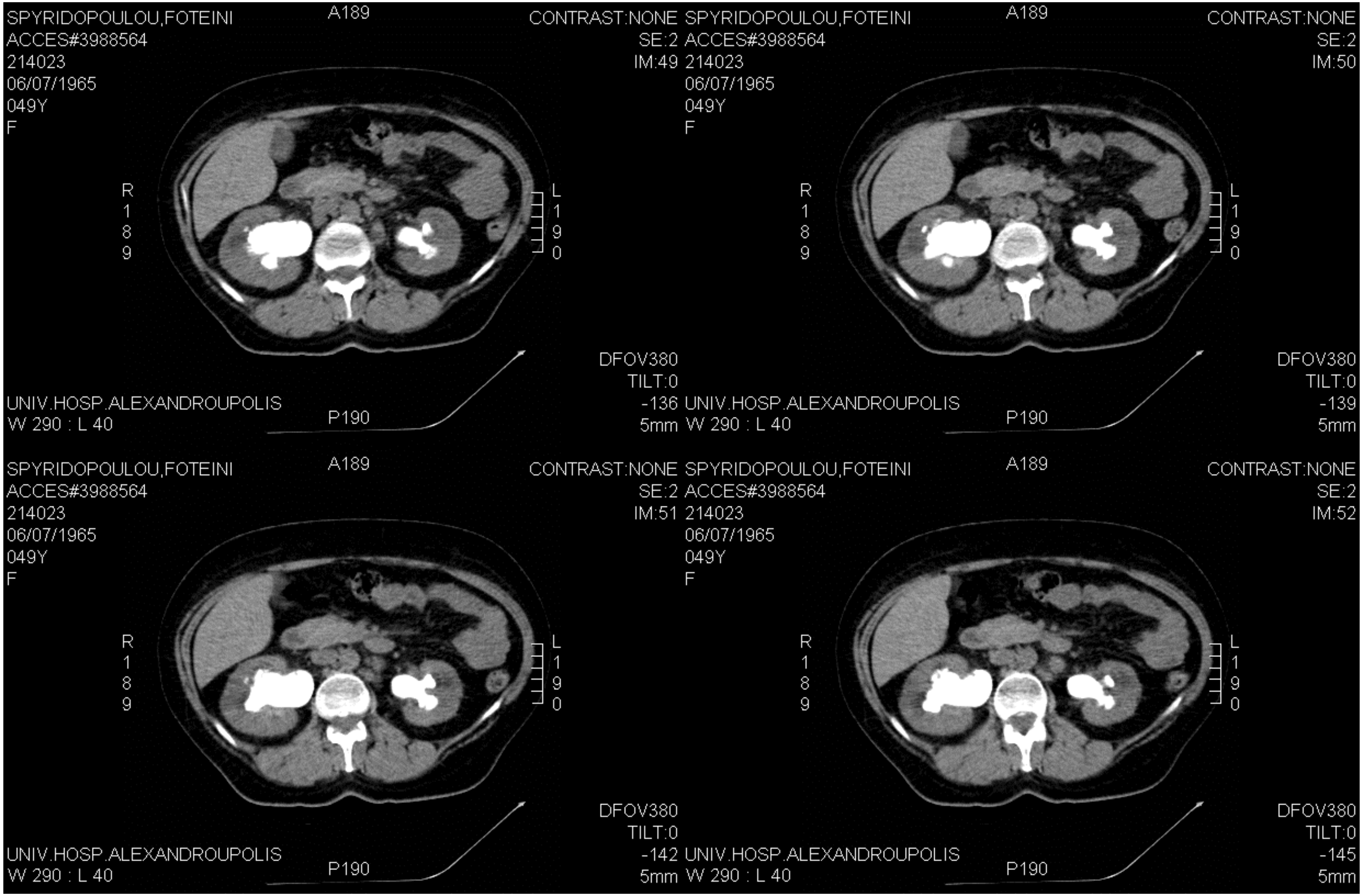

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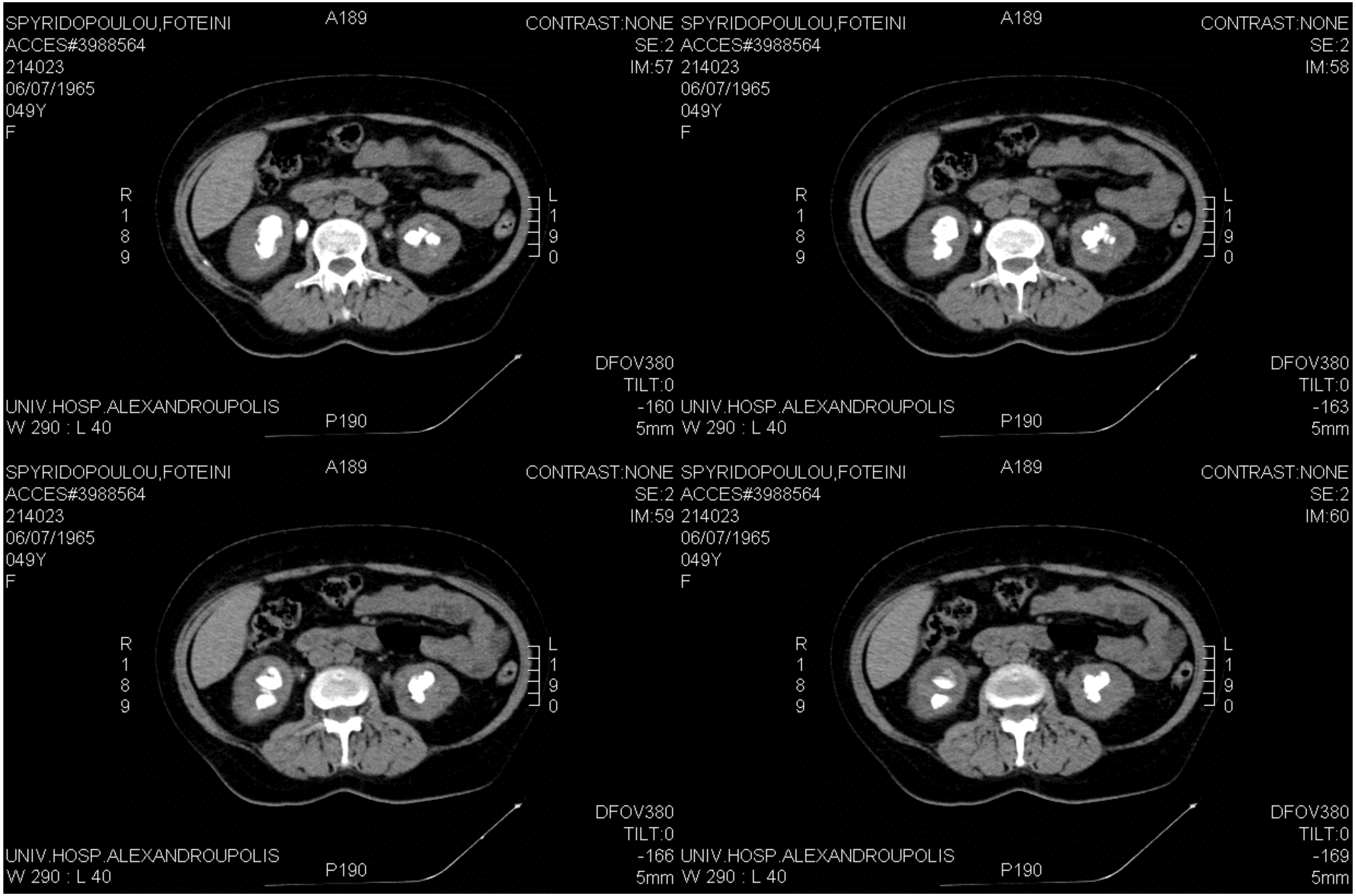
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3.2.2 *Analysis of stone composition*

Stone analysis should be performed in all first-time stone formers.

In clinical practice, repeat stone analysis is needed in case of:

- recurrence under pharmacological prevention;
- early recurrence after interventional therapy with complete stone clearance;
- late recurrence after a prolonged stone-free period (6).

Patients should be instructed to filter their urine to retrieve a concrement for analysis. Stone passage and restoration of normal renal function should be confirmed.

The preferred analytical procedures are infrared spectroscopy (IRS) or X-ray diffraction (XRD) (5,7,8). Equivalent results can be obtained by polarisation microscopy, but only in centres with expertise. Chemical analysis (wet chemistry) is generally deemed to be obsolete (5).

Recommendations	**LE**	**GR**
Always perform stone analysis in first-time formers using a valid procedure (XRD or IRS).	2	A
Repeat stone analysis in patients: • presenting with reccurent stones despite drug therapy; • with early recurrence after complete stone clearance; • with late recurrence after a long stone-free period because stone composition may change (3).	2	B

J Urol. 2003 Jun;169(6):2026-9.

Conversion of calcium oxalate to calcium phosphate with recurrent stone episodes.

Mandel N[1], Mandel I, Fryjoff K, Rejniak T, Mandel G.

Author information

Abstract

PURPOSE:

We have extended our previous observation that the percent occurrence of calcium oxalate stones decreased while that of calcium phosphate stones increased with each new stone event.

MATERIALS AND METHODS:

The National VA Crystal Identification Center has analyzed veteran patient urinary tract stones from VA hospitals throughout the United States since 1983. We reviewed the composition of 33,198 stones with emphasis on the changes in composition. More than 11,786 stones came from 5,088 recurrent stone formers. Stones were analyzed using high resolution x-ray powder diffraction and Fourier transform infrared spectroscopic techniques. When the stones were investigated as a function of time, it was determined that there was greater variability when samples were more than 30 days apart.

RESULTS:

The percent occurrence of whewellite, weddelite, apatite, brushite and uric acid in stones increased between 1.0% and 5.9% since our previous study. The percent occurrence of struvite decreased by 2.6%. The percent of calcium oxalate stones decreased while that of calcium phosphate stones increased with each new event. However, the total percent occurrence of all calcium containing stones did not significantly change with recurrent stone events.

CONCLUSIONS:

Our study suggests a strong trend for the conversion of stone disease from calcium oxalate to calcium phosphate containing stones, which could influence the progression and severity of disease.

Υλικό: 127 ασθενείς με ουρολιθίαση, υπό παρακολούθηση επί 15ετία, χωρίς να λαμβάνουν προφυλακτική θεραπεία

33 με ουρικό οξύ

52 με οξαλικό ασβέστιο

42 με στρουβίτη

ΣΥΣΤΑΣΗ ΠΡΩΤΟΥ ΛΙΘΟΥ	ΚΥΡΙΑ ΣΥΣΤΑΣΗ ΛΙΘΟΥ ΤΩΝ ΥΠΟΤΡΟΠΩΝ
Ουρικό οξύ	Ουρικό οξύ ή **οξαλικό ασβέστιο ή φωσφορικό ασβέστιο**
Οξαλικό ασβέστιο	Οξαλικό ασβέστιο ή **φωσφορικό ασβέστιο**
Στρουβίτης	Στρουβίτης ή **ουρικό οξύ ή οξαλικό ασβέστιο**

Konstantinova et al. Arch Ital Urol Androl 2011; 83: 20

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Stone analysis should be performed in all first-time stone formers.

In clinical practice, repeat stone analysis is needed in case of:

- recurrence under pharmacological prevention;
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Patients should be instructed to filter their urine to retrieve a concrement for analysis. Stone passage and restoration of normal renal function should be confirmed.

The preferred analytical procedures are infrared spectroscopy (IRS) or X-ray diffraction (XRD) (5,7,8). Equivalent results can be obtained by polarisation microscopy, but only in centres with expertise. Chemical analysis (wet chemistry) is generally deemed to be obsolete (5).

Recommendations	**LE**	**GR**
Always perform stone analysis in first-time formers using a valid procedure (XRD or IRS).	2	A
Repeat stone analysis in patients: • presenting with reccurent stones despite drug therapy; • with early recurrence after complete stone clearance; • with late recurrence after a long stone-free period because stone composition may change (3).	2	B

5. STONE RELIEF

When deciding between active stone removal and conservative treatment with medical expulsive therapy (MET), it is important to consider all the patients' circumstances that may affect treatment decisions (1).

5.1 Observation of ureteral stones

5.1.1 Stone-passage rates

There are only limited data about spontaneous stone passage according to size (2,3). A meta-analysis of 328 patients harbouring ureteral stones < 10 mm investigated the likelihood of ureteral stone passage (Table 5.1) (2). These studies had limitations including non-standardisation of stone size measurement, and lack of analysis of stone position, stone-passage history, and time to stone passage.

Table 5.1: Likelihood of ureteral stone passage of ureteral stones (2)

Stone size	Average time to pass	Percentage of passages (95% CI)
< 5 mm (n = 224)		68% (46-85%)
> 5 mm (n = 104)		47% (36-58%)
< 2 mm	31 days	
2-4 mm	40 days	
4-6 mm	39 days	

95% of stones up to 4 mm pass within 40 days (3).

Recommendations	LE	GR
In patients with newly diagnosed ureteral stones < 10 mm, and if active removal is not indicated (Chapter 6), observation with periodic evaluation is an optional initial treatment.	1a	A
Such patients may be offered appropriate medical therapy to facilitate stone passage during observation.*		

EUROPEAN UROLOGY 52 (2007) 1610–1631

available at www.sciencedirect.com
journal homepage: www.europeanurology.com

European Association of Urology

Guidelines

2007 Guideline for the Management of Ureteral Calculi☆

Glenn M. Preminger, Hans-Göran Tiselius*, Dean G. Assimos, Peter Alken, A. Colin Buck, Michele Gallucci, Thomas Knoll, James E. Lingeman, Stephen Y. Nakada, Margaret Sue Pearle, Kemal Sarica, Christian Türk, J. Stuart Wolf Jr.*

From the American Urological Association Education and Research, Inc. and the European Association of Urology

The Panel performed a meta-analysis of studies in which spontaneous ureteral stone passage was assessed. The median probability of stone passage was 68% for stones $\leq$5 mm ($n = 224$) and 47% for those >5 and $\leq$10 mm ($n = 104$) in size (details previously discussed and provided in the appendixes). The Panel recognized that these studies had certain limitations including nonstandardization of the stone size measurement methods and lack of analysis of stone position, stone-passage history, and time to stone passage in some. A meta-analysis

Παρατήρηση επί 520 ουρητηρικών λίθων

ΔΙΑΜΕΤΡΟΣ ΛΙΘΟΥ	ΠΟΣΟΣΤΟ ΑΥΤΟΜΑΤΗΣ ΑΠΟΒΟΛΗΣ
<4mm	60-80%
4-6mm	50%
>6mm	20%

- Η διάμεση εγκάρσια διάμετρος των αποβληθέντων λίθων ήταν 4 ± 2.5 mm
- Λίθοι με εγκάρσια διάμετρο > 8 mm πρέπει να αφαιρούνται χειρουργικά

Ueno A, et al. Urology 1977; 10: 544

5. STONE RELIEF

When deciding between active stone removal and conservative treatment with medical expulsive therapy (MET), it is important to consider all the patients' circumstances that may affect treatment decisions (1).

5.1 Observation of ureteral stones

*5.1.1 **Stone-passage rates***

There are only limited data about spontaneous stone passage according to size (2,3). A meta-analysis of 328 patients harbouring ureteral stones < 10 mm investigated the likelihood of ureteral stone passage (Table 5.1) (2). These studies had limitations including non-standardisation of stone size measurement, and lack of analysis of stone position, stone-passage history, and time to stone passage.

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Recommendations	LE	GR
In patients with newly diagnosed ureteral stones < 10 mm, and if active removal is not indicated (Chapter 6), observation with periodic evaluation is an optional initial treatment.	1a	A
Such patients may be offered appropriate medical therapy to facilitate stone passage during observation.*		

5. STONE RELIEF

5.4.2 ***Oral chemolysis***

Oral chemolitholysis is efficient only for uric acid calculi, and is based on alkalinisation of urine by application of alkaline citrate or sodium bicarbonate (3-6).

When chemolitholysis is planned, the pH should be adjusted to 6.5-7.2. Within this range chemolysis is more effective at a higher pH, which, however, might lead to calcium phosphate stone formation.

In case of uric acid obstruction of the collecting system, oral chemolysis in combination with urinary drainage is indicated (7). A combination of alkalinisation with tamsulosin seems to achieve the highest SFRs for distal ureteral stones (8).

Recommendations	**GR**
The dosage of alkalising medication must be modified by the patient according to urine pH, which is a direct consequence of such medication.	A
Dipstick monitoring of urine pH by the patient is required at regular intervals during the day. Morning urine must be included.	A
The physician should clearly inform the patient of the significance of compliance.	A


R ΩPA 17.05

- Τιμές pH >6,1 και <7.0

1. Sakhaee K, et al. Contrasting effects of potassium citrate and sodium citrate therapies on urinary chemistries and crystallization of stone-forming salts. Kidney Int. 1983; 24(3):348–52

2. Pak CY, Sakhaee K, Fuller C. Successful management of uric acid nephrolithiasis with potassium citrate. Kidney Int. 1986; 30(3):422–8.

5. STONE RELIEF

5.5 Extracorporeal shock wave lithotripsy (SWL)

Introduction of SWL in the early 1980s dramatically changed the management of urinary tract stones. The development of new lithotripters, modified indications, and treatment principles has also completely changed urolithiasis treatment. Modern lithotripters are smaller and usually included in uroradiological tables. They ensure application of SWL and other associated diagnostic and ancillary procedures.

More than 90% of stones in adults might be suitable for SWL treatment (1-3). However, success depends on the efficacy of the lithotripter and the following factors:

- size, location (ureteral, pelvic or calyceal), and composition (hardness) of the stones (Chapter 6);
- patient's habitus (Chapter 6);
- performance of SWL (best practice, see below).

Each of these factors has an important influence on retreatment rate and final outcome of SWL.

5.5.1 Contraindications of extracorporeal shock wave lithotripsy

There are several contraindications to the use of extracorporeal SWL, including:

- pregnancy, due to the potential effects on the foetus (4);
- bleeding diatheses, which should be compensated for at least 24 h before and 48 h after treatment (5);
- uncontrolled UTIs;
- severe skeletal malformations and severe obesity, which prevent targeting of the stone;
- arterial aneurysm in the vicinity of the stone (6);
- anatomical obstruction distal to the stone.

J Urol. 1992 Jul;148(1):18-20.

Extracorporeal shock wave lithotripsy for patients with calcified ipsilateral renal arterial or abdominal aortic aneurysms.

Carey SW[1], Streem SB.
Author information

Abstract
A total of 4 patients with renal or upper ureteral calculi associated with ipsilateral calcified renal arterial or abdominal aortic aneurysms underwent extracorporeal shock wave lithotripsy. One patient with a renal artery aneurysm had a solitary kidney. Linear distance from the calcified aneurysm to the stone, calculated by computerized and plain tomography, ranged between 4.6 and 6.5 cm. (mean 5.3). Treatment was accomplished on an unmodified Dornier HM3 lithotriptor using 900 to 2,400 shock waves (mean 1,575) at 18 kv. There were no complications of treatment and all 4 patients were discharged from the hospital within 24 hours, at which time radiographic examination revealed excellent stone comminution without change in the calcified aneurysm. With followup as long as 30 months, no adverse effects of therapy have become evident. We conclude that the presence of an ipsilateral calcified aneurysm may not necessarily preclude treatment of renal or upper ureteral calculi with extracorporeal shock wavelithotripsy, although further studies are required to help define the potential limits of such therapy in this setting.

J Urol. 1995 Nov;154(5):1671-2.

Extracorporeal shock wave lithotripsy in 5 patients with aortic aneurysm.

Deliveliotis C[1], Kostakopoulos A, Stavropoulos N, Karagiotis E, Kyriazis P, Dimopoulos C.

Author information

Abstract

PURPOSE:

The safety and efficacy of extracorporeal shock wave lithotripsy (ESWL*) in patients with an aortic aneurysm were assessed.

MATERIALS AND METHODS:

Five patients with an aortic aneurysm and symptomatic renal (4) or upper ureteral (1) lithiasis underwent ESWL with either an HM3 or HM4 lithotriptor.

RESULTS:

The procedure was well tolerated in all patients. The stone was fragmented completely in the 4 patients with renal lithiasis, while 1 with ureteral lithiasis also required ureteroscopic extraction of the stone fragments.

CONCLUSIONS:

For patients with symptomatic renal stones and an aortic aneurysm ESWL may be the treatment of choice.

J Urol. 1997 Apr;157(4):1197-203.

Contemporary clinical practice of shock wave lithotripsy: a reevaluation of contraindications.

Streem SB[1].

Author information

Abstract

PURPOSE:

The current clinical practice of shock wave lithotripsy is reviewed, specifically regarding patients in whom the presence of presumed absolute or relative contraindications may preclude treatment.

MATERIALS AND METHODS:

Peer reviewed basic scientific and clinical studies on shock wave lithotripsy in patients with urinary stones and concomitant conditions that might contraindicate treatment reported between 1982 and 1996 were critically reviewed.

RESULTS:

The exclusion of patients with conditions previously believed to contraindicate shock wave lithotripsy has almost always been empiric rather than based on experimental or clinical studies showing adverse effects in those settings. The contemporary literature suggests that shock wavelithotripsy in patients with proximate calcified aneurysms, implanted cardiac pacemakers and defibrillators, and bleeding diatheses can be accomplished safely and effectively with careful treatment and monitoring before, during and after shock wave lithotripsy. Likewise, patients with morbid obesity, children, and those with mid and distal ureteral calculi can also be treated successfully, even with first generation lithotriptors, with minor modifications that allow for appropriate positioning of the patient and stone.

CONCLUSIONS:

The designation of most conditions as absolute or relative contraindications to shock wave lithotripsy has been empiric. A review of experimental and clinical studies pertinent to these issues clearly shows that most concomitant conditions previously precluding shock wave treatment can be circumvented to allow safe and effective use of this minimally invasive technology. Currently, pregnancy is the only condition that should remain an absolute contraindication to this treatment.

5. STONE RELIEF

5.6 Endourology techniques

5.6.1 Percutaneous nephrolithotomy (PNL)

Recommendation	GR
Preprocedural imaging, including contrast medium where possible or retrograde study when starting the procedure, is mandatory to assess stone comprehensiveness, view the anatomy of the collecting system, and ensure safe access to the kidney stone.	A*

** Upgraded based on panel consensus.*

5. STONE RELIEF

5.6 Endourology techniques

5.6.2 *Ureterorenoscopy (URS) (including retrograde access to renal collecting system)*

Recommendation	LE	GR
Stone extraction using a basket without endoscopic visualisation of the stone (blind basketing) should not be performed.	4	A*

** Upgraded based on panel consensus.*

Recommendation	GR
Placement of a safety wire is recommended.	A*

** Upgraded based on panel consensus.*

Η χρήση guidewire δεν είναι απαραίτητη στην ουρητηροσκόπηση

1. Dickstein RJ, Kreshover JE, Babayan RK, et al. Is a safety wire necessary during routine flexible ureteroscopy? J Endourol 2010 Oct;24(10):1589-92

2. Patel SR et al. The ureteroscope as a safety wire for ureteronephroscopy. J Endourol 2012; 26: 351-4

3. Eandi JA, Hu B, Low RK. Evaluation of the impact and need for use of a safety guidewire during ureteroscopy. J Endourol 2008 Aug;22(8):1653-8

5. STONE RELIEF

5.7 Open and laparoscopic surgery for removal of renal stones

Table 5.6: Indications for open surgery

Kidney stones
• Complex stone burden
• Failure of SWL, PNL, or ureteroscopic procedure
• Intrarenal anatomical abnormalities: infundibular stenosis; stone in the calyceal diverticulum (particularly in an anterior calyx); obstruction of the ureteropelvic junction; and stricture if endourologic procedures have failed or are not promising
• Morbid obesity
• Skeletal deformity, contractures and fixed deformities of hips and legs
• Comorbidity
• Concomitant open surgery
• Non-functioning lower pole (partial nephrectomy), non-functioning kidney (nephrectomy)
• Patient choice (after failed minimally invasive procedures, a single procedure avoiding the risk of multiple PNL procedures might be preffered by the case)
• Stone in an ectopic kidney where percutaneous access and SWL may be difficult or impossible
• For the paediatric population, the same considerations apply as for adults
Ureteral stones
• Large impacted ureteral stones
• Cases requiring surgery for other concurrent conditions
• In cases with failed other non-invasive or low-invasive procedures
• For upper ureteral calculi, laparoscopic urolithomy has the highest stone-free rate compared to URS and SWL (31) (LE: 1b)

Urology. 1995 Feb;45(2):218-21.

Current indications for open stone surgery in an endourology center.

Kane CJ[1], Bolton DM, Stoller ML.

Author information

Abstract

OBJECTIVES:

To evaluate the current indications and outcome of open stone surgery in a tertiary endourology unit.

METHODS:

A 3-year retrospective review (1990 to 1993) of all endoscopic and open stone surgery was undertaken.

RESULTS:

Twenty-five open procedures were performed on 20 patients of a total of 799 stone treatment procedures (3.13%). The most common indications for open stone surgery included large stone burdens in association with abnormal anatomy limiting endoscopic access (31%), concurrent open surgical procedures (24%), or previous failed endourologic procedures (17%). Anatomic factors contributing to the need for open surgeryincluded renal transplantation, morbid obesity, and severe limb contractures.

CONCLUSIONS:

Open stone surgery has become more complex. Patients undergoing open surgery, who failed endourologic techniques, or for anatomic or medical reasons, currently are the cohorts who may still benefit from treatment for calculus disease using open surgical techniques.

5. STONE RELIEF

5.7 Open and laparoscopic surgery for removal of renal stones

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PCNL σε ασθενείς με κανονικό, υψηλό και πολύ υψηλό BMI

- Καμία διαφορά στην αποτελεσματικότητα
- Καμία διαφορά στις επιπλοκές

1. Obesity in percutaneous nephrolithotomy. Is body mass index really important?
   Torrecilla O, et al. Urology 2014; 84: 538 (255 επεμβάσεις)

2. Outcomes of percutaneous nephrolithotomy stratified by body mass index.
   Tomaszewski J, et al. J Endourol 2010; 24: 547 (234 επεμβάσεις)

3. Outcome of percutaneous surgery stratified according to body mass index and kidney stone size.
   Sergeyev I, et al Surg Laparosc Endosc Percutan Tech 2007; 17: 179 (148 επεμβάσεις)

4. Outcome of percutaneous nephrolithotomy: effect of body mass index.
   El-Assmy AM, et al. Eur Urol 2007; 52: 199 (1287 επεμβάσεις)

J Urol. 2012 Jul;188(1):138-44. doi: 10.1016/j.juro.2012.03.013. Epub 2012 May 15.

The CROES percutaneous nephrolithotomy global study: the influence of body mass index on outcome.

Fuller A[1], Razvi H, Denstedt JD, Nott L, Pearle M, Cauda F, Bolton D, Celia A,
de la Rosette J; CROES PCNL Study Group.
Author information

Abstract

PURPOSE:

In addition to more commonly forming stones, obese patients present a number of challenges when undergoing percutaneous nephrolithotomy. We evaluated percutaneous nephrolithotomy outcomes in 3,709 patients stratified by body mass index.

MATERIALS AND METHODS:

A prospective database administered by CROES (Clinical Research Office of the Endourological Society) captured data on 5,803 patients treated with percutaneous nephrolithotomy between November 2007 and December 2009. Patients with known solitary kidney, previous percutaneous nephrolithotomy and congenital abnormalities were excluded from analysis. For statistical analysis patients were categorized as normal weight--body mass index 18.5 to 25 kg/m(2), overweight--25 to 30, obese--30 to 40 and super obese--greater than 40.

RESULTS:

During the study period 5,803 patients underwent percutaneous nephrolithotomy, of whom 3,709 met the inclusion criteria. As expected,obesity was associated with significantly higher rates of comorbid conditions and anticoagulant use ($p < 0.001$). Operative time was significantly longer in obese patients and use of a balloon device for tract dilation was more common (each $p < 0.001$). The stone-free rate decreased with obesity($p = 0.009$), corresponding to a significantly higher re-treatment rate in this group ($p < 0.001$). No difference was seen in length of stay or the transfusion rate. No significant difference was seen in the overall complication rate among the 4 groups ($p = 0.707$).

CONCLUSIONS:

Percutaneous nephrolithotomy may be done safely in obese patients, although with a longer operative time, an inferior stone-free rate and a higher re-intervention rate.

5. STONE RELIEF

5.7 Open and laparoscopic surgery for removal of renal stones

Table 5.6: Indications for open surgery

Kidney stones
• Complex stone burden
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• Morbid obesity
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• Comorbidity
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• Patient choice (after failed minimally invasive procedures, a single procedure avoiding the risk of multiple PNL procedures might be preffered by the case)
• Stone in an ectopic kidney where percutaneous access and SWL may be difficult or impossible
• For the paediatric population, the same considerations apply as for adults
Ureteral stones
• Large impacted ureteral stones
• Cases requiring surgery for other concurrent conditions
• In cases with failed other non-invasive or low-invasive procedures
• For upper ureteral calculi, laparoscopic urolithomy has the highest stone-free rate compared to URS and SWL (31) (LE: 1b)

J Urol. 2012 Jan;187(1):164-8. doi: 10.1016/j.juro.2011.09.054. Epub 2011 Nov 17.

Prospective randomized study of treatment of large proximal ureteral stones: extracorporeal shock wave lithotripsy versus ureterolithotripsy versus laparoscopy.

Lopes Neto AC[1], Korkes F, Silva JL 2nd, Amarante RD, Mattos MH, Tobias-Machado M, Pompeo AC.

Author information

Abstract

PURPOSE:

The best treatment modalities for large proximal ureteral stones are controversial, and include extracorporeal shock wave lithotripsy, ureterolithotripsy, percutaneous nephrolithotripsy, laparoscopic ureterolithotomy and open surgery. To the best of our knowledge extracorporeal shock wave lithotripsy, semirigid ureterolithotripsy and laparoscopic ureterolithotomy have not been previously compared for the treatment of large proximal ureteral stones. Therefore, we compared these modalities for the treatment of large proximal ureteral stones.

MATERIALS AND METHODS:

A total of 48 patients with large proximal ureteral stones (greater than 1 cm) were prospectively randomized and enrolled in the study at a single institution between 2008 and 2010. Eligible patients were assigned to extracorporeal shock wave lithotripsy, semirigid ureterolithotripsy or laparoscopic ureterolithotomy.

RESULTS:

Extracorporeal shock wave lithotripsy had a 35.7% success rate, semirigid ureterolithotripsy 62.5% and laparoscopic ureterolithotomy 93.3%. Stone-free rates showed a statistically significant difference among the groups (p = 0.005). Patients treated with laparoscopic ureterolithotomy vs semirigid ureterolithotripsy vs extracorporeal shock wave lithotripsy required fewer treatment sessions (mean ± SD 1.9 ± 0.3 vs 2.2 ± 0.6 vs 2.9 ± 1.4, p = 0.027). Neither major nor long-term complications were observed.

CONCLUSIONS:

Proximal ureteral stone treatment requires multiple procedures until complete stone-free status is achieved. Laparoscopic ureterolithotomy is associated with higher success rates and fewer surgical procedures, but with more postoperative pain, longer procedures and a longer hospital stay. Although it is associated with the highest success rates for large proximal ureteral calculi, laparoscopic ureterolithotomy remains a salvage, second line procedure, and it seems more advantageous than open ureterolithotomy. At less well equipped centers, where semirigid ureterolithotripsy or extracorporeal shock wave lithotripsy is not available, it remains a good treatment option.

J Endourol. 2008 Dec;22(12):2677-80. doi: 10.1089/end.2008.0095.

Retrograde, antegrade, and laparoscopic approaches for the management of large, proximal ureteral stones: a randomized clinical trial.

Basiri A[1], Simforoosh N, Ziaee A, Shayaninasab H, Moghaddam SM, Zare S.

Author information

Abstract

BACKGROUND AND PURPOSE:

Multiple procedures have been introduced for the management of urinary stones in the upper ureter. In this randomized clinical trial, we compared three surgical options in this regard.

PATIENTS AND METHODS:

From September 2004 to May 2006, we enrolled in the study 150 patients with upper ureteral stones who were referred to our center. We included patients with a stone size >or= 1.5 cm in the greatest diameter. Using the random table, patients were divided into three 50-patient groups by treatment: Group A, retrograde ureteroscopic lithotripsy using a semirigid ureteroscope; group B, transperitoneal laparoscopicureterolithotomy; and group C, percutaneous nephrolithotripsy. All procedures were performed in a training program.

RESULTS:

The stone-free rates for patients in groups A, B, and C, at discharge and 3 weeks later, were 56%, 88% and 64% and 76%, 90% and 86%, respectively. Conversion to open surgery and repeated laparoscopy was necessary for two and one patients in group B. Urinary leakage continued more than 3 days in eight (16%) and nine (18%) patients in groups B and C after operation, respectively (P = 0.7).

CONCLUSIONS:

Although the success rate of ureteroscopy was not significantly lower than the two other options, the complications seen with this technique were negligible. Consequently, the procedure of choice for large proximal ureteral stones seems to depend on surgeon expertise and availability of equipment.

J Endourol. 2014 Jan;28(1):100-3. doi: 10.1089/end.2013.0391. Epub 2013 Oct 4.

Retrograde, antegrade, and laparoscopic approaches to the management of large upper ureteral stones after shockwave lithotripsy failure: a four-year retrospective study.

Zhu H[1], Ye X, Xiao X, Chen X, Zhang Q, Wang H.

Author information

Abstract

PURPOSE:

We compare the success rate and complications of retrograde ureteroscopy, laparoscopic ureterolithotomy, and percutaneous nephrolithotomy for the management of large upper ureteral stones.

PATIENTS AND METHODS:

We retrospectively analyzed data from 73 patients with large (≥1 cm) upper ureteral stones at two institutions from January 2010 to May 2013. Twenty-two patients underwent retrograde ureteroscopy (group ULS), 30 patients underwent percutaneous nephrolithotripsy (group PCNL), and 21 patients underwent laparoscopic ureterolithotomy (group LS) for removal of upper ureteral stones. CT, intravenous urography, and ultrasound were performed 1 week and 1 month after surgical removal.

RESULTS:

There were no significant differences in age, sex, or stone size among the three groups. Mean estimated blood loss and mean hospital stay showed a statistically significant difference among the three groups. Success rates in the PCNL, LS, and ULS groups were 100%, 90.5%, and 77.3%, respectively. The procedures of two patients in group LS were converted to open surgery because of the inability to find the ureteral stone in one patient and an adhesion too difficult to dissect in the other. The procedures of two patients in the ULS group were converted to LS, and those of three patients were converted to PCNL because of severe edema impaction at the site of the stone, a sharply angulated ureter obstruction, upward migration of the stone (seven patients), and intraoperative complications (two patients).

CONCLUSIONS:

Percutaneous antegrade nephrolithotomy is a safe and effective minimally invasive treatment for patients with large upper ureteral stones that has several advantages over retrograde ureteroscopy and laparoscopic ureterolithotomy. Thus, percutaneous antegrade nephrolithotomy is recommended as a safe and good treatment option for large upper ureteral stones. A combined procedure (e.g., ureteral push-back and percutaneous removal) can be considered in some patients.

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Clinical Study

A Comparison of Antegrade Percutaneous and Laparoscopic Approaches in the Treatment of Proximal Ureteral Stones

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[1] *Urology Clinic, Diskapi Yildirim Beyazit Training and Research Hospital, 06310 Ankara, Turkey*
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Academic Editor: Berkan Resorlu

Purpose. To compare the effectiveness and safety of retroperitoneal laparoscopic ureterolithotomy (RLU) and percutaneous antegrade ureteroscopy (PAU) in which we use semirigid ureteroscopy in the treatment of proximal ureteral stones. *Methods.* Fifty-eight patients with large, impacted stones who had a history of failed shock wave lithotripsy (SWL) and, retrograde ureterorenoscopy (URS) were included in the study between April 2007 and April 2014. Thirty-seven PAU and twenty-one RLU procedures were applied. Stone-free rates, operation times, duration of hospital stay, and follow-up duration were analyzed. *Results.* Overall stone-free rate was 100% for both groups. There was no significant difference between both groups with respect to postoperative duration of hospital stay and urinary leakage of more than 2 days. PAU group had a greater amount of blood loss (mean hemoglobin drops for PAU group and RLU group were 1.6 ± 1.1 g/dL versus 0.5 ± 0.3 g/dL, resp.; $P = 0.022$). RLU group had longer operation time (for PAU group and RLU group 80.1 ± 44.6 min versus 102.1 ± 45.5 min, resp.; $P = 0.039$). *Conclusions.* Both PAU and RLU appear to be comparable in the treatment of proximal ureteral stones when the history is notable for a failed retrograde approach or SWL. The decision should be based on surgical expertise and availability of surgical equipment.

5. STONE RELIEF

5.7 Open and laparoscopic surgery for removal of renal stones

Recommendations	**LE**	**GR**
Laparoscopic or open surgical stone removal may be considered in rare cases in which SWL, URS, and percutaneous URS fail or are unlikely to be successful.	3	C
When expertise is available, laparoscopic surgery should be the preferred option before proceeding to open surgery. An exception is complex renal stone burden and/or stone location.	3	C
For ureterolithotomy, laparoscopy is recommended for large impact stones or when endoscopic lithotripsy or SWL has failed.	2	B

6. INDICATION FOR ACTIVE STONE REMOVAL AND SELECTION OF PROCEDURE

6.1 Indications for active removal of ureteral stones (1-3)

- Stones with low likelihood of spontaneous passage.
- Persistent pain despite adequate analgesic medication.
- Persistent obstruction.
- Renal insufficiency (renal failure, bilateral obstruction, or single kidney).

6.2 Indications for active removal of kidney stones (4)

- Stone growth.
- Stones in high-risk patients for stone formation.
- Obstruction caused by stones.
- Infection.
- Symptomatic stones (e.g., Pain or haematuria).
- Stones > 15 mm.
- Stones < 15 mm if observation is not the option of choice
- Patient preference.
- Comorbidity.
- Social situation of the patient (e.g., Profession or travelling).
- Choice of treatment.

6. INDICATION FOR ACTIVE STONE REMOVAL AND SELECTION OF PROCEDURE

*6.2.1 **Natural history of caliceal stones***

Natural history of small, non-obstructing asymptomatic lower pole calculi is not well defined, and the risk of progression is unclear. There is still no consensus on the follow-up duration, and timing and type of intervention.

Statement	LE
Although the question of whether caliceal stones should be treated is still unanswered, stone growth, de novo obstruction, associated infection, and acute and/or chronic pain are indications for treatment (4-6).	3


0,5 x 0,2cm

ΑΣΥΜΠΤΩΜΑΤΙΚΟΙ ΝΕΦΡΙΚΟΙ ΛΙΘΟΙ

- Ο κίνδυνος συμπτωματικού επεισοδίου ή χειρουργικής παρέμβασης είναι ~10% ανά έτος με αθροιστική 5ετή πιθανότητα ~48.5%

  Glowacki LS, et al. J Urol 1992; 147: 319

- 77% των ασυμπτωματικών ασθενών με νεφρικούς λίθους όλων των μεγεθών, εμφάνισαν επιδείνωση της νόσου και 26% χρειάστηκαν χειρουργική παρέμβαση

  Burgher A, et al. J Endourol 2004; 18: 534

- 83% των καλυκικών λίθων χρειάστηκαν παρέμβαση μέσα στα πρώτα 5 έτη από τη διάγνωση

  Hubner & Porpaczy. Br J Urol 1990; 66: 9

- Καμία διαφορά σε ασυμπτωματικούς καλυκικούς λίθους <15mm μεταξύ SWL και παρακολούθησης, όσον αφορά το SFR, τα συμπτώματα, την ανάγκη για επιπλέον παρεμβάσεις και εισαγωγή στο νοσοκομείο

  Keeley FX, et al. BJU Int 2001; 87: 1

6. INDICATION FOR ACTIVE STONE REMOVAL AND SELECTION OF PROCEDURE

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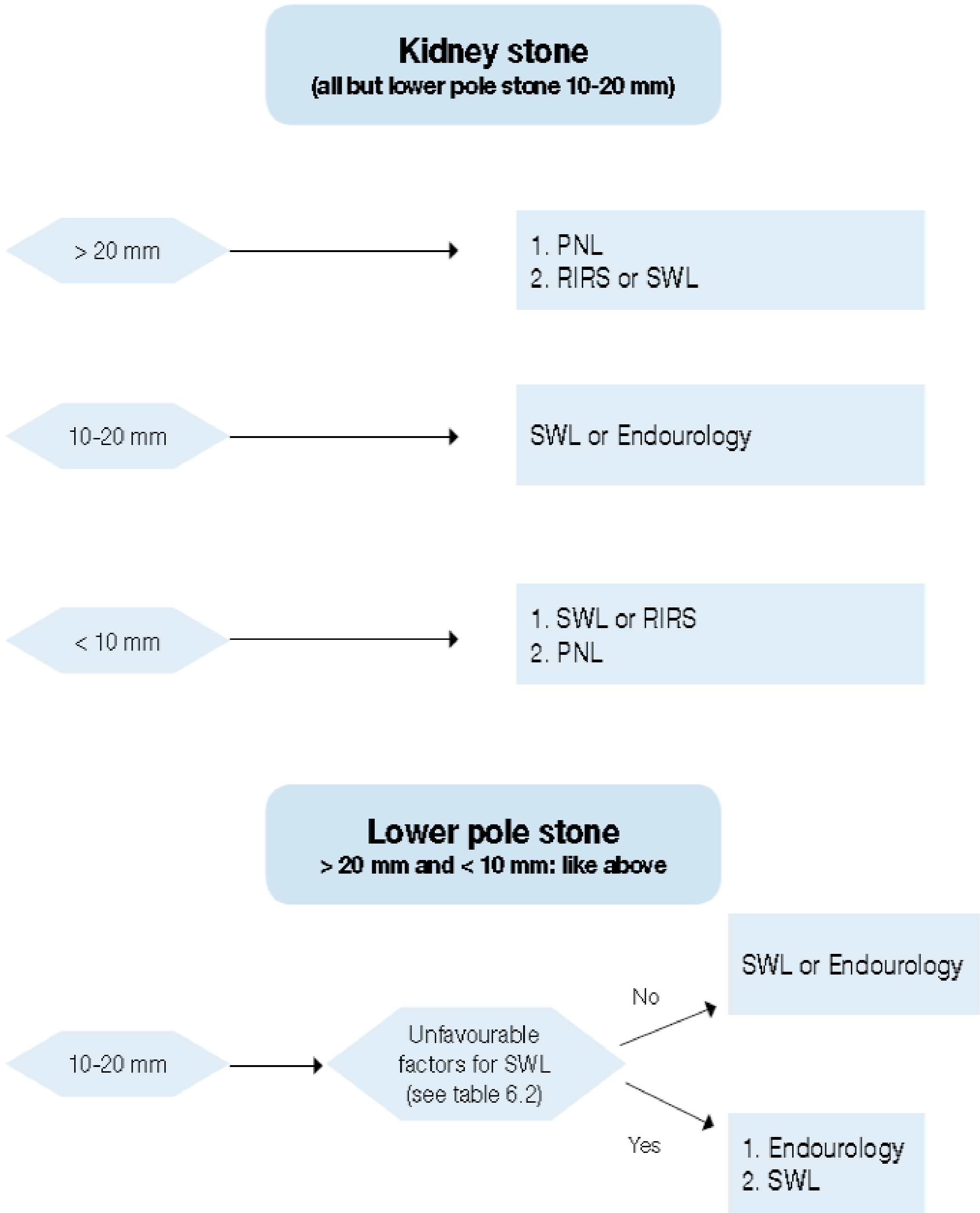
- Stones < 15 mm if observation is not the option of choice
- Patient preference.
- Comorbidity.
- Social situation of the patient (e.g., Profession or travelling).
- Choice of treatment.

6. INDICATION FOR ACTIVE STONE REMOVAL AND SELECTION OF PROCEDURE

Recommendations	GR
For asymptomatic caliceal stones in general, active surveillance with annual follow-up of symptoms and stone status (KUB radiography, US, or NCCT) is an option for 2-3 years, whereas intervention should be considered after this period provided patients are adequately informed.	C
Observation might be associated with a greater risk of necessitating more invasive procedures.	



In complex stone cases, open or laparocopic approaches are possible alternatives (see appropriate chapters).

6. INDICATION FOR ACTIVE STONE REMOVAL AND SELECTION OF PROCEDURE

6.5 Selection of procedure for active removal of ureteral stones

6.5.1 Methodology

Stone free rates were analysed for SWL and URS. If the study reported the SFR after all primary procedures, that rate was used for analysis. If not, and the study reported the SFR after the first procedure, then that rate was used. The Panel aimed to present an estimate of the number of primary procedures and the associated SFRs. There is a lack of uniformity in reporting the time to stone-free status, thereby limiting the ability to comment on the timing of this parameter.

6.5.2 Extracorporeal shock wave lithotripsy and ureteroscopy

For proximal stones, no difference in overall SFRs between SWL and URS was detected. However, after stratifying for stone size, in proximal ureteral stones < 10 mm (n = 1,285), SWL had a higher SFR than URS had. For stones > 10 mm (n = 819), URS had superior SFRs. This can be attributed to the fact that proximal ureteral stones treated with URS did not vary significantly with size, whereas the SFR following SWL negatively correlated with stone size.

Table 6.4: Recommended treatment options (if indicated for active stone removal) (GR: A*)

Stone location and size	**First choice**	**Second choice**
Proximal ureter < 10 mm	SWL	URS
Proximal ureter > 10 mm	URS (retrograde or antegrade) or SWL	
Distal ureter < 10 mm	URS or SWL	
Distal ureter > 10 mm	URS	SWL

9. MANAGEMENT OF STONE PROBLEMS IN CHILDREN

Statement	LE
Spontaneous passage of a stone is more likely in children than adults (6,11,12).	4

Statements	LE
In children, the indications for SWL are similar to those in adults, however, they pass fragments more easily.	3
Children with renal stones of a diameter up to 20 mm (~300 mm^2) are ideal candidates for SWL.	1b

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PEDIATRIC STONE DISEASE: AN EVOLVING EXPERIENCE

KEVAN STERNBERG, SAUL P. GREENFIELD,* PIERRE WILLIOT AND JULIAN WAN

From the Department of Pediatric Urology, Women and Children's Hospital of Buffalo and Department of Urology, State University of New York at Buffalo School of Medicine, Buffalo, New York

ABSTRACT

Purpose: The presentation and management of pediatric stone disease have changed due to early identification and treatment of congenital urological conditions, as well as technological advances. Therefore, we reviewed our 12-year experience.

	ΑΡΙΘΜΟΣ ΛΙΘΩΝ	ΛΙΘΟΙ ΠΟΥ ΑΠΟΒΛΗΘΗΚΑΝ ΑΥΤΟΜΑΤΑ	ΠΟΣΟΣΤΟ ΑΥΤΟΜΑΤΗΣ ΑΠΟΒΟΛΗΣ
ΛΙΘΟΙ ΝΕΦΡΟΥ	**80**	**24**	**30%**
ΛΙΘΟΙ ΟΥΡΗΤΗΡΑ	**72**	**51**	**71%**

Treatment of distal ureteral stones in children: similarities to the american urological association guidelines in adults.

Van Savage JG, Palanca LG, Andersen RD, Rao GS, Slaughenhoupt BL.

Division of Pediatric Urology, Department of Surgery, University of Louisville School of Medicine, Louisville, Kentucky, USA.

Journal of Urology 2000; 164: 1089-1093

	ΔΙΑΜΕΤΡΟΣ ΛΙΘΟΥ 1mm	ΔΙΑΜΕΤΡΟΣ ΛΙΘΟΥ 2mm	ΔΙΑΜΕΤΡΟΣ ΛΙΘΟΥ 3mm	ΔΙΑΜΕΤΡΟΣ ΛΙΘΟΥ > 4mm
ΠΟΣΟΣΤΟ ΑΥΤΟΜΑΤΗΣ ΑΠΟΒΟΛΗΣ	58%	67%	33%	0%

*Λίθοι κάτω τριτημορίου ουρητήρα

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CLINICAL OUTCOME OF PEDIATRIC STONE DISEASE

PAUL K. PIETROW, JOHN C. POPE, IV, MARK C. ADAMS, YU SHYR AND JOHN W. BROCK, III

From the Divisions of Pediatric Urology and Biostatistics, Department of Preventive Medicine, Vanderbilt University Medical Center, Nashville, Tennessee

ABSTRACT

Purpose: The natural history of stone disease in children is not well defined. We evaluated the clinical outcome in children with urinary calculi.

Materials and Methods: An 8-year retrospective review of 129 pediatric patients with primary urinary lithiasis was performed. Age, renal versus ureteral stone location, stone size, spontaneous passage, recurrence and metabolic evaluation were considered. Patients were divided into groups 1—0 to 5, 2—6 to 10 and 3—11 to 18 years old.

	ΑΡΙΘΜΟΣ ΛΙΘΩΝ	ΠΟΣΟΣΤΟ ΑΥΤΟΜΑΤΗΣ ΑΠΟΒΟΛΗΣ
ΛΙΘΟΙ ΝΕΦΡΟΥ		
Ομάδα Α (0-5 ετών)	**17**	**24%**
Ομάδα Β (6-10 ετών)	**13**	**8%**
Ομάδα Γ (11-18 ετών)	**12**	**50%**
ΛΙΘΟΙ ΟΥΡΗΤΗΡΑ		
Ομάδα Α (0-5 ετών)	**8**	**63%**
Ομάδα Β (6-10 ετών)	**23**	**61%**
Ομάδα Γ (11-18 ετών)	**56**	**64%**

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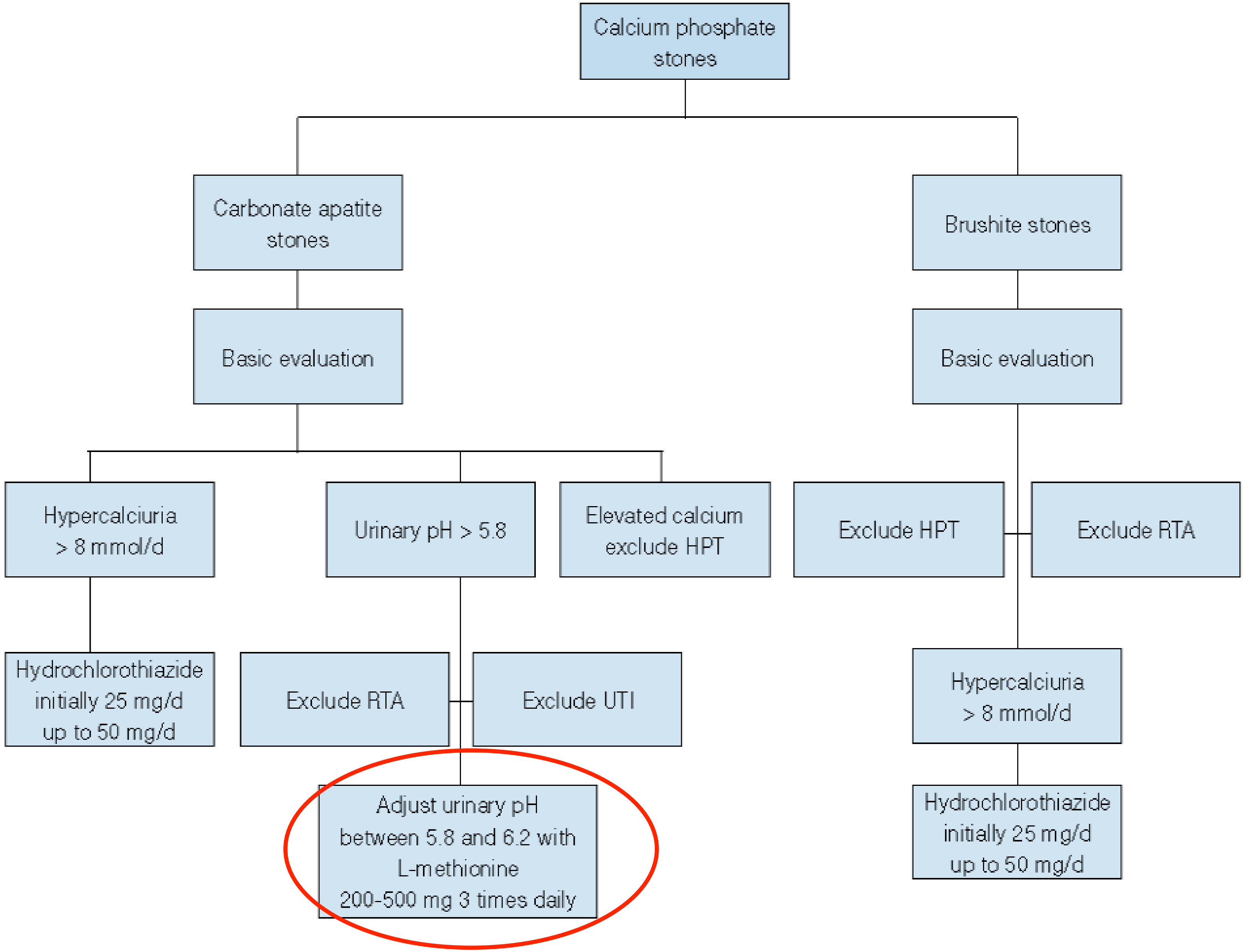
- **Το ποσοστό αυτόματης αποβολής των ουρητηρικών λίθων ≤4mm ήταν παρόμοιο για όλες τις ηλικιακές ομάδες**
- **Το ποσοστό αυτόματης αποβολής έπεφτε αισθητά όταν η διάμετρος του λίθου έφτανε τα 4mm**
- **Μόνο 1 παιδί απέβαλλε λίθο ουρητήρα >5mm**

ΠΑΙΔΙΑΤΡΙΚΗ ΛΙΘΙΑΣΗ ΚΑΙ ΑΥΤΟΜΑΤΗ ΑΠΟΒΟΛΗ ΤΩΝ ΛΙΘΩΝ

- Οι λίθοι του ουρητήρα αποβάλλονται σε υψηλότερο ποσοστό σε σχέση με τους λίθους του νεφρού

- Η πιθανότητα αυτόματης αποβολής μειώνεται σημαντικά όταν η διάμετρος του λίθου ξεπερνά τα 4-5mm

Figure 11.3: Diagnostic and therapeutic algorithm for calcium phosphate stones



ΕΥΧΑΡΙΣΤΩ