

DIU de techniques de monitoring et
d'ultrasonographie
en médecine pré-hospitalière
et salle d'accueil des urgences vitales

Session janvier 2016

Echographie des voies urinaires

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Voies urinaires



The Journal of Emergency Medicine, Vol. 16, No. 6, pp. 465-470, 1998
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0736-4676/98 \$12.00 + .00

PII S0736-4676(98)00100-0



Selected Topics:
Emergency Radiology

ULTRASONOGRAPHY BY EMERGENCY PHYSICIANS IN PATIENTS WITH SUSPECTED URETERAL COLIC

Carlo L. Rosen, MD,* David F. M. Brown, MD,* Mark J. Sagarin, MD,* YuChiao Chang, MD,†
Charles J. McCabe, MD,* and Richard E. Wolfe, MD*

Voies urinaires

- Etude prospective en 1996
- 126 patients avec dl lombaires évoquant CN
- Comparaison UIV ou TDM (systématiquement demandées)
- Médecins urgentistes avec ou sans expérience en écho
- Formation : 2h de théorie, 3h de pratique

Voies urinaires

Table 3. A Comparison of the Test Characteristics of Emergency US for Detecting HNS Compared with IVP Results for EAs with Previous Experience <50 Examinations vs. EAs with >50 Examinations before the Study

	Overall	Prior Experience	
		EAs With <50 Examinations	EAs With >50 Examinations
Sensitivity	72	70	75
Specificity	73	65	89
PPV	85	81	93
NPV	54	50	62

p > .05 in all cases.

Rosen et al, *J Emerg Med*, 1998

Voies urinaires

Table 6. Comparison of the Sensitivity and Specificity of the Various Diagnostic Modalities for HNS and Nephrolithiasis

Test	HNS		Nephrolithiasis	
	Sensitivity	Specificity	Sensitivity	Specificity
IVP	—	—	64-90%	94-100%
Helical CT	—	—	97%	96%
Formal US (interpreted by a radiologist)	87-98%	74-92%	64-86%	100%
Bedside emergency US	72%	73%	—	—

From References 3, 7, 13-25, 29-34.

*The higher sensitivity is for renal calculi; US is less sensitive for ureteral calculi.

Rosen et al, J Emerg Med, 1998

Voies urinaires

1180

Gaspari and Horst • EMERGENCY ULTRASOUND IN FLANK PAIN

Emergency Ultrasound and Urinalysis in the Evaluation of Flank Pain

Romolo J. Gaspari, MD, MSc, RDMS, Kurt Horst, MD

Gaspari et al, Acad Emerg Med, 2005

Voies urinaires

- Etude prospective, sur deux ans
- 104 patients dl lombaire (sans fièvre, trauma, lithiase connue)
- Clinique, BU
- Recherche d'hydronéphrose par urgentiste (> 25 EUS urinaires)
- Comparaison TDM (lecture finale par sénior radio)
- Suivi sur un mois

• Se = 88 %, Sp = 85 %

Gaspari et al, Acad Emerg Med, 2005

• (Identique littérature radiologique)

Voies urinaires : courbes d'apprentissage

The Learning Curve of Resident Physicians Using Emergency Ultrasonography for Obstructive Uropathy

Timothy B. Jang, MD, R. Jack Casey, MD, Pamela Dyne, MD, and Amy Kaji, MD, PhD

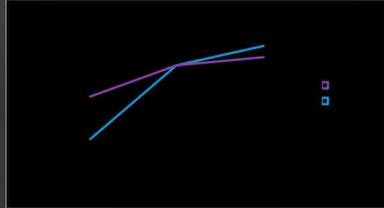
Jang et al, Acad Emerg Med, 2010

Courbe apprentissage

- 23 internes des urgences, 393 dl abdo suggérant uropathie
- Obstruction ?
- Echo voies urinaires (internes des urgences) vs TDM (radiologues)

Jang et al, Acad Emerg Med, 2010

Courbe apprentissage



Jang et al, Acad Emerg Med, 2010

Voies urinaires

American Journal of Emergency Medicine (2012) 30, 218–221



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The
American Journal of
Emergency Medicine
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Brief Report

Bedside renal ultrasound in the evaluation of suspected ureterolithiasis[☆]

James H. Moak MD, RDMS^{☆*}, Michael S. Lyons MD[§], Christopher J. Lindsell PhD[§]

[☆]Department of Emergency Medicine, University of Virginia, Charlottesville, VA 22908, USA

[§]Department of Emergency Medicine, University of Cincinnati

Voies urinaires

- Etude prospective de 2006 à 2008 sur 107 patients
- Probabilité de lithiase sur
 - 1) la clinique et la BU
 - 2) l'écho par urgentiste
 - Utilité si augmentation de probabilité > 20 %

Moak et al, Am J Emerg Med, 2012

Voies urinaires

- Résultats :
 - Modification de la probabilité dans 1/3 des cas
 - 2/3 vers le diagnostic final
 - 1/3 à l'opposé du diagnostic
- Donc faible impact sur diagnostic évoqué de lithiase?
- Mais nombreuses limites (internes 1ère année, delta 20%)
- Face à TDM
 - Temps
 - Exposition rx...

Moak et al, *Am J Emerg Med*, 2012

THE NEW ENGLAND JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Ultrasonography versus Computed Tomography for Suspected Nephrolithiasis

R. Smith-Bindman, C. Aubin, J. Bailitz, R.N. Bengiamin, C.A. Camargo, Jr., J. Corbo, A.J. Dean, R.B. Goldstein, R.T. Griffey, G.D. Jay, T.L. Kang, D.R. Kriesel, O. J. Ma, M. Mallin, W. Manson, J. Melnikow, D.L. Miglioretti, S.K. Miller, L.D. Mills, J. R. Miner, M. Moghadassi, V.E. Noble, G.M. Press, M.L. Stoller, V.E. Valencia, J. Wang, R.C. Wang, and S.R. Cummings

Smith-Bindman, *N Engl J Med*, 2014

Ultrasonography versus Computed Tomography for Suspected Nephrolithiasis

- Prospective multicentrique randomisée
- Confirmer ou infirmer une CN sur lithiase
- ECU versus écho radio versus TDM AP
- Comparer à J30 l'incidence de diagnostics à haut risque de complications graves et l'irradiation des patients sur 6 mois
- Comparer incidence événements indésirables graves, la douleur, la performance diagnostique
- Performance diagnostique des tests comparée sur déclaration du patient : expulsion ou retrait chir calcul

Smith-Bindman, *N Engl J Med*, 2014

Ultrasonography versus Computed Tomography for Suspected Nephrolithiasis

- 2759 patients inclus : 1/3 dans chaque groupe
- Réalisation TDM aux urgences après ECU : 41 %
- Réalisation TDM aux urgences après écho radio : 27 %

Smith-Bindman, *N Engl J Med*, 2014

Table 3. Primary and Secondary Study Outcomes According to Study Group*				
	Point-of-Care Ultrasonography	Bedside Ultrasonography	Computed Tomography	
Primary Outcomes				
High-risk diagnosis with complication — no. of patients (%)	6 (0.7)	3 (0.3)	2 (0.2)	0.30
During emergency department enrollment visit	3,334	4,744	14,145	<0.001
From enrollment to 30 days	1,244	1,814	1,363	0.18
30–180 days	1,363	2,143	1,243	0.08
Secondary Outcomes				
Emergency department length of stay — hr‡				
Median	6.3	7.0	6.4	<0.001
Interquartile range	4.5–9.0	5.4–9.9	4.7–9.0	
Return emergency department visit — no. of patients/total no. (%)				
Within 1 mo	86,873 (0.3)	77,816 (0.4)	89,872 (0.4)	0.41
Within 1 mo	136,819 (0.8)	121,816 (0.4)	143,873 (0.6)	0.42
Within 6 mo	211,867 (0.7)	211,816 (0.5)	211,873 (0.9)	0.37
Hospital admission after emergency department discharge — no. of patients (%)				
Within 1 mo	27,873 (0.2)	23,816 (0.1)	17,873 (0.1)	0.21
Within 1 mo	44,815 (0.3)	48,816 (0.1)	34,873 (0.1)	0.14
Within 6 mo	83,815 (0.4)	84,816 (0.3)	83,873 (0.3)	0.80
§At discharge from the emergency	3,323	3,623	3,623	0.09
Accuracy for diagnosis of nephrolithiasis				
Sensitivity — % (95% CI)	85 (80–89)	84 (79–89)	86 (82–90)	0.74
Specificity — % (95% CI)	50 (45–54)	53 (49–57)	53 (49–58)	0.38

Ultrasonography versus Computed Tomography for Suspected Nephrolithiasis

- Complications graves suite pathologie non diagnostiquée : < 1%
- Lors d'une suspicion de CN, TDM, écho ECU ou écho par radio ont le même impact sur le pronostic
- Premier examen par écho serait donc intéressant

Smith-Bindman, *N Engl J Med*, 2014

Ultrasonography versus Computed Tomography for Suspected Nephrolithiasis

- Par ailleurs,
- Temps attente SU plus long dans groupe écho radio
- Temps attente SU plus court si ECU seule
- Performance diagnostique identique (analyse en ITT) selon diagnostic en sortie des urgences (critère jugement est expulsion spontanée ou chirurgicale d'un calcul)
- Cout écho < cout TDM
- Expo Rx groupe écho < expo Rx groupe TDM

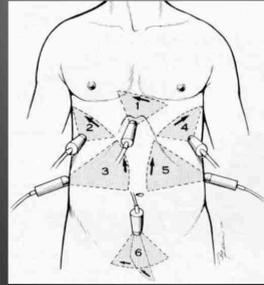
Smith-Bindman, *N Engl J Med*, 2014

Technique

- Sonde " abdominale " (5-7 MHz)
- Décubitus dorsal
- Sonde verticale
- Puis transversale

Voies urinaires

- Etude morphologique du rein
- Etude du rein controlatéral
- Etude de la vessie

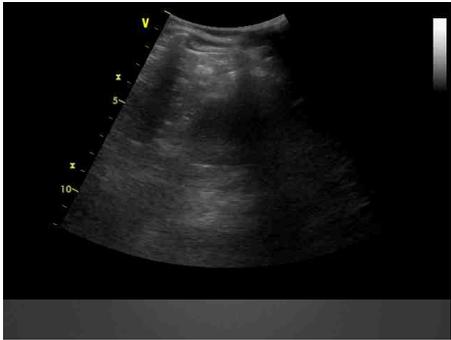
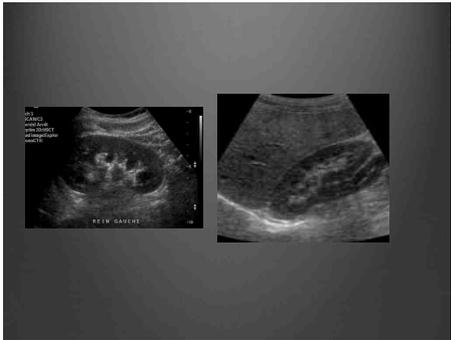


X. Bobbia



Etude morphologique du rein

- Cortex hyperéchogène
- Pyramides de Malpighi, médullaire, hypoéchogène
- Sinus hyperéchogène, central
- Hile : 1 artère + 1 veine
- Morphologie globale
- CPC non visibles à l'état normal

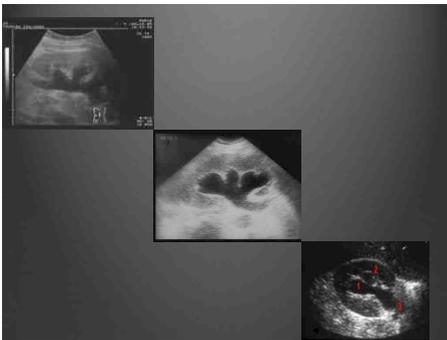


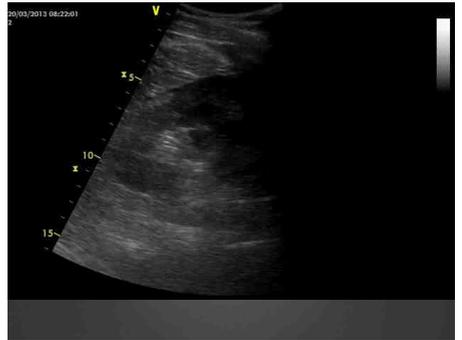
Colique néphrétique

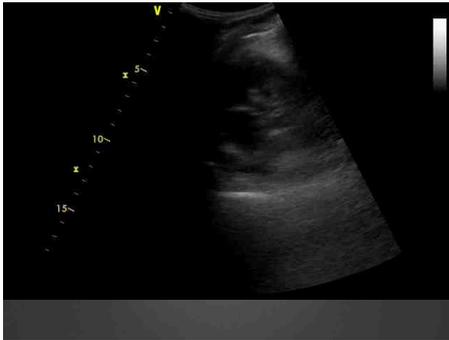
- Signe indirect
 - Dilatation des cavités pyélocalicielles
- Signe direct
 - lithiase

Dilatation de l'appareil collecteur

- Visibilité des calices
 - Dès que CPC visibles
 - Mesure diam transversal du bassin (urgentiste ?)
- Visibilité de l'uretère sous pyélique

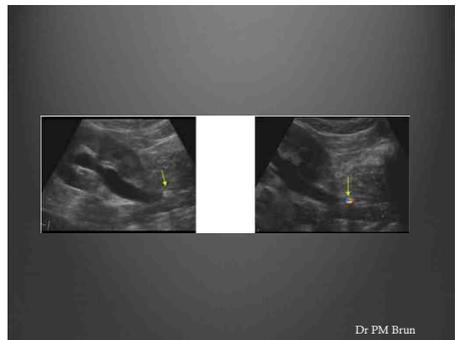
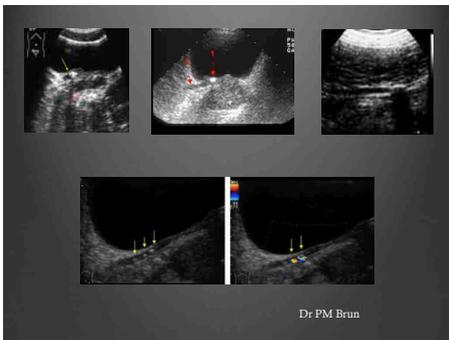




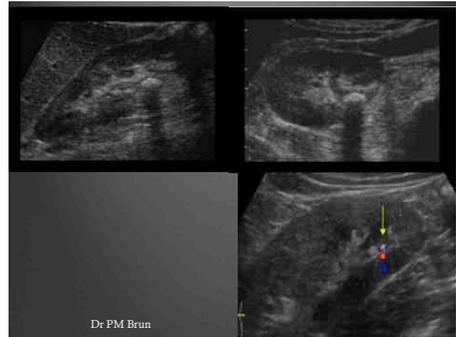
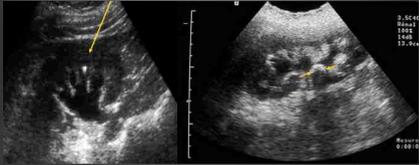


Visibilité de l'obstacle

- Souvent difficile
 - Zone aveugle du 1/3 moyen uretère lombaire au méat
 - Nécessite une dilatation urétérale
- Deux zones
 - 1/3 proximal uretère lombaire
 - Méat



- Calculs intrasinusaux

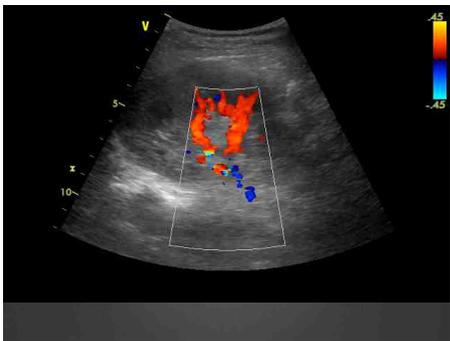
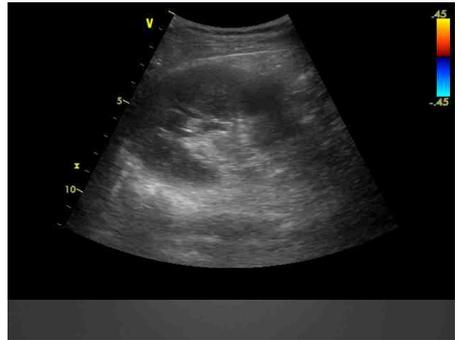
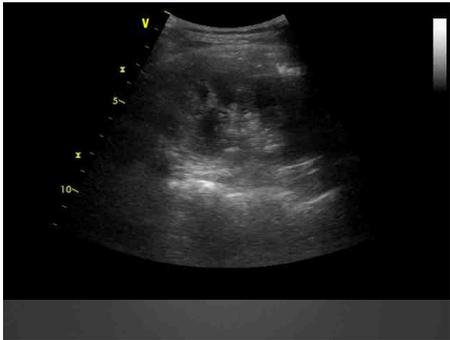


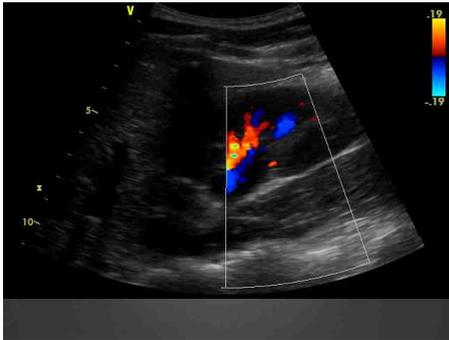
SIMPLE ?

NOMBREUX PIEGES

Dilatation des voies urinaires : fausses dilatations

- Bassinet globuleux extrasinusal
- Pyramides proéminentes
- Veines du sinus
- Graisse sinusale hypoéchogène
- Cavités larges constitutionnelles
- Kystes parapyéliqués multiloculaires





Dilatation des voies urinaires : pas d'obstruction

- Séquelles d'obstruction avec cavités hypotoniques
- Séquelles de reflux vésico-urétéral
- Distension vésicale (rétention)
- Utérus gravide

Obstruction sans dilatation

- Dilatation masquée : caillots, débris...
- Obstacle aigu récent (< 6 heures)

Voies urinaires

- Résultat négatif
 - Faux négatif
 - Pyélonéphrite compliquée non obstructive
 - Étiologie vasculaire : lombalgie gauche , FDR CV

Voies urinaires

PERSPECTIVES ?

Taille calcul

American Journal of Emergency Medicine (2010) 28, 813–816



Brief Report

Can the degree of hydronephrosis on ultrasound predict kidney stone size?[☆]

Jacob K. Goertz MD^{a,*}, Seth Lotterman MD^{a,b}

^aDepartment of Emergency Medicine, Long Island Jewish Medical Center, New Hyde Park, NY 11040, USA
^bDepartment of Emergency Medicine, Wilford Hall Medical Center, Lackland Air Force Base, TX 78236, USA

The
American Journal of
Emergency Medicine
www.elsevier.com/locate/ajem

Taille calcul

- Etude rétrospective de patients sortis avec diagnostic de lithiase (TDM)
- 177 écho des voies urinaires enregistrées au SAU
- Relecture secondaire de la TDM
- Quantification de la dilatation à l'écho
- Taille de la lithiase sur la TDM

Goertz et al, Am J Emerg Med, 2010

Taille calcul

Table 1 Interobserver agreement between emergency physician and QA ultrasound findings

Emergency physician hydronephrosis	QA hydronephrosis				Total
	None	Mild	Moderate	Severe	
None	22	4	1	0	27
Mild	7	90	3	0	100
Moderate	0	1	42	0	43
Severe	0	0	0	5	5
Total	29	95	46	5	175

$\kappa = 0.347$ (95% confidence interval, 0.773-0.918).

Table 2 Hydronephrosis vs ureteral calculi size

Hydronephrosis	Calculi ≤ 5 mm	Calculi > 5 mm	Total
None	25	3	28
Mild	88	13	101
Moderate	30	13	43
Severe	1	4	5
Total	144	33	177

$P < .001$.

Table 3 Hydronephrosis categories vs ureteral calculi size

Hydronephrosis	Calculi ≤ 5 mm	Calculi > 5 mm	Total
None or mild	113	16	129
Moderate or severe	31	17	48
Total	144	33	177

$P < .001$.

Goertz et al, *Am J Emerg Med*, 2010

American Journal of Emergency Medicine (2011) 29, 843.e1–843.e3



ELSEVIER

Case Report

Ultrasound detection of obstructive pyelonephritis due to urolithiasis in the ED

Carnell et al., 2011

Pyélonéphrite obstructive

- Près de 6% des patients venant pour pyélonéphrite ont une obstruction

Lejan et al, *Arch Esp Urol*, 1997



Daignault et al. *Critical Ultrasound Journal* 2013, 4:9
<http://www.criticalultrasoundjournal.com/content/4/1/9>

Critical Ultrasound Journal
 a SpringerOpen Journal

CASE REPORT

Open Access

Bedside ultrasound diagnosis of atraumatic bladder rupture in an alcohol-intoxicated patient: a case report

Michael C Daignault^{1*}, Turandot Sau¹ and Resa E Lewis¹



doi:10.1016/j.cuej.2011.01.022

The Journal of Emergency Medicine, Vol. 41, No. 3, pp. 206–223, 2011
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 0736-4674 - see front matter

**Ultrasound in
Emergency Medicine**

BESIDE ULTRASOUND DIAGNOSIS OF A TRAUMATIC BLADDER RUPTURE

Teresa S. Wu, MD,¹ Thomas C. Pearson, MD,² Suzanne Melnick, MD,³ and Jennifer Daugherty, MD⁴

¹EM Ultrasound Program, Ultrasound-Based Training Program, Department of Emergency Medicine, Montpelier Medical Center, Montpelier, Vermont; ²Department of Emergency Medicine, University of Arizona, College of Medicine, Phoenix, Arizona; ³Department of Emergency Medicine, University of Arizona, College of Medicine, Phoenix, Arizona; and ⁴Colorado Regional Medical Center, Colorado Springs

*Present Address: Teresa S. Wu, MD, Department of Emergency Medicine, Montpelier Medical Center, 2001 S. Poppleville, Phoenix, AZ 85028

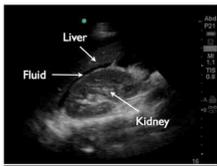


Figure 1 Right upper quadrant Morison's pouch view demonstrates free fluid between the liver and the right kidney.

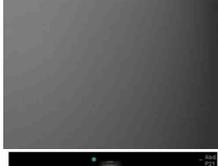


Figure 2 Left upper quadrant view reveals fluid surrounding the inferior pole of the left kidney. Echogenic material is seen floating in the fluid at the lower pole of the kidney.



Figure 3 Pelvic sagittal view. A Foley balloon is seen as well as a heterogeneous echogenic collection posterior to it. The walls of the bladder cannot be clearly delineated.



Figure 4. Ultrasound of contracted bladder with wall irregularities (arrow). Note the dark hypoechoic free fluid from urine and blood accumulating anterior to the bladder.

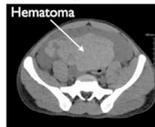


Figure 5 A large high-density collection in the inferior abdomen compatible with a hematoma.

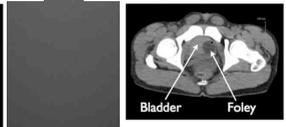


Figure 6 Collapsed urinary bladder. The urinary bladder is entirely collapsed around a Foley catheter with high-density fluid within the bladder compatible with blood products.

Voies urinaires

POUR LES ECHOGRAPHISTES

Jet urétéral

- Recherche jet urétéral en Doppler-couleur
- Réglage des vitesses
- En théorie
 - absent ou faible et continu du côté symptomatique
 - Péristaltisme du côté asymptomatique
- En pratique
 - difficile

Urinome

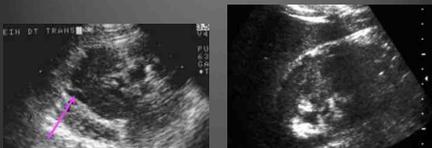
- Par rupture des cavités
- lame liquidienne qui vient mouler la convexité du rein
- Authentifie l'obstruction
- Dilatation peut manquer
- Piège de graisse péri-rénale hypoéchogène
 - Regarder de l'autre côté

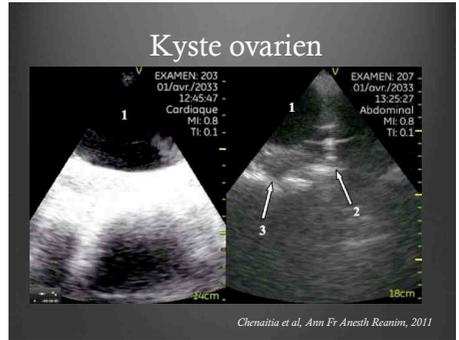
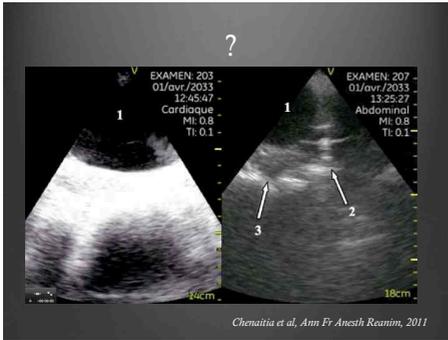


Voies urinaires

RETENTION VESICALE COMPLETE

- Globe ou distension abdominale ?
- RAU ou oligo-anurie ?
- Fiabilité du Bladder Scan dans les autres pathologies





Rétention vésicale



ADULT UROLOGY
CME ARTICLE

THREE-DIMENSIONAL ULTRASOUND DEVICE FOR RAPID DETERMINATION OF BLADDER VOLUME

LEONARD S. MARKS, FREDERICK J. DOREY, MARIA LUZ MACAIRAN, CINDY PARK,
AND JEAN B. DEKERNION

Rétention vésicale

- Etude prospective
- 249 patients
- Comparaison Bladderscan et cathétérisme

Marks et al, Urology, 1997

Rétention vésicale

- Bonne corrélation
- Bonne reproductivité

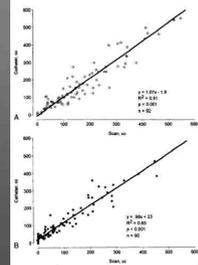
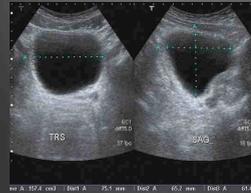


FIGURE 4. Scattergram of catheter versus scan volume in men (A) and women (B). The two volumes are correlated in both men and women ($P < 0.001$), although scan volume consistently underestimates catheter volume by approximately 10 cc in men and 20 cc in women (see text). Four points exceeding 600 cc are not plotted.

Marks et al, Urology, 1997

Rétention vésicale

- Calcul volume vésical



Rétention vésicale

- Echo-repérage
- Echo-guidage
- Cystocath