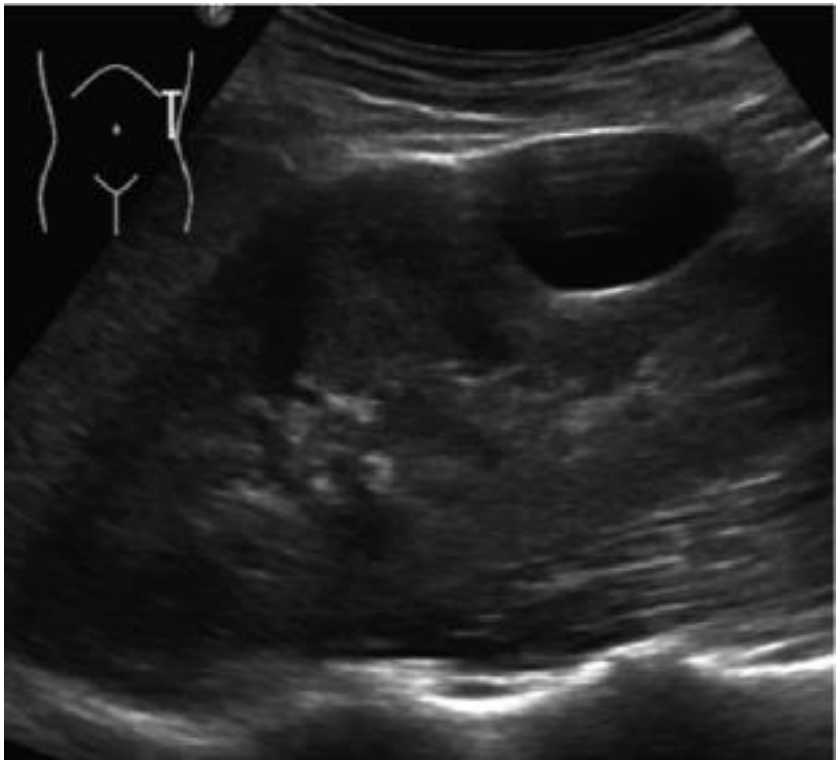
Solitary renal cysts in children



Sudarsana De
Paediatric Nephrologist
Nottingham

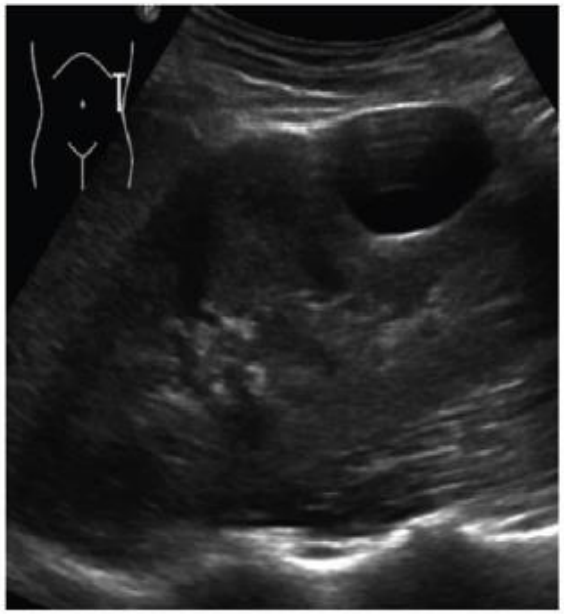
Radiology

ORIGINAL RESEARCH • SPECIAL REPORT

Imaging of Kidney Cysts and Cystic Kidney Diseases in Children: An International Working Group Consensus Statement

Charlotte Gimpel, MB, BChir, MA • E. Fred Avni, MD, PhD • Luc Breysem, MD • Kathrin Burgmaier, MD • Anna Caroli, PhD • Metin Cetiner, MD • Dieter Haffner, MD, PhD • Erum A. Hartung, MD, MTR • Doris Franke, MD • Jens König, MD • Max C. Liebau, MD • Djalila Mekahli, MD, PhD • Albert C. M. Ong, DM, MA, FRCP • Lars Pape, MD, PhD • Andrea Titieni, MD • Roser Torra, MD, PhD • Paul J. D. Winyard, BM, BCh, MA, PhD • Franz Schaefer, MD, PhD

A simple renal cyst

US Diagnosis	Image	Comment	Additional Imaging/ Follow-up
Simple cyst • single • round • thin-walled • anechoic • nonseptated • separate from collecting system • no Doppler flow • normal renal parenchyma		Diagnosis of exclusion in children	Clinical work-up and at least one follow-up US to rule out development of another cystic kidney disease. No need for contrast-enhanced US, MRI or CT.

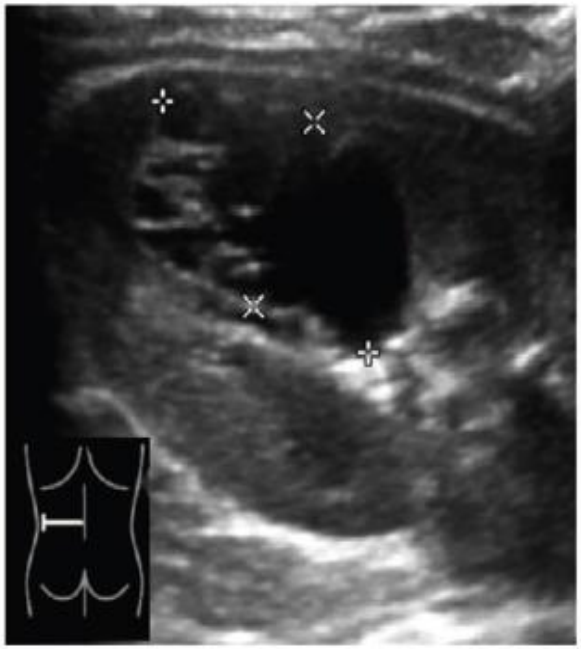
A child with a first-time diagnosis of a single kidney cyst requires a detailed medical and family history, thorough clinical examination, and at least one follow-up assessment.-

A simple cyst in a child does not need contrast-enhanced US, MRI, or CT imaging.-

How common are simple renal cysts?

729 individuals (Australia)	617 individuals (Scotland)
<30 years: 0.2%	17-39 years: 8.2%
30-49 years: 2%	40-59 years: 27.5%
50-70 years: 11.5%	60- 80 years: 49%
>70 years:22%	>80 years: 60.6%

A complex renal cyst

Complex cysts Cyst with any of: • thickened wall • septations • calcifications • enhanced perfusion on color Doppler		Limited evidence in children suggests modified US Bosniak classification can be used to decide on need to biopsy.	Contrast-enhanced MRI if malignancy is suspected. Contrast-enhanced US in experienced centers.

Kieran McHugh, MRCPI, FRCR • David A. Stringer, FRCR, FRCPC[2] • Diane Hebert, FRCPC • Catherine A. Babiak, RTR, RDMS

Simple Renal Cysts in Children: Diagnosis and Follow-up with US[1]

Radiology 1991; 178:383–385

Twenty-three cysts in 22 patients were followed up sonographically for up to 5 years

Seventeen cysts (74%) were unchanged at follow-up, three (13%) were smaller, two (9%) were slightly larger, and one (4%) was no longer evident. The largest cyst, which measured 7.0 cm in maximum diameter, appeared as an abdominal mass and was drained percutaneously. All other cysts were managed conservatively. No patient showed deterioration in renal function.

Sonographic Frequency of Simple Renal Cysts in Children over a 5-year Period

Age (y)	No. of Patients Examined	No. of Patients with Cysts
<1	4,410	7 (0.16)
1	1,041	1 (0.10)
2	951	2 (0.21)
3	760	0 (0.00)
4	813	1 (0.12)
5	661	3 (0.45)
6	609	0 (0.00)
7	659	1 (0.15)
8	566	1 (0.18)
9	550	1 (0.18)
10	551	6 (1.09)
11	545	2 (0.37)
12	551	2 (0.36)
13	619	1 (0.16)
14	670	1 (0.15)
15	608	2 (0.33)
16	693	2 (0.29)
17	510	1 (0.20)
18	335	1 (0.30)

Note.—Total number of patients examined = 16,102. Total number of patients with cysts = 35 (0.22%). Percentages are in parentheses.

Journal of Pediatric Urology (2015) xx, 1.e1–1.e6

Ultrasound classification of solitary renal cysts in children

B. Karmazyn [a], A. Tawadros [b], L.R. Delaney [a], M.B. Marine [a], M.P. Cain [c], R.C. Rink [c], S.G. Jennings [d], M. Kaefer [c]

Table 1 The modified Bosniak classification system for renal cysts, based on ultrasound findings.

Grade	Shape	Wall			Septations				Calcification	Content
		Thickness	Nodules	Doppler flow	Number	Thickness	Nodules	Doppler flow		
I	Round	≤1 mm	No	No	0	N/A	No	No	No[a]	Anechoic
II	Lobulated	≤1 mm	No	No	Few	≤1 mm	No	No	No	Debris
III	N/A	≥1 mm	No	Yes	Multiple	≥1 mm	No	Yes	Yes	N/A
IV	N/A	N/A	Yes	N/A	N/A	N/A	Yes	N/A	N/A	Soft tissue

[a] Not including movable cyst stone.

Journal of Pediatric Urology (2015) xx, 1.e1–1.e6

Ultrasound classification of solitary renal cysts in children

B. Karmazyn [a], A. Tawadros [b], L.R. Delaney [a], M.B. Marine [a], M.P. Cain [c], R.C. Rink [c], S.G. Jennings [d], M. Kaefer [c]

212 children with solitary renal cysts

Retrospective study: 2003-2011

Mean age was 8.4 years (range 1 day to 17 years)

2 independent Paediatric Radiologists graded the cysts (without clinical information) using the Bosniak classification

96% (202) were simple renal cysts, 4%(10) were complex renal cysts, good inter-observer agreement

Journal of Pediatric Urology (2015) xx, 1.e1–1.e6

Ultrasound classification of solitary renal cysts in children

B. Karmazyn [a], A. Tawadros [b], L.R. Delaney [a], M.B. Marine [a], M.P. Cain [c], R.C. Rink [c], S.G. Jennings [d], M. Kaefer [c]

Of the 212 children, 89 (42%) had follow up ultrasound scans

36(40.4%) - resolved
6(6.7%) - decreased in size
29 (32.6%) - had a stable cyst
18 (20.2%) - the cyst increased in size

4 (4.4%) cysts changed to complex cysts on follow up
2 remained stable, 1 had a CT- thought to be a grade II simple renal cyst, 1was resected (benign on pathology)

5 (5.6%) children had an increase in number of cysts
One was consistent with the diagnosis of ADPKD

One complex renal cyst – multiloculated cystic nephroma

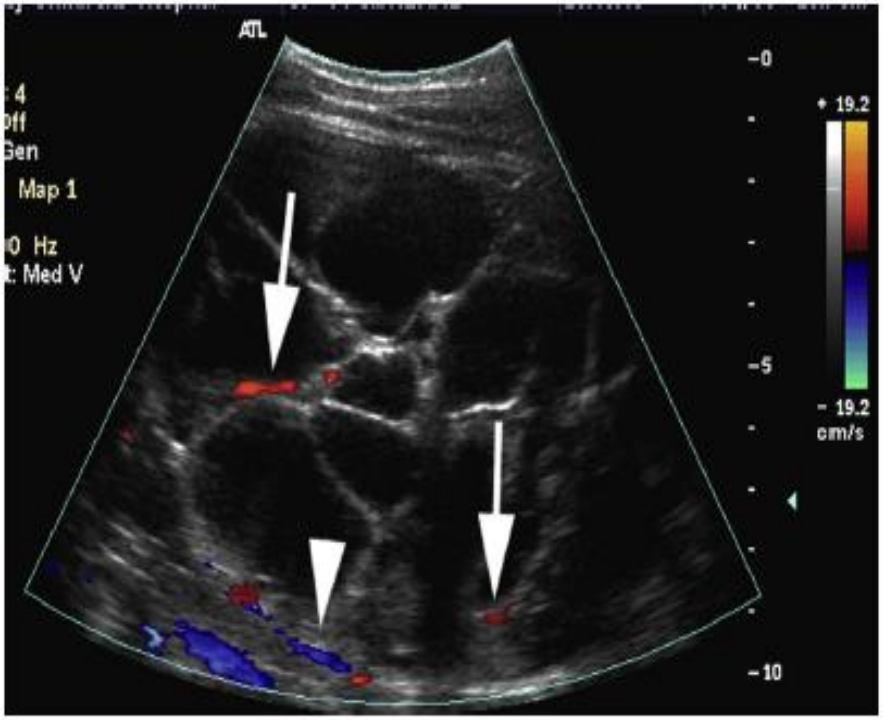


Figure Longitudinal color doppler US of a complex (grade III by both radiologists) left renal cyst in a 7.2 year-old boy. The child presented with gross hematuria. Ultrasound shows a septated cystic mass with vascularity of the septations (arrowheads) and cyst wall (arrow). Radical nephrectomy was performed with pathologic diagnosis of multiloculated cystic nephroma.

Paediatric International December 2018; 60(12): 1068-1072

Retrospective Analysis of Simple and Stage II Renal Cysts: Pediatric Nephrology Point of View

Fehime Kara Eroglu, MD[1], Evrim Kargın Çakıcı, MD[1], Gökçe Can Gür, MD[1], Tülin Güngör, MD[1], Fatma Yazılıtaş, MD[1], Eda Didem Kurt-Sukur[1], Evra Celikkaya[1], Çiğdem Üner, MD[2], Emin Çakmakçı, MD[2], Mehmet Bülbül, MD[1]

[1] Dr Sami Ulus Maternity and Child's Health Hospital, Department of Pediatric Nephrology , Ankara, Turkey

[2]Dr Sami Ulus Maternity and Child's Health Hospital, Department of Radiology, Ankara, Turkey

Retrospective Analysis of Simple and Stage II Renal Cysts: Paediatric Nephrology Point of View

57 children with stage I (n=35) & stage II (n=22) simple renal cysts

Mean age 12.4 years +/-3.6 years

Followed up for 2.8 to 3.1 years

Stage I: 65.7%, Stage II: 45% : No change

Stage 1:13 (37.1%), Stage II : 8 (36.4%):Increase in diameter of the cyst

Renal follow up-

13 (22%) patients had a GFR <90ml/min/1.73 sq.m

2 children had hypertension- needed therapy

Normal urinalysis, no proteinuria

No loin pain, rupture, compression, bleeding

Retrospective Analysis of Simple and Stage II Renal Cysts: Paediatric Nephrology Point of View

Family evaluation of parents by US (n,%)	28 (80%)	16 (72.7%)	0.80
No cyst	26 (92.8%)	15 (93.6%)	
Present	2 (7.1%)	1 (6.4%)	
Office systolic BP-SDS	-0.216±0.94	0.13±0.79	0.156
Office diastolic BP-SDS	0.48±0.75	0.69±0.71	0.292
Serum creatinine at initial visit(mg/dl)(n=43)	0.53±0.17	0.48±0.15	0.546
eGFR at initial visit (ml/min/1.73m^2)(n=43)	108±16.54	105±12.34	0.645
eGFR <90 ml/min/1.73 m^2 at initial visit(n,%)	2 (7.7%)	1 (5.9%)	
Serum creatinine at last visit(mg/dl)	0.61 ±0.10	0.58±0.11	0.193
eGFR at last visit (ml/min/1.73m^2)	99.06±14.71	99.77±12.04	0.582
eGFR <90 ml/min/1.73m^2 at last visit	9 (25.7%)	4 (18.2%)	0.509
Serum uric acid (mg/dl)	4.35±1.22	4.30±1.19	0.866

Management of simple renal cysts in children: French multicenter experience of 36 cases and review of the literature

Nicolas Koutlidisa, Luc Joyeuxa, Nathalie Méjeanb, Emmanuel Sapina

Journal of Pediatric Urology, June 2015 11(3):113-7

A retrospective multicentre study between January 1998 - May 2009

11 patients were in the primary surgical group (Group 1) and 25 were in the conservative management group (Group 2).

Management of simple renal cysts in children: French multicenter experience of 36 cases and review of the literature

Group 1: 11 patients

Median age: 44 months

Mean cyst size: 55.4 mm +/- 16 mm

8 has cyst de-roofings

3 has cyst excisions

Median F/U: 7 years, no complications

Group 2: 25 patients

Median age 12 months

Median cyst size 25.7mm +/- 19.7 mm

9 patients had surgery due to increasing size

7 had marsupialization, 1 had cyst excision and 1 had percutaneous puncture

Median F/U: 4 years, no complications

ARTICLE IN PRESS
+ MODEL

Journal of Pediatric Urology (xxxx) xxx xxx

Renal cyst evolution in childhood: a contemporary observational study

C. Rediger [a,b,*], L.A. Guerra [a,b], M.A. Keays [a,b], C. Wayne [b], D. Reddy [c], S. Ksara [a,b], M.P. Leonard [a,b]

[a]Faculty of Medicine, University of Ottawa, Ottawa, ON, Canada

Aims of the study

1. What proportion of children with simple renal cysts eventually had a diagnosis of ADPKD or ARPKD or malignancy
2. At what time point during follow up was the diagnosis made
3. Were any cyst characteristic factors predictive of a future diagnosis

Renal cyst evolution in childhood: a contemporary observational study

Table 1 Patient and cyst demographics.

Characteristic	Overall
Number of patients (N)	87
Male; n (%)	43 (49.4%)
Female: n (%)	44 (50.6%)
Reasons for presentation (more than 1 possible)	
Abdominal pain	14 (16.1%)
Hematuria	7 (8.0%)
UTI	25 (28.7%)
Family history (screening)	4 (4.6%)
Asymptomatic/Incidental discovery	34 (39.1%)
Screening (in known familial RCC syndrome – tuberous sclerosis)	2 (2.3%)
Lower urinary tract symptoms	4 (4.6%)
Other	5 (5.7%)
Initial diagnosis	
Simple cyst	77 (88.5%)
Minimally complex cyst	10 (11.5%)

RCC = renal cell carcinoma.

- Retrospective review between 2004 and 2014
- 87 eligible children had <3 renal simple cysts
- Median age of detection was 7.6 years, 22/87 were detected antenatally or in the first year of life
- 60/87 (69%) had a solitary cyst on the initial US
- Median length of follow up 4.1 years

Renal cyst evolution in childhood: a contemporary observational study

Summary Table Summary of final diagnoses

Final diagnosis[a]	n (%); (95% CI)
ADPKD	11 (12.6) (7.2–21.2)
ARPKD	1 (1.1) (0.2–6.2)
Minimally complex cyst	5 (5.7) (2.5–12.8)
Renal dysplasia	1 (1.1) (0.2–6.2)
Simple cyst	1 (1.1) (0.2–6.2)
Renal cyst NOS[b]	75 (86.2) (77.4–91.9)
Resolution	10 (11.5) (6.4–19.9)
Malignancy	0 (0) (0–4.2)

ADPKD = autosomal dominant polycystic kidney disease; ARPKD = autosomal recessive polycystic kidney disease; NOS = not otherwise specified.

[a] Multiple diagnoses possible.

[b] Not otherwise specified.

Renal cyst evolution in childhood: a contemporary observational study

Table 3 Predictors of ADPKD/ARPKD diagnosis.

Predictor	Unadjusted OR (95% CI)	*P*-value
Side of cyst: right	1.42 (0.28, 7.3)	0.68
Side of cyst: left	0.14 (0.02,1.24)	0.08
Number of cysts on ultrasound (2 vs 1)	3.36 (0.89, 12.66)	0.07
Number of cysts on ultrasound (3 vs 1)	5.61 (0.85, 37.08)	0.07
Size of the largest cyst on ultrasound	1.09 (0.71, 1.69)[a]	0.69
Size of the second largest cyst on ultrasound	0.76 (0.06, 10.05)	0.83
Calcifications on ultrasound	2.05 (0.02, 190.5)	0.76
Septations on ultrasound	0.19 (0.01, 3.69)	0.27
Enhancing on ultrasound	1.18 (0.03, 50.89)	0.93
Non-enhancing on ultrasound	2.05 (0.02, 190.5)	0.76
Debris on ultrasound	1.18 (0.03, 50.89)	0.93
Clear margin on ultrasound	0.32 (0.02, 6.95)	0.47
Number of cysts on CT	0.57 (0.04, 8.21)	0.68
Size of largest cyst on CT	2.26 (0.36, 14.11)	0.38
Calcifications on CT	2.05 (0.02, 190.5)	0.76
Septations on CT	2.05 (0.02, 190.5)	0.76
Non-enhancing on CT	2.05 (0.02, 190.5)	0.76

ADPKD = autosomal recessive polycystic kidney disease; ARPKD = autosomal recessive polycystic kidney disease; CT = computed tomography; OR = odds ratio.

[a] Refers to the change in OR for a 1-unit increase in size (cm).

The mean time to the diagnosis to ADPKD was 2.2 years after a median of 2 F/U US

5 children had a family history of ADPKD

The child with ADPKD was diagnosed at 13 days of life

No statistically significant US predictors were identified

Thank you
Any questions?