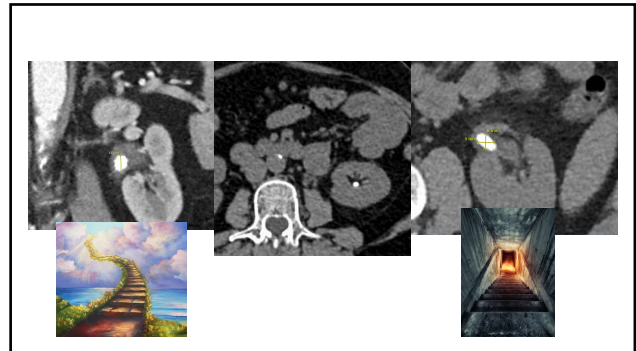


Residual fragments after ureterorenoscopy

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BAU2019
19th ANNUAL CONGRES
OOSTENDE

BRUGMANN



Goal of any stone treatment is stone free, but what is stone free?

- Size of fragments

zero fragment?



max fragment size: 1 mm? 2 mm? 3 mm? 4 mm? 5 mm? 6 mm? 7 mm?

**Wide variability in reporting outcomes
No uniform 'Stone Free' definition in literature**

	UHC (%)	100	100	
KUB (%)	70.5	0.01	85.7	0.03
US (%)	52.5	0.001	57.1	0.006

- Timing of imaging

Postop: day 1? 1st month? 3 months? 6 months?

Gokce et al, Int Braz J Urol 2015

What is known about residual fragments after FURS: Reports on 'StoneFree' Rates

Study	SF definition	Imaging modality	Timing of imaging	SFR
Ito, 2012	0 fragment	KUB	3 months	59%
Gunmar, 2011	< 4 mm	KUB + US	POD 1	70%
Herrera-Gonzalez, 2011	0 fragment	KUB + US	POD 1	74%
Berquet, 2014	< 3 mm	US or CT	3 months	85%
Chen, 2018	< 2 mm	KUB + US	POD 1	89%
Breda, 2009	< 1 mm	US	1 month	92%
Cansino, 2010	≤ 5 mm	RxIVP	3 months	93%
Perlmutter, 2008	0 fragment	KUB/US/CT	3 months	94%
Miernik, 2012	≤ 1 mm	Fluoro + US	POD 1	97%
Schoenthaler, 2012	< 1 mm	Fluoro + US	2-4 months	97%

→ Heterogeneous data with wide range of Stone Free Rates (range 59 – 97%, mean 85%)

The real deal: SRF and zero fragment rate after FURS, as shown on CT

Study	SF definition	Timing of imaging	SFR
Macejko, 2012	0 fragment	3 months	35%
Pearle, 2005	0 fragment	3 months	50%
Ito, 2014	0 fragment	3 months	60%
Resorlu, 2012	≤ 1 mm	1 month	86%
Hussain, 2011	< 2 mm	6 months	91%
Cocuzza, 2008	< 3 mm	2 months	93%

**Residual fragments after FURS are frequent!
Mean Zero Fragment Rate on CT = 51%**

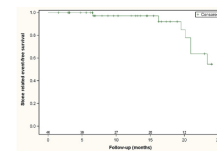
Natural history of residual stone fragments after FURS

The Natural History of Renal Stone Fragments Following Ureteroscopy

David A. Rebeck, Amanda Macejko, Vishal Bhatani, Patrick Ramos, and Robert B. Nadler

51 patients, RF detected CT
RF ≤ 4 mm
F-U 19 months

Risk stone event (emergency dept./hospitalisation/intervention) 20%
Risk spontaneous stone passage 20%



Freedom from stone event includes patients who either spontaneously passed their fragments or who retained asymptomatic fragments.
Figure 1. Kaplan-Meier curve illustrating freedom from stone event* over time.

Rebeck et al, Urology 2010

Natural history of residual stone fragments after fURS

Natural History, Complications and Re-Intervention Rates of Asymptomatic Residual Stone Fragments after Ureteroscopy: a Report from the EDGE Research Consortium

Ben H. Chew,¹ Hilary L. Brotherhood,⁴ Roger L. Sur,¹ An Qi Wang,⁴ Bodo E. Knudsen,⁴ Courtney Yang,⁴ Tracy Mariens,¹ Nicole L. Miller,⁵ Amy E. Krambeck,¹ Cameron Charchenko,⁷ and Mitchell R. Humphreys¹

232 patients, RF detected by KUB or CT
F-U 16 months

Risk of re-intervention

> 4 mm	38%
≤ 4 mm	18%

Figure 2. Kaplan-Meier curve comparing rate of fragments 4 mm or smaller vs larger than 4 mm.

Treat RF > 4 mm, but what about RF ≤ 4 mm?

Cheew et al. J Urol 2010

Natural history of residual stone fragments after fURS

Repeat Surgery After Ureteroscopic Laser Lithotripsy With Attempted Complete Extraction of Fragments: Long-term Follow-up

Andrew J. Portis, Mark A. Laliberte, and Andrew Heintsch

216 patients, 226 renal units treated with fURS
Postop imaging NC CT
F-U 4.1 y
9% needs repeat surgery during F-U

Evaluation risk factors for repeat surgery

Variables	Categories	Mean ± SD or n (%)	Repeat Surgery		P
			No	Yes	
Sum of stone lengths (mm)	≤5	8.6 ± 4.9 (7/23)	8.9 ± 4.8 (4/9)	10.9 ± 5.1 (2/6)	0.02
	6-10	12 (58)	123 (93)	9 (7)	
	11-15	36 (55)	31 (86)	5 (14)	
	>15	11 (5)	8 (72)	3 (27)	
Residual fragments (mm)	Not detectable	84 (53)	81 (96)	3 (4)	<0.001
	≤2	37 (28)	37 (50)	0 (0)	
	2-4	28 (18)	21 (81)	7 (19)	
	>4	13 (8)	7 (54)	6 (46)	

19% patients with RF 2-4 mm will require repeat surgery

Stone size ↑ } risk repeat surgery ↑
RF size ↑ }

Portis et al. Urology 2015

Natural history of residual stone fragments after fURS

Repeat Surgery After Ureteroscopic Laser Lithotripsy With Attempted Complete Extraction of Fragments: Long-term Follow-up

Andrew J. Portis, Mark A. Laliberte, and Andrew Heintsch

Overall cumulative repeat surgery rate: 9%

Cumulative repeat surgery rate, stratified by fragment size

RF > 2 mm associated with repeat surgery

Portis et al. Urology 2015

OK then.....RF larger than 2 mm need to be avoided

Studies did not take into account metabolic measures! Number 'de novo lithiasis' unknown

Fluid intake / dietary changes / pharmacological interventions prevent stone episodes

= stone clinic effect

Long-Term Results of Percutaneous Nephrolithotomy: Does Prophylactic Medical Stone Management Make a Difference?

Dori E. Zilberman, M.D., and Glenn M. Preminger, M.D.

TABLE 1. STUDY POPULATION, PREOPERATIVE AND POSTOPERATIVE STONE-FORMATION RATE, AND STONE DISEASE REMISSION RATES²⁸

	No. of patients	Preoperative SFR	Postoperative SFR	P value ^a	Remission rate (%)
Stone free medicated	23	0.67	0.02	<0.0001	87
Stone free nonmedicated	7	0.67	1.0	0.5	29
Residual fragments medicated	26	0.67	0.02	<0.0001	77
Residual fragments nonmedicated	14	1.0	1.0	0.17	21

SFR = stone formation rate.
^aWilcoxon signed rank test.

Zilberman et al. J. Endourol 2009



How to avoid residuals? Stone size: choose the right treatment!

Table 3. Multivariate analysis of factors associated with RF after LURS

	OR (95% CI)	p Value
Target stone size (mm)		
0-5	Referent	
6-10	2.03 (1.07-3.84)	0.03
Greater than 10	3.74 (1.57-8.94)	0.003
No output		
Single	Referent	
Multiple	1.57 (0.52-2.95)	0.23
Stone location:		
Kidney	Referent	
Distal	1.9 (0.96-3.8)	0.057
Kidney +/- ureter stone location:		
Kidney or ureter stone	Referent	
Kidney +/- ureter	1.77 (0.90-3.51)	0.099
Operative time (min):		
Less than 60	Referent	
Greater than 60	1.10 (0.58-2.10)	0.77
Ureteroscope type:		
Rigid +/- flexible	Referent	
Flexible only	1.20 (0.54-2.74)	0.56

Residual Fragments Following Ureteroscopic Lithotripsy: Incidence and Predictors on Postoperative Computerized Tomography

Christopher A. Rippe, Lucas Nikkol, Yu Kuan Lin, Zhenhan Dianawala, Vincent Chonrattanasom, Ramy F. Youssaf, Margaret S. Pearle, Yael Lotan and Jay D. Raman¹⁴

In multivariate analysis: Stone size independently associated with post URS residual fragments

Rippe et al. J Urol 2012

How to avoid residuals? Stone VOLUME: choose the right treatment!

The Time Has Come to Report Stone Burden in Terms of Volume Instead of Largest Diameter

4 cm³ ≠ 1 cm³ ≠ 0.25 cm³


4 times less 16 times less

Think about alternative treatments (mini)PCNL: single session SFR higher

De Coninck V.J. Endourol 2018
Traxer, Twitter

How to maximise SFR? Postop adjuvant treatments in order to increase SFR

Postural therapy after ureterorenoscopy: 'Percussion, inversion, diuresis', after SWL, also applicable postURS



maximum of four SWL treatments. For all assessable patients, the radiologically documented complete stone clearance rate at 3 months for the SWL-alone group was 55.4% and for the SWL plus PDI group was 62.5% (chi-square test, $P = 0.006$).

FIGURE 1. Patient placed in prone Trendelenburg position on 45°-angle couch, with continuous 10-minute manual mechanical percussion applied over flank using cupped hands by registered nurse or trained assistant.

Pace et al, K. Urol 2005
Chang et al, Urology 2005
Faine et al, J. Pediatr Urol 2016

How to maximise SFR? Postop adjuvant treatments in order to increase SFR

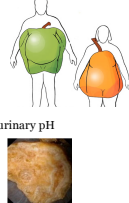
Postop treatment: oral chemoysis

Oral dissolution therapy in uric acid stones

recognize UA stones!

metabolic syndrome, radiolucent stones (400-600 HU), low urinary pH

typical appearance



Adjuvant oral treatment

- Kcitrata (Uralyt-U) 10 grams dissolved in 1 l H₂O: to be drunk during the day
- Nabic 3 to 4 grams Nabic/day

Dose to be adopted in order to achieve pH 6,2 - 7


How to maximise SFR? Postop adjuvant treatments in order to increase SFR

Postop treatment: percutaneous chemoysis

Percutaneous dissolution therapy via nephrostomy tube or ureteric cath

Struvite SubyG citric acid -> at least 1 week

UA Nabic (1,4%, 1/6 M) -> SF in 48h



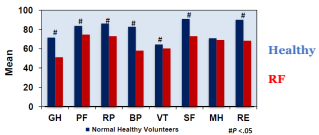
Heimbach et al, Int Urol and Nephrol 1998

Impact on Quality of Life

No data regarding PROM and QoL in patients with RF after URS

Do the Residual Fragments After Shock Wave Lithotripsy Affect the Quality of Life?

71 patients, post SWL RF, detected by US/KUB/CT
Evaluation QoL via SF-36 questionnaire
QoL of healthy patients versus patients with RF



Healthy RF

Sahin et al, Urology 2005

Conclusions

- > Post URS residual fragments are very frequent (51%)
- > RF > 2 mm associated with repeat surgery, comparable with SWL and PCNL data ~~CIRF~~
- > Prevention of stone recurrence is essential
- > Avoid residual fragments :
 - choose the right treatment, depending on stone size
 - adjuvant treatment
 - always render the kidney ASFAB (As Stone Free As Possible)
- > Future research needed: prospective / uniform SF definition / impact on QoL / stone clinic effect /