

Safety of Urologic Procedures for Stone Management in Patients with CKD

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Introduction



- Management of stones in CKD is challenging
- Appropriate approach
 - Stabilize renal function
 - Delay the requirement of renal replacement therapy

Problems specifically related to stones and CKD



- Patients with CKD
 - Anemic
 - Leucopenia (lymphopenia)
 - Low platelet count, Impaired platelet function
 - Increased tendency for bleeding
 - More susceptible to infection and sepsis
 - Impaired body hemostasis
 - Electrolyte disturbances, fluid overload and pulmonary edema
 - Other problems:
 - Secondary hyperparathyroidism, renal osteodystrophy, altered lipid profile and cardiomyopathy

Management of urolithiasis in CKD

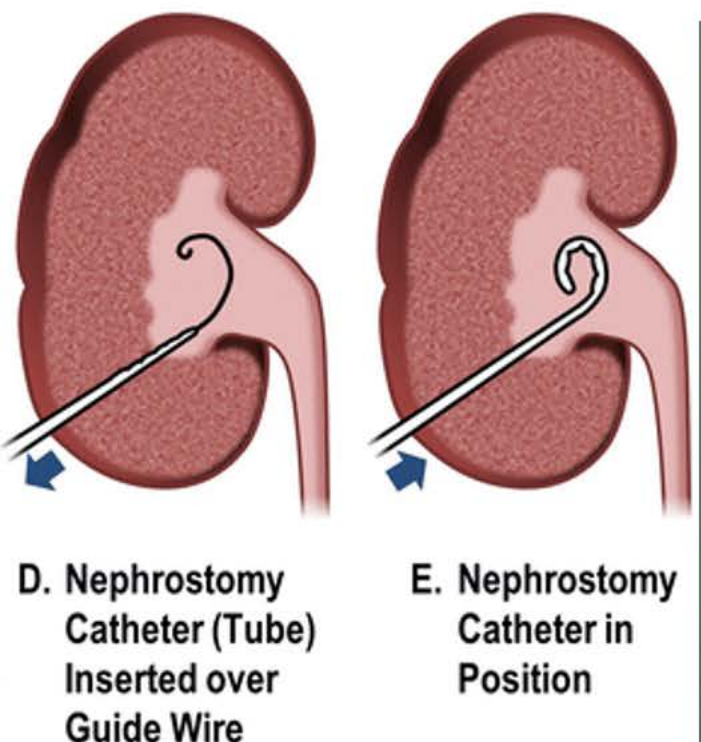
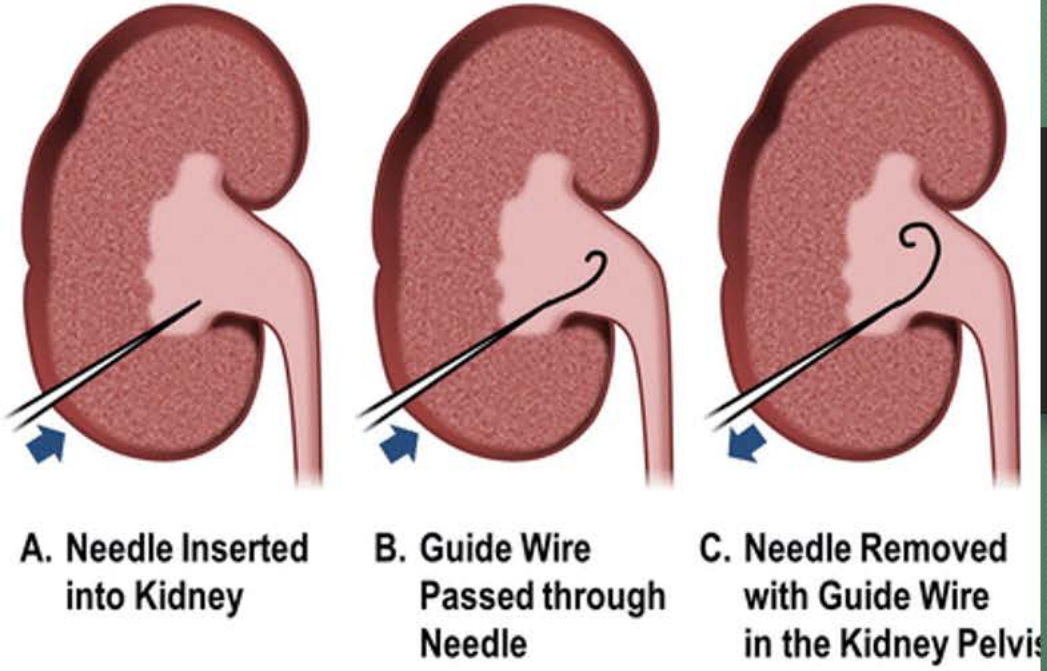


- Presentation of patients with CKD and urolithiasis
 - Silent uremia
 - Loin pain
 - Fever, urosepsis
 - Anuria
 - Pulmonary edema
 - Neglected stones and uremia
 - Low SES
 - Alternative medicine

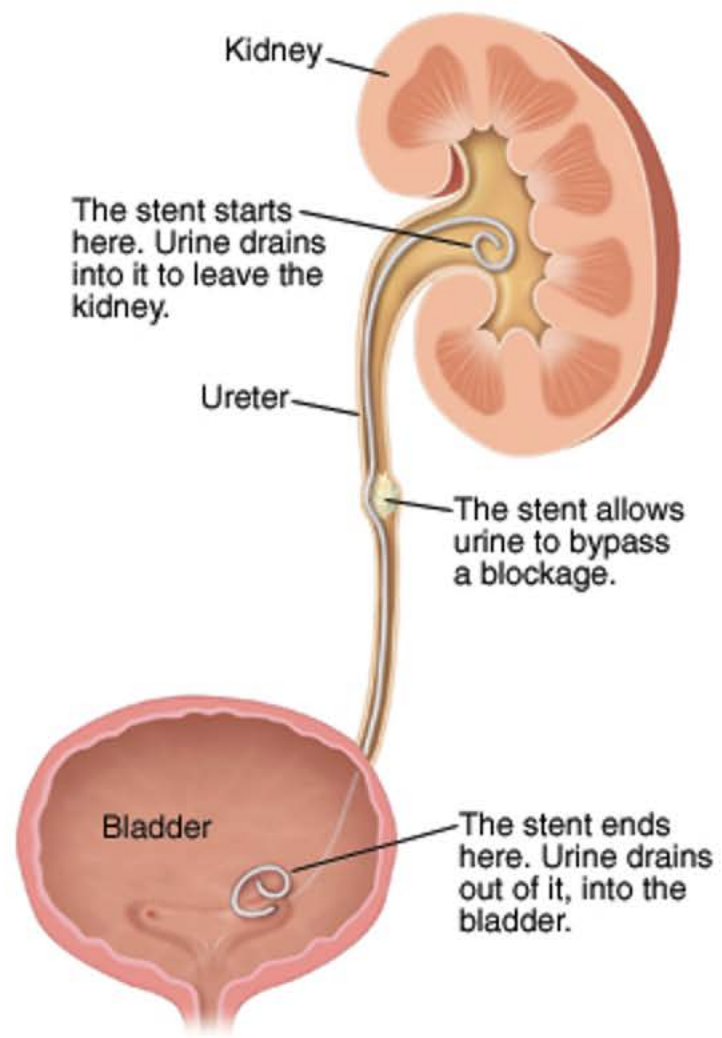
Management of urolithiasis in CKD (cont'd)



- Minimally invasive therapy has replaced open stone surgery in the last two decades
- Decompression of the pelvicalyceal system
 - Percutaneous nephrostomy (PCN)
 - Ureteral stents (DJ)
- There is little evidence → superiority of PCN over retrograde stenting for primary tx of infected hydronephrosis.



PCN



DJ stent

Delayed Relief of Ureteral Obstruction is Implicated in the Long-Term Development of Renal Damage and Arterial Hypertension in Patients with Unilateral Ureteral Injury

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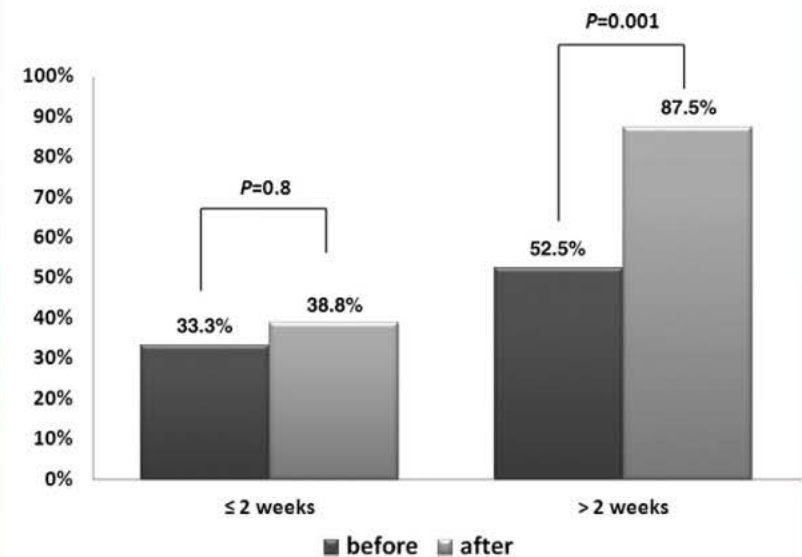
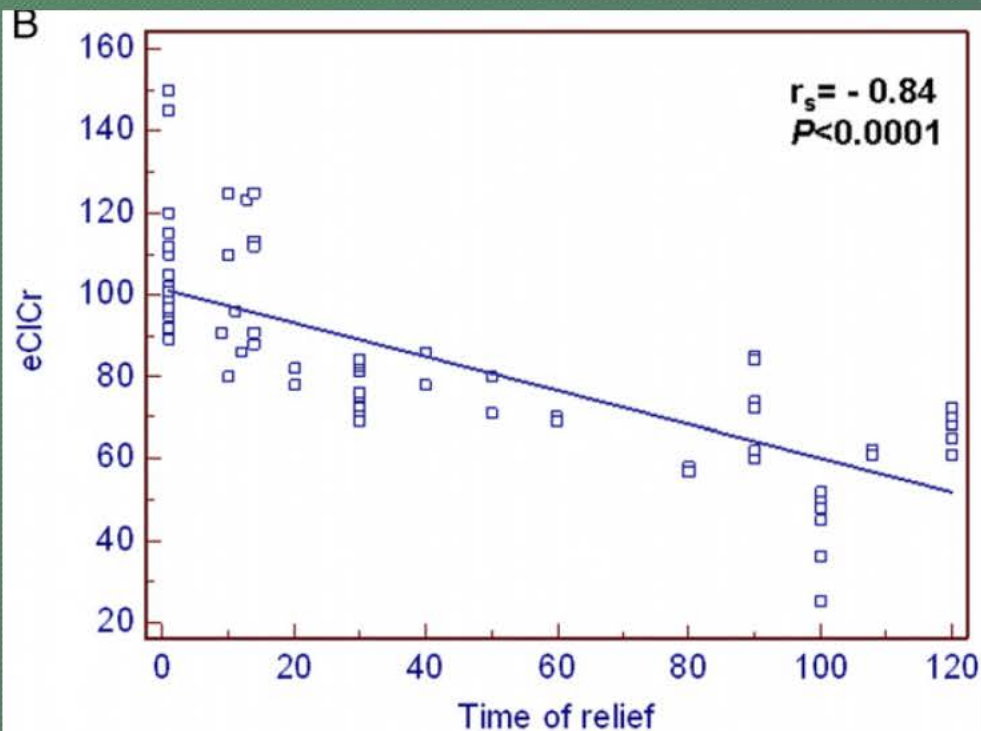


Figure 1. Hypertensive state before and after surgical relief of obstruction in 2 groups of patients (time of relief 2 weeks or less vs greater than 2 weeks).

Nephrectomy



- It may be appropriate to remove a poorly functioning kidney when
 - **eGFR** is below 15 ml/min
 - + Daily PCN **output** below 400 ml
 - + Renal parenchymal **thickness** < 5 mm
- Worthwhile to remove such a kidney and place the patient on RRT rather than leave behind an infective focus which could lead to life-threatening sepsis

Open stone surgery



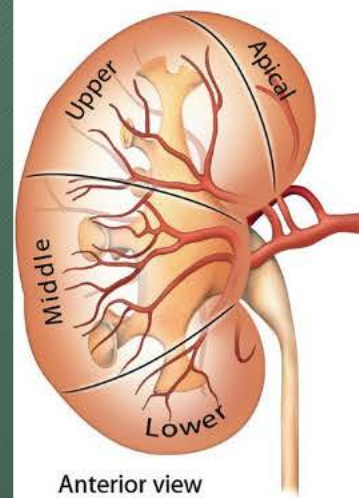
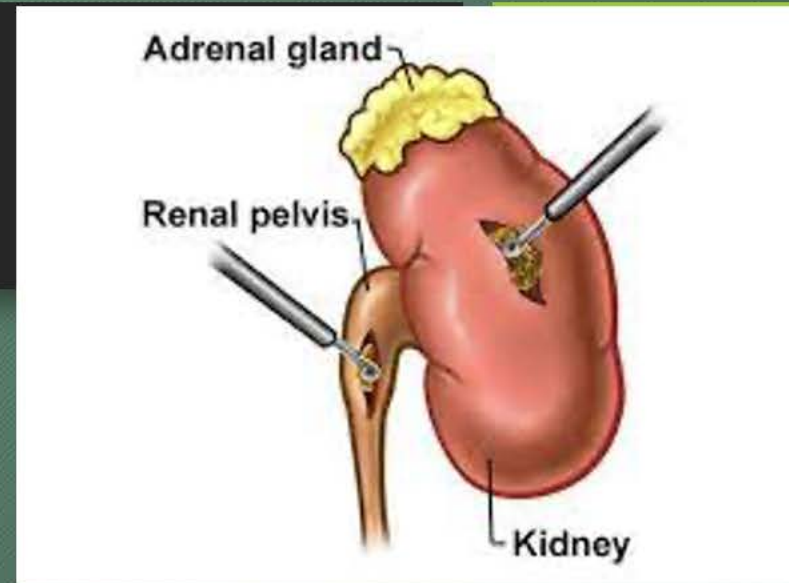
- Advances in SWL and endourological surgery (URS and PNL)
 - decreased the indications for open or laparoscopic stone surgery
- Most complex stones, including partial and complete staghorn stones, should be approached primarily with PNL

Recommendation	Strength rating
Offer laparoscopic or open surgical stone removal in rare cases in which shock wave lithotripsy, retrograde or antegrade ureteroscopy and percutaneous nephrolithotomy fail, or are unlikely to be successful.	Strong

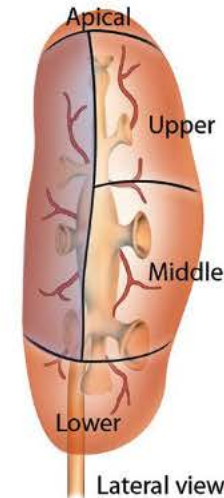
Open stone surgery

- Ureterolithotomy
- Pyelolithotomy
- Extended pyelolithotomy
- Anatomic nephrolithotomy

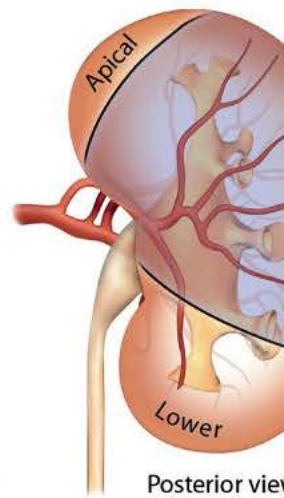
These more invasive procedures have yielded high SFRs and lower auxiliary procedure rates



Anterior view

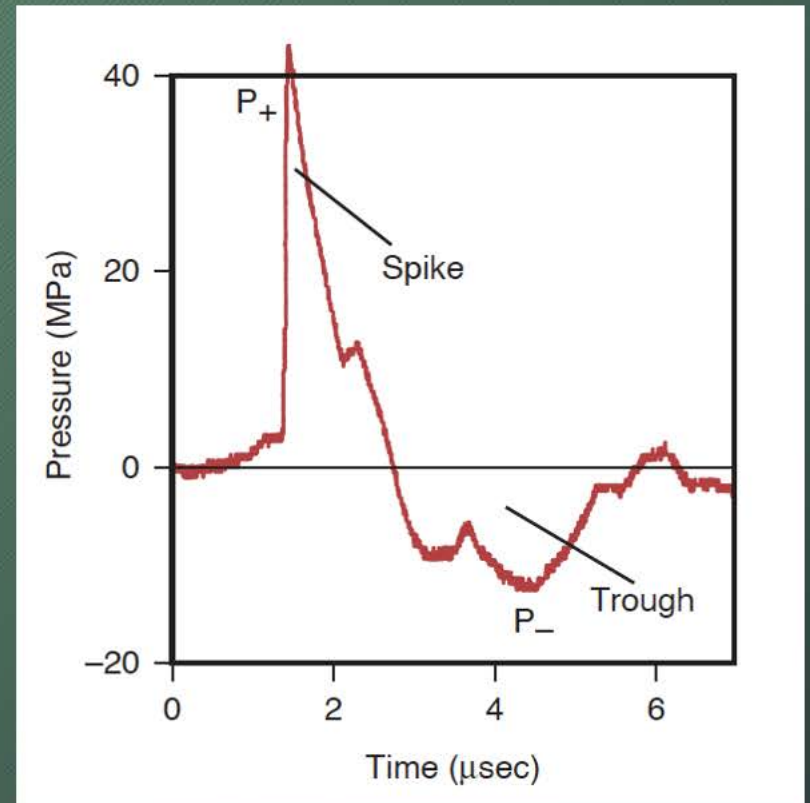


Lateral view



Posterior view

Shockwave lithotripsy (SWL)



SWL: cont'd



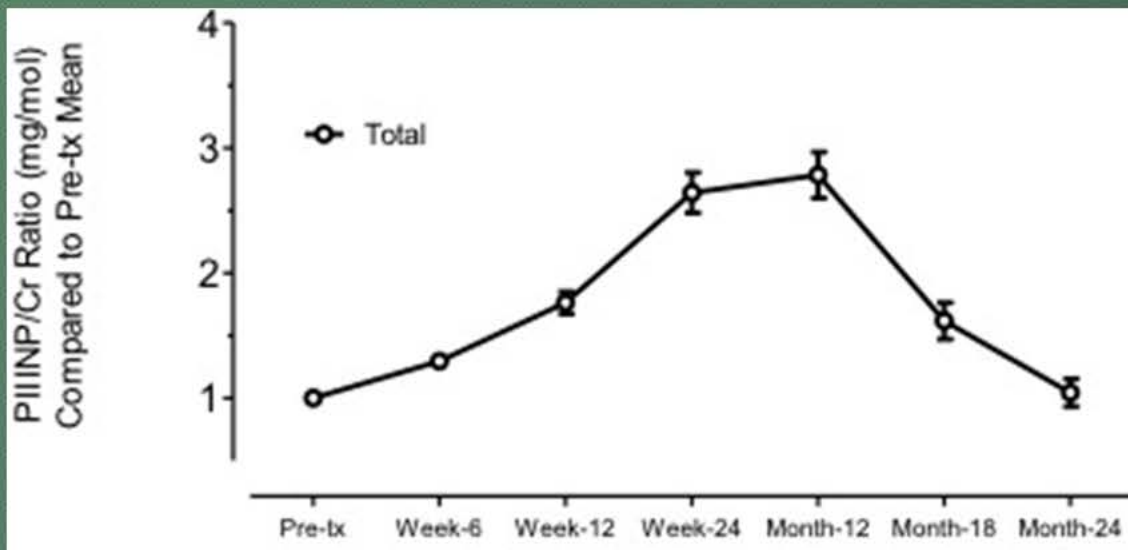
- Concerns in using SWL in patients with CKD:
 - Decreased **fragmentation** due to a deficient wet layer over the stone.
 - Doubtful complete clearance of fragments due to decreased urine **output**
 - Possibility of further loss of **renal function**.



SWL: cont'd



- Laboratory studies
 - Typical clinical dose of 2000 shock waves produces a **lesion** measuring 5% to 6% of the functional renal



SWL: cont'd



Long-term adverse effects of extracorporeal shock-wave lithotripsy for nephrolithiasis and ureterolithiasis: a systematic review

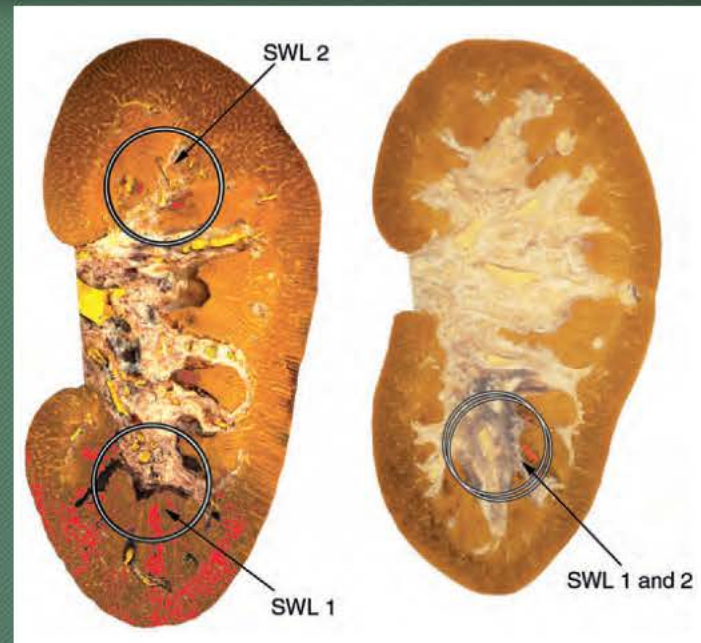
Fankhauser, Christian D ; Kranzbühler, Benedikt ; Poyet, Cédric ; Hermanns, Thomas ; Sulser, Tullio ; Steurer, Johann

- Majority of studies show no evidence for any increase in post-ESWL incidence of
 - Arterial hypertension (24 of 30 studies)
 - Diabetes mellitus (4 of 6 studies)
 - Kidney dysfunction (14 of 14 studies)

Retrospective design

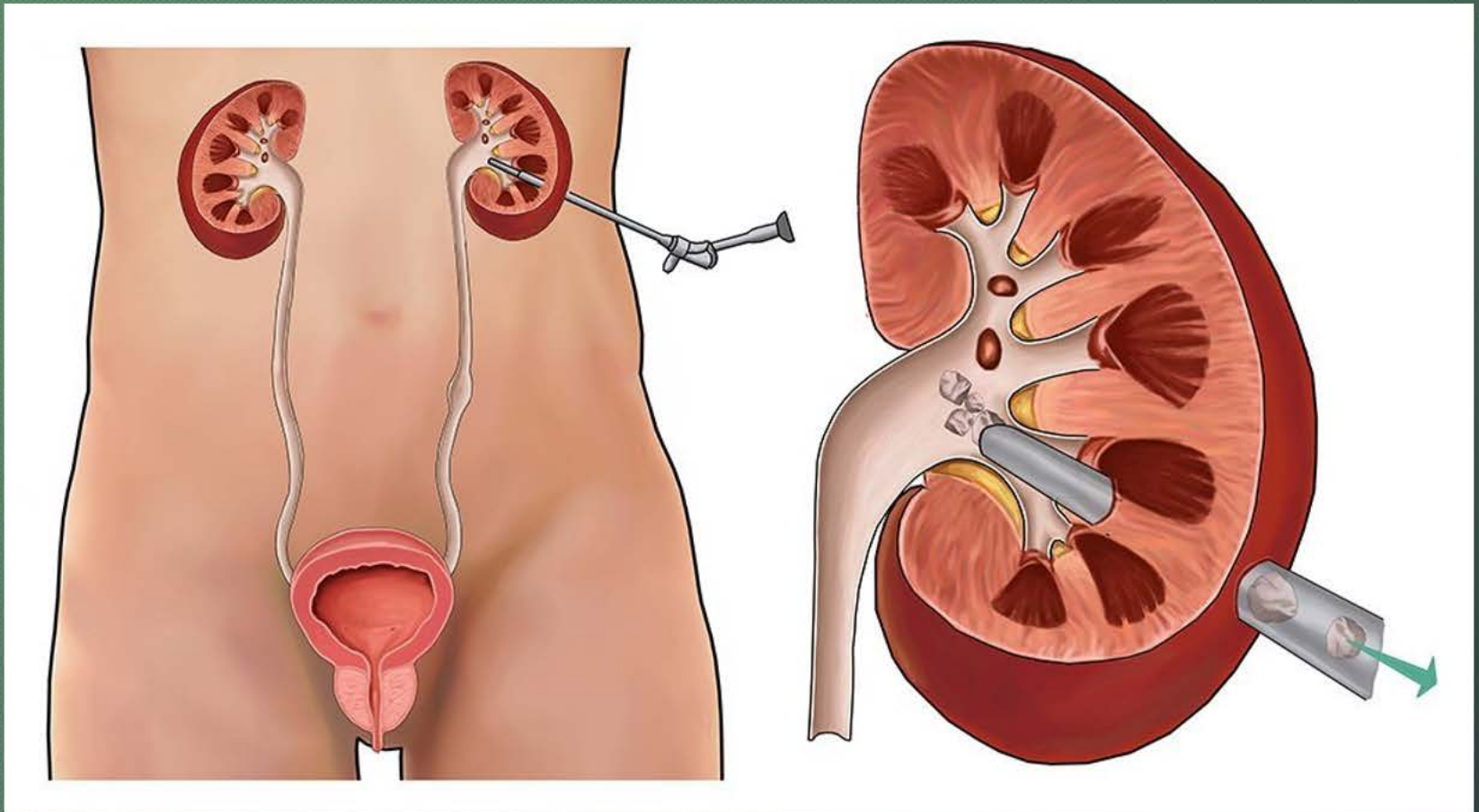
Few long-term F/U

SWL: cont'd



Summary of evidence	LE
Stepwise power ramping prevents renal injury.	1b
Clinical experience has shown that repeat sessions are feasible (within one day for ureteral stones).	4
Optimal shock wave frequency is 1.0 to 1.5 Hz.	1a

Percutaneous nephrolithotomy (PCNL)



PCNL: cont'd



- Concerns in CKD patients:
 - Hypothermia
 - Fluid overload
 - Higher sepsis rate



PNL: cont'd



Outcome:

- Renal scintigraphy and SPECT after PCNL
 - No changes in total renal function
 - **Although**
 - New focal cortical defects
 - Reduced renal functional activity were seen in a minority of patients at the site of percutaneous renal access
- Effects of multi-access tract PCNL on renal functional outcomes are mixed

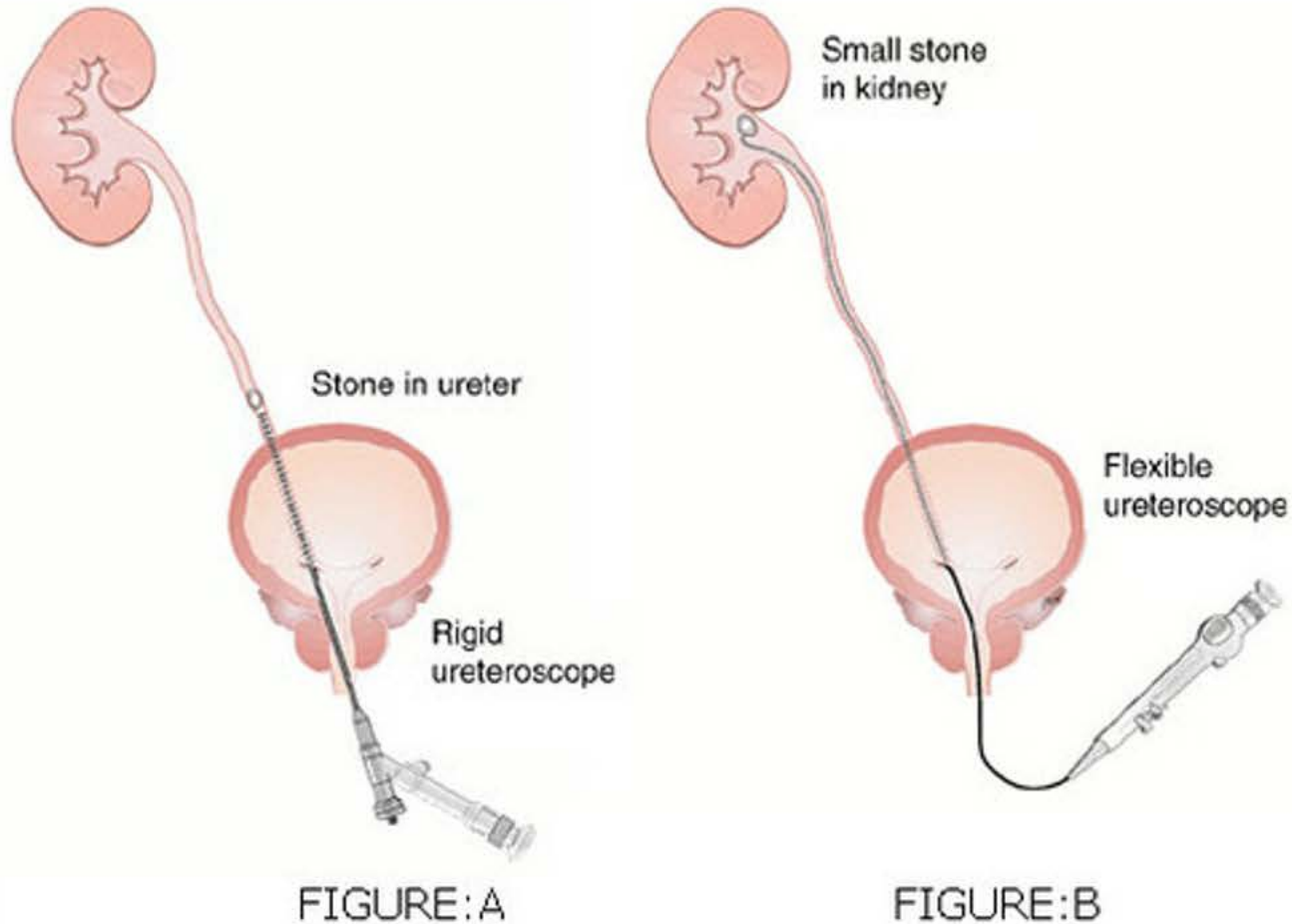
PNL: cont'd



- Recommendations for preventing kidney injury
 - Use single access
 - Combine with flexible URS for unreachable locations
 - Perform papillary access



Ureteroscopy (URS)



URS: cont'd




- It is believed that
 - URS induces minimal renal parenchymal damage
 - No change in long-term renal function has been reported even after multiple URS treatments
- Lower possibility of bleeding





The effects of shock wave lithotripsy and retrograde intrarenal surgery on renal function

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ABSTRACT

Introduction: The aim of this study was to compare the early effects of shock wave lithotripsy (SWL) and retrograde intrarenal surgery (RIRS) on renal function using the cystatin C levels.

Material and methods: Serum samples were taken from each of the patients preoperatively, on the first postoperative day, and on the 30th postoperative day in order to evaluate the renal damage. The cystatin C level was determined using a particle-enhanced turbid metric immunoassay with a clinical chemistry analyzer.

Results: In the comparison between the preoperative and postoperative cystatin C levels on day 1, there was an increase in the SWL group ($p = .001$); however, the decrease in the RIRS group was statistically significant ($p = .007$). There were statistically significant differences in the cystatin C levels on the first postoperative day in both groups ($p = .001$). In the SWL group, there was a statistically significant increase between the preoperative and the 30th postoperative day cystatin C levels ($p = .006$), but no differences were found between these levels in the RIRS group or between the two groups ($p = .255$).

Conclusions: RIRS may be the preferred procedure for patients who need more renal function protection when treating renal stones <2 cm

ARTICLE HISTORY

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KEYWORDS

Cystatin C; shockwave lithotripsy; retrograde intrarenal surgery; renal stones

The last word



- Considering the available evidence, as long as adequate renal function exists and nephrectomy is not being entertained,
stone treatment decisions should not, in general, be based on renal function.
- Rather, they should be based on
 - Stone-specific characteristics
 - Renal anatomic factors
 - Other more relevant clinical factors

THANK YOU

