

Papel de la aspiración en la Cirugía Percutánea Renal

Emma de Lorenzo-Cáceres
F.E.A. Urología CHUIMI

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Review – Stone Disease

Suction in Percutaneous Nephrolithotripsy: Evolution, Development, and Outcomes from Experimental and Clinical studies. Results from a Systematic Review

Virgilio De Stefano^{a,}, Daniele Castellani^a, Bhaskar K. Somani^b, Carlo Giulioni^a, Angelo Cormio^a, Andrea Benedetto Galosi^a, Kemal Sarica^c, Xavier Glover^d, Rodrigo Donalisio da Silva^e, Yiloren Tanidir^f, Nariman Gadzhiev^g, Giacomo Maria Pirola^h, Prashant Motiram Mulawkar^{i,j,k}, Jeremy Yuen-Chun Teoh^l, Manoj Monga^m, Thomas R.W. Herrmannⁿ, Vineet Gauhar^o*

- PUBMED 212
- EMBASE 677
- SCOPUS 105

994 → 737 → 34

Article info

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SUCTION EMS TRILOGY

- 6 STUDIES
- 2019 – 2022
- 1 COMPARATIVE HOLMUN vs TRILOGY

SUCTION SHEATHS

- 25 STUDIES
- 2004 – 2022
- TRACT SIZE 10Fr – 20Fr
- PNEUMATIC / US / HOLMIUN LASER
- 10 PROSCTECTIVE

OTHER SUCTION METHODS

- 3 STUDIES
- 2016 – 2022
- RETROSPECTIVE

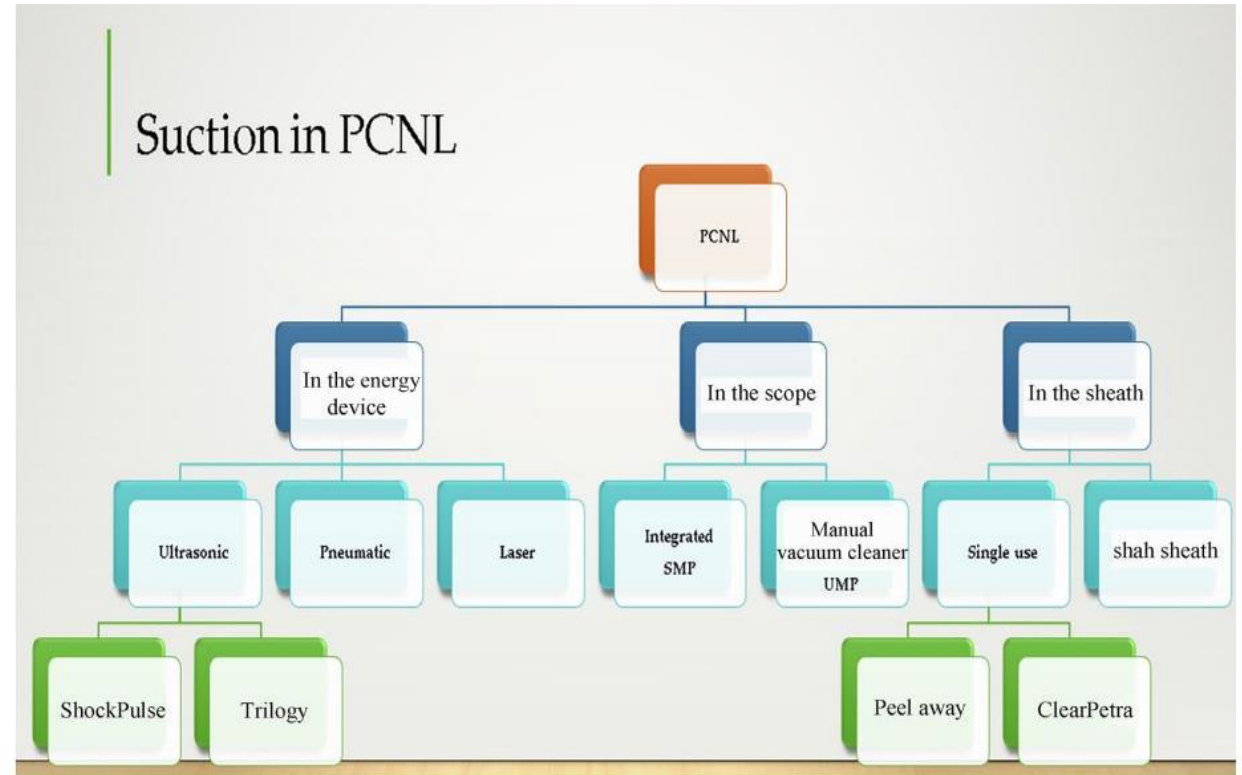


Fig. 1 – Flowchart for available mechanisms of suction in PCNL. PCNL = percutaneous nephrolithotomy; SMP = supermini percutaneous nephrolithotomy; UMP = ultramini percutaneous nephrolithotomy.



Percutaneous nephrolithotomy with suction: is this the future?

Yang Liu, Wei Zhu and Guohua Zeng

Department of Urology, Minimally Invasive Surgery Center, The First Affiliated Hospital of Guangzhou Medical University, Guangdong Key Laboratory of Urology, Guangzhou, China

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Curr Opin Urol 2021, 31:95–101

DOI:10.1097/MOU.0000000000000854

2021

KEY POINTS

- The feasibility of suctioning PCNL techniques has been proved with the advantages of higher SFR, less postinfectious complications and higher fragmentation efficiency.
- The application of a real-time intrarenal pressure sensor in suctioning PCNL devices will help to monitor the pressure in procedures and reduce the risk of infection-related complications.
- Suctioning PCNL is a cost-effective treatment strategy in the management of renal stones.
- Most of current suctioning PCNL studies were retrospective design; higher level of evidence is required to further confirm the safety and application of this technique.

SUCTION IN PCNL

- HIGHER SFR
- LESS INFECTIOUS
- REAL-TIME IRP
- COST-EFFECTIVE
- MOST RETROSPECTIVE



Current evidence for suction in endourological procedures: comprehensive review of literature

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^bDepartment of Urology, King Fahad Specialist Hospital, Dammam, Saudi Arabia, ^cDepartment of Urology, Minimally Invasive Surgery Center, The First Affiliated Hospital of Guangzhou Medical University, and Guangdong Key Laboratory of Urology, Guangzhou, China and ^dEuropean Urolithiasis Society (EULIS), Arnhem, The Netherlands

Correspondence to Christian Seitz, Department of Urology, Medical University Vienna, Währinger Gürtel 18-20, 1090 Vienna, Austria. Tel: +43 69918195333; e-mail: drseitz@gmx.at

Curr Opin Urol 2023, 33:77–83

DOI:10.1097/MOU.0000000000001061

2023

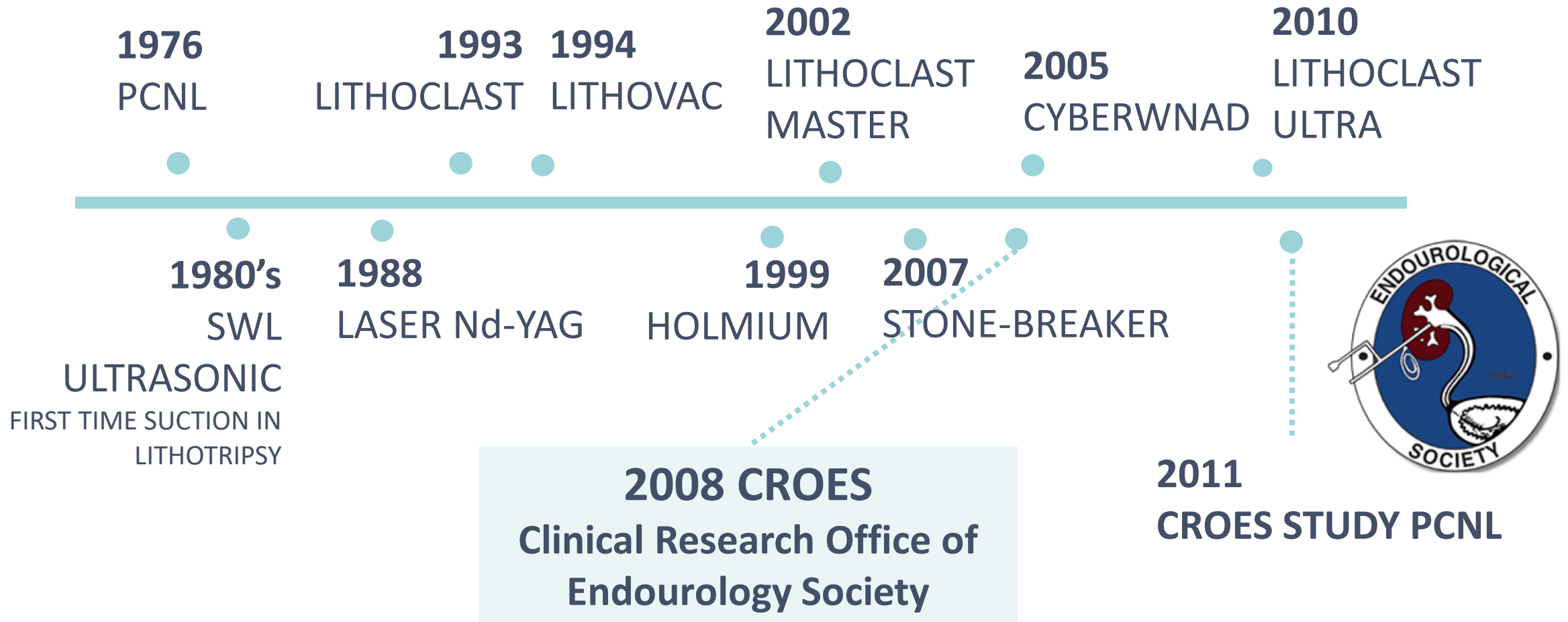
KEY POINTS

- Prospective and randomized controlled trial (RCT) demonstrated increased SFR and reduced complication rates using suctioning devices in PNL procedures.
- RCT demonstrated favorable SFR in mini PNL procedures.
- Retrospective and comparative demonstrated increased SFR and reduced complication rates using suctioning devices in RIRS.
- Multicenter RCTs are needed to further confirm these observations.

PROSPECTIVE RCT

- BETTER SFR
- LESS COMPLICATIONS
- SFR miniPCNL
- SUCTION DEVICES
- MORE EVIDENCE

SUCTIONING IN STANDART PCNL



2007-2009
N = 5803
96 CENTERS
26 COUNTRIES

The Clinical Research Office of the Endourological Society Percutaneous Nephrolithotomy Global Study: Indications, Complications, and Outcomes in 5803 Patients

Jean de la Rosette, M.D.; Dean Assimos, M.D.; Manesh Desai, M.D.; Jorge Gutierrez, M.D.;
 James Lingeman, M.D.;⁵ Roberto Scarpa, M.D.;⁶ Ahmet Tefekli, M.D.;⁷
 on behalf of the CROES PCNL Study Group

STONES
 STAGHORN 27.5%
 RENAL PELVIS 50.1%



PCNL TECHNIQUE	
Access Urologist	90.1%
Prone position	80.3%
Mutiple tract	8.0%
Puncture by XR	61.9%
Dilators/Ballon	58.9%
Nephrostomy	91.2%
Ureter TRACT Fr?	42.7%

LITHOTRPSY	
Pneumatic	41.6%
ULTRASONIC	24%
Combined	18.3%
Laser	7.0%
Electrohydraulic	1.0%

OUTCOMES	
Bleeding	7.8%
Pelvis perforation	3.4%
Fever (>38.5°C)	10.5%
Hydrothorax	1.7%
STONE FREE RATE*	75.7%

* SFR: Only 14% by CT, the true rate should be lower

- 1993
LITHOCLAST
- 1994
LITHOVAC

The Lithovac: New Suction Device for the Swiss Lithoclast

G. HAUPT, M.D., J. PANNEK, M.D., T. HERDE, M.D., H. SCHULZE, M.D., and T. SENGE, M.D.

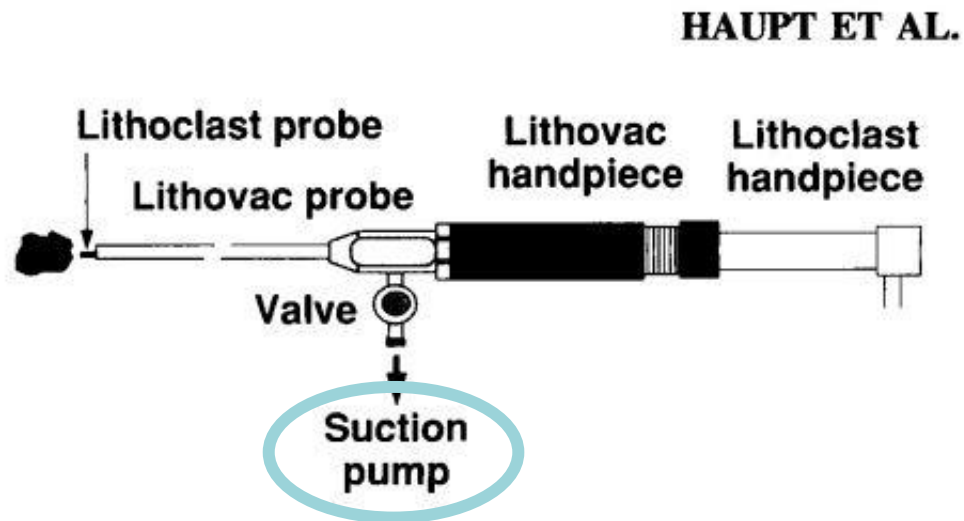


FIG. 1. Lithovac and Lithoclast assembled for fragmentation with suction. After removal of Lithoclast, the device can be used for suction of larger fragments.

IN VITRO STUDIES	
Probe Size	Suction
4.8 Fr	1.3mm
10.5Fr	2.7mm
12.0Fr	3.5mm

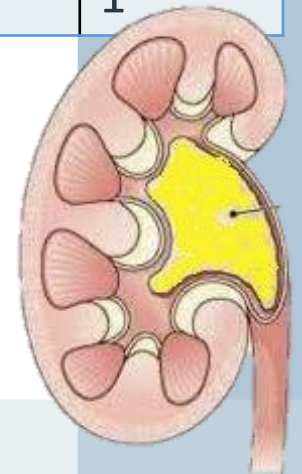
IN VIVO STUDIES N = 40	
Kidney (PCNL)	N = 7
Vol (cm)	4.2
SFR	71%
Bleeding	1

PCNL (STAGHORN)

LITHOVAC PROBE 12FR
LITHOCLAST PROBE 4.8-10FR

CONTINUOUS SUCTION

- GOOD VISION
- NO PUSHBACK
- LESS TIME



● **2002**
LITHOCLAST MASTER

TECHNICAL DEVELOPMENT

1. **PNEUMATIC SHOCK WAVES (0-12 HZ)**
 - CENTRAL COMPRESSED AIR
 - COMPRESSOR
2. **ULTRASOUND PROBE 24-26 KHZ**
3. **SUCTION TUBE + STONE CATCHER**
4. **INTEGRATED VALVE FOR FLUID**

IN VITRO STUDIES			
% DESINTEGRATION 1 MIN			
	US	LC	COMB
9 n/m²	15	10	40
85 n/m²	5	5	20
120 n/m²	5	15	30

Experimental Studies and First Clinical Experience with a New Lithoclast and Ultrasound Combination for Lithotripsy

R. Hofmann*, J. Weber, A. Heidenreich, Z. Varga, P. Olbert

Department of Urology and Pediatric Urology, Medical School, Philipps Universität Marburg, Baldingerstr., 35033 Marburg, Germany

Accepted 15 July 2002

IN VIVO STUDIES N = 68	
STAGHORN > 15cm	35
PCNL tract	22 Fr
Puncture	xRay
Nephrostomy 20Fr	100%
DJ catheter	100%

- **DUST SUCTIONED**
- **PARTICLES MUCH SMALLER**
- **LESS TIME**

OUTCOMES	
Bleeding	8.8%
Pelvis perforation	8.8%
Fever (>38.5°C)	NR
OP TIME	61 min*
STONE FREE RATE	75%

* Range 42-120min

- 2002
LITHOCLAST MASTER

- 2010
LITHOCLAST ULTRA

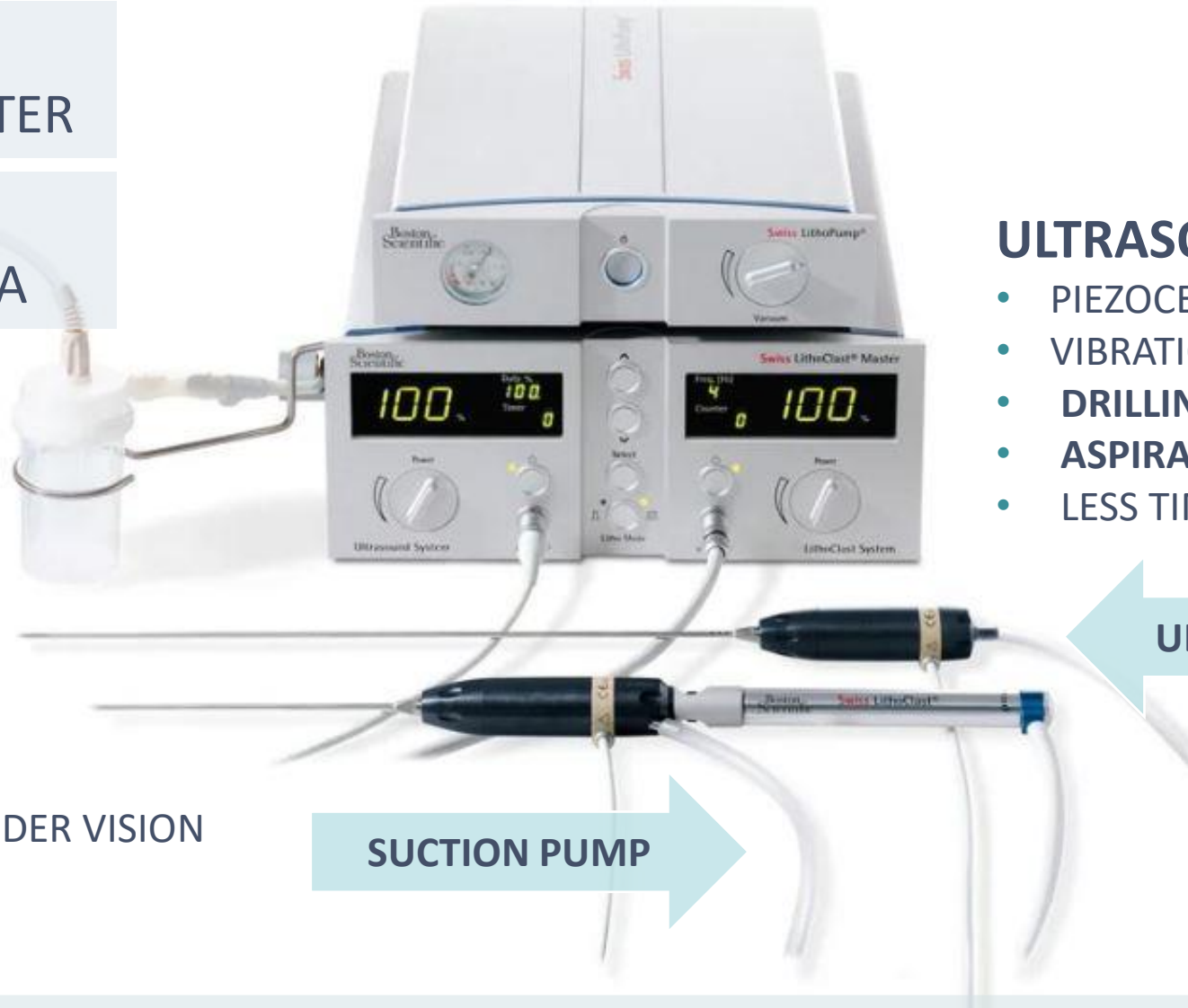
STONE BUCKET

MECHANICAL

- BALLISTIC
- COMPRESSED AIR
- NO HEAT
- NO PERFORATION UNDER VISION

ACCESORIES

- IRRIGATION VALVE
- STONE COLLECTOR



SUCTION PUMP

ULTRASOUND

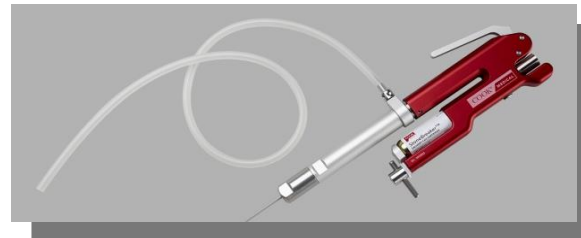
- PIEZOCERAMIC ELEMENTS
- VIBRATION 23-27 KHz
- DRILLING ACTION
- ASPIRATION THROUGH HOLLOW
- LESS TIME

ULTRASODUN PROBE

The Canadian StoneBreaker Trial: A Randomized, Multicenter Trial Comparing the LMA StoneBreaker™ and the Swiss LithoClast® During Percutaneous Nephrolithotripsy

Ben H. Chew, M.D., M.Sc., FRCSC,¹ Olga Arsovska, B.Sc.,¹ Dirk Lange, Ph.D.,¹
 Jamie E. Wright, M.D., FRCSC,¹ Darren T. Beiko, M.D., FRCSC,²
 Daniela Ghiculete, M.Sc.,³ John R. D'A. Honey, M.A., M.B., Ch.B., FRCS(E), FRCSC,³
 Kenneth T. Pace, M.D., M.Sc., FRCSC,³ and Ryan F. Paterson, M.D., FRCSC¹

1. PNEUMATIC



2. US OLYMPUS LUS-2



- DUST SUCTIONED
- NO COMPLICATIONS
- NO FOOT PEDALS

PATIENST + TECHNIQUE

Stone Size	> 100mm ²
PCNL tract	30 Fr
Dilation	ballon
Nephrostomy	1-7 days

OUTCOMES

N = 77	LITHOCLAST	STONEBRAKER
Pressure	3 bar	31 bar
Set up	101seg	67.7seg
Time	1012seg	671seg
Fatigue	7.5	9.5
Vision	8.39	9.16
SFR	90%	87%
RF<4mm	51%	33%

SUCTION EMS TRILOGY

2020

LITHOCLAST TRILOGY

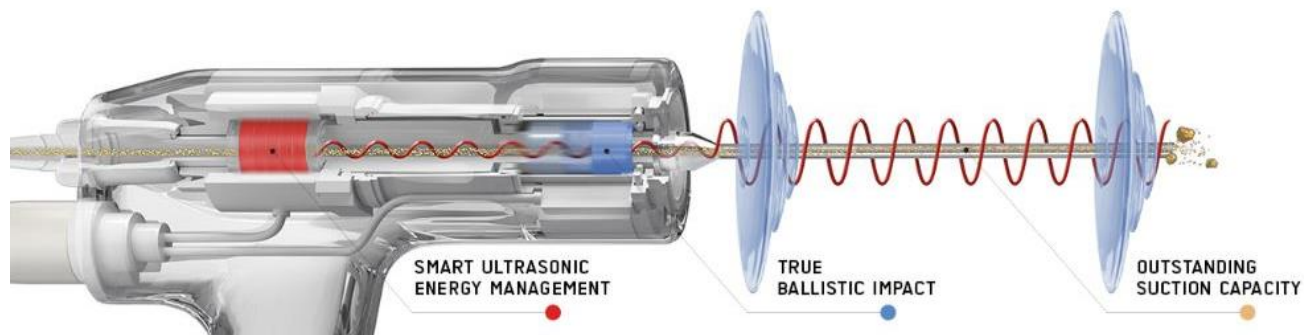


ENHANCED VERSATILITY

1. ULTRASONIC ENERGY
2. BALLISTIC ENERGY
3. SUCTION

INTUITIVE USER EXPERIENCE

TOUCH SCREEN SETTINGS



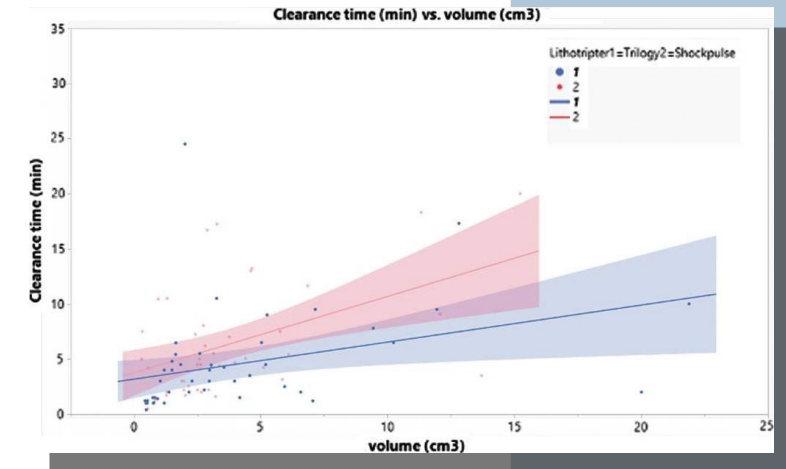
SUCTIONING IN STANDART PCNL

[J Endourol.](#) September 2021; 35(9): 1326–1332.

Published online 2021 Sep 14. doi: [10.1089/end.2020.1097](https://doi.org/10.1089/end.2020.1097)

Multi-Institutional Prospective Randomized Control Trial of Novel Intracorporeal Lithotripters: ShockPulse-SE vs Trilogy Trial

[Tim Large](#), MD,¹ [Charles Nottingham](#), MD,¹ [Ethan Brinkman](#), MD,¹ [Deepak Agarwal](#), MD,¹ [Andrea Ferrero](#), PhD,² [Michael Sourial](#), MD,³ [Karen Stern](#), MD,⁴ [Marcelino Rivera](#), MD,¹ [Bodo Knudsen](#), MD,³ [Mitchel Humphreys](#), MD,⁴ and [Amy Krambeck](#), MD⁵



OUTCOMES		
N = 100	TRILOGY	SHOCKPULSE
Stone volume	4.2 ± 4.8	3.9 ± 3.4
Time	5.8 ± 6.3	6.7 ± 6.2
Sepsis	6.3%	5.0%
Malfunction	1.9%	34.7%
SFR (<4mm)	80,3%	71,5%

SHOCKPULSE



TRILOGY



CONCLUSION

- BOTH FAR SUPERIOR TO PRIOR STUDIED LITHOTRITES
- TRILOGY SIGNIFICANTLY IMPROVED CLEARANCE TIME

SUCTION SHEATHS

SUCTIONING IN Mini- PCNL



2011
Song

2014
Shah

2016
Huang

2019
Zhu

2021

2009
Li

2016
Zeng

2020
Zanetti

mNLPC SUCTION SHEATH

1. PATENTED SHEATH 16Fr
2. SHAH SHEATH 12Fr
3. (VAAS) CLEAR PETRA 18Fr

mNLPC SUCTION SYSTEM

- SUPER-MINI PCNL 12-14Fr

mNLPC SUCTION COMPONENT

- PEEL-AWAY SHEATH 20Fr

SUCTIONING IN Mini- PCNL



European Urology

Volume 79, Issue 1, January 2021, Pages 114-121

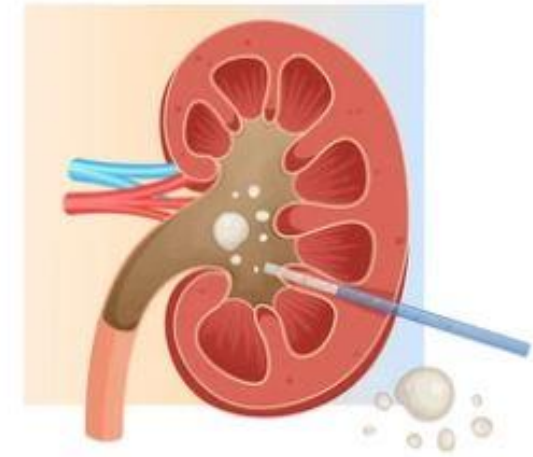


Platinum Priority – Stone Disease

Editorial by Panagiotis Kallidonis, Despoina Liourdi, Evangelos Liatsikos and Arman Tsaturyan on pp. 122–123 of this issue

Mini Percutaneous Nephrolithotomy Is a Noninferior Modality to Standard Percutaneous Nephrolithotomy for the Management of 20–40mm Renal Calculi: A Multicenter Randomized Controlled Trial

Guohua Zeng^{a †}  , Chao Cai^{a †}, Xianzhong Duan^{b †}, Xun Xu^{c †}, Houping Mao^d, Xuedong Li^e, Yong Nie^f, Jianjun Xie^g, Jiongming Li^h, Jun Luⁱ, Xiaofeng Zou^j, Jianfeng Mo^k, Chengyang Li^l, Jianzhong Li^m, Weiguo Wangⁿ, Yonggang Yu^o, Xiang Fei^p, Xianen Gu^q, Jianhui Chen^r, Xiangbo Kong^s...Jean de la Rosette^{a u v}



2016 -2019

N = 1980

20 CENTERS

24Fr vs 18Fr

OUTCOMES

COMPARABLE STONE FREE RATES

FEVER/SEPSIS: NO DIFFERENCES

sPCNL SHORTER TIME

mPCNL LESS BLEEDING

mPCNL LESS HOSPITALIZATION

SUCTIONING IN Mini- PCNL

> J Endourol. 2009 Oct;23(10):1693-7. doi: 10.1089/end.2009.1537.

● 2009
Li

Chinese minimally invasive percutaneous nephrolithotomy: the Guangzhou experience

Xun Li¹, Zhaohui He, Kaijun Wu, Shu Keung Li, Guohua Zeng, Jian Yuan, Yongzhong He, Ming Lei

CHINESE mini-PCNL

1. SMALLER INSTRUMENTS AND TRACTS
2. MIDDLE CALICEAL PUNCTURE 11TH RIB
3. STRONG IRRIGANT CURRENT
4. PRONE POSITION **Guangzhou**

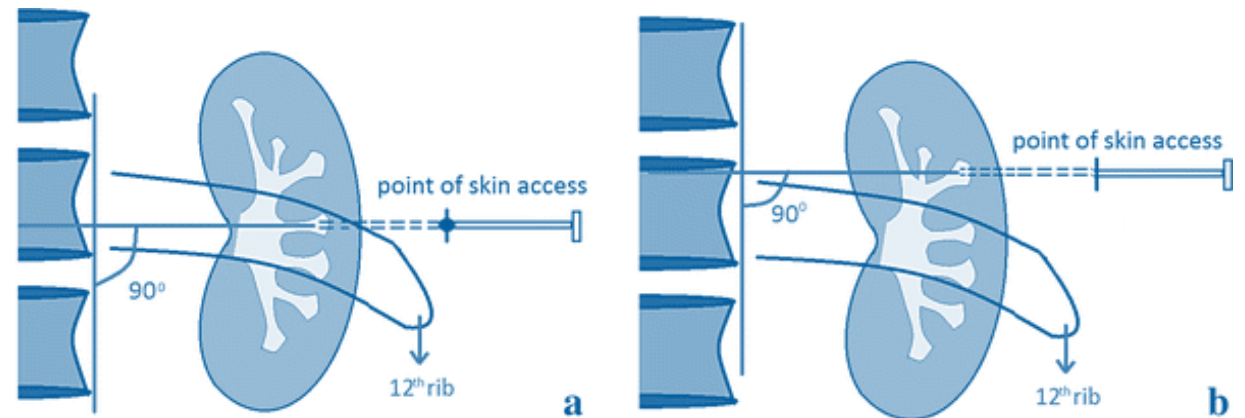
CONCLUSION:

- SAFE AND EFFECTIVE
- **STONE-FREE RATE 89%**
- COMPLICATION 0.86%.

2001 - 2005

N = 4760 MPCNL

- 1240 staghorn
- 85 ureteral
- 14 transplanted kidneys
- 27 horseshoe



mNLPC SUCTION SHEATH

2011
 Song

PATENTED SHEATH 16Fr

2008 - 2009

- 60 PATIENTS
- NEW SUCTION SHEATH
- LITHOTRIPSY
 - 16 Fr HOLMIUM-YAG
 - 24 Fr US/BALLISTIC
- PERFUSION PUMP 20Fr
- ASPIRATION PRESSURE
- 5Fr URETERAL CATHETER

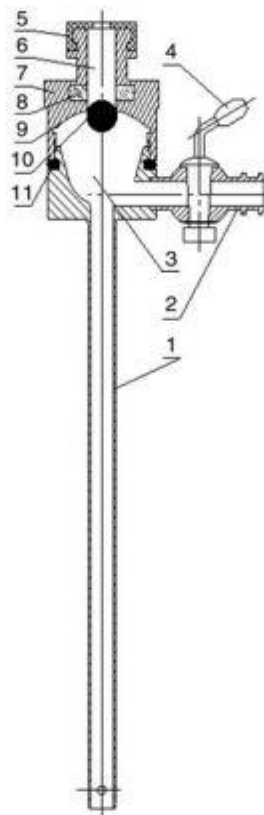


FIG. 3. Parts of the patented sheath. (1) Metal sheath; (2) side suction tube; (3) funnel-shaped internal cavity; (4) valve of side suction tube; (5) sealed cap; (6) sealed working passage; (7) sealed lid; (8) permanent magnetic ring; (9) hemisphere surface; (10) magnetic steel ball; (11) sealing soft ring.

The Application of a Patented System to Minimally Invasive Percutaneous Nephrolithotomy

Leming Song, M.D.^{1,*} Zhiqiang Chen, M.D.^{2,*} Tairong Liu, M.D.¹ Jiuqing Zhong, M.D.¹ Wen Qin, M.D.¹ D.¹ Zuofeng Peng, M.D.¹ Min Hu, M.D.¹ Chuance Du, M.D.¹ Lunfeng Zhu, M.D.¹ D.¹ Zhongsheng Yang, M.D.¹ Jianrong Huang, M.D.¹ and Donghua Xie, M.D.³

IC RING

N = 60	New SHEATH	PCNL
PCNL tract	16 Fr	24 Fr
SHEATH	SUCTION	STANDART
Nephroscope	12Fr	24Fr
Lithotripsy	HOLMIUM-YAG	US/Ballistic
stone burden	8.5cm ²	8.6cm ²
suction	100-250mmHg	

mNLPC SUCTION SHEATH

2011
Song

1. PATENTED SHEATH 16Fr



SUCTION TUBE



STONE BUCKET



JOURNAL OF ENDOUROLOGY
Volume 25, Number 8, August 2011
© Mary Ann Liebert, Inc.
Pp. 1281–1286
DOI: 10.1089/end.2011.0032

The Application of a Patented System to Minimally Invasive Percutaneous Nephrolithotomy

Leming Song, M.D.^{1,*} Zhiqiang Chen, M.D.^{2,*} Tairong Liu, M.D.¹ Jiuqing Zhong, M.D.¹ Wen Qin, M.D.¹
Shulin Guo, M.D.¹ Zuofeng Peng, M.D.¹ Min Hu, M.D.¹ Chuance Du, M.D.¹ Lunfeng Zhu, M.D.¹
Lei Yao, M.D.¹ Zhongsheng Yang, M.D.¹ Jianrong Huang, M.D.¹ and Donghua Xie, M.D.³

OUTCOMES		
N = 60	NEW 16Fr	STANDART
Single tract	28	19
Time	39min	42min
RP Pressure	4,1mmHg	4,5mmHg
Fever	10%	13,3%
Bleeding	90,0mL	110,0mL
SFR (<4mm)	90%	73,3%

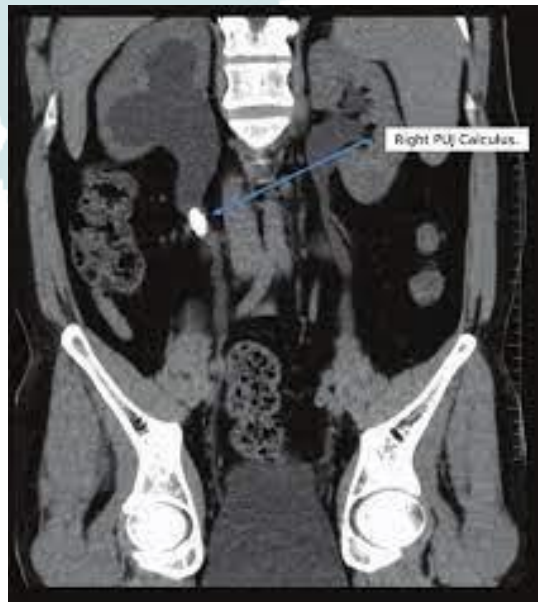
- ✓ LESS PUNCTURE
- ✓ LESS TIME

mNLPC SUCTION SHEATH

2012
Song

1. PATENTED SHEATH 16Fr

- 182 URETERAL STONES
- ABOVE L4
- ECTASIA/ >2MONTH
- HOLMIUN-YAG



Endourology and Stones

Comparative Study of Outcome in Treating Upper Ureteral Impacted Stones Using Minimally Invasive Percutaneous Nephrolithotomy With Aid of Patented System or Transurethral Ureteroscopy

Zhongsheng Yang, Leming Song, Donghua Xie, Min Hu, Zuofeng Peng, Tairong Liu, Chuance Du, Jiuqing Zhong, Wen Qing, Shulin Guo, Lunfeng Zhu, Lei Yao, Jianrong Huang, Difu Fan, and Zhangqun Ye

N = 182	NEW 16Fr N=91	URS N=91
Stone burden	158 ± 96 cm ²	134 ± 83 cm ²
Pyelectasis G2	71,4%	70,3%
Instrument	Nephroscope 12Fr	Ureteroscope 8Fr
Time	27,4 min	45,2 min
Fever > 38°C	5,5%	15,4%
SFR (<4mm)	100%	89%

mNLPC SUCTION SHEATH

2016
Song

1. PATENTED SHEATH 16Fr

Huang et al. *BMC Urology* (2016) 16:71
DOI 10.1186/s12894-016-0184-0

BMC Urology

RESEARCH ARTICLE

Open Access



A Randomized Study of Minimally Invasive Percutaneous Nephrolithotomy (MPCNL) with the aid of a patented suctioning sheath in the treatment of renal calculus complicated by pyonephrosis by one surgery

Jianrong Huang^{1†}, Leming Song^{1†*}, Donghua Xie^{1,2†*}, Monong Li^{3†}, Xiaolin Deng^{1†}, Min Hu¹, Zuofeng Peng¹, Tairong Liu¹, Chuan Du¹, Lei Yao¹, Shengfeng Liu¹, Shulin Guo¹ and Jiuqing Zhong¹



Fig. 1 Patented suctioning lithotripsy sheath

2011-2013

- 182 PATIENTS PYONEPHROSIS (91/91)
- SAME SURGEON
- ANTIBIOTICS PRE + POST OP

OUTCOMES		
N = 182	NEW 16Fr + H-Y	STANDART + US
Stone burden	16,7mm	15,1mm
Pyelectasis G2	51,6%	53,8%
Lower calyx	33,0%	37,4%
Single tract	75	77
Time	54,5 ± 14min	70,2± 12min
Fever >38,5°C	10,9%	27,4%
Bleeding >800mL	0	16,4%
SFR (<4mm)	96,7%	73,6%

mNLPC SUCTION SHEATH

2018
Song

1. PATENTED SHEATH 16Fr

2009-2014

- 912 STAHORN (≤ 2 BRANCHES)
- 4 HOSPITALS
- 3 GROUPS:
 1. SUCTIONmPCNL 16Fr + 100W H-Y
 2. sPCNL 24Fr + US/Pneumatic (EMS)
 3. mPCNL peel-away 16Fr + 100W H-Y
- PYONEPHROSYS EXCLUDED
 - ✓ SINGLE TRACT
 - ✓ LESS FEVER
 - ✓ LESS BLEEDING

Suctioning Minimally Invasive Percutaneous Nephrolithotomy with a Patented System Is Effective to Treat Renal Staghorn Calculi: A Prospective Multicenter Study

Chuance Du^a Leming Song^a Xiaoyuan Wu^a Difu Fan^a Lunfeng Zhu^a
Shengfeng Liu^a Xiaolin Deng^a Tairong Liu^a Zhongsheng Yang^a
Zuofeng Peng^a Min Hu^a Qigui Liu^b Tiejun Pan^c Zhiqiang Chen^d
Zhangqun Ye^d



OUTCOMES

	NEW 16Fr N = 311	STANDARD N = 297	mPCNL N = 304
N = 912			
Single tract	58,5%	28,6%	17,1%
Time	56 ± 32min	53 ± 27min	81 ± 41
RP Pressure	1,8mmHg	5,8mmHg	9,2mmHg
Fever >38,5°C	8,03%	8,41%	14,8%
Bleeding	153 ± 55mL	216 ± 140mL	172 ± 78mL
SFR (<4mm)	81%	73,0%	74%

mNLPC SUCTION SHEATH

2016
Song

Urologia
Internationalis

1. PATENTED SHEATH 16Fr

Urol Int 2016;97:67-71
DOI: 10.1159/000443774

Received: October 3
Accepted after revis
Published online: Fe

Predicting Outcomes after Minimally Percutaneous Nephrolithotomy with the Aid of a Patented System by Using the Guy's Stone Score

Xiaolin Deng^a Leming Song^a Donghua Xie^a Jianrong Huang^a Lunfeng Zhu^a
Xiaolin Wang^b Difu Fan^a Zuofeng Peng^a Min Hu^a Zhongsheng Yang^a
Tairong Liu^a Zhangqun Ye^c

^aDepartment of Urology, Affiliated Ganzhou Hospital of Nanchang University, Ganzhou, Jiangxi, ^bDepartment of Urology, The Chinese Traditional Medicine Hospital of Pinghu City, Ping Hu, Zhejiang, and ^cDepartment of Urology, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei, China

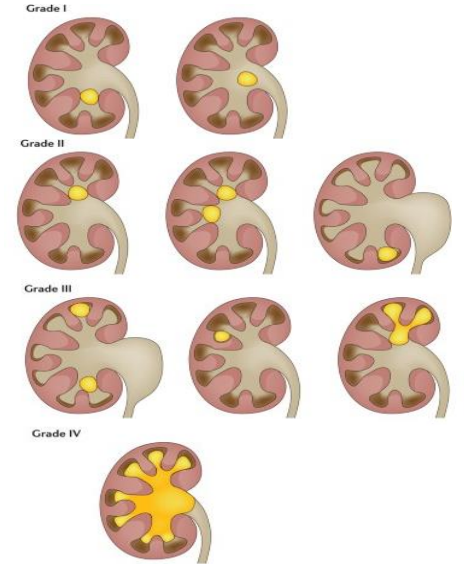
2008-2012

- 222 PATIENTS
- STONE COMPLEXTY
- COMPLICATIONS

OUTCOMES

N = 222	NEW 16Fr	STANDART
Device	HOLMIUN	EMS US
Stone	24mm	23,8mm
Time	36,4 min	39,5 min
Clavien		
CSS 1	4%	5%
CSS 2	8%	9%
CSS 3	12%	27%
CSS 4	21%	46%
SFR	91%	82%
CSS 1	96%	93%
GSS 2	91%	72%
GSS 3	95%	43%
GSS 4	67%	31%

Guy's Stone Score



BETTER RESULTS

- GSS 3
- GSS 4

mNLPC SUCTION SHEATH

2016
Shah

2. SHAH SHEATH 12Fr

Superperc: A new technique in minimally-invasive percutaneous nephrolithotomy

Kaushik Shah, Madhu Sudan Agrawal¹, Dilip Kumar Mishra^{1*}

Department of Urology, Varun Kidney Hospital, Surat, Gujarat, ¹Department of Urology, Global Rainbow Hospital, Agra, Uttar Pradesh, India

SHAH SHEATH

1. SUCTION MASTER
2. CANNULA 10/12Fr
3. OBTURATOR
4. PEDIATRIC URETEROSCOPE 6Fr

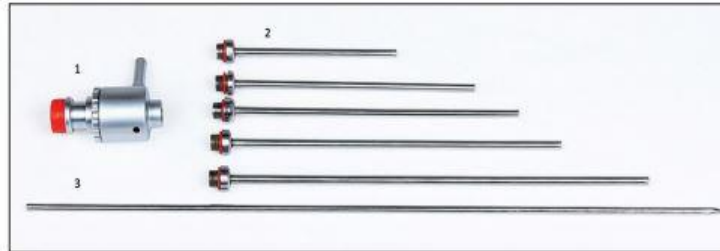


Figure 1: Shah Sheath with different length cannulas

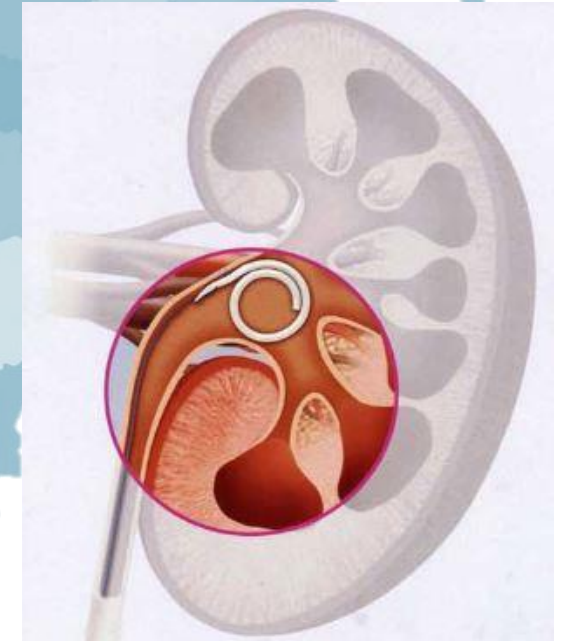


Figure 2: Shah Sheath with suction attached

2014-2015

- 52 PATIENTS
- PROSPECTIVE-OBSERVATIONAL
- ONE-WAY FLOW SUCTION
- SHAH SHEATH 10/12Fr
- URETERIC CATHETER 6Fr INFLOW
- HOLMIUM LASER (365 μ m) 50W

Gujarat



mNLPC SUCTION SHEATH

2016
Shah

2. SHAH SHEATH 12Fr

Superperc: A new technique in minimally-invasive percutaneous nephrolithotomy

Kaushik Shah, Madhu Sudan Agrawal¹, Dilip Kumar Mishra^{1*}


Department of Urology, Varun Kidney Hospital, Surat, Gujarat, ¹Department of Urology, Global Rainbow Hospital, Agra, Uttar Pradesh, India

ADVANTAGES

- ONE-STEP
- SUCTION
- BETTER VISIBILITY
- ALLOW GRASPERS



Figure 3: Whole assembly of Superperc with nephroscope inserted into the Sheath



OUTCOMES	
N = 52	SHAH SHEATH
Stone burden	19,1 ± 7,1 mm
Single puncture	90,36%
Superior calyx	52%
Time	40,9 ± 12 min
Tubesless	61,5%
Fever >38,5°C	5,7%
Transfusion	0
STONE FREE	96,15%

mNLPC SUCTION SHEATH

2017
Lai D.

3. (VAAS) CLEAR PETRA 18Fr

JOURNAL OF ENDOUROLOGY
Volume 34, Number 3, March 2020
© Mary Ann Liebert, Inc.
Pp. 339–344
DOI: 10.1089/end.2019.0652

Experimental Endourology

Use of a Novel Vacuum-Assisted Access Sheath in Minimally Invasive Percutaneous Nephrolithotomy: A Feasibility Study

Dehui Lai, PhD, MD, Meiling Chen, MS, Ming Sheng, MD, Yifan Liu, MD, Guibin Xu, MD,
Yongzhong He, MD, and Xun Li, MD

Guangzhou

VACUUM ASSISTED ACCESS SHEATH

1. GUIDE OBTURATOR
 2. WORKING CHANNEL
 3. OBLIQUE SLICE > SUCTION
 4. PRESSURE VENT
- **ASPIRATION 0,035MPa**

2017-2018

- 150 PATIENTS
 - SINGLE PELVIS STONES
 - 12Fr MiniNEPHROSCOPE
 - LASER HOLMIUM 100W
 - PERFUSION PUMP 250ml
 - 1:1 MATCHED ANALYSIS
- 18Fr VAAS (CLEAR PETRA)
 - 18Fr PAAS (Create Medic)

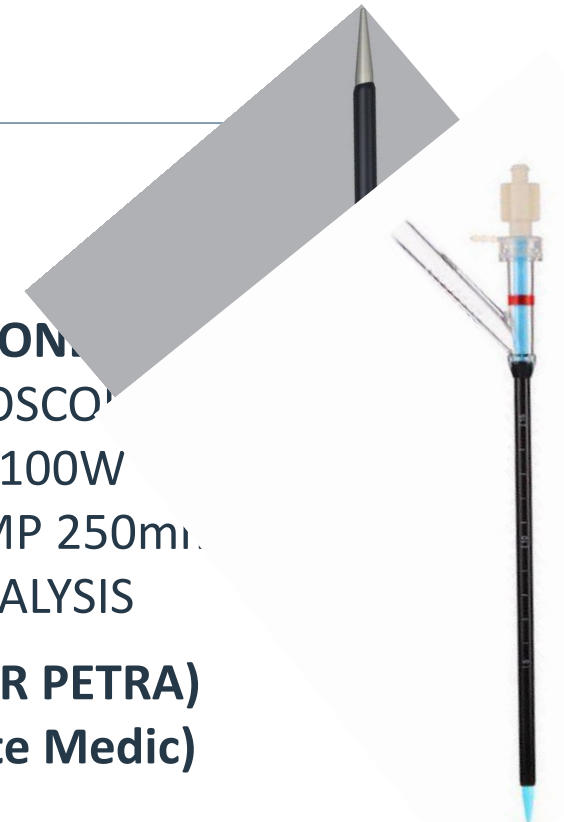


FIG. 2. (a) Oblique egress sluice; (b) straight egress sluice with a red line marker; (c) longitudinal slit shape pressure regulating vent.



FIG. 1. (a) 12F mini-nephroscope; (b) 18F vacuum-assisted access sheath; (c) a rubber cap with a central aperture.

mNLPC SUCTION SHEATH

2017
Lai D.

3. (VAAS) CLEAR PETRA 18Fr

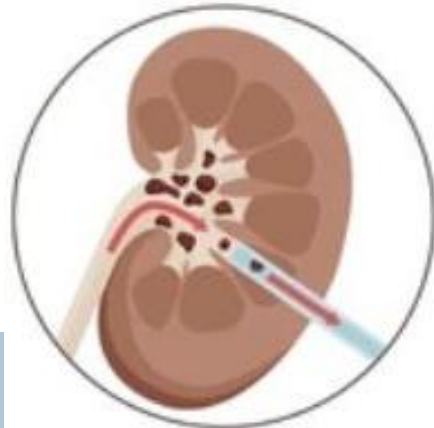
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Experimental Endourology

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Yongzhong He, MD, and Xun Li, MD

Guangzhou



CONCLUSION

- LOWER TIME
- LOWER PPR
- LESS SEPSIS
- HALF TRANSFUSION
- BETTER RESULTS

VACUUM CLEANER EFFECT”

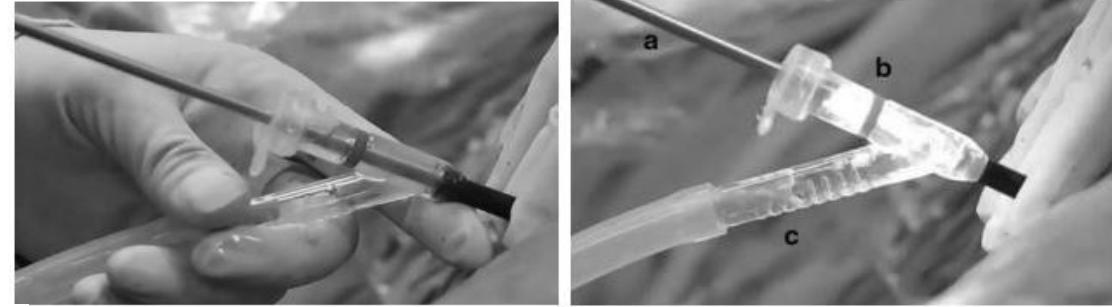


FIG. 5. Increasing pressure by pressing the longitudinal vent. FIG. 4. (a) Withdraw the endoscope; (b) the red marker in an endoscopic vision; (c) an all-internal sheath space pass-way for sucking out the larger fragments through the oblique sluice.

OUTCOMES

N = 150	VAAS	PAAS
Stone burden	676,1mm ²	629,3mm ²
Stone density	865,3 UH	814,2 UH
Middle Calyx	66,6%	72%
Time	32,4 min	46,2 min
RPP > 30mmHg	10 – 160seg	38 – 267seg
Fever	8%	20%
Transfusion	2,7%	1,3%
STONE FREE	89,3%	77,3%

mNLPC SUCTION SHEATH

2018
Xu.

3. (VAAS) CLEAR PETRA 18Fr

2018

- 60 STAGHORN STONES
- LITHOTRIPSY
 1. PNEUMATIC
 2. LASER HOLMIUM 100W
- PERFUSION PUMP 26,7kPa
- ASPIRATION PRESSURE 35kPa

Guangzhou

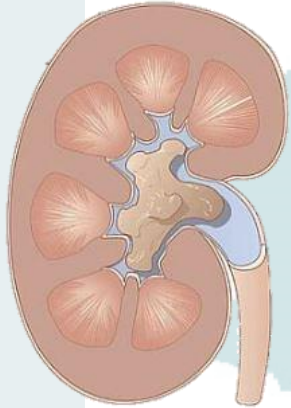


Fig. 1 The suction-evacuation nephrostomy sheath.



18Fr VAAS (CLEAR PETRA)
20Fr NEPHROSTOMY SHEATH

CONCLUSION

- LOWER TIME
- LOWER PPR
- HIGHER STONE FREE

Comparison of two different minimally invasive percutaneous nephrostomy sheaths for the treatment of staghorn stones

Guibin Xu, Jian Liang, Yongzhong He, Xiezhao Li, Weiqing Yang, Dehui Lai, Haibo Zhao and Xun Li

Department of Urology, The Fifth Affiliated Hospital of Guangzhou Medical University, Guangzhou, Guangdong, China
Guibin Xu and Jian Liang are first co-authors and contributed equally to this work.

OUTCOMES		
N = 60	18Fr VAAS	20Fr NS
Stone diameter	4,2cm	3,8cm
Stone density	998 UH	1031 UH
Middle Calyx	83,3%	76,6%
Time	64,3 ± 29min	72,9 ± 28min
RPP > 30mmHg	20%	96,7%
Clavien I	6,6%	20%
Clavien II	6,6%	13,33%
STONE FREE	90,0%	76,6%

mNLPC SUCTION SHEATH

2020
Zanetti

3. (VAAS) CLEAR PETRA 18Fr

2017-2019

- 122 vmPCNL CLEAR PETRA 16Fr
- VALDIVIA POSITION
- 12Fr NEPHROSCOPE
- HOLMIUN-YAG 550 μ M
- GRAVITY IRRIGATION
- CENTRAL VACUUM SYSTEM



CONCLUSION:
EASY SUCTION REMOVAL + LOW COMPLICATION



World Journal of Urology (2021) 39:1717–1723
<https://doi.org/10.1007/s00345-020-03318-5>

TOPIC PAPER

**Vacuum-assisted mini-percutaneous nephrolithotomy:
a new perspective in fragments clearance and intrarenal pressure control**

Stefano Paolo Zanetti¹ · Elena Lievore¹ · Matteo Fontana¹ · Matteo Turetti¹ · Andrea Gallioli¹ · Fabrizio Longo¹ · Giancarlo Albo² · Elisa De Lorenzis² · Emanuele Montanari²

STONE CHARACTERISTICS	
Stone Vol	1,92 cm ³
Stone density	850 UH
Location	
• Pelvis	19,6%
• Lower calyx	12,3%

OUTCOMES	
Single tract	91%
Lower calyx	68,8%
Basket	36,1%
Nephrostomy	79,5%
Time	71 - 120 min
RPP > 30mmHg	12,5 – 60 min
Clavien I	11,4%
Clavien II	8,2%
STONE FREE	71,3%

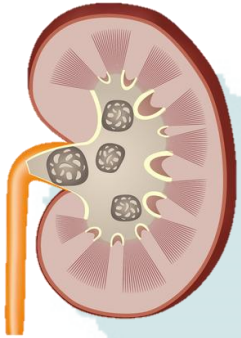
mNLPC SUCTION SYSTEM

2015
G. Zeng.

Super-mini NLPC

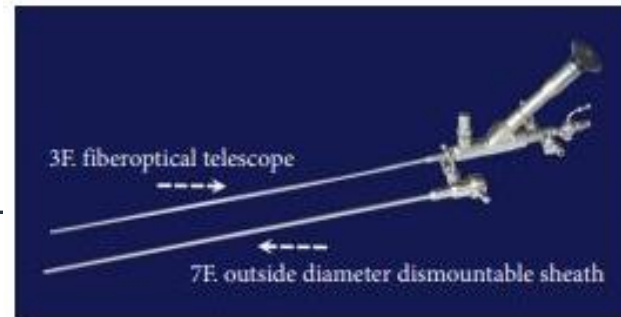
2012 - 2014

- 146 PATIENTS
- STONES < 2,5cm
- 14 CENTRES
- PROSPECTIVE



NEW 7Fr MINI-NEPHROSCOPE

- DISMOUNTABLE SHEATH
- 2 AUXILIARY IRRIGATION CHANNEL
- 3Fr FIBER-OPTIC BUNDLE
- WORK CHANNEL
 - 0,8mm PNEUMATIC PROBE
 - 365 LASER FIBER
 - 2,5Fr BASKET/FORCEPS



Super-mini percutaneous nephrolithotomy (SMP): a new concept in technique and instrumentation

Guohua Zeng, ShawPong Wan*, Zhijian Zhao, Jianguo Zhu†, Aierken Tuerxun†, Chao Song§, Liang Zhong¶, Ming Liu**, Kewei Xu††, Hulin Li††, Zhiqiang Jiang§§, Sanjay Khadgi¶¶, Shashi K. Pal***, Jianjun Liu†††, Guoxi Zhang†††, Yongda Liu, Wenqi Wu, Wenzhong Chen and Kemal Sarica§§§



SHEATH HANDEL 10/12/14Fr

- V-FORM
- RUBBER CAP
- PRESSURE VENT
- STONE COLLECTOR

mNLPC SUCTION SYSTEM

2015
G. Zeng.

Super-mini NLPC



ASSEMBLY SHEATH + MINI SCOPE

CONCLUSION

- GOOD IRRIGATION FLOW
- CLEAR VISION
- LOW PRESURE
- NO COMPLICATIONS

Super-mini percutaneous nephrolithotomy (SMP): a new concept in technique and instrumentation

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STONE CHARACTERISTICS	
< 14 years	27 (19,1%)
IMC > 25	15 (10,6%)
Location	
• Ureter	11,3%
• Pelvis	28,4%
• L calyx	24,8%
• M calyx	18,5%
• Multiple	11,3%
Lithotripter	HOLMIUN
Stone size	2,2 ± 0,5
Stone UH	1009,6

OUTCOMES	
Conversion PCNL	5 (3,4%)
Single tract	97,9%
Middle calyx	65,3%
Tubeless	72,3%
Time min	45,6 ± 21,5
Fever	11,3%
Transfusion	0
STONE FREE	90,1%
SFR 3 MONTS	95,8%

mNLPC SUCTION SYSTEM

2016

NEW Super-mini NLPC


G. Zeng.

1. 8 Fr NEPHROSCOPE
 - 4,2Fr Optic
 - **3,3Fr Working cannal**
 - 0,8mm PNEUMATIC PROBE
 - 550 μ LASER FIBER
 - 3,0Fr BASKET/FORCEPS

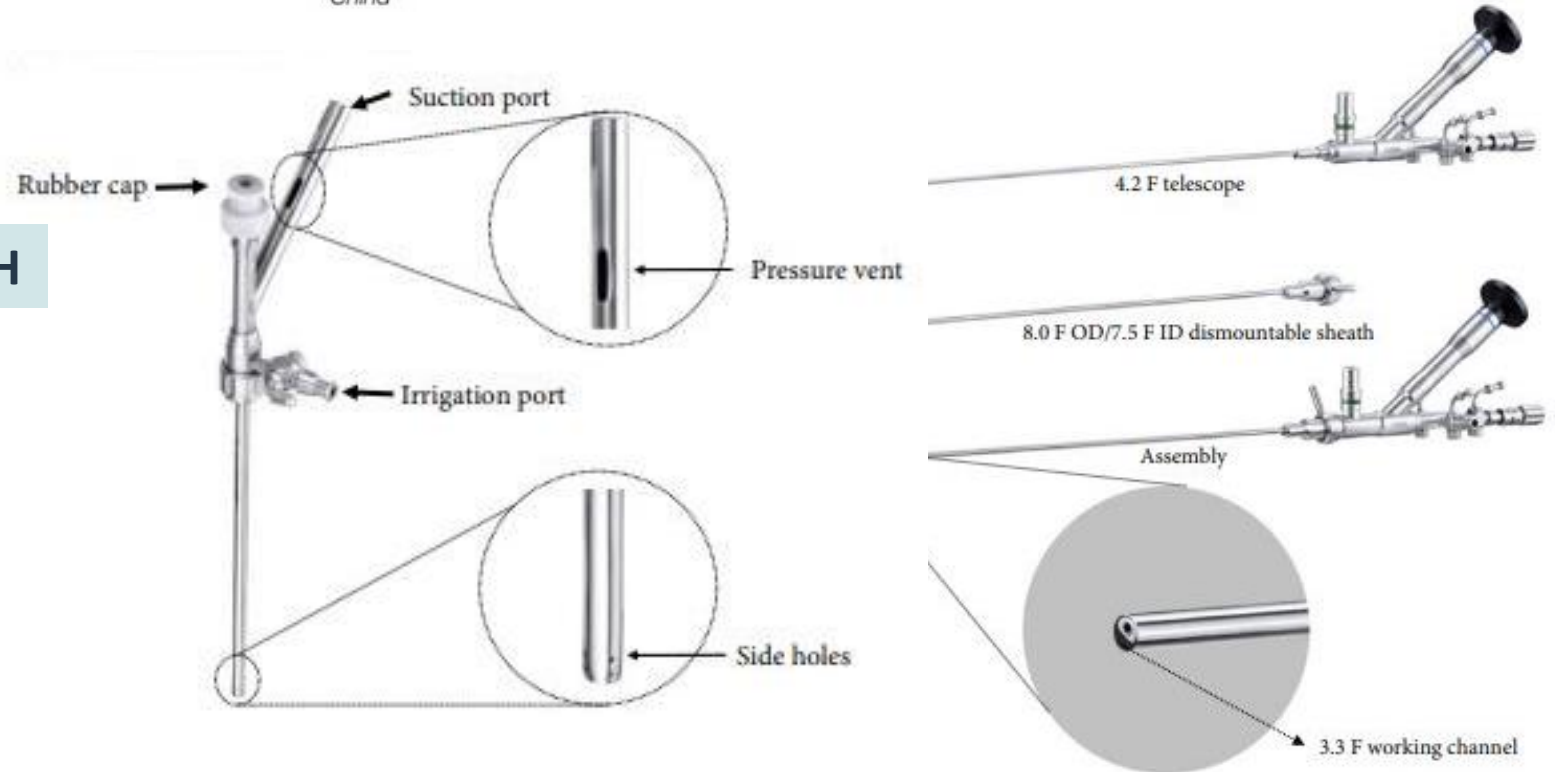
NEW IRRIGATION-SUCTION SHEATH

2. 12/14Fr IRRIGATION-SUCTION SHEATH
 - 2-LAYERED
 - DISTAL TIP HOLES
3. HANDLE
 - IRRIGATION PORT
 - SUCTION PORT 45 $^{\circ}$ + PRESSUR
 - RUBBER CAP

The new generation super-mini percutaneous nephrolithotomy (SMP) system: a step-by-step guide

Guohua Zeng^{*†‡} , Wei Zhu^{*†‡}, Yang Liu^{*†‡}, Junhong Fan^{*†‡}, Zhijian Zhao^{*†‡} and Chao Cai^{*†‡}

**Department of Urology, Minimally Invasive Surgery Center, The First Affiliated Hospital of Guangzhou Medical University, †Guangdong Key Laboratory of Urology, and ‡Guangzhou Institute of Urology, Guangzhou, Guangdong, China*



mNLPC SUCTION SYSTEM

2016
Zeng.

NEW Super-mini NLPC

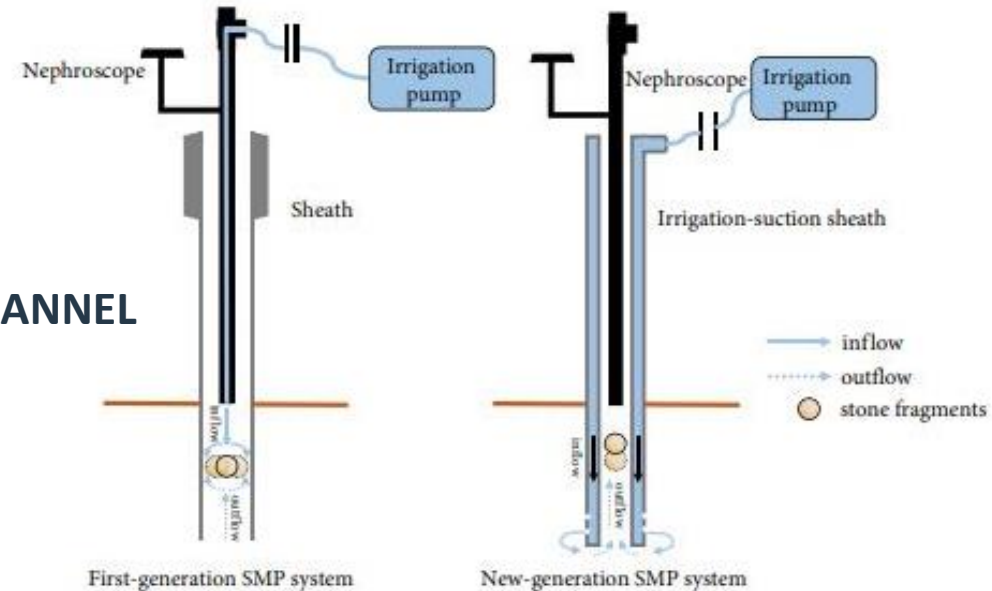
The new generation super-mini percutaneous nephrolithotomy (SMP) system: a step-by-step guide

Guohua Zeng^{*†‡}, Wei Zhu^{*†‡}, Yang Liu^{*†‡}, Junhong Fan^{*†‡}, Zhijian Zhao^{*†‡} and Chao Cai^{*†‡}

^{*}Department of Urology, Minimally Invasive Surgery Center, The First Affiliated Hospital of Guangzhou Medical University, [†]Guangdong Key Laboratory of Urology, and [‡]Guangzhou Institute of Urology, Guangzhou, Guangdong, China

- 59 PATIENTS
- 1 CENTRE PROSPECTIVE
- STONES < 3cm
- LITHOTRIPSY
 - HOLMIUM
 - PNEUMATIC

HYDRODYNAMIC MECHANISMS



CONCLUSION

- BETTER IRRIGATION
- HIGHER WORKING CHANNEL
- CENTRAL OUT-FLOW
- NO MIGRATIONS
- NO COMPLICATIONS

OUTCOMES

Stone size	2,4 ± 0,8
Time	32,9 ± 23 min
RPP	20,8mmHg
Tubeless	71,2%
DJ Stent	25,4%
Fever	5,1%
Transfusion	0
STONE FREE	91,5%

mNLPC SUCTION COMPONENT

2018
Zhu.

PEEL-AWAY SHEATH 20Fr

2018-2019

- 512 STAHORN (≥ 2 BRANCHES)
- SINGLE CENTER + RETROSPECTIVE
 - SUCTION SYSTEM + PEEL-AWAY 20Fr SHEATH
 - TRADITIONAL PEEL-AWAY 20Fr
- 12Fr NEPHROSCOPE
- HOLMIUM 60W + 400 μ FIBER
- PYONEPHROSIS EXCLUDED



SUCTION COMPONENT

1. SIDE SUCTION CHANNEL
2. PRESSURE AIR VALVE
3. RUBBER CAP
4. 12Fr NEPHROSCOPE



Suctioning versus traditional minimally invasive percutaneous nephrolithotomy to treat renal staghorn calculi: A case-matched comparative study

Zewu Zhu, Yu Cui, Huimin Zeng, Yongchao Li, Cheng He, Jinbo Chen, Feng Zeng, Yang Li, Zhiyong Chen, Hequn Chen*

Department of Urology, Xiangya Hospital, Central South University, Changsha, Hunan, 410008, China



ASPIRATION MACHINE

mNLPC SUCTION COMPONENT

2018
Zhu.

PEEL-AWAY SHEATH 20Fr

OUTCOMES		
N = 512	SUCTION	TRADITIONAL
Stone burden	1523 ± 667 mm ²	1487 ± 632mm ²
Stone density	1163 UH	1133 UH
Ectasia > G2	28,1%	31,6%
Time	106,2 ± 18 min	132,1 ± 22 min
Complications	16,8%	27,3%
Fever	7,4%	13,7%
UroSepsis	3,5%	8,2%
Transfusion	2,7%	2,0%
STONE FREE	78,5%	69,1%



Suctioning versus traditional minimally invasive percutaneous nephrolithotomy to treat renal staghorn calculi: A case-matched comparative study

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Department of Urology, Xiangya Hospital, Central South University, Changsha, Hunan, 410008, China

CONCLUSION

- LOWER TIME
- LOWER SEPSIS
- HIGHER STONE FREE

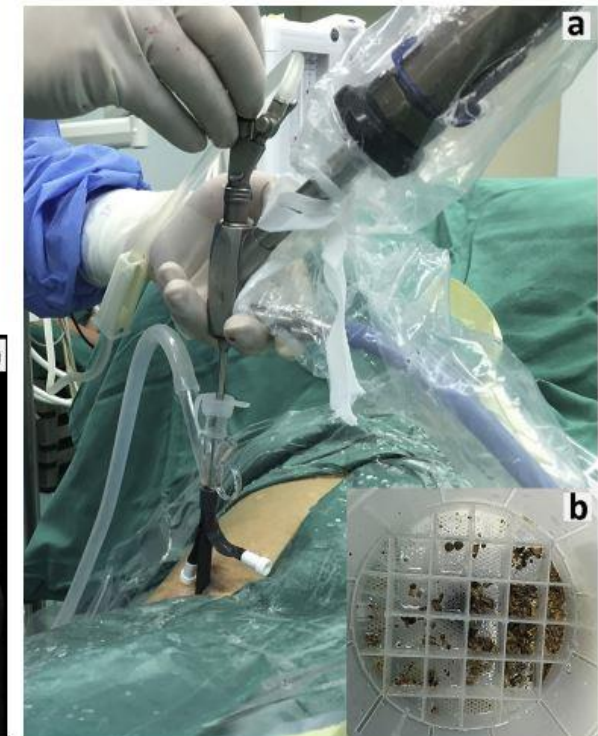





Fig. 2. (a) Application of the suctioning peel-away sheath during percutaneous nephrolithotomy. (b) Stone fragments sucked out by the suctioning system.

OTHER SUCTION METHODS

SUCTIONING IN Mini- PCNL

LASER SUCTION HANDPIECE

Introducing in clinical practice a new laser suction handpiece for percutaneous nephrolithotomy

Noam Bar-Yaakov, Haim Hertzberg, [...], and Mario Sofer    [View all authors and affiliations](#)


Volume 89, Issue 4 | <https://doi.org/10.1177/03915603211031874>



16Fr NASOGASTRIC TUBE WITH SPONGE

Original Paper | Published: 05 June 2017

Which way is best for stone fragments and dust extraction during percutaneous nephrolithotomy

Bulent Kati , Eyyup Sabri Pelit, Ismail Yagmur, Yigit Akin, Halil Ciftci & Ercan Yeni

MINI-NEPHROSCOPE CONNECTED TO SUCTION

Original Paper | Published: 09 February 2016

Mini-nephroscope combined with pressure suction: an effective tool in MPCNL for intrarenal stones in patients with urinary tract infections

Guibin Xu , Yongzhong He, Haibo Zhao, Xianhan Jiang, Gang Feng, Weiqing Yang, Wei Xu, Qingling Xie & Xun Li 

CHARACTERISCTICS

	Bar-Yaakov	Kati	Xu
YEAR	2022	2018	2016
Country	ISREAEL	TRUKEY	CHINA
N	40	102	683
Stone burden	1.6 cm	2,7 cm	84,3 cm ²
Size tract	11,3Fr	16Fr	20Fr
SUCTION	LSH	SNG	Nefroscope
STONE FREE	95,9%	NR	83,2%

COST-EFFECTIVE EVIDENCE

World Journal of Urology (2022) 40:201–211
<https://doi.org/10.1007/s00345-021-03811-5>

ORIGINAL ARTICLE

Cost analysis between mini-percutaneous nephrolithotomy with and without vacuum-assisted access sheath

Elena Lievore¹ · Stefano Paolo Zanetti¹ · Irene Fulgheri² · Matteo Turetti¹ · Carlo Silvani¹ · Carolina Bebi¹ · Francesco Ripa¹ · Gianpaolo Lucignani¹ · Edoardo Pozzi³ · Lorenzo Rocchini¹ · Elisa De Lorenzis^{1,4} · Giancarlo Albo^{1,4} · Fabrizio Longo¹ · Andrea Salonia³ · Emanuele Montanari^{1,4} · Luca Boeri¹ 

2016-2020

- 162 PATIENTS
- SINGLE CENTER + RETROSPECTIVE
- EXPERT SURGEON (>150PCNL)
 - ClearPetra 18 Fr (vmPCNL)
 - Mini 20Fr SHEATH
- VALDIVIA
- HOLMIUM + 550 μ FIBER



OUTCOMES

N = 162	vmPCNL 108	MiniPCNL 54
Stone burden	22,2 cm ²	22,2 cm ²
Staghorn	31,5%	31,4%
Lower Calyx	63,8%	59,3%
Time	89 min	115 min
Nephrostomy	76,8%	64,8%
Complications	24,1%	38,8%
Fever/sepsis	8,3%	24,1%
Transfusion	0,9%	3,7%
Re-admission	3,7%	3,7%
STONE FREE	89,9%	77,3%

COST-EFFECTIVE EVIDENCE

World Journal of Urology (2022) 40:201–211
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ORIGINAL ARTICLE

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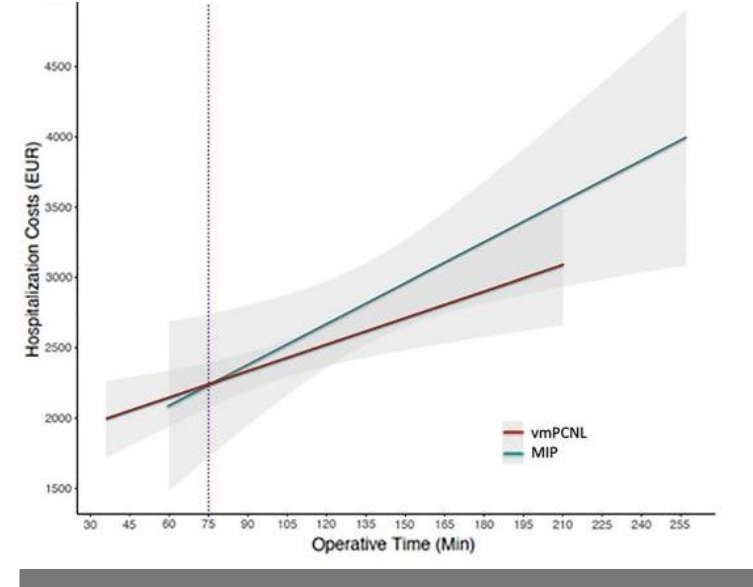
ECONOMIC OUTCOMES

	vmPCNL	MiniPCNL
Devices cost	256,20€	20,48€
General cost	421,51€	421,51€
Operating fee	253,8€	338,4€
Hospital cost	2302,9€	2658,2€
Hospital stay	1200€	1500€
Complications	204,3€	172,8€
TOTAL €	4114,91€	4669,40€

EQUIPMENT COST

- STERILE MATERIAL (26 ÍTEMS)
- PHARMACY
- RADIOLOGY
- OTHER PROCEDURES

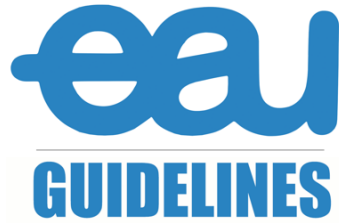
LINEAR REGRESION ANALYSIS



vmPCNL REDUCE COST

- ✓ PROCEDURE TIME
- ✓ HOSPITALIZATION





There is **some evidence** for using suction during PNL to reduce IRP and increase SFR

3.4.7.1. Summary of evidence and recommendations for endourology techniques for renal stone removal

Summary of evidence	LE
Imaging of the kidney with US or CT can provide information regarding inter-positioned organs within the planned percutaneous path (e.g., spleen, liver, large bowel, pleura, and lung).	1a
Both prone and supine positions are equally safe with equivalent SFR.	1a
Percutaneous nephrolithotomy performed with small instruments tends to be associated with significantly lower blood loss, but the duration of procedure tended to be significantly longer. There are no significant differences in SFR or any other complications.	1a
In uncomplicated cases, a totally tubeless PNL results in a shorter hospital stay, with no increase in complication rate.	1a
Peri-operative use of tranexamic acid may reduce bleeding complications and transfusion rates.	1a
Urine culture taken directly from the renal pelvis or a stone culture are more predictive of post-PNL sepsis than a pre-operative midstream urine culture.	1a

RECOMMENDATIONS 1a

- US –TC INFORMATION PREOP
- PRONED – SUPINE: EQUIVALENT
- SMALL PCNL TRACTS
 - LOWER BLOOD LOSS
 - LONGER SURGERY
 - **NO SFR DIFFERENCES**
- TUBELESS IN SOME CASES
- TRANEXEMIC ACID
- URINE CULTURE FROM RENAL PELVIS

TAKE-HOMME MESSAGES



1. SUCTION MINI-PCNL HAS SUPERIOR OUTCOMES THAN MINI-PCNL

- MINIMIZE INFECTIOUS COMPLICATIONS
- FASTER IRRIGATION/ASPIRATION
- LESS INTRA-RENAL PRESSURE

2. SUCTION MINI-PCNL CAN BE USED IN ANY STONE SIZE

- ANY LITHOTRIPSY DEVICE
- ANY SURGICAL TECHNIQUE

3. SUCTION SHEATHS ARE AVAILABLE FOR PCNL

4. QUALITY AND QUANTITY OF EVIDENCE STILL WEAK

- RANDOMIZED TRIALS
- LITHOTRIPSY DEVICES AND TECHNIQUE



MUCHAS GRACIAS

Emma de Lorenzo-Cáceres
F.E.A. Urología CHUIMI

mNLPC SUCTION SHEATH

2011
Desai. M

Micro-PERC 4,58 Fr



2011

- 10 PATIENTS
- 16G NEEDLE SHEATH
- 3-WAY CONNECTOR
 1. IRRIGATION
 2. FLEXIBLE TELESCOPE
 3. 200µm HOLMIUM:YAG

> J Urol. 2011 Jul;186(1):140-5. doi: 10.1016/j.juro.2011.03.029. Epub 2011 May 14.

Single-step percutaneous nephrolithotomy (microperc): the initial clinical report

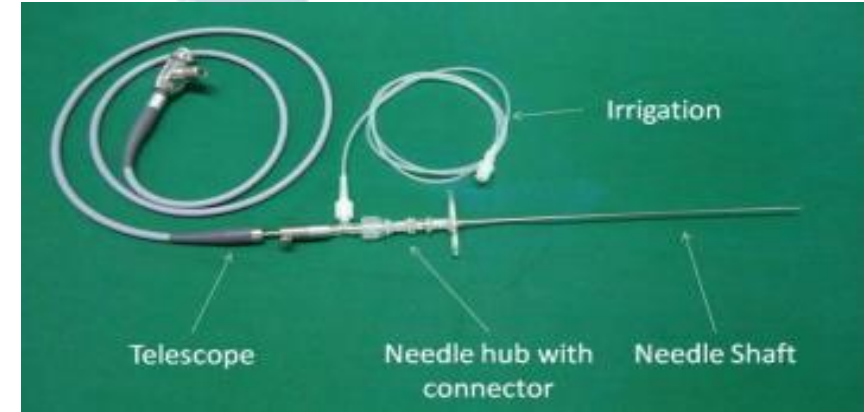
Mahesh R Desai¹, Rajan Sharma, Shashikant Mishra, Ravindra B Sabnis, Christian Stief, Markus Bader

Current role of microperc in the management of small renal calculi

Ravindra B. Sabnis, Raguram Ganesamoni, Arvind P. Ganpule, Shashikant Mishra, Jigish Vyas, Jitendra Jagtap, Mahesh Desai

Department of Urology, Muljibhai Patel Urological Hospital, Nadiad, Gujarat, India

4,58Fr ALL-SEEING NEEDLE



- NO SUCTION
- ONLT DJ OUT-FLOW
- HIGH PELVIC PRESSURE
- LOW VISION
- TORQUE

OUTCOMES

COMPLICATION	9,5 - 20%
STONE FREE RATE*	85 - 88.%