Review Article A meta analysis on the treatment of renal calculus by percutaneous nephroscope set and retrograde intra renal surgery

Jianpeng You¹, Honglin Liu²

¹Guangxi University of Chinese Medicine, Nanning, China; ²Nanxishan Hospital, Guilin, China

Received July 8, 2016; Accepted November 25, 2016; Epub February 15, 2017; Published February 28, 2017

Abstract: This meta analysis was focused on the comparison using percutaneous nephroscope set and retrograde intra renal surgery to treat renal calculus. The data were obtained from PubMed and Web of Science databases. The published time of literature were from March, 2014, the language included Chinese and English. The literature selection strategies were based on the evaluation and meta analysis on the preferred reporting items. The subgroup analysis comparison criteria were percutaneous nephrolithotomy (PCNL) minimally invasive percutaneous procedures (MIPPs), which included the comparison among mini-PCNL, micro-PCNL and RIRS. The research objects were selected from adult population. The searching words included: percutaneous nephrolithotomy, retrograde intrarenal surgery, percutaneous lithotripsy, RIRS, miniPCNL, micropercutaneous nephrolithotomy, flexible ureteroscopy. The efficiency of calculus removal, complication rate and hemoglobin decline rate after treatment were compared. PCNL had higher efficiency of calculus removal, but also had relatively higher complication rate, hemorrhage and longer hospitalization time. The standard efficiency of calculus removal for PCNL was higher than that of RIRS, while RIRS was better than MIPPs. Considering the complication and low efficacy, if the calculus was less than 2 cm, we should consider the use of RIRS standard treatment.

Keywords: Percutaneous nephroscope set, retrograde intra renal surgery, renal calculus, meta analysis

Introduction

Recently, minimally invasive surgery replaced the open operation to treat renal calculi gradually [1-3]. We used percutaneous nephrolithotomy (PCNL) to treat renal calculus which the diameter was larger than 2 cm [4]. While with the increasing complete clearance rate of renal calculi, the complication rate of the treatment also increased. To solve this problem, two kinds of minimally invasive percutaneous procedures (MIPPs) including mini-PCNL and micro-PCNL were used [4, 5]. Another kind of percutaneous treatment of renal calculus surgery was retrograde intra renal stone removal (RIRS), which was recommended by European Association for the urinary tract in 2013. If the anatomic structure was not suitable for using laser lithotripsy, then applied PCNL and RIRS would be the best choices for treating lower urinary calculi [6-8]. The aim of this study is to compare the advantages and disadvantages of using RIRS and MIPP to treat renal calculus.

Material and methods

The selection of the included literature

The data were obtained from PubMed and Web of Science databases. The published time of literature were from March, 2014, the language included Chinese and English. The literature selection strategies were based on the evaluation and meta analysis on the preferred reporting items. The subgroup analysis comparison criteria were PCNL minimally invasive percutaneous surgery (MIPPS), which included the comparison among mini-PCNL, micro-PCNL and RIRS. The research objects were selected from adult population. Keywords included: percutaneous nephrolithotomy, retrograde intrarenal surgery, percutaneous lithotripsy, RIRS, miniPCNL, micropercutaneous nephrolithtomy, flexible ureteroscopy.

Literature retrieval strategies were based on Preferred Reporting Items for Systematic Re-



views and Meta-analysis criteria (**Figure 1**). Only the study on the analysis and comparison between PCNL and RIRS would be included [9, 10]. We also retrieved the references which were included in this study. The abstract of the study was not included in this study, because it did not describe the research method in detail. There were two authors retrieving independently, who discussed and reached agreement on the differences in the study.

Statistics

Meta analysis was performed to assess the overall evaluation of PCNL and RIRS procedures. The subgroup analyzed and compared standard PCNL (the size of sheath was more than 24F) plus RIRS method and MIPPS plus RIRS method. The extracted data included the length of operation, the amount of bleeding during operation, hospitalization time, help program and the complication rate after operation. Odds ratio (RO) was adopted to compare binary variables, and the average deviation and standardized mean difference was used to describe continuous parameters. For some studies, if we chose to use average value and valid data range to describe the data, then we would apply the method described by Hozo for calculating the standard deviations [11]. If the heterogeneity detection showed no obvious difference, then we would use fixed effect model (Mantel-Haenszel method) [12, 13] to calculate total estimated value or used random effect model(DerSimonian-Lairdmethod) [13, 14]. The merger effect was assessed by z examination. If P < 0.05, the differences had significant statistical difference. Cochrane chisquare test and the differences (I²) were used to estimate the heterogenicity among the researches. The data analysis was processed

by Review Manager software (RevMan v.5.1, Cochrane Collaboration, Oxford, UK) software.

The features of the included researches

Finally 10 researches were included in the statistical analysis, including 697 PCNL operations and 545 RIRS operations. The patients' age of PCNL group and RIRS group was 44.8 and 45.07 years old, the body mass index was 24 kg/m^2 and 24.1 kg/m^2 respectively. And there was no statistical difference. Four studies compared RIRS and standard PCNL operation [15-18], four studies compared RIRS and miniperc [13, 19-21], one study compared RIRS and microperc operation [22], six studies were retrospective case control study [12, 13, 15, 16, 18, 20], two of them were prospective case control study [19, 21]. The operations of the PCNL and RIRS were not same, the differences in the operation pointer of the multiple renal calculi was that megalo-ureter, the usage of sheathe and stent intervention which was in one of the MIPP research [18] and one PCNL

Study	Research institute (country)	Research project	Research design	LE	PCNL technique	PCNL	RIRS	
Akman et al. [15]	Haseki hospital (Turkey)	2008-2011	pair analysis	3 b	Standard (30 F)	34	34	6*
Bozkurt et al. [16]	Kecioren hospital (Turkey)	2008-2010	Retrospective case control	3 b	Standard (24 F)	42	37	6*
Bryniarski et al. [17]	Silesiamedical college (Poland)	2009-2011	RCT	2 b	Standard (24 F)	32	32	3°
Sabnis et al. [19]	Muljibhai Patel hospital (India)	2007-2012	prospective case control	3 b	Small (16-19 F)	32	32	6*
Ozturk et al. [18]	Diskapi Yildirim Beyazithospital (Turkey)	2009-2012	Retrospective case control	3 b	Standard (30 F)	144	38	5*
Kirac et al. [20]	Koru hospital (Turkey)	2011-2012		3 b	(16-18 F)	37	36	6*
Sabnis et al. [22]	Muljibhai Patelhospital (India)	2011-2012	RCT	2 b	(16 g)	35	35	3⁰
Kruck et al. [13]	Organizations (Germany)	2001-2007	Retrospective case control	3 b	(16-19 F)	172	108	4*
Resorlu et al. [12]	Organizations (Turkey)		Retrospective case control	3 b	(12-30 F)	140	46	6*
Pan et al. [21]	Yan Chai Hospital (China)	2005-2011	prospective case control	Зb	(18 F)	59	56	6*

Table 1. Literature comparison of percutaneous renal stone removal and retrograde renal surgery

LE = level of evidence; PCNL = percutaneous nephrolithotripsy; RCT = randomized controlled trial; RIRS = retrograde intrarenal surgery. *Using Newcastle-Ottawa Scale (score from 0 to 9). 8 Using Jadad scale (score from 0 to 5).

	Stone	e size	Multiple	e stones (%)	Stone position							
Study					Highe	r level	Middle level		Low level		Pelvis	
	PCNL	RIRS	PCNL	RIRS	PCNL	RIRS	PCNL	RIRS	PCNL	RIRS	PCNL	RIRS
Akman et al. [15]	270*	286*	32.4	17.6	17.6	17.6	5.8	5.8	41.2	44.1	35.3	32.4
Bozkurt et al. [16]	170*	165*	40.4	51.3	-	-	-	-	-	-	-	-
Bryniarski et al. [17]	352*	4 <u>1</u> 4*	-	-	-	-	-	-	-	-	-	-
Sabnis et al. [19]	15.2	14.2	21.8	34.4	3.1	9.4	0	3.1	31.2	28.1	43.7	25
Ozturk et al. [18]	17.4	17.3	-	-	-	-	-	-	100	100	-	-
Kirac et al. [20]	10.5	10.2	23.4	27.0	-	-	-	-	100	100	-	-
Sabnis et al. [22]	1.1	1	-	-	8.5	5.78	8.57	8.57	42.8	48.6	40	37.1
Kruck et al. [13]	12.6	6.8	-	-	-	-	-	-	42.7	76.8	-	-
Resorlu et al. [12]	17.3	15.6	15.7	21.7	12.1#	15.2#	-	-	38.6	30.4	33.6	32.6
Pan et al. [21]	22.4	22.3	-	-	8.5	12.5	18.6	12.5	53	51.8	19.9	23.2
								-				

 Table 2. Stone size, multiple stones and stone position

PCNL = percutaneous nephrolithotripsy; RIRS = retrograde intrarenal surgery. *unite was mm², other unite was mm. #Upper and middle pole stones.

research [15]. Normal stent intervention was mentioned in three studies [15, 17, 21], most stent intervention stayed 1-2 weeks in the body (**Tables 1-3**)

Results

Overall analysis

For the evaluation of PCNL and RIRS treatment, there was no obvious difference in the duration of operation, weighted mean difference (WMD: -4.81 min; 95% CI, -14.05 to 4.43; P = 0.31). The stone-free rate of PCNL operation was higher (OR: 2.19; 95% CI, 1.53-3.13; P < 0.001), but at the same time, there were more complications (OR: 1.61; 95% CI, 1.11-2.35; P < 0.001), and hemoglobin decreased greatly (WMD: 0.87 g/dl; 95% CI, 0.51-1.22; P < 0.001, Figure 2A-E). The hospitalization time after

RIRS operation was shorter (WMD: 1.28 d; 95% CI, 0.79-1.77; P < 0.001).

Subgroup analysis

Standard percutaneous nephrolithotomy: The stone elimination rate of standard PCNL was relatively higher (OR: 4.32; 95% CI, 1.99~9.37; P = 0.0002). But the length of the operation had no obvious difference (WMD: -9.21 min; 95% CI, -28.80~10.38; P = 0.36). There was also no obvious difference in the complication after operation (OR: 1.59; 95% CI, 0.84-3.02; P = 0.16, **Figure 3A-D**). While the hospitalization time was longer and RIRS was shorter (WMD: 1.84 d; 95% CI, 0.64-3.04; P = 0.003).

Minimally invasive percutaneous procedures (*MIPPs*): Compared with RIRS, the length of MIPPs was shorter (WMD -6.75 min; 95% CI,

	Akman		Bryniarski		Ozturk	Kirac	Sabnis	Kruck	Resorlu	Pan
	et al. [15]	et al. [16]	et al. [17]	et al. [19]	et al. [18]	et al. [20]	et al. [22]	et al. [13]	et al. [12]	et al. [21]
PCNL skills										
Imaging	F		F	US	F	F	F/US	F/US	F	US
Access			Urologist			Urologist	Urologist			
Sheath size, F	30	24	30	16-19	30	16-18	4.5	16-18	12-30	18
Dilator										
Balloon	Х	Х				Х			Х	
Metal			Х		Х			Х	Х	Х
Amplatz		Х				Х				
Lithotripsy technique										
Pneumatic		Х			Х	Х			Х	
Ultrasonic		Х	Х			Х	Х		Х	Х
Laser		Х		Х						Х
Grasper removal		Х		Х		Х			Х	
NT	R	S		S		S	None	None	S	R
RIRS										
Safety wire	Х	Х				Х			Х	
UAS	S	S		S	R	R	R		S	R
Dilator										
Fascial				Х		Х	Х	Х	Х	Х
Semirigid URS	Х		Х							Х
Technique										
Dust		Х	Х	Х		Х	Х		Х	Х
Basket				Х			Х			
Relocation of LP				Х			Х			Х
Laser setting, W	8-10		15	15			5-15			10-15
Stent	R	S	R	S		S	S		S	R

Table 3. Summary of the operation methods: the usage of percutaneous nephroscope set and Retro-	
grade renal surgery	

-12.97 to -0.52; P = 0.03), but the clearance rate of RIRS was better (OR: 1.70; 95% Cl, 1.07-2.70; P = 0.03, **Figure 4A-D**). And the hospitalization time of RIRS after the operation was also shorter (WMD: 1.11 d; 95% Cl, 0.39-1.83; P = 0.003). There was no obvious difference in the complication between RIRS and MIPPs (OR: 1.46; 95% Cl, 0.87-2.45; P = 0.15).

Discussion and conclusion

In this study, a meta analysis processed the comparison between three kinds of PCNL skills (standard, small-sized and minitype) and RIRS by the first overall analysis. Then the analysis of two subgroup was processed, one of the standard was only PCNL, another was MIPPs (miniperc and microperc).

There was no obvious difference in operation duration between PCNL and RIRS. Five studies showed that the operation duration of PCNL was short, while another two studies showed that RIRS was faster [22, 23]. If only compared with MIPPs, statistical result of subgroup analysis showed that PCNL had obvious advantages, including (WMD: 6.75 min; 95% Cl, 12.97 to 0.52; *p* value = 0.03). Percutaneous urinary calculi removal showed the differences in the changes of image, dilation technique, size of sheath, stone-crusher, type/possition of the stone, ureteral stent implantation, road seal and etc among the illness case were very great during the operation.

Stone-free rate was the most important parameter in the evaluation of urinary surgery. The overall analysis showed that the stone-free rate of PCNL was obviously higher than that of RIRS (OR: 2.19; 95% CI, 1.53-3.13; P < 0.00001), which was different from the result of subgroup analysis, the stone-free rate of standard PCNL was better than that of RIRS, while RIRS was better than MIPPs. Stone-free rate related to the feature of stone, one of them explained the removal condition of MIPPs and PCNL on Multiple calculus [24]. The stone size of most PNCL studies was more than 2 cm, while the

А		F	CNL		F	RIRS			Mean Differen	ce		Mean Difference	
	or Subgroup	Mean	SD	Total I	Mean	SD	Total	Weight	IV, Random, 9	5% CI	Year	IV, Random, 95% CI	
Akman			11.6	34		13.4	34		-19.50 [-25.46,-		2011		
	rt 2011		19.6	42	67.5		37		-21.70 [-31.52, -		2011		
	is 2012		13.8	32		19.2	32	12.4%	-9.80 [-17.99,		2012		
	rski 2012	100.1		32		17.6	32	11.2%	15.10 [3.08, 3		2012		
Pan 20		62.4	10.6	59		13.5	56	13.3%	-10.60 [-15.05,			-	
	is 2013	51.6	18.5	35		17.5	35	12.4%	4.50 [-3.94,		2013		
Ozturk		0	0	0	0	0	0		Not estin		2013		
	lu 2013	57.5	22.1	140	43.1	17	46	13.0%	14.40 [8.27, 2		2013		
Kirac 2		57.3	14.5	37	66.4	15.8	36	12.8%	-9.10 [-16.06,		2013		
Kruck		0	0	0	0	0	0	12.070	Not estin	-	2013	_	
RIVER	2013	•	•	•	•	•	•		NOT USIN	naore	2013		
Total ((95% CI)			411			308	100.0%	-4.81 [-14.05,	4 431		-	
Hetero	geneity: Tau* =			95.53, 0	ff = 7 (p < 0.0					3	50 -25 0 25	50
Test fo	or overall effect:	Z = 1.02	(p = 0	.31)								Favours PCNL Favours RIR	
в		PCN		RIR				Odds Rat	ie.			Odds Ratio	
	or Subgroup	Events			-	Wela			95% CI Year			M-H, Fixed, 95% Cl	
					_							M-H, Pixed, 35% Cl	
Akman		31	34	25	34	5.5		•	15.22] 2011			-	
Bozkur		41	42 32	35	37	2.2			26.95 2011				
Sabinis		32		31	32	1.2			78.87 2012			_	
	rski 2012	30 34	32 35	24 33	32	3.8			25.77 2012				
Sabinis Pan 20		34 57	35	33	35	3.5			23.83] 2013 52.36] 2013				
Fan 20 Kruck 2		137	172	84	108	52.7			2, 2.01 2013			-	
Ozturk		137	144	28	38	7.0			14.39 2013			T	
Kirac 2		33	37	32	36	8.8			4.48] 2013				
Resort		128	140	40	46	13.0			5, 4.54 2013				
		120							and were			-	
Total (95% CI)		727		454	100.0	%	2.19 [1.53	, 3.13]			•	
Total e		658		372									
	geneity: Chi? = 15		9(D=		= 42%				+				
	r overall effect: Z								0.00	02		1 1 10 wors RIRS Favors PCNL	500
											Pa		
С			PC			IRS			Odds Ratio			Odds Ratio	
_	Study or Subgr	roup	Events	Total	Even	ts To	tal W	eight N	4-H, Fixed, 95% C	I Year		M-H, Fixed, 95% Cl	_
	Bozkurt 2011		7	42		4	37	7.8%	1.65 [0.44, 6.16]	2011			
	Akman 2011		5	34		4	34	7.5%	1.29 [0.32, 5.30]	2011			
	Bryniarski 2012		9	32		8	32 1	2.6%	1.17 [0.39, 3.57]	2012		-	
	Sabinis 2012												
			2	32		3	32	6.2%	0.64 [0.10, 4.14]	2012			
	Kirac 2013		2						0.64 [0.10, 4.14]				
	Kirac 2013		6	37		0	36	0.9% 15	5.06 [0.82, 278.09]	2013			
	Kirac 2013 Kruck 2013		6 19	37 172		0 9 1	36 08 2	0.9% 15	5.06 [0.82, 278.09] 1.37 [0.59, 3.14]	2013 2013			
	Kirac 2013 Kruck 2013 Pan 2013		6 19 7	37 172 59		0 9 1 9	36 08 2 56 1	0.9% 15 1.6% 7.9%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04]	2013 2013 2013			
	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013		6 19 7 9	37 172 59 35		0 9 1 9 4	36 08 2 56 1 35	0.9% 15 1.6% 7.9% 6.5%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73]	2013 2013 2013 2013			
	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013		6 19 7 9 19	37 172 59 35 144		0 9 1 9 4 2	36 08 2 56 1 35 38	0.9% 15 1.6% 7.9% 6.5% 6.0%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30]	2013 2013 2013 2013 2013 2013			
	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013		6 19 7 9	37 172 59 35 144		0 9 1 9 4 2	36 08 2 56 1 35 38	0.9% 15 1.6% 7.9% 6.5%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73]	2013 2013 2013 2013 2013 2013			
	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resorlu 2013		6 19 7 9 19	37 172 59 35 144 140		0 9 1 9 4 2 5	36 08 2 56 1 35 38 46 1	0.9% 15 21.6% 7.9% 6.5% 6.0% 2.9%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41]	2013 2013 2013 2013 2013 2013 2013			
	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resorlu 2013 Total (95% CI)		6 19 7 9 19 31	37 172 59 35 144 140 727		0 9 1 9 4 2 5	36 08 2 56 1 35 38	0.9% 15 21.6% 7.9% 6.5% 6.0% 2.9%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30]	2013 2013 2013 2013 2013 2013 2013		•	
	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resorlu 2013 Total (95% CI) Total events	°+3 - 7	6 19 7 9 19 31 114	37 172 59 35 144 140 727		0 9 1 9 4 2 5 4 48	36 08 56 1 35 38 46 1 54	0.9% 15 21.6% 7.9% 6.5% 6.0% 2.9%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41]	2013 2013 2013 2013 2013 2013 2013			
	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resorlu 2013 Total (95% CI) Total events Heterogeneity: C		6 19 7 9 19 31 31 114 68, df =	37 172 59 35 144 140 727 9 (p =	0.57); 1	0 9 1 9 4 2 5 4 48	36 08 56 1 35 38 46 1 54	0.9% 15 21.6% 7.9% 6.5% 6.0% 2.9%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41]	2013 2013 2013 2013 2013 2013 2013	0.01		
	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resorlu 2013 Total (95% CI) Total events		6 19 7 9 19 31 31 114 68, df =	37 172 59 35 144 140 727 9 (p =	0.57); 1	0 9 1 9 4 2 5 4 48	36 08 56 1 35 38 46 1 54	0.9% 15 21.6% 7.9% 6.5% 6.0% 2.9%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41]	2013 2013 2013 2013 2013 2013 2013		0.1 10 100 vors PCNL Favors RIRS	
	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resorlu 2013 Total (95% CI) Total events Heterogeneity: C		6 19 7 9 19 31 31 114 68, df =	37 172 59 35 144 140 727 9 (p = (p = 0.0	0.57); 1	0 9 1 9 4 2 5 4 48	36 08 56 1 35 38 46 1 54	0.9% 15 21.6% 7.9% 6.5% 6.0% 2.9%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41]	2013 2013 2013 2013 2013 2013 2013			
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resorlu 2013 Total (95% CI) Total events Heterogeneity: C	effect: Z	6 19 7 9 19 31 31 114 68, df = = 2.52 PCI	37 172 59 35 144 140 727 9 (p =	0.57); I 1)	0 9 1 9 4 2 5 4 48 ² = 0% RIRS	36 08 2 56 1 35 38 46 1 54 10	0.9% 15 21.6% 7.9% 6.5% 6.0% 2.9%	6.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference	2013 2013 2013 2013 2013 2013 2013	Far	vors PCNL Favors RIRS	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resorlu 2013 Total (95% CI) Total events Heterogeneity: C Test for overall	effect: Z	6 19 7 9 19 31 31 114 68, df = = 2.52 PCI	37 172 59 35 144 140 727 9 (p = 0.0) NL <u>D Tota</u>	0.57); I)1) I Mea	0 9 1 9 4 2 5 4 48 ² = 0% RIRS	36 08 2 56 1 35 38 46 1 54 10	0.9% 15 11.6% 7.9% 6.5% 6.0% 2.9%	6.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference	2013 2013 2013 2013 2013 2013 2013	Far	vors PCNL Favors RIRS Mean Difference	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resorlu 2013 Total (95% CI) Total events Heterogeneity: C Test for overall Study or Subgro	effect: Z	6 19 7 9 19 31 114 68, df = = 2.52 PCP 1.6 1	37 172 59 35 144 140 727 9 (p = 0.0) NL <u>D Tota</u> 2 3	0.57); I 1) <u>I Mea</u> 4 0.	0 9 1 9 4 2 5 4 48 1 ² = 0% RIRS <u>n SD</u>	36 08 2 56 1 35 38 46 1 54 10 Total	0.9% 15 1.6% 7.9% 6.5% 6.0% 2.9% 00.0% Weight	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Random, 95 1.30 [0.90, 1.	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11	vors PCNL Favors RIRS Mean Difference	_
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resoriu 2013 Total (95% CI) Total events Heterogeneity: c Test for overall of <u>Study or Subgrr</u> Akman 2011	effect: Z	6 19 7 9 19 31 114 68, df = = 2.52 PCP 1.6 1	37 172 59 35 144 140 727 9 (p = 0.0) NL <u>D Tota</u> 2 3	0.57); I 1) 1 <u>Mea</u> 4 0.	$ \begin{array}{c} 0 \\ 9 \\ 1 \\ 9 \\ 4 \\ 2 \\ 5 \\ 4 \\ 48 \\ 2^2 = 0\% \\ RIRS \\ n SD \\ 3 0.1 \\ \end{array} $	36 08 56 1 35 38 46 1 54 10 Total 34	0.9% 15 1.6% 7.9% 6.5% 6.0% 2.9% 00.0% Weight 20.2%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference IV, Random, 957 1.30 [0.90, 1, Not estima	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11	vors PCNL Favors RIRS Mean Difference	_
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: C Test for overall o <u>Study or Subgra</u> Akman 2011 Sabinis 2012	effect: Z	6 19 7 9 19 31 114 68, df = 2.52 PCt lean S 1.6 1 0 1.4	$37 \\ 172 \\ 59 \\ 35 \\ 144 \\ 140 \\ 727 \\ 9 (p = 0.0 \\ (p = 0.0 \\ NL \\ D \ Tota \\ 2 \ 3 \\ 0 \ (1 \ 3) \\ 1 \ 3)$	0.57); 1 1) 1 Mea 4 0. 2 0.	$\begin{array}{c} 0 \\ 9 \\ 1 \\ 9 \\ 4 \\ 2 \\ 5 \\ 4 \\ 48 \\ 2^2 = 0\% \\ RIRS \\ n \\ SD \\ 3 \\ 0.1 \\ 0 \\ 0 \end{array}$	36 08 56 1 35 38 46 1 54 10 7 7 0 34 0 32	0.9% 15 1.6% 7.9% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Randorn, 95' 1.30 [0.90, 1. Not estima 1.00 [0.60, 1.	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12	vors PCNL Favors RIRS Mean Difference	_
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: (Test for overall of Study or Subgro Akman 2011 Bozkurt 2011	effect: Z	6 19 7 9 19 31 114 68, df = = 2.52 PCf tean S 1.6 1 0	37 172 59 35 144 140 727 9 (p = 0.0 NL D Tota 2 3 0 1 3 0 0	0.57); 1 1) 1 <u>Mea</u> 4 0. 2 0.	$\begin{array}{c} 0 \\ 9 \\ 1 \\ 9 \\ 4 \\ 2 \\ 5 \\ 4 \\ 48 \\ k^2 = 0\% \\ RIRS \\ n \\ SD \\ 3 \\ 0.1 \\ 0 \\ 0 \\ 4 \\ 0.6 \end{array}$	36 08 56 1 35 38 46 1 54 10 <u>Total</u> 34 0	0.9% 15 1.6% 7.9% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference IV, Random, 957 1.30 [0.90, 1, Not estima	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12	vors PCNL Favors RIRS Mean Difference	_
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: C Test for overall Study or Subgra Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012	effect: Z	6 19 7 9 19 31 114 68, df = = 2.52 PCt lean S 1.6 1 0 1.4 0	$\begin{array}{c} 37\\ 172\\ 59\\ 35\\ 144\\ 140\\ 727\\ 9 (p = 0.0\\ (p = 0.0\\ VL\\ D \ Tota\\ 2 \ 30\\ 0 \ (0\\ 1 \ 30\\ 0 \ (0\\ 0 \ (0\\ 0 \ (0\\ 0\\ 0 \ (0\\ 0\\ 0 \ (0\\ 0\\ 0\\ 0 \ (0\\ 0\\ 0\\ 0 \ (0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0$	0.57); I 11) 11 <u>Mea</u> 4 0. 0 2 0. 0	$\begin{array}{c} 0 \\ 9 \\ 4 \\ 2 \\ 5 \\ 48 \\ RIRS \\ n \\ SD \\ 3 \\ 0.1 \\ 0 \\ 0 \\ 4 \\ 0.6 \\ 0 \\ 0 \end{array}$	36 08 56 1 35 38 46 1 54 10 <u>Total</u> 34 0 32 0	0.9% 15 11.6% 7.9% 6.5% 6.5% 2.9% 00.0% Weight 20.2% 20.2%	6.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Random, 95 ⁹ 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13	vors PCNL Favors RIRS Mean Difference	_
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% Cl) Total events Heterogeneity: (Test for overall o Study or Subgre Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013	effect: Z	6 19 7 9 19 31 114 68, df = = 2.52 PCP lean S 1.6 1 0 1.4 0 0	$37 \\ 172 \\ 59 \\ 35 \\ 144 \\ 140 \\ 727 \\ 9 (p = 0.0 \\ (p = 0.0 \\ NL \\ D \ Tota \\ 2 \ 3.0 \\ 0 \ 0 \\ 1 \ 3.0 \\ 0 \ 0 \\ .7 \ 3.0 \ 3.0 \\ .7 \ 3.0 \\ .7 \ 3.0 \ 3.0 \\ .7 \ 3.0 \\ .7 \ 3.0 \ 3.0 \ 3.0 \\ .7 \ 3.0 \ 3$	0.57); I h1) 11 4 0. 0 2 0. 0 7 0.	$\begin{array}{c} 0 \\ 9 \\ 4 \\ 2 \\ 5 \\ 48 \\ t^2 = 0\% \\ RIRS \\ n \\ SD \\ 3 \\ 0.1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $	36 08 2 56 1 35 38 46 1 54 10 7 7 0 32 0 0 0 0	0.9% 15 11.6% 7.9% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 9.4%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Randorn, 957 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2.	2013 2013 2013 2013 2013 2013 2013 2013	Far 11 11 12 12 13 13	vors PCNL Favors RIRS Mean Difference	_
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: (Test for overall of Study or Subgro Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Kirac 2013	oup M	6 19 7 9 19 31 114 68. df = = 2.52 PCt lean S 1.6 1 0 1.4 0 1.5 0	37 172 59 35 144 140 727 9 (p = 0.0 NL D Tota 2 3 0 (1 3 0 0 (2 3 3 0 (2 3 3 3 3 5 3 3 5 3 5 3 5 3 5 3 3 3 3 3 0 0 (2) 3 3 3 3 3 3 3 3	0.57); I 11) 11 4 0. 0 2 0. 0 7 0. 9 0.	$\begin{array}{c} 0 \\ 9 \\ 1 \\ 9 \\ 4 \\ 2 \\ 5 \\ 48 \\ 2^2 = 0\% \\ RIRS \\ n \\ SD \\ 3 \\ 0.1 \\ 0 \\ 0 \\ 4 \\ 0.6 \\ 0 \\ 0 \\ 0 \\ 0 \\ 4 \\ 2.8 \end{array}$	36 08 2 56 1 35 38 46 1 54 10 <u>Total</u> 0 32 0 0 36	0.9% 15 11.6% 7.9% 6.5% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Random, 95 ⁴ 1.30 [0.90, 1. Not estima Not estima Not estima	2013 2013 2013 2013 2013 2013 2013 2013	Far 11 11 12 12 13 13 13	vors PCNL Favors RIRS Mean Difference	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: C Test for overall Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Pan 2013	oup M	6 199 7 9 19 31 114 68, df = = 2.52 PCI 1.6 1 0 1.4 0 0 1.5 0 1.3 0 0.096 0	37 172 59 35 144 140 727 $9 (p = 0.0$ NL $D Tota$ $2 30$ $0 (0)$ $1 33$ $0 0$ (0) $7 35$ $4 33$	0.57); I 11) 11 4 0. 0 2 0. 0 7 0. 9 0. 5 0.5	9 1 9 4 2 5 448 48 8 RIRS 7 00 3 0.1 0 0 4 0.6 0 0 0 0 4 2.8 5 0.4	36 08 25 56 1 35 38 46 1 54 10 Total 34 0 32 0 0 36 56 56 56 1 1 1 1 1 1 1 1 1 1 1 1 1	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 20.2% 9.4% 24.5% 25.8%	6:06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2:68 [0.74, 9.73] 2:74 [0.61, 12.30] 2:33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Randorn, 95' 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.00 [0.62, 1. Not estima 1.00 [0.16, 2. 0.80 [0.57, 1.	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 12 12 13 13 13 13 13	vors PCNL Favors RIRS Mean Difference	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: (Test for overall of Study or Subgro Akman 2011 Bozkurt 2011 Sabinis 2012 Kruck 2013 Kirac 2013 Sabinis 2013	oup M	6 199 7 9 19 31 114 68, df = = 2.52 PCI 1.6 1 0 1.4 0 0 1.5 0 1.3 0 0.096 0	$\begin{array}{c} 37\\ 172\\ 59\\ 35\\ 144\\ 140\\ 727\\ 9 (p = 0.0\\ (p = 0.0\\ NL\\ D \ Tota\\ 2 \ 3.\\ 0 \ (c\\ 1 \ 3.\\ 0 \ (c\\ 7 \ 3.\\ 8 \ 5.\\ 4 \ 3.\\ 0 \ (c\\ 0 \ 0 \ (c\\ 7 \ 3.\\ 8 \ 5.\\ 4 \ 3.\\ 0 \ (c\\ 0 \ (c\\ 7 \ 3.\\ 8 \ 5.\\ 14\\ 0 \ (c\\ 7 \ 3.\\ 8 \ 5.\\ 14\\ 0 \ (c\\ 7 \ 3.\\ 14\ (c\\ 7 \ 14\ (c\ 14\$	0.57); I 11) 11 11 11 11 14 0 12 0 0 0 0 0 0 0 0 0 0 0 0 0	0 9 1 9 4 2 5 5 4 4 8 8 1 ² = 0% RIRS n SD 3 0.1 1 0 0 0 4 0.6 6 0.3 5 0.4 4 5 5 0.4 4 0.6 6 0.3	36 36 56 1 35 38 46 1 54 10 Total 34 0 32 0 0 36 56 35 54 10	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 20.2% 9.4% 24.5% 25.8%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference IV, Randorn, 95' 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0.	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difference	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: (Test for overall of Study or Subgro Akman 2011 Bozkurt 2011 Sabinis 2012 Kruck 2013 Kirac 2013 Sabinis 2013 Ozturk 2013 Resortu 2013	oup M	6 199 7 9 19 31 114 68, df = = 2.52 PCt lean S 1.6 1 0 1.4 0 0 1.4 0 0.1.5 0 1.3 0 0.0.96 0 0	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.57); I i1) i1 <u>Mea</u> 4 0. 2 0. 2 0. 5 0.5 0 0	9 1 9 4 2 5 5 4 448 ¹² = 0% RIRS 7 0 0 4 0.6 0 0 0 4 0.8 5 0.4 6 0.3 0 0	36 36 35 35 38 46 1 54 10 Total 34 0 32 0 0 36 56 35 0 0 0	0.9% 15 11.6% 7.9% 6.5% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference IV, Randorn, 95' 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima Not estima	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difference	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% Cl) Total events Heterogeneity: (Test for overall Study or Subgre Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Kirac 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resortu 2013 Total (95% Cl)	effect: Z	6 19 7 9 9 31 31 4 68, df = = 2.52 PCt lean <u>5</u> 1.6 1 0 1.4 0 0 1.5 0 1.3 0 0.96 0 0 0 0	3772 599(<i>p</i> = (<i>p</i> =0.0) 144 140 727 9(<i>p</i> =0.0) 144 140 727 72 9(<i>p</i> =0.0) 144 140 727 72 73 9(<i>p</i> =0.0) 144 140 727 72 73 9(<i>p</i> =0.0) 144 140 727 72 73 9(<i>p</i> =0.0) 144 140 727 72 73 9(<i>p</i> =0.0) 144 140 727 72 73 9(<i>p</i> =0.0) 144 140 727 72 73 9(<i>p</i> =0.0) 144 140 727 72 73 74 74 74 74 74 74 74 74 74 74 74 74 74	0.57); I i1) i1 i1 i1 Mea 4 0. 0 2 0. 0 7 0. 9 0. 5 0.5 0 0	0 9 9 4 2 5 5 5 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	36 36 56 1 35 38 46 1 54 10 <u>Total</u> 34 46 1 0 32 0 0 36 35 0 0 1 93 1 1 1 1 1 1 1 1 1 1 1 1 1	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8%	5:06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2:68 [0.74, 9.73] 2:68 [0.74, 9.73] 2:74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference IV, Random, 95' 1.30 [0.90, 1 Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difference	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: (Test for overall of Study or Subgro Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Kirac 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resortu 2013 Total (95% CI) Heterogeneity: T	effect: Z oup M au ² = 0.1	6 199 7 9 9 31 114 658, df = 2.52 PCC 1.6 1 0 1.4 0 0 1.5 0 1.3 0 0.96 0 0 2; Chi ^p	37 172 59 35 144 140 727 9 (p = 0.0 NL D Tota 0 (0 1 33 0 (0 1 33 8 55 4 35 0 (0 1 1 33 0 (0 1 1 33 0 (0 1 1 33 0 (0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.57); 1 1) 1 Mea 4 0. 0 2 0. 0 0 0 0 0 0 0 0 0 0 0 0 0	0 9 9 4 2 5 5 5 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	36 36 56 1 35 38 46 1 54 10 <u>Total</u> 34 46 1 0 32 0 0 36 35 0 0 1 93 1 1 1 1 1 1 1 1 1 1 1 1 1	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference IV, Randorn, 95' 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima Not estima	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% Cl) Total events Heterogeneity: (Test for overall Study or Subgre Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Kirac 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resortu 2013 Total (95% Cl)	effect: Z oup M au ² = 0.1	6 199 7 9 9 31 114 658, df = 2.52 PCC 1.6 1 0 1.4 0 0 1.5 0 1.3 0 0.96 0 0 2; Chi ^p	37 172 59 35 144 140 727 9 (p = 0.0 NL D Tota 0 (0 1 33 0 (0 1 33 8 55 4 35 0 (0 1 1 33 0 (0 1 1 33 0 (0 1 1 33 0 (0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.57); 1 1) 1 Mea 4 0. 0 2 0. 0 0 0 0 0 0 0 0 0 0 0 0 0	0 9 9 4 2 5 5 5 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	36 36 56 1 35 38 46 1 54 10 <u>Total</u> 34 46 1 0 32 0 0 36 35 0 0 1 93 1 1 1 1 1 1 1 1 1 1 1 1 1	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference IV, Randorn, 95' 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima Not estima	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13 -2	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: (Test for overall of Study or Subgro Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Kirac 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resortu 2013 Total (95% CI) Heterogeneity: T	effect: Z oup M au ² = 0.1	6 19 7 9 9 19 31 114 658, df = = 2.52 PCt lean S 1.4 0 0 1.3 0 0 0 0 0 0 2; Chi ^p ($\begin{array}{c} 37\\ 72\\ 59\\ 935\\ 144\\ 140\\ 727\\ 9\left(p=0\right)\\ 144\\ 140\\ 727\\ 9\left(p=0\right)\\ 144\\ 140\\ 727\\ 9\left(p=0\right)\\ 144\\ 140\\ 727\\ 9\left(p=0\right)\\ 144\\ 140\\ 0\\ 10\\ 10\\ 10\\ 10\\ 10\\ 10\\ 10\\ 10\\ 10$	0.57); 1 1) 1 Mea 4 0. 0 2 0. 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 0 \\ 9 \\ 1 \\ 9 \\ 4 \\ 2 \\ 5 \\ 1 \\ 2 \\ 5 \\ 1 \\ 2 \\ 5 \\ 1 \\ 2 \\ 2 \\ 1 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2$	36 36 56 1 35 38 46 1 54 10 <u>Total</u> 34 46 1 0 32 0 0 36 35 0 0 1 93 1 1 1 1 1 1 1 1 1 1 1 1 1	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Randorn, 95' 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima Not estima Not estima Not estima 0.87 [0.51, 1.]	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13 -2	Vors PCNL Favors RIRS Mean Difference IV, Random, 95% CI 	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: (Test for overall of Study or Subgro Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Kruck 2013 Resortu 2013 Resortu 2013 Total (95% CI) Heterogeneity: T Test for overall of	effect: Z oup M au ² = 0.1 ffect: Z =	6 199 7 9 19 19 31 114 68, df = 2.52 PCC 1.4 0 0 1.5 0 1.5 0 1.5 0 1.5 0 2.56 PC 2.52 PC PC 2.52 PC PC 2.52 PC PC 2.52 PC PC PC PC PC PC PC PC PC PC	$\begin{array}{c} 37\\ 72\\ 59\\ 935\\ 144\\ 140\\ 727\\ 9(p=0.0\\ 142\\ 140\\ 727\\ 727\\ 727\\ 727\\ 727\\ 727\\ 727\\ 72$	0.57); I 1) 1) 1) 1) 1) 1) 1) 1) 1) 1)	0 9 9 4 2 5 4 4 8 8 2 5 7 4 4 8 8 7 8 0 0 0 0 4 0.0 0 0 4 2.5 5 8 8 7 8 0 7 8 0 7 8 0 7 8 0 7 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	36 36 56 11 54 10 <u>Total</u> 34 10 34 0 32 0 0 36 56 50 0 193 30001);	0.9% 15 11.6% 7.9% 6.5% 6.5% 2.9% 00.0% Weight 20.2% 20.2% 20.2% 9.4% 24.5% 25.8%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference IV, Randorn, 95 ³ 1.30 [0.90, 1, Not estima 1.00 [0.60, 1, Not estima 1.10 [0.16, 2, 0.80 [0.57, 1, 0.87 [0.51, 1. Mean Difference	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 111 112 13 13 13 13 13 13 -2 Fi	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: C Test for overall of Study or Subgro Akman 2011 Sabinis 2012 Bryniarski 2012 Bryniarski 2012 Kruck 2013 Krac 2013 Pan 2013 Sabinis 2013 Resortu 2013 Resortu 2013 Total (95% CI) Heterogeneity: T Test for overall e Study or Subgro	effect: Z oup M au ² = 0.1 ffect: Z =	6 199 7 9 19 31 114 68, df = = 2.52 PCt lean S 1.6 1 0 1.4 0 0 1.5 0 1.3 0 0.96 0 0 0 2; Chi ^p 4.77 (/ PC 4.77 (/ PC	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.57); I 11) 11 11 11 11 11 11 11 11 1	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ RIRS \\ n \\ SD \\ 3 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 4 \\ 0.6 \\ 0 \\ 0 \\ 0 \\ 0 \\ 4 \\ 2.8 \\ 5 \\ 0.4 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $	36 08 25 56 10 54 10 Total 34 0 32 0 0 0 0 193 00001): Total	0.9% 15 11.6% 7.9% 6.5% 6.5% 6.5% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8% 100.0% ² = 83% Weight	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Randorn, 957 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima 0.87 [0.51, 1. Mean Difference IV, Randorn, 95%	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 111 112 123 133 133 13 13 13 -2 Fi r	Vors PCNL Favors RIRS Mean Difference IV, Random, 95% CI 	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: (Test for overall of Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Resortu 2013 Sabinis 2013 Ozturk 2013 Resortu 2013 Total (95% CI) Heterogeneity: T Test for overall e <u>Study or Subg</u> Akman 2011	effect: Z oup M au ² = 0.1 ffect: Z =	6 19 7 9 19 31 114 68, df = = 2.52 1.6 1 0 1.4 0 0 0 0 2; Chi ^p (4.77 (4.77 (PCC) 4.77 ($\begin{array}{c} 37\\ 72\\ 59\\ 9(p=)\\ (p=0,0)\\ 9(p=)\\ (p=0,0)\\ 144\\ 140\\ 727\\ 9(p=)\\ 144\\ 140\\ 727\\ 9(p=)\\ 33\\ 144\\ 140\\ 727\\ 9(p=)\\ 33\\ 144\\ 140\\ 727\\ 9(p=)\\ 33\\ 144\\ 140\\ 140\\ 10\\ 10\\ 10\\ 10\\ 10\\ 10\\ 10\\ 10\\ 10\\ 1$	0.57); 1 11) 11 11 11 11 11 11 11 11	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 8 \\ 8 \\ 2 \\ 5 \\ 4 \\ 8 \\ 8 \\ 8 \\ 1 \\ 2 \\ 2 \\ 5 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 2 \\ 1 \\ 1 \\ 1 \\ 1$	36 08 25 56 10 Total 34 10 Total 34 0 0 0 0 36 56 35 0 193 300001); Total 34	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 20.2% 20.2% 100.0% 1 ² = 83% Weight 10.6%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference IV, Randorn, 95' 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima 0.87 [0.51, 1. Mean Difference IV, Randorn, 95% 1.30 [0.61, 1.5]	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 12 12 13 13 13 13 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% Cl) Total events Heterogeneity: c Test for overall of Study or Subgr Akman 2011 Bozkurt 2011 Bozkurt 2013 Kirac 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Resortu 2013 Total (95% Cl) Heterogeneity: T Test for overall e <u>Study or Subgr</u> Akman 2011 Bozkurt 2011	effect: Z oup M au ² = 0.1 ffect: Z =	6 19 7 9 9 19 31 114 68, df = 2.52 PCC PCC PCC PCC PCC PCC PCC PC	$\begin{array}{c} 37\\ 72\\ 59\\ 935\\ 144\\ 140\\ 727\\ 9(p=.0,0)\\ 144\\ 140\\ 727\\ 9(p=.0,0)\\ 144\\ 140\\ 727\\ 9(p=.0,0)\\ 143\\ 00\\ (0,0)\\ 113\\ 133\\ 00\\ (0,0)\\ 113\\ 133\\ 00\\ (0,0)\\ 113\\ 133\\ 00\\ 113\\ 133\\ 133\\ 133\\ 133\\$	0.57); [1] 11) 11) 11) 11) 11) 11) 11) 1	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ 8 \\ 1 \\ 2 \\ 5 \\ 1 \\ 1 \\ 2 \\ 1 \\ 1 \\ 2 \\ 1 \\ 1 \\ 2 \\ 1 \\ 1$	36 08 25 56 10 54 10 54 10 54 10 54 10 0 0 0 0 0 0 0 0 0 0 0 0 0	0.9% 15 1.6% 7.9% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8% 100.0% ² = 83% Weight 1.0%%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Random, 95 ⁹ 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima 0.87 [0.51, 1. Mean Difference IV, Random, 95 ⁹ 1.30 [0.61, 1.5] 1.00 [0.47, 1.5]	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 12 12 13 13 13 13 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: (Test for overall of Study or Subgro Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2013 Kruck 2013 Kruck 2013 Resortu 2013 Resortu 2013 Total (95% CI) Heterogeneity: T Test for overall e <u>Study or Subgr</u> Akman 2011 Bozkurt 2013	au ² = 0.1 ffect: Z = group	6 19 7 9 19 19 31 114 68, df = 2.52 PCI 1.4 0 1.5 0 1.4 0 0 1.5 0 1.5 0 1.5 0 1.5 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.57); 1 11) 11) 11) 11) 12 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ 8 \\ 1^2 = 0\% \\ RIRS \\ n \\ SD \\ 3 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	36 08 25 56 10 54 10 7 7 7 10 10 10 10 10 10 10 10 10 10	0.9% 15 1.6% 7.9% 6.5% 6.5% 0.0% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8% 100.0% ² = 83% Weight 10.6% 11.6% 11.6%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference IV, Randorn, 957 1.30 [0.90, 1, Not estima 1.00 [0.60, 1, Not estima 1.10 [0.16, 2, 0.80 [0.57, 1, 0.80 [0.57, 1, 0.87 [0.51, 1, Mean Difference IV, Randorn, 95% 1.30 [0.61, 1, 3, 1.00 [0.61, 1, 3, 1.00 [0.61, 1, 3, 1.00 [0.61, 1, 3, 1.00 [0.61, 1, 3, 0.00 [0.71, 1, 5, 0.00 [0.71, 1, 5, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 12 12 13 13 13 13 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: (Test for overall of Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Sabinis 2013 Ozturk 2013 Resortu 2013 Total (95% CI) Heterogeneity: T Test for overall e <u>Study or Subgr</u> Akman 2011 Bozkurt 2011 Bozkurt 2011 Bozkurt 2012 Bryniarski 2012 Bryniarski 2012 Bryniarski 2012 Bryniarski 2012 Bryniarski 2012	au ² = 0.1 ffect: Z = group	6 19 7 9 19 31 114 68, df = = 2.52 1.6 1 0 1.4 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 37\\ 72\\ 59\\ 9(p=:\\(p=0,0)\\ 144\\ 140\\ 727\\ 9(p=:\\(p=0,0)\\ 144\\ 140\\ 727\\ 9(p=:\\(p=0,0)\\ 144\\ 140\\ 727\\ 9(p=:\\(p=0,0)\\ 144\\ 140\\ 0\\ 0\\ 11\\ 11\\ 12\\ 12\\ 12\\ 12\\ 12\\ 12\\ 12\\ 12$	0.57); 1 11) 11) 11) 11) 11) 11) 11) 1	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ RIRS \\ \frac{n}{SD} \\ 3 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 4 \\ 0.6 \\ 0 \\ 0 \\ 0 \\ 0 \\ 4 \\ 2.8 \\ 5 \\ 0.4 \\ 2 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	36 08 25 56 13 54 10 Total 54 10 10 34 0 34 0 34 0 32 0 0 193 300001): Total 34 7 33 10 10 10 10 10 10 10 10 10 10	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 20.2% 100.0% 12.8% Weight 10.6% 11.6% 12.7% 4.3%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Randorn, 95 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima 0.87 [0.51, 1. Mean Difference IV, Randorn, 95% 1.30 [0.61, 1.5] 0.10 [-0.22, 0.4 4.50 [2.57, 6.4]	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% Cl) Total events Heterogeneity: c Test for overall Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Kirac 2013 Resortu 2013 Total (95% Cl) Heterogeneity: T Test for overall e Study or Subgr Akman 2011 Bozkurt 2013 Total (95% Cl) Heterogeneity: T Test for overall e Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Drai (2013)	au ² = 0.1 ffect: Z = group	6 19 7 9 9 19 31 114 658, df = = 2.52 PCC lean S 1.6 1.3 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 37\\ 7\\ 7\\ 7\\ 9\\ 9\\ 7\\ 7\\ 9\\ 9\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\$	0.57); 11 11 11 11 11 11 11 11 11 11	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ 8 \\ 7 \\ 7 \\ 8 \\ 1 \\ 2 \\ 7 \\ 7 \\ 8 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$	36 08 25 56 10 54 10 54 10 54 10 54 10 0 0 0 0 0 0 0 0 193 300001): Total 193 300001): 193 3000011: 193 193 193 193 193 193 193 193	0.9% 15 1.6% 7.9% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8% 100.0% 1 ² = 83% Weight 10.6% 11.6% 12.7% 4.3%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Random, 95% 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima 0.87 [0.51, 1. Mean Difference IV, Random, 95% 1.30 [0.61, 1.9] 1.00 [0.47, 1.5] 0.10 [-0.22, 0.4 Not estimat	2013 2013 2013 2013 2013 2013 2013 2013	Far Far Far Far Far Far Far Far	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% Cl) Total events Heterogeneity: c Test for overall of Study or Subgro Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Resortu 2013 Total (95% Cl) Heterogeneity: T Test for overall of Study or Subgro Akman 2011 Bozkurt 2013 Resortu 2013 Total (95% Cl) Heterogeneity: T Test for overall of Study or Subgro Akman 2011 Bozkurt 2013 Bozkurt 2013 Dottal (95% Cl)	au ² = 0.1 ffect: Z = group	6 19 7 9 19 19 31 114 68, df = 2.52 PCC lean S 1.6 1 0 1.3 0 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 37\\ 77\\ 77\\ 77\\ 77\\ 77\\ 77\\ 77\\ 77\\ 77\\$	0.57); 1 11 11 11 11 11 12 14 14 14 14 15 15 15 15 15 15 15 15 15 15	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ 8 \\ 1 \\ 2 \\ 5 \\ 1 \\ 1 \\ 2 \\ 1 \\ 1 \\ 2 \\ 1 \\ 1 \\ 2 \\ 1 \\ 1$	36 08 25 56 10 54 10 7 7 7 10 10 10 10 10 10 10 10 10 10	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8% 100.0% 1 ² = 83% Weight 10.6% 11.6% 12.7% 4.3% 11.8%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Moan Difference IV, Random, 95 ³ 1.30 [0.90, 1, Not estima 1.00 [0.60, 1, Not estima 1.10 [0.16, 2, 0.80 [0.57, 1, 0.80 [0.57, 1, 0.87 [0.51, 1, Mean Difference IV, Random, 95 ³ 1.30 [0.61, 2, 0.87 [0.51, 1, Mean Difference IV, Random, 95 ⁴ 1.30 [0.61, 1, 1.30 [0.61, 1, 1.	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: C Test for overall of Study or Subgrr Akman 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Heterogeneity: T Test for overall e Study or Subg Akman 2011 Bozkurt 2013 Total (95% CI) Heterogeneity: T Test for overall e Study or Subg Akman 2011 Bozkurt 2013 Pan 2013 Kirac 2013 Pan 2013 Kirac 2013	au ² = 0.1 ffect: Z = group	6 19 7 9 19 19 19 31 114 68. df = = 2.52 PCt lean S 1.6 1 0 1.4 0 0 1.4 0 0 1.5 0 1.3 0 0.96 0 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.57); 1 11) 11) 11) 11) 11) 12 12 13 14 15 15 15 15 15 15 15 15 15 15	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ 8 \\ 1 \\ 2 \\ 5 \\ 1 \\ 1 \\ 2 \\ 5 \\ 1 \\ 1 \\ 2 \\ 1 \\ 1 \\ 2 \\ 1 \\ 1 \\ 2 \\ 1 \\ 1$	36 08 25 56 10 54 10 Total 34 35 54 10 75 10 10 36 56 35 00 0 193 30001): Total 34 34 34 35 00 00 00 193 30001): 193 00001): 193 00001): 193 00001): 193 00001): 193 00001): 193 00001): 193 193 193 193 193 193 193 193	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.5% 0.0% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8% 100.0% 1 ² = 83% Weight 10.6% 11.6% 11.6% 12.7% 4.3%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Randorn, 95 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima 0.87 [0.51, 1. Mean Difference IV, Randorn, 95% 1.30 [0.61, 1.5 1.00 [0.47, 1.5] 0.10 [-0.22, 0.4 Not estima 2.50 [2.01, 2.5 0.70 [0.53, 0.8] 0.70 [0.53, 0.8] 0.71 [0	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 12 13 13 13 13 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% Cl) Total events Heterogeneity: (Test for overall of Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Resortu 2013 Total (95% Cl) Heterogeneity: T Test for overall of Study or Subgr Akman 2011 Bozkurt 2013 Total (95% Cl) Heterogeneity: T Test for overall of Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Czturk 2013 Far 2013 Kirac 2013 Kirac 2013 Kirac 2013 For 2013 Kirac 2013 Kirac 2013	au ² = 0.1 ffect: Z = group	6 19 7 9 9 19 31 114 658, df = = 2.52 PCC lean S 1.4 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 37\\ 72\\ 59\\ 935\\ 144\\ 140\\ 727\\ 9(p=.\\(p=0.0)\\ 140\\ 140\\ 727\\ 9(p=.\\(p=0.0)\\ 144\\ 140\\ 727\\ 9(p=.\\(p=0.0)\\ 144\\ 30\\ 00\\ (0)\\ 193\\ = 24.05\\ 00\\ (0)\\ 193\\ = 24.05\\ 00\\ (0)\\ 193\\ = 24.05\\ 00\\ (1)\\ 111\\ 101\\ 101\\ 101\\ 101\\ 101\\ 101\\ 1$	0.57); 1 11) 11) 11) 11) 11) 12 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ 8 \\ 7 \\ 7 \\ 8 \\ 1 \\ 1 \\ 2 \\ 7 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$	36 36 37 38 38 38 38 38 34 54 10 54 10 54 10 32 32 32 30 00 01 93 300001): Total 193 300001): Total 193 300001): 193 300001]: 193 193 193 193 193 193 193 193	0.9% 15 1.6% 7.9% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 20.2% 9.4% 24.5% 25.8% 100.0% 1 ² = 83% Weight 10.6% 11.6% 12.7% 4.3% 11.8% 13.2%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Randorn, 95' 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima 0.87 [0.51, 1. Mean Difference IV, Randorn, 95% 1.30 [0.61, 1.5 1.00 [0.47, 1.5 0.10 [-0.22, 0.4 4.50 [2.57, 6.4 Not estimat 2.50 [2.01, 2.5] 0.70 [0.53, 0.8 2.20 [1.44, 2.5]	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% Cl) Total events Heterogeneity: C Test for overall of Study or Subgro Akman 2011 Bozkurt 2011 Bozkurt 2011 Bozkurt 2013 Kruck 2013 Resortu 2013 Total (95% Cl) Heterogeneity: T Test for overall of Study or Subgro Akman 2011 Bozkurt 2013 Resortu 2013 Total (95% Cl) Heterogeneity: T Test for overall of Akman 2011 Bozkurt 2013 Resortu 2013 Total (95% Cl) Heterogeneity: T Test for overall of Akman 2011 Sabinis 2012 Bryniarski 2012 Ozturk 2013 Pan 2013 Kirac 2013 Kirac 2013 Kirac 2013 Kirac 2013 Sabinis 2013	au ² = 0.1 ffect: Z = group	6 19 7 9 9 19 31 114 68, df = 2.52 PCC lean S 1.6 1 0 1.3 0 0 0 0 0 0 2; Chi ^p (PC Mean 2.3 2 111 4.4 1.7 2.3 0 4.4 1.7 2.3 0 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	$\begin{array}{c} 37\\ 77\\ 77\\ 79\\ 9\\ (p=0.0)\\ 727\\ 9\\ (p=0.0)\\ 144\\ 140\\ 727\\ 727\\ 9\\ (p=0.0)\\ 144\\ 140\\ 727\\ 727\\ 9\\ (p=0.0)\\ 144\\ 3\\ 0\\ 0\\ (1-3)\\ 32\\ 0\\ 10\\ 10\\ 10\\ 14\\ 3\\ 0\\ 0\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14$	0.57); 1 1 1 1 1 1 1 1 1 1 1 1 1 1	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ 48 \\ 7 \\ 8 \\ 5 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	36 08 25 56 10 54 10 Total 34 6 10 35 38 46 10 34 54 10 32 00 36 56 56 35 00 00 32 00 36 36 36 38 38 38 38 46 10 32 32 38 38 38 38 38 38 38 38 38 38	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 9.4% 24.5% 25.8% 100.0% 1 ² = 83% Weight 10.6% 11.8% 12.7% 4.3% 11.8% 12.5%	 5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Random, 957 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. Not estima Not estima Not estima Not estima Not estima Not estima 1.10 [0.61, 1. 0.87 [0.51, 1. Mean Difference IV, Random, 959 1.30 [0.67, 1. 0.87 [0.51, 1. Mean Difference IV, Random, 959 1.30 [0.61, 1.5] 0.00 [0.47, 1.5] 0.10 [-0.22, 0.4 4.50 [2.57, 6.4. Not estimat 2.50 [2.01, 2.5] 0.70 [0.53, 0.6] 2.20 [1.44, 2.5] 0.30 [-0.08, 0.6] 	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% Cl) Total events Heterogeneity: (Test for overall of Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Resortu 2013 Total (95% Cl) Heterogeneity: T Test for overall of Study or Subgr Akman 2011 Bozkurt 2013 Total (95% Cl) Heterogeneity: T Test for overall of Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Czturk 2013 Far 2013 Kirac 2013 Kirac 2013 Kirac 2013 For 2013 Kirac 2013 Kirac 2013	au ² = 0.1 ffect: Z = group	6 19 7 9 9 19 31 114 658, df = = 2.52 PCC lean S 1.4 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 37\\ 77\\ 77\\ 79\\ 9\\ (p=0.0)\\ 727\\ 9\\ (p=0.0)\\ 144\\ 140\\ 727\\ 727\\ 9\\ (p=0.0)\\ 144\\ 140\\ 727\\ 727\\ 9\\ (p=0.0)\\ 144\\ 3\\ 0\\ 0\\ (1-3)\\ 32\\ 0\\ 10\\ 10\\ 10\\ 14\\ 3\\ 0\\ 0\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14$	0.57); 1 1 1 1 1 1 1 1 1 1 1 1 1 1	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ 8 \\ 7 \\ 7 \\ 8 \\ 1 \\ 1 \\ 2 \\ 7 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$	36 08 25 56 13 38 46 10 54 10 54 10 10 32 0 0 0 0 0 0 0 193 300001): Total 193 300001): Total 193 300001): 193 193 193 193 193 193 193 193	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 9.4% 24.5% 25.8% 100.0% 1 ² = 83% Weight 10.6% 11.8% 12.7% 4.3% 11.8% 12.5%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Randorn, 95' 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima 0.87 [0.51, 1. Mean Difference IV, Randorn, 95% 1.30 [0.61, 1.5 1.00 [0.47, 1.5 0.10 [-0.22, 0.4 4.50 [2.57, 6.4 Not estimat 2.50 [2.01, 2.5] 0.70 [0.53, 0.8 2.20 [1.44, 2.5]	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% Cl) Total events Heterogeneity: (Test for overall Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Resorlu 2013 Total (95% Cl) Heterogeneity: T Test for overall e Study or Subgr Akman 2011 Bozkurt 2013 Total (95% Cl) Heterogeneity: T Test for overall e Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Czturk 2013 Resorlu 2013 Kirac 2013 Kirac 2013 Kirac 2013 Resorlu 2013 Resorlu 2013 Resorlu 2013 Resorlu 2013 Resorlu 2013 Resorlu 2013 Resorlu 2013	au ² = 0.1 ffect: Z = group	6 19 7 9 9 19 31 114 68, df = 2.52 PCC lean S 1.6 1 0 1.3 0 0 0 0 0 0 2; Chi ^p (PC Mean 2.3 2 111 4.4 1.7 2.3 0 4.4 1.7 2.3 0 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	$\begin{array}{c} 37\\ 77\\ 77\\ 79\\ 9\\ (p=0.0)\\ 727\\ 9\\ (p=0.0)\\ 144\\ 140\\ 727\\ 727\\ 9\\ (p=0.0)\\ 144\\ 140\\ 727\\ 727\\ 9\\ (p=0.0)\\ 144\\ 3\\ 0\\ 0\\ (1-3)\\ 32\\ 0\\ 10\\ 10\\ 10\\ 14\\ 3\\ 0\\ 0\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14$	0.57); 1 1 Meaa 4 0 2 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ 48 \\ 7 \\ 8 \\ 5 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	36 08 25 56 10 54 10 54 10 54 10 54 10 54 10 0 0 0 0 0 0 0 0 0 0 0 0 193 300001): Total 193 300001): Total 193 300001): 193 3000010 193 3000010 193 3000010 193 3000010 193 3000010 193 3000010 193 3000010 193 3000010 193 300000000000000000000000000000000000	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 00.0% Weight 20.2% 9.4% 24.5% 25.8% 100.0% 1 ² = 83% Weight 10.6% 11.8% 12.7% 4.3% 11.8% 12.5%	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Randorn, 95' 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.10 [0.16, 2. 0.80 [0.57, 1. 0.40 [0.23, 0. Not estima 0.87 [0.51, 1. Mean Difference IV, Randorn, 95% 1.30 [0.61, 1.5 1.00 [0.47, 1.5 0.10 [-0.22, 0.4 4.50 [2.57, 6.4 Not estimat 2.50 [2.01, 2.5 0.70 [0.53, 0.8 2.20 [1.44, 2.5 0.30 [-0.08, 0.6 1.30 [1.09, 1.5]	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% CI) Total events Heterogeneity: c Test for overall Study or Subgre Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Kruck 2013 Resortu 2013 Total (95% CI) Heterogeneity: T Test for overall e Study or Subgre Akman 2011 Bozkurt 2013 Resortu 2013 Total (95% CI) Pan 2013 Sabinis 2012 Bryniarski 2012 Cyturk 2013 Pan 2013 Sabinis 2013 Cyturk 2013 Sabinis 2013 Kruck 2013 Sabinis 2013 Resortu 2013 Kruck 2013 Kruck 2013 Resortu 2013 Kruck 2013 Resortu 2013 Kruck 2013 Resortu 2013 Total (95% CI)	au ² = 0.1 ffect: Z = group	6 19 7 9 9 19 31 114 68, df = 2.52 PCC 1.6 1.5 0 1.5 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 37\\ 77\\ 77\\ 79\\ 9\\ 727\\ 9\\ 9\\ 727\\ 9\\ 9\\ 727\\ 727$	0.57); 1 1 1 1 1 1 1 1 1 1 1 1 1 1	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ 48 \\ 7 \\ 8 \\ 8 \\ 7 \\ 8 \\ 8 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$	36 36 37 38 38 46 10 54 10 54 10 54 10 32 00 32 00 36 56 55 00 0 193 30001); Total 34 35 46 10 46 46 46 46 46 46 46 46 46 46	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 0.0	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Random, 95 ³ 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.00 [0.60, 1. Not estima 0.87 [0.51, 1. Mean Difference IV, Random, 95 ⁹ 1.30 [0.71, 1. 0.40 [0.23, 0. Not estima 0.87 [0.51, 1. Mean Difference IV, Random, 959 ³ 1.30 [0.47, 1.5 0.01 [-0.22, 0.4 Ato estimal 2.50 [2.01, 2.5 0.70 [0.53, 0.6 1.30 [1.09, 1.5 1.30 [0.9, 1.5] 1.28 [0.79, 1.7	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 11 12 12 13 13 13 13 13 13 13 13 13 13	Vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI -1 0 1 2 avours PCNL Favours RIRS Mean Difforence IV, Random, 95% CI	
D	Kirac 2013 Kruck 2013 Pan 2013 Sabinis 2013 Ozturk 2013 Total (95% Cl) Total events Heterogeneity: (Test for overall Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Kruck 2013 Resorlu 2013 Total (95% Cl) Heterogeneity: T Test for overall e Study or Subgr Akman 2011 Bozkurt 2013 Total (95% Cl) Heterogeneity: T Test for overall e Study or Subgr Akman 2011 Bozkurt 2011 Sabinis 2012 Bryniarski 2012 Czturk 2013 Resorlu 2013 Kirac 2013 Kirac 2013 Kirac 2013 Resorlu 2013 Resorlu 2013 Resorlu 2013 Resorlu 2013 Resorlu 2013 Resorlu 2013 Resorlu 2013	effect: Z oup M au ² = 0.1 ffect: Z = group 2 Tau ² = 0	6 19 7 9 9 19 31 114 68, df = 2.52 PCI 1.6 1 0 1.4 0 0 1.5 0 1.5 0 1.5 0 1.5 0 1.5 0 1.5 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 37\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7\\ 7$	0.57); 1 1 1 1 1 1 1 1 1 1 1 1 1 1	$\begin{array}{c} 0 \\ 9 \\ 9 \\ 1 \\ 2 \\ 5 \\ 4 \\ 48 \\ 48 \\ 7 \\ 8 \\ 8 \\ 7 \\ 8 \\ 8 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$	36 36 37 38 38 46 10 54 10 54 10 54 10 32 00 32 00 36 56 55 00 0 193 30001); Total 34 35 46 10 46 46 46 46 46 46 46 46 46 46	0.9% 15 1.6% 7.9% 6.5% 6.5% 6.0% 2.9% 0.0	5.06 [0.82, 278.09] 1.37 [0.59, 3.14] 0.70 [0.24, 2.04] 2.68 [0.74, 9.73] 2.74 [0.61, 12.30] 2.33 [0.85, 6.41] 1.61 [1.11, 2.35] Mean Difference IV, Random, 95 ³ 1.30 [0.90, 1. Not estima 1.00 [0.60, 1. Not estima 1.00 [0.60, 1. Not estima 0.87 [0.51, 1. Mean Difference IV, Random, 95 ⁹ 1.30 [0.71, 1. 0.40 [0.23, 0. Not estima 0.87 [0.51, 1. Mean Difference IV, Random, 959 ³ 1.30 [0.47, 1.5 0.01 [-0.22, 0.4 Ato estimal 2.50 [2.01, 2.5 0.70 [0.53, 0.6 1.30 [1.09, 1.5 1.30 [0.9, 1.5] 1.28 [0.79, 1.7	2013 2013 2013 2013 2013 2013 2013 2013	Far ar 11 12 12 13 13 13 13 13 13 13 13 13 13	vors PCNL Favors RIRS Mean Difforence IV, Random, 95% CI	

Figure 2. Statistical forest map: A: Operation time, B: Stone removal rate, C: Finished rate, D: HP decline, E: Hospitalization time.

Study or Subgroup Mean SD Total Mean SD Total Weight IV, Random, 95% CI IV, Random, 95% CI Akman 2011 38.7 11.6 34 52.5 13.4 34.05.0% -19.50 -25.46, -13.54] IV IV Random, 95% CI IV, Random,	A		CNL			RIRS			Mean Difference		Mean Difference
Akman 2011 38.7 11.6 34 58.2 13.4 34 35.0% -19.50 [-25.46 , -13.54] Boxkur 2011 45.8 19.6 42 67.5 24.3 37 33.2% -21.70 [-31.52 , -11.84] Boryniarski 2012 100.1 29.9 32 85 17.5 32 31.8% 15.10 [3.10, 27.10] Total (95% CI) 108 103 100.0% -9.21 [-28.0 , 10.38] -10050 50 10 Study or Subgroup Events Total Events Odds Ratio Odds Ratio Odds Ratio Bozkur 2011 31 34 32 34 15.4% 2.34 [0.20, 26.95] Brynlarski 2012 30 32 24 32 24.6% 5.06 [0.97, 25.77] 0.05 0.05 0.05 0.05 0.05 0.05 0.205 0.000 0.05		-					Total	Weigh			
Backurt 2011 45.8 19.6 42 67.5 24.3 37 33.2% -21.70]-31.52, -11.88] Byniarski 2012 100.1 29.9 32 85 17.5 32 31.8% 15.10 [3.10, 27.10] Total (95% CI) 108 103 100.0% -9.21 [-28.80, 10.38] Heterogeneity: Tau' = 276.32; Chi ² = 28.12, df = 2 ($p < 0.00001$); i ² = 93% Test for overall effect: Z = 0.92 ($p = 0.36$) PCNL RIRS Odds Ratio Odds Ratio Study or Subgroup PCNL Fixed, 95% CI M-H, Fixed, 95% CI M-H, Fixed, 95% CI M-H, Fixed, 95% CI Odds Ratio Bryniarski 2012 30 32 24 32 24.6% 5.00 [0.97, 25.77] Ozturk 2013 135 144 28 36 45.4% 5.36 [1.99, 14.39] Total (95% CI) 252 141 100.0% 4.32 [1.99, 9.37] Total (95% CI) 252 141 100.0% 1.59 [0.84, 3.02] Total (95% CI) 26.7 (6.43] Total (95% CI) 26.8 3.4 32 20.6 % 4.50 [2.57, 6.43] Total (95% CI) 108 103 100.0 % 1.84 [0.64, 3.04] Total (95% CI) 0.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0											-
Bryniarski 2012 100.1 29.9 32 85 17.5 32 31.8% 15.10 [3.10, 27.10] Total (95% CI) 108 103 100.0% -9.21 [-28.80, 10.38] Heterogeneity: Tau ² = 276.32; Ch ² = 2.8.12, df = 2 ($P < 0.00001$); P = 9.3% Test for overall effect: Z = 0.92 ($P = 0.06$) PCNL RIRS Odds Ratio M-H, Fixed, 95% CI M-H, Fixed, 95%, CI M-H, Fixed, 9											
Total (95% CI) Total (95% CI) Total (95% CI) Total (95% CI) Total 276.32; Ch ² = 28.12, df = 2 ($P < 0.00001$); P = 33% Test for overall effect: Z = 0.92 ($P = 0.36$) PCNL RIRS DCMM Total Events Total Events Total Weight M-H, Fixed, 95% CI M-H, Fixed, 95											
Heterogeneity: Tau ³ = 276.32; Ch ² = 28.12, df = 2 ($P < 0.00001$); $P = 93%$ Total for overall effect: Z = 0.32 ($P = 0.36$) PCNL RIRS Odds Ratio Odds Ratio Study or Subgroup Events Total Events Total Weight M-H, Fixed, 95% CI M-H	-,									,	
Test for overall effect: Z = 0.92 (<i>p</i> = 0.36) -100 - 50 0 50 10 Favours PCNL Ravours PCNL Favours PCNL Favours PCNL 239 119 144 28 38 45.4% 5.36 [1.99, 14.39] Image: Favours PCNL	Total (95% CI)			108			103	100.09	6 -9.21 [-28.80,	10.38]	-
Test for overall effect: Z = 0.32 (P = 0.36) For the state of the second s	Heterogeneity: Tau ² =	276.32;	Chi? •	= 28.12	2, df = 2 (p < 0.0	00001);	12 = 93	%	100	E0 0 E0 10
PCNL RIRS Odds Ratio Odds Ratio Study or Subgroup 33 34 32 34 15.4% 2.06 [0.18, 23.88] Bookurt 2011 31 34 32 34 15.4% 2.06 [0.18, 23.88] Bookurt 2011 41 42 35 37 14.5% 2.34 [0.20, 26.95] Bryniarski 2012 30 32 24 32 24.6% 5.00 [0.97, 25.77] Ozturk 2013 135 144 28 38 45.4% 5.36 [1.99, 14.39] Total (95% CI) 252 141 100.0% 4.32 [1.99, 9.37] Total events 239 119 Heterogeneity: Chi ² = 0.80; I ² = 0.002; Verset Total Weight M-H, Fixed, 95% CI Study or Subgroup FONL RIRS Odds Ratio Odds Ratio Odds Ratio Bryniarski 2012 9 32 8.2 37.2% 1.17 [0.32, 5.50] Eavents Total (95% CI) 252 141 100.0% 1.59 [0.34, 3.02] 0.01 0.1 1 10 10	Test for overall effect:	Z = 0.92	(<i>p</i> =	0.36)							
Study or Subgroup Events Total Events Total Weight M-H, Fixed, 95% CI M-H, Fixed, 95% CI Akman 2011 33 34 32 34 15.4% 2.06 [0.18, 23.88] Bozkurt 2011 41 42 35 37 14.5% 2.34 [0.20, 26.95] Bozkurt 2011 41 42 35 37 14.5% 2.06 [0.18, 23.88] Bozkurt 2013 135 144 28 38 45.4% 5.00 [0.97, 25.77] Ozturk 2013 135 144 28 38 45.4% 5.36 [1.99, 14.39] Total (95% CI) 252 141 100.0% 4.32 [1.99, 9.37] Total events 239 119 Heterogeneity: Chi ² = 0.80, df = 3 (<i>P</i> = 0.85); i ² = 0% 0.0dd s Ratio Study or Subgroup Events Total Weight M-H, Fixed, 95% CI Akman 2011 5 34 4 32 37.2% 1.17 [0.39, 3.57] Ozturk 2013 19 144 2 38 17.8%	В	Р	CNL		RIR	s			Odds Ratio		
Akman 2011 33 34 32 34 15,4% 2.06 [0.18, 23.88] Bozkurt 2011 41 42 35 37 14,5% 2.34 [0.20, 26.95] Bryniarski 2012 30 32 24 32 24,6% 5.00 [0.97, 25.77] Ozturk 2013 135 144 28 38 45.4% 5.36 [1.99, 14.39] Total (95% Cl) 252 141 100.0% 4.32 [1.99, 9.37] Total (95% Cl) 252 141 100.0% 4.32 [1.99, 9.37] Total (95% Cl) 252 141 100.0% 4.32 [1.99, 9.37] Total events 239 119 10 200 Fetrogeneity: Chi ² = 0.80, df = 3 (<i>p</i> = 0.85); i ² = 0% 0/dd Ratio Odds Ratio Study or Subgroup Events Total Weight M-H, Fixed, 95% Cl M-H, Fixed, 95% Cl Study or Subgroup Events Total 82 37.2% 1.17 [0.39, 3.57] 0.01 0.1 1.00 0.20 Cotal (95% Cl) 252 141 100.0% 1.59 [0.84, 3.02] 0.01 0.1 1.0 1.00<	Study or Subgroup	-		Total		-	l Wei	aht M	+	+	
Bozkurt 2011 41 42 35 37 14.5% 2.34 $[0.20, 26.95]$ Bryniarski 2012 30 32 24 32 24.6% 5.00 $[0.97, 25.77]$ Ozturk 2013 135 144 28 38 45.4% 5.36 $[1.99, 14.39]$ Total (95% Cl) 252 141 100.0% 4.32 $[1.99, 9.37]$ Total events 239 119 Heterogeneity: Chi ² = 0.80, df = 3 (<i>p</i> = 0.85); I ² = 0% Test for overall effect: Z = 3.71 (<i>p</i> = 0.0002) Events Total Events Total Weight NH, Fixed, 95% Cl M-H, Fixed,								-			
Brynlarski 2012 30 32 24 32 24.6% 5.00 [0.97, 25.77] Ozturk 2013 135 144 28 38 45.4% 5.36 [1.99, 14.39] Total (95% Cl) 252 141 100.0% 4.32 [1.99, 9.37] Total events 239 119 Heterogeneity: Chi ² = 0.80, df = 3 ($P = 0.85$); $P = 0$ % 0.005 0.1 1 0 200 Test for overall effect: Z = 3.71 ($P = 0.0002$) Events Total Weight M-H, Fixed, 95% Cl M-H, Fixed, 95% Cl Akman 2011 5 34 4 34 22.9% 1.65 [0.44, 6.16] Image: Size (1.00, 0.1, 1.1, 0.0) Image: Size (1.00, 0.1, 1.2, 0.0) Image: Size (1.00, 0.1, 1.2, 0.0) Image: Size (1.0, 0.1, 1.2, 0.0) Bozkurt 2011 7 42 32 37.2% 1.17 [0.39, 3.57] Image: Size (1.0, 0.1, 1.1, 0.0) Image: Size (1.0, 0.1, 1.2, 0.0) Image: Size (1.0, 0.0, 0.0, 0.0, 0.0) Image: Size (1.0, 0.0, 0.0, 0.0, 0.0)				• •							
Ozturk 2013 135 144 28 38 45.4% 5.36 [1.99, 14.39] Total (95% Cl) 252 141 100.0% 4.32 [1.99, 9.37] Total events 239 119 Heterogeneity: Chi ² = 0.80, df = 3 (p = 0.85); $l2$ = 0% Odds Ratio Odds Ratio Study or Subgroup Events Total Events Cold 4 34 22.1% 1.29 [0.32, 5.30] Bozkurt 2011 7 42 4 37 22.9% 1.65 [0.44, 6.16] [0.01 0.1 1 0 00] Bryniarski 2012 9 32 8 32 37.8% 1.71 [0.39, 3.57]											
Total (95% Cl) 252 141 100.0% 4.32 [1.99, 9.37] Total events 239 119 Heterogeneity: Chi ² = 0.80, df = 3 ($p = 0.85$); $i^{2} = 0$ % 0.005 0.1 1 10 200 Test for overall effect: Z = 3.71 ($p = 0.0802$) PCNL RIRS Odds Ratio Odds Ratio Study or Subgroup PCNL RIRS Odds Ratio M-H, Fixed, 95% Cl M-H, Fixed, 95% Cl Akman 2011 5 34 4 34 22.1% 1.29 [0.32, 5.30] Bozkurt 2011 7 42 4 37 22.9% 1.65 [0.44, 6.16] Bryniarski 2012 9 32 8 32 37.2% 1.17 [0.39, 3.57] Ozdurk 2013 19 144 2 38 1.78% 2.74 [0.61, 12.30] Total (95% Cl) 252 141 100.0% 1.59 [0.84, 3.02]	,										
Total events 239 119 Heterogeneity: Chi ² = 0.80, df = 3 ($p = 0.85$); $p = 0\%$ 0.005 0.1 1 0 200 Test for overall effect: Z = 3.71 ($p = 0.0002$) PCNL RIRS Odds Ratio Odds Ratio Study or Subgroup Events Total Events Total Weight M-H, Fixed, 95% CI M-H, Fixed, 95% CI Akman 2011 5 34 4 34 22.1% 1.29 [0.32, 5.30] 0 Bozkurt 2011 7 42 4 37 22.9% 1.65 [0.44, 6.16] 0 Bryniarski 2012 9 32 8 32 37.2% 1.17 [0.39, 3.57] 0.01 0.1 1 10 100 Total (95% CI) 252 141 100.0% 1.59 [0.84, 3.02] 0.01 0.1 1 10 100 Test for overall effect: Z = 1.41 ($p = 0.16$) 18 Mean Difference Mean Difference Mean Difference Mean Difference Nean Differ	Ozlurk 2013	1	35	144	20	30	40.	476	5.36 [1.89, 14.39]		
Total events 239 119 Heterogeneity: Chi ² = 0.80, df = 3 ($p = 0.85$); $p = 0\%$ 0.005 0.1 1 0 200 Test for overall effect: Z = 3.71 ($p = 0.0002$) PCNL RIRS Odds Ratio Odds Ratio Study or Subgroup Events Total Events Total Weight M-H, Fixed, 95% CI M-H, Fixed, 95% CI Akman 2011 5 34 4 34 22.1% 1.29 [0.32, 5.30] 0 Bozkurt 2011 7 42 4 37 22.9% 1.65 [0.44, 6.16] 0 Bryniarski 2012 9 32 8 32 37.2% 1.17 [0.39, 3.57] 0.01 0.1 1 10 100 Total (95% CI) 252 141 100.0% 1.59 [0.84, 3.02] 0.01 0.1 1 10 100 Test for overall effect: Z = 1.41 ($p = 0.16$) 18 Mean Difference Mean Difference Mean Difference Mean Difference Nean Differ	Total (95% Cl)			252		141	100	0%	4.32 [1.99, 9.37]		•
Heterogeneilty: $Chi^2 = 0.80$, $df = 3$ ($p = 0.85$); $l^2 = 0\%$ Test for overall effect: $Z = 3.71$ ($p = 0.0002$) PCNL RIRS Total Events Total Events Total Weight M-H, Fixed, 95% CI Akman 2011 5 34 4 34 22.1% 1.29 (0.32, 5.30) Bozkurt 2011 7 42 4 37 22.9% 1.65 (0.44, 6.16) Bryniarski 2012 9 32 8 32 37.2% 1.17 (0.39, 3.57) Ozturk 2013 19 144 2 38 17.8% 2.74 (0.61, 12.30) Total (95% CI) 252 141 100.0% 1.59 [0.84, 3.02] Total vents 40 18 Heterogeneity: $Chi^2 = 0.87$, $df = 3$ ($p = 0.83$); $l^2 = 0\%$ Test for overall effect: $Z = 1.41$ ($p = 0.16$) PCNL RIRS Mean Difference IV, Random, 95% CI Nean Difference IV, Random,		2	30		110						•
Test for overall effect: Z = $3.71 (p = 0.0002)$ 0.005 0.1 1 10 200 Favours RIRS Favours RIRS Favours PCNL Study or Subgroup PCNL RIRS Odds Ratio Akman 2011 5 34 4 34 22.1% 1.29 [0.32, 5.30] Bozkurt 2011 7 42 4 37 22.9% 1.65 [0.44, 6.16] Bryniarski 2012 9 32 8 32 37.2% 1.17 [0.39, 3.57] Odds Ratio Odds Ratio Odds Ratio Odds Ratio Bryniarski 2012 9 32 8 32 37.2% 1.17 [0.39, 3.57] Odds Ratio Odds Ratio <tr< td=""><td></td><td>-</td><td>••</td><td>n = 0</td><td></td><td>0%</td><td></td><td></td><td></td><td>+ +</td><td></td></tr<>		-	••	n = 0		0%				+ +	
PCNL RIRS Odds Ratio Odds Ratio Akman 2011 5 34 4 34 22.1% 1.29 0.32, 5.30 M-H, Fixed, 95% CI M-H, Fixed, 95% CI Bozkurt 2011 7 42 4 37 22.9% 1.65 0.44, 6.16 M-H, Fixed, 95% CI M-H, Fixed, 95% CI Bryniarski 2012 9 32 8 32 37.2% 1.17 [0.39, 3.57] Image: Colored				•	,.	0 /0					
Study or Subgroup Events Total Events Total Weight M-H, Fixed, 95% Cl M-H, Fixed, 95% Cl Akman 2011 5 34 4 34 22.1% 1.29 [0.32, 5.30] Bozkurt 2011 7 42 4 37 22.9% 1.65 [0.44, 6.16] Bryniarski 2012 9 32 8 32 37.2% 1.17 [0.39, 3.57] Ozturk 2013 19 144 2 38 17.8% 2.74 [0.61, 12.30] Total (95% Cl) 252 141 100.0% 1.59 [0.84, 3.02] Total (95% Cl) 252 141 100.0% 1.59 [0.84, 3.02] Total (95% Cl) 252 141 100.0% 1.59 [0.84, 3.02] Total (95% Cl) 251.4 34 1.2 1.5 Study or Subgroup Mean SD Total Weight IV, Random, 95% Cl Wman 2011 2.5 1.4 34 1.2 1.5 34 38.6% 1.30 [0.61, 1.99] Kozkurt 2011 2.3 <td></td> <td>1. 2 = 3.1</td> <td>1 (0</td> <td>- 0.00</td> <td>02)</td> <td></td> <td></td> <td></td> <td></td> <td>Favours RI</td> <td>RS Favours PCNL</td>		1. 2 = 3.1	1 (0	- 0.00	02)					Favours RI	RS Favours PCNL
Akman 2011 5 34 4 34 22.1% 1.29 [0.32, 5.30] Bozkurt 2011 7 42 4 37 22.9% 1.65 [0.44, 6.16] Bryniarski 2012 9 32 8 32 37.2% 1.17 [0.39, 3.57] Ozturk 2013 19 144 2 38 17.8% 2.74 [0.61, 12.30] Total (95% Cl) 252 141 100.0% 1.59 [0.84, 3.02] Total events 40 18 Heterogeneity: Chi ² = 0.87, df = 3 ($P = 0.83$); $I^2 = 0\%$ 0.01 0.1 1 10 100 Fest for overall effect: Z = 1.41 ($P = 0.16$) Veight V. Random, 95% Cl IV, Random, 95	С	-				-			Odds Ratio	Od	lds Ratio
Bozkurt 2011 7 42 4 37 22.9% 1.65 [0.44, 6.16] Bryniarski 2012 9 32 8 32 37.2% 1.17 [0.39, 3.57] Ozturk 2013 19 144 2 38 17.8% 2.74 [0.61, 12.30] Total (95% Cl) 252 141 100.0% 1.59 [0.84, 3.02] Total events 40 18 Heterogeneity: Chi ² = 0.87, df = 3 ($P = 0.83$); $I^2 = 0\%$ 1.59 [0.84, 3.02] Test for overall effect: Z = 1.41 ($P = 0.16$) RIRS Mean Difference Mean Difference Study or Subgroup Mean SD Total Mean SD Total Mean pifference Riman 2011 2.5 1.4 34 1.2 1.5 34 38.6% 1.30 [0.61, 1.99] Image: stand of the stand of t	Study or Subgroup	Ever	nts 1	Total	Events	Total	Weig	ght N	1-H, Fixed, 95% CI	M-H, F	ixed, 95% Cl
Bryniarski 2012 9 32 8 32 37.2% 1.17 [0.39, 3.57] Ozturk 2013 19 144 2 38 17.8% 2.74 [0.61, 12.30] Total (95% CI) 252 141 100.0% 1.59 [0.84, 3.02] Total events 40 18 Heterogeneity: Chi ² = 0.87, df = 3 ($P = 0.83$); $I^2 = 0\%$ 1.17 [0.39, 3.57] Test for overall effect: Z = 1.41 ($P = 0.16$) RIRS Mean Difference Mean Difference Study or Subgroup Mean SD Total Mean SD Total Weight 1.30 [0.61, 1.99] Not estimable Study or Subgroup Mean SD Total Mean SD Total Weight 1.30 [0.64, 1.99] Image: Study of 0.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Akman 2011		5	34	4	34	22.	1%	1.29 [0.32, 5.30]	-	
Ozturk 2013 19 144 2 38 17.8% 2.74 [0.61, 12.30] Total (95% Cl) 252 141 100.0% 1.59 [0.84, 3.02] Total events 40 18 Heterogeneity: Chi ² = 0.87, df = 3 ($P = 0.83$); $I^2 = 0\%$ 0.01 0.1 1 10 100 Test for overall effect: Z = 1.41 ($P = 0.16$) RIRS Mean Difference Mean Difference Mean Difference Mean Difference IV, Random, 95% Cl IV, Random, 95% Cl Study or Subgroup Mean SD Total Mean SD Total Weight 1.30 [0.61, 1.99] IV, Random, 95% Cl IV, Random, 95% Cl Study or Subgroup Mean SD Total Mean SD Total Weight 1.30 [0.61, 1.99] IV, Random, 95% Cl Study or Subgroup Mean SD Total Mean SD Total Weight 1.00 [0.47, 1.53] IV, Random, 95% Cl Bozkurt 2011 2.3 1.6 42 1.3 0.7 37 40.7% 1.00 [0.47, 1.53] IV, Random, 95% Cl Octal (95% Cl) 108 103 100.0% 1.84 [0.64, 3.04] IV, Andom, 95% Cl IV, Random, 95% Cl IV, Random, 95% Cl Octal (95% Cl) 108	Bozkurt 2011		7	42	4	37	22.	9%	1.65 [0.44, 6.16]		
Total (95% Cl) 252 141 100.0% 1.59 [0.84, 3.02] Total events 40 18 Heterogeneity: Chi ² = 0.87, df = 3 ($p = 0.83$); $l^2 = 0\%$ 0.01 0.1 1 10 100 Test for overall effect: Z = 1.41 ($p = 0.16$) RIRS Mean Difference Mean Difference Mean Difference IV, Random, 95% Cl IV, Random, 95% Cl Study or Subgroup Mean SD Total Mean SD Total Weight 1.30 [0.61, 1.99] Kman 2011 2.5 1.4 34 1.2 1.5 34 38.6% 1.30 [0.61, 1.99] Bozkurt 2011 2.5 1.4 34 1.2 0.7 37 40.7% 1.00 [0.47, 1.53] Bryniarski 2012 11.3 4.4 32 6.8 3.4 32 20.6% 4.50 [2.57, 6.43] Oztar (95% Cl) 108 103 100.0% 1.84 [0.64, 3.04]	Bryniarski 2012		9	32	8	32	37.				
Total events 40 18 Heterogeneity: Chi ² = 0.87, df = 3 (p = 0.83); $ ^2$ = 0% 0.01 0.1 1 10 100 Test for overall effect: Z = 1.41 (p = 0.16) PCNL RIRS Mean Difference Mean Difference Mean Difference Study or Subgroup Mean SD Total Mean SD Total Mean SD Cl IV, Random, 95% Cl IV, Random, 95% Cl Wama 2011 2.5 1.4 34 1.2 1.5 34 38.6% 1.30 [0.61, 1.99] Image: Color of the color of	Ozturk 2013		19	144	2	38	17.	8%	2.74 [0.61, 12.30]		+
Total events 40 18 Heterogeneity: Chi ² = 0.87, df = 3 (p = 0.83); $ ^2$ = 0% 0.01 0.1 1 10 100 Test for overall effect: Z = 1.41 (p = 0.16) PCNL RIRS Mean Difference Mean Difference Mean Difference Study or Subgroup Mean SD Total Mean SD Total Mean SD Cl IV, Random, 95% Cl IV, Random, 95% Cl Wama 2011 2.5 1.4 34 1.2 1.5 34 38.6% 1.30 [0.61, 1.99] Image: Color of the color of	Total (05% OI)			050			400	0.0/	4 50 10 04 0 000		
Heterogeneity: Chi ² = 0.87, df = 3 (p = 0.83); l ² = 0% O.01 0.1 1 10 100 Test for overall effect: Z = 1.41 (p = 0.16) Mean SD Total Mean SD Total Weight Mean Difference Mean Difference Mean Difference Nean Difference Mean Difference Nean Difference Mean Difference Notal Mean SD Total Mean SD Total Weight N. Rean Difference Mean Difference Mean Difference Mean Difference Mean Difference Notal Mean SD Total Mean SD Total Weight N. Rean Difference Mean Difference Mean Difference Mean Difference Mean Difference Not colspan="4">Not colspan="4"Not colspan="4">Not colspan="4"Not colspan="	. ,			252		141	100.	0%	1.59 [0.84, 3.02]		—
Output of the set of overall effect: Z = 1.41 (p = 0.16) Output of the set of overall effect: Z = 1.41 (p = 0.16) Output of the set of overall effect: Z = 1.41 (p = 0.16) Output of the set of overall effect: Z = 1.41 (p = 0.16) Set of overall effect: Z = 1.41 (p = 0.16) Note of the set of overall effect: Z = 1.41 (p = 0.16) Set of the set of overall effect: Z = 1.41 (p = 0.16) Note of the set of t											
PCNL RIRS Mean Difference Mean Difference Mean Difference Study or Subgroup Mean SD Total Mean SD IV, Random, 95% CI <				•		0%				0.01 0.1	1 10 100
Study or Subgroup Mean SD Total Mean SD Total Weight IV, Random, 95% CI IV, Random, 95% CI kkman 2011 2.5 1.4 34 1.2 1.5 34 38.6% 1.30 [0.61, 1.99] IV, Random, 95% CI IV, Random, 95% CI kkman 2011 2.3 1.6 42 1.3 0.7 37 40.7% 1.00 [0.47, 1.53] IV	lest for overall effec	C Z = 1.4	1 (P	= 0.16)					Favours PCN	L Favours RIRS
kkman 2011 2.5 1.4 34 1.2 1.5 34 38.6% 1.30 [0.61, 1.99] Bozkurt 2011 2.3 1.6 42 1.3 0.7 37 40.7% 1.00 [0.47, 1.53] Bryniarski 2012 11.3 4.4 32 6.8 3.4 32 20.6% 4.50 [2.57, 6.43] Dzturk 2013 0 0 0 0 0 Not estimable Fotal (95% CI) 108 103 100.0% 1.84 [0.64, 3.04] Letterogeneilty: Tau ² = 0.84; Chi ² = 11.79, df = 2 (p = 0.003); l ² = 83% -4 -2 0 2	D	P	CNL		RI	RS			Mean Difference	M	lean Difference
Akman 2011 2.5 1.4 34 1.2 1.5 34 38.6% 1.30 [0.61, 1.99] bozkurt 2011 2.3 1.6 42 1.3 0.7 37 40.7% 1.00 [0.47, 1.53] bryniarski 2012 11.3 4.4 32 6.8 3.4 32 20.6% 4.50 [2.57, 6.43] Dzturk 2013 0 0 0 0 0 Not estimable Fotal (95% CI) 108 103 100.0% 1.84 [0.64, 3.04] Leterogeneily: Tau ² = 0.84; Chi ² = 11.79, df = 2 (p = 0.003); l ² = 83% -4 -2 0 2	Study or Subgroup	Mean	SD	Total	Mean	SD T	otal V	Veight	IV, Random, 95%	CI IV,	Random, 95% CI
Bozkurt 2011 2.3 1.6 42 1.3 0.7 37 40.7% 1.00 [0.47, 1.53] Bryniarski 2012 11.3 4.4 32 6.8 3.4 32 20.6% 4.50 [2.57, 6.43] Dzturk 2013 0 0 0 0 0 Not estimable Fotal (95% CI) 108 103 100.0% 1.84 [0.64, 3.04] Letterogeneilty: Tau ² = 0.84; Chi ² = 11.79, df = 2 (<i>p</i> = 0.003); l ² = 83% -4 -2 0 2	Akman 2011	2.5	1.4	34	1.2	1.5	34	38.6%			
Bryniarski 2012 11.3 4.4 32 6.8 3.4 32 20.6% 4.50 [2.57, 6.43] Dzturk 2013 0 0 0 0 0 Not estimable Fotal (95% CI) 108 103 100.0% 1.84 [0.64, 3.04] I eterogeneily: Tau ² = 0.84; Chi ² = 11.79, df = 2 (p = 0.003); l ² = 83% -4 -2 0 2	Bozkurt 2011	2.3	1.6	42	1.3	0.7	37	40.7%			
Discrete for comparison of the strength of the strengh of the strength of the strength of the s	Bryniarski 2012	11.3	4.4	32	6.8	3.4	32	20.6%			
Heterogeneity: Tau ² = 0.84; Chi ² = 11.79, df = 2 (p = 0.003); l ² = 83% -4 -2 0 2 4	Ozturk 2013	0	0	0	0	0	0		• •		
Heterogeneity: Tau ² = 0.84; Chi ² = 11.79, df = 2 (p = 0.003); l ² = 83% -4 -2 0 2 4	Total (95% CI)			108			103 1	00.0%	1.84 (0.64 3.0	141	•
-4 -2 0 2 4		0.84. Ch	12 = 4		f = 2 (n)				1.04 [0.04, 0.0		
Favours PCNL Favours RIRS					· ·	0.000	, · · -	00%			
	reation overall dildct.	0.01	V#	0.003)						Favours	PCNL Favours RIRS

Figure 3. Forest map of percutaneous percutaneous nephrolithotripsy subgroup: A: Operation time, B: Stone removal rate, C: Finished rate, D: Hospitalization time.

stone size was relatively small for MIPPs operations. The position of the stone would also influence the removal efficiency. If the minimum of urethra was more than 1.5 cm, it would be more convenient to use percutaneous strategy, so it could reach the stone position directly. And the stone-free rate would be improved because the debris would be discharged with urine after operation.

The overall analysis showed that compared with RIRS, PCNL had higher complication rate

(OR: 1.61; 95% CI, 1.11-2.35; P < 0.01). Fever (PCNL: 3-25%; RIRS: 2-28%), long-term use of antibiotics (PCNL: 2-8%; RIRS: 4-5%) and hematosepsis (PCNL: 0.5-2%; RIRS: 3-5%). Haemorrhage problem made most complications of PCNL [26], which mentioned that hemoglobin value was decreased (WMD: 0.87 g/deciliter; 95% CI, 0.51-1.22; P < 0.00001). 5.5% patients with PCNL received transfusion. Distinctive PCNL extended urinary extravasation (N = 4), embolism (N = 1), injury of pleura (N = 1) and pelvic perforation (N = 2) and ureteral injury (N

Meta analysis on the treatment of renal calculus



Figure 4. Forest map of Minimally invasive percutaneous procedure subgroup: A: Operation time, B: Stone removal rate, C: Finished rate, D: Hospitalization time.

= 2) needed to re-open (N = 1) specific RIRS. There was no obvious difference in the complication rate between MIPPs and standard PCNL, RIRS. Tyson and the colleagues reported that pulmonary disease (OR: 7.77), blood coagulation (OR: 6.16), anemia (OR: 3.82), paralysis (OR: 2.16) and other complications were the risk factor of increasing the expenses in the hospital [27].

Some parameters in this study had high heterogenicity. This kind of heterogenicity could be explained as the difference of surgery practice, follow-up method, follow-up frequency and results. The studies of MIPPs and RIRS should be compared by focusing on the operation of RIRS. Most of them used the ureter to enter sheath, semi rigid ureter mirror (dilated ureter), lower pole calculus shift and selective stent insertion. About percutaneous procedure, some studies [2, 21, 25] used intraoperative ultrasound imaging, follow up CT imaging and etc. The usage of these methods could also cause the bias in the results of the MIPPs study. The meta analysis showed that compared with RIRS, PCNL could provide higher stone-free rate, but its complication rate was also higher, hemorrhage and hospitalization time was longer, but there was no obvious difference in operation time. While compared with MIPPs, RIRS could provide higher stone-free rate. Considering MIPPs could increase the mortality rate and decrease the stone-free rate, which stone diameter was less than 2 cm, RIRS should be regarded as the first choice for treating this kind of stone, while MIPPs could be adopted under the situation of the surgical instruments and the experience of the operator was not enough.

Disclosure of conflict of interest

None.

Address correspondence to: Jianpeng You, Guangxi University of Chinese Medicine, NO. 179, Mingxiu East Road, Nanning 530011, China. E-mail: youjian201600@sina.cn

References

- [1] Breda A, Ogunyemi O, Leppert JT, Lam JS, Schulam PG. Flexible ureteroscopy and laser lithotripsy for single intrarenal stones 2 cm or greater-is this the new frontier? J Urol 2008; 179: 981-984.
- [2] Turk C, Knoll T, Petrik A. Guidelines on urolithiasis. european urological association web site. Updated 2014.
- [3] de la Rosette JJ, Opondo D, Daels FP, Giusti G, Serrano A, Kandasami SV, Wolf JS Jr, Grabe M, Gravas S; CROES PCNL Study Group. Categorisation of complications and validation of the Clavien score for percutaneous nephrolithotomy. Eur Urol 2012; 62: 246-255.
- [4] Monga M, Oglevie S. Minipercutaneous nephorlithotomy. J Endourol 2000; 14: 419-421.
- [5] Desai MR, Sharma R, Mishra S, Sabnis RB, Stief C, Bader M. Singlestep percutaneous nephrolithotomy (microperc): the initial clinical report. J Urol 2011; 186: 140-145.
- [6] Grasso M, Ficazzola M. Retrograde ureteropyeloscopy for lower pole caliceal calculi. J Urol 1999; 162: 1904-1908.
- [7] Schoenthaler M, Wilhelm K, Katzenwadel A, Ardelt P, Wetterauer U, Traxer O, Miernik A. Retrograde intrarenal surgery in treatment of nephrolithiasis: is a 100% stone-free rate achievable? J Endourol 2012; 26: 489-493.
- [8] Landman J, Lee DI, Lee C, Monga M. Evaluation of overall costs of concurrently available

small flexible ureteroscopes. Urology 2003; 62: 218-222.

- [9] Phillips B, Ball C, Sackett D. Oxford Centre for Evidence-based Medicine-levels of evidence (March 2009). Centre for Evidence- Based Medicine Web site. Accessed March 30, 2014.
- [10] Wells GA, Shea B, O'Connell D. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomized studies in metaanalyses. Ottawa Hospital Research Institute Web site.
- [11] Clark HD, Wells GA, Huët C, McAlister FA, Salmi LR, Fergusson D, Laupacis A. Assessing the quality of randomized trials: reliability of the Jadad scale. Control Clin Trials 1999; 20: 448-452.
- [12] Resorlu B, Unsal A, Ziypak T, Diri A, Atis G, Guven S, Sancaktutar AA, Tepeler A, Bozkurt OF, Oztuna D. Comparison of retrograde intrarenal surgery, shockwave lithotripsy, and percutaneous nephrolithotomy for treatment of medium-sized radiolucent renal stones. World J Urol 2013; 31: 1581-1586.
- [13] Kruck S, Anastasiadis AG, Herrmann TR, Walcher U, Abdelhafez MF, Nicklas AP, Hölzle L, Schilling D, Bedke J, Stenzl A, Nagele U. Minimally invasive percutaneous nephrolithotomy: an alternative to retrograde intrar- enal surgery and shockwave lithotripsy. World J Urol 2013; 31: 1555-1561.
- [14] Hozo SP, Djulbegovic B, Hozo I. Estimating the mean and variance from the median, range, and the size of a sample. BMC Med Res Methodol 2005; 5: 13.
- [15] Akman T, Binbay M, Ozgor F, Ugurlu M, Tekinarslan E, Kezer C, Aslan R, Muslumanoglu AY. Comparison of percutaneous nephrolithotomy and retrograde flexible nephrolithotripsy for the management of 2-4 cm stones: a matchedpair analysis. BJU Int 2012; 109: 1384-1389.
- [16] Bozkurt OF, Resorlu B, Yildiz Y, Can CE, Unsal A. Retrograde intrar- enal surgery versus percutaneous nephrolithotomy in the management of lower-pole renal stones with a diameter of 15 to 20 mm. J Endourol 2011; 25: 1131-1135.
- [17] Bryniarski P, Paradysz A, Zyczkowski M, Kupilas A, Nowakowski K, Bogacki R. A randomized controlled study to analyze the safety and efficacy of percutaneous nephrolithotripsy and retrograde intrar- enal surgery in the management of renal stones more than 2 cm in diameter. J Endourol 2012; 26: 52-57.
- [18] Ozturk U, SenerNC, Goktug HN, Nalbant I, Gucuk A, Imamoglu MA. Comparison of percutaneous nephrolithotomy, shock wave lithotripsy, and retrograde intrarenal surgery for lower pole renal calculi 10-20 mm. Urol Int 2013; 91: 345-349.

- [19] Sabnis RB, Jagtap J, Mishra S, Desai M. Treating renal calculi 1-2 cm in diameter with minipercutaneous or retrograde intrarenal surgery: a prospective comparative study. BJU Int 2012; 110: E346-349.
- [20] Kirac M, Bozkurt OF, Tunc L, Guneri C, Unsal A, Biri H. Comparison of retrograde intrarenal surgery and mini-percutaneous nephrolithotomy in management of lower-pole renal stones with a diameter of smaller than 15 mm. Urolithiasis 2013; 4: 241-246.
- [21] Pan J, Chen Q, Xue W, Chen Y, Xia L, Chen H, Huang Y. RIRS versus mPCNL for single renal stone of 2-3 cm: clinical outcome and cost-effective analysis in Chinese medical setting. Urolithiasis 2013; 41: 73-78.
- [22] Sabnis RB, Ganesamoni R, Doshi A, Ganpule AP, Jagtap J, Desai MR. Micropercutaneous nephrolithotomy (microperc) vs retrograde intrarenal surgery for the management of small renal calculi: a randomized controlled trial. BJU Int 2013; 112: 355-361.
- [23] Rodrigues Netto N Jr, Lemos GC, Palma PC, Fiuza JL. Staghorn calculi: percutaneous versus anatrophic nephrolithotomy. Eur Urol 1988; 15: 9-12.

- [24] Hyams ES, Munver R, Bird VG, Uberoi J, Shah O. Flexible ureteror- enoscopy and holmium laser lithotripsy for the management of renal stone burdens that measure 2 to 3 cm: a multiinstitutional experience. J Endourol 2010; 24: 1583-1588.
- [25] Mariani AJ. Combined electrohydraulic and holmium: YAG laser ureteroscopic nephrolithotripsy of large (greater than 4 cm) renal calculi. J Urol 2007; 177: 168-173.
- [26] Armitage JN, Withington J, van der Meulen J, Cromwell DA, Glass J, Finch WG, Irving SO, Burgess NA. Percutaneous nephrolithotomy in England: practice and outcomes described in the Hospital Episode Statistics database. BJU Int 2014; 113: 777-782.
- [27] Tyson MD, Humphreys MR. Postoperative complications after percutaneous nephrolithotomy: a contemporary analysis by insurance status in the United States. J Endourol 2014; 28: 291-297.