

Comparison of Perioperative and Functional Outcomes between Standard Laparoscopic and Robotic-Assisted Radical Prostatectomy: A Systemic Review and Meta-Analysis

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Received: Nov. 1st, 2018; accepted: Nov. 22nd, 2018; published: Nov. 29th, 2018

Abstract

[Objective] The goal of this study was to perform a systemic review and meta-analysis to evaluate the perioperative and functional outcomes between laparoscopic radical prostatectomy (LRP) and robotic-assisted radical prostatectomy (RARP). [Methods] A literature search of EMBASE, MEDLINE, PubMed, and Cochrane Library databases was conducted. We selected randomized controlled trials (RCTs) and non-randomized comparative studies (including prospective and retrospective studies) comparing perioperative and functional outcomes of both LRP and RARP, and meta-analysis was applied using the Review Manager 5.3 software. [Results] Twenty-four studies were identified in the literature search, including 2 RCTs, 7 prospective studies, and 15 retrospective studies. LRP and RARP showed similarity in the operative time, catheterization duration, in-hospital stay, and overall complication rate ($P > 0.05$). However, blood loss and transfusion rate were lower in RARP ($P < 0.05$). Moreover, RARP was associated with significantly improved outcomes for continence and potency rates to those of LRP at 3, 6, and 12 months postoperatively ($P < 0.05$). [Conclusion] RARP was associated with lower blood loss and transfusion rate and much greater functional outcomes in contrast to LRP.

Keywords

Prostate Cancer, Radical Prostatectomy, Laparoscopy, Robotics, Meta-Analysis

机器人辅助腹腔镜与标准腹腔镜前列腺癌根治术疗效比较的Meta分析

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收稿日期: 2018年11月1日; 录用日期: 2018年11月22日; 发布日期: 2018年11月29日

摘要

[目的] 评价机器人辅助腹腔镜前列腺癌根治术(RARP)与标准腹腔镜前列腺癌根治术(LRP)治疗局限性前列腺癌的临床疗效。**[方法]** 检索EMBASE、MEDLINE、PubMed、Cochrane图书馆, 并选择有关LRP与RARP临床疗效的随机对照研究(RCTs)和非随机对照研究(包括前瞻和回顾性研究), 应用系统评价软件Rev Man5.3进行Meta分析。**[结果]** 通过文献检索共纳入24个研究, 包括2个RCTs、7个前瞻性和15个回顾性研究。Meta分析表明: 两组在手术时间、导尿管留置时间、住院时间和总体并发症发生率方面无统计学差异($P > 0.05$)。但在失血量、输血率、术后3、6、12月的控尿和勃起功能恢复方面, RARP组明显优于LRP组($P < 0.05$)。**[结论]** 与LRP相比, RARP在局限性前列腺癌的手术治疗中出血量少、输血率低, 且在术后控尿和勃起功能恢复上较LRP更有优势。

关键词

前列腺癌, 根治性前列腺切除术, 腹腔镜, 机器人, Meta分析

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1. 引言

前列腺癌是老年男性最常见的恶性肿瘤之一, 随着我国人口老龄化, 前列腺癌在我国的发病率和死亡率逐年升高。根治性前列腺切除术是临床局限性前列腺癌患者唯一的手术选择[1]。随着微创外科技术的迅猛发展, 根治性前列腺切除术最主要的微创手术方式包括标准腹腔镜根治性前列腺切除术(laparoscopic radical prostatectomy, LRP)和机器人辅助腹腔镜根治性前列腺切除术(robotic-assisted radical prostatectomy, RARP)。与LRP相比, RARP具有更好的视觉放大效果、3D手术视角、操作精细灵活等优点, 在世界范围内的应用越来越广泛[2]。

近年来, 有两项关于LRP与RARP临床疗效的随机对照研究(randomized controlled trails, RCTs)证实: RARP在控尿和勃起功能恢复上具有明显优势[3] [4]。但是, 其他系统性回顾研究又表明二者在围手术期及功能恢复上无明显差异[2] [5] [6]。因此, 我们采用Meta分析方法对相关的临床对照研究进行定量评价, 以探讨二者在围手术期和术后功能恢复方面的疗效差异, 为今后临床决策提供一定的理论参考。

2. 资料与方法

2.1. 文献检索策略

我们检索EMBASE、MEDLINE、PubMed、Cochrane图书馆, 并选择有关LRP与RARP临床疗效的对照研究(截止至2016年7月)。检索中以“radical prostatectomy, laparoscopic, robotic”为英文检索词, 三者之间逻辑操作符为“AND”。并对入选文献的参考文献进行二次检索。

2.2. 纳入/排除标准

纳入标准：1) 研究类型：检索上述数据库中有关 LRP 和 RARP 治疗前列腺癌的临床对照研究文献，研究设计为 RCTs 和非随机对照研究(包括前瞻性和回顾性研究)。2) 病例类型：首次治疗的临床局限性前列腺癌患者，且均有前列腺癌手术指征。3) 观察指标：两种手术方式的手术时间、失血量、输血率、导尿管留置时间、住院时间、总体并发症发生率、术后 3、6、12 月的控尿和勃起功能恢复率。

排除标准：1) 非对照研究；2) 研究设计有缺陷、质量差，统计学方法错误且无法修正或原始数据提供不完整；3) 晚期前列腺癌或合并其他恶性肿瘤患者，入组前接受过内分泌治疗、放疗、化疗等，且治疗导致不同预后者；4) 对于重复报告，只纳入发表日期较新的研究。

2.3. 数据提取

根据纳入/排除标准筛选文献，两位研究者单独提取数据记录在提前制定的数据表中，并交叉审核，意见不一致时通过讨论决定或者由第三者来裁决。针对纳入研究的特征，提取的数据包括：第一作者、发表年份、国家、研究设计及证据水平；患者特征指标包括：年龄、体重指数(body mass index, BMI)和术前前列腺特异性抗原(prostate-specific antigen, PSA)值；围手术期指标包括：手术时间、失血量、输血率、导管留置时间、住院时间和并发症发生率；功能恢复指标包括：控尿和勃起功能。使用 Cochrane 系统评价员手册对纳入的 RCTs 进行偏倚风险评价。

2.4. 统计学分析

采用英国牛津大学 Cochrane 协作网推荐的系统评价软件 RevMan5.3 进行 Meta 分析。连续性变量采用均数差值(MD)、二分类变量采用比值比(OR)及它们的 95%可信区间(CI)对结果进行描述， $P < 0.05$ 为差异有统计学意义。通过 Cochrane Q 检验来评估纳入研究的异质性，若 $P > 0.05$ ， $I^2 < 50\%$ ，认为各研究间不具异质性，采用固定效应模型，用 Mantel-Haenszel 法(M-H)分析；若 $P < 0.05$ ， $I^2 > 50\%$ ，认为各研究间存在异质性，采用随机效应模型，用 Inverse-Variance 法分析。

3. 结果

3.1. 文献检索结果

文献筛选过程见图 1。通过初筛纳入文献 3103 篇，阅读文献标题和摘要后排除 2933 篇。初步纳入文献 170 篇，通过阅读全文，按照图 1 所示原因排除了 148 篇文献，同时对纳入文献的参考文献进行二次检索，纳入 2 篇文献。最终，共有 24 篇文献纳入本 Meta 分析[3] [4] [7]-[28]。在上述 24 篇文献中，21 篇报道了围手术期结果和并发症[3] [4] [7]-[13] [15]-[23] [26] [27] [28]，15 篇报道了术后尿控恢复情况[3] [4] [7] [9] [10] [12] [15] [17] [18] [19] [21] [23] [26] [27] [28]，13 篇报道了术后勃起功能恢复情况[3] [4] [9] [10] [15] [17] [18] [19] [21] [23] [26] [27] [28]。

3.2. 研究的基本特性

本研究共纳入 9178 例患者，5064 例患者行 LRP，4114 例患者行 RARP。在纳入的 24 个研究中，有 2 个随机对照研究(证据级别 1b) [3] [4]，7 个前瞻性研究(证据级别 2b) [8] [9] [14] [16] [20] [21] [23]，7 个病例对照的回顾性研究(证据级别 3b) [7] [11] [15] [17] [19] [22] [28]，以及 8 个研究病例系列或使用历史病例作为对照的回顾性研究(证据级别 4) [10] [12] [13] [18] [24] [25] [26] [27]。两项 RCTs 研究的偏倚风险为中等(图 2)。纳入研究的基本特征详见表 1。

Table 1. Characteristics of studies included in the meta-analysis
表 1. 纳入研究的文献特征

First author	Cases	Operative time, min, mean/median	Blood loss, ml, mean/median	Transfusion n (%)	Catheterization duration d (range)	In-hospital stay d (range)	Overall Complications n (%)
Asawabhanuj 2014 [7]	561 LRP 486 RARP	255 (125 - 680) 210 (105 - 730)	766 (40 - 6,000) 449 (20 - 2,600)	141 (25.2) 37 (7.6)	-	8.6 (3 - 149) 7 (2 - 35)	239 (42.6) 102 (21.0)
Asimakopoulos 2011 [13]	60 LRP 52 RARP	-	-	3 (5.0) 0 (0)	7.45 ± 2.3 7.25 ± 2.7	-	5 (8.3) 8 (15.4)
Asimakopoulos 2013 [8]	91 LRP 136 RARP	-	-	-	-	-	11 (12.1) 20 (14.7)
Berge 2013 [9]	210 LRP 210 RARP	182 ± 44 170 ± 39	203 ± 226 190 ± 187	6 (2.9) 8 (3.8)	-	-	-
Hakimi 2009 [10]	75 LRP 75 RARP	232 (170 - 385)	311 (100 - 800)	-	-	3.4 (2 - 12)	11 (14.7)
Hu 2006 [11]	358 LRP 322 RARP	246 (150 - 768) 186 (114 - 528)	200 (0 - 1,500) 250 (50 - 1,600)	8 (2.2) 5 (1.6)	-	1.95 (1 - 7)	8 (10.7) 99 (27.7)
Joseph 2005 [12]	50 LRP 50 RARP	264 277	299 206	-	-	-	47 (14.6)
Kasraeian 2011 [13]	200 LRP 200 RARP	150 (75 - 300) 120 (60 - 240)	400 (50 - 1,300) 350 (50 - 1,500)	-	-	4 (3 - 23) 4 (3 - 11)	-
Ku 2015 [15]	100 LRP 50 RARP	118.1 ± 39.1 145.5 ± 43.6	-	-	-	6.6 ± 1.1 6.4 ± 0.9	-
Menon 2002 [16]	40 LRP 40 RARP	258 ± 80.2 274 ± 94.2	391 ± 278.7 256 ± 164.3	1 (2.5) 0 (0)	-	-	4 (10.0) 2 (5.0)
Papachristos 2015 [17]	100 LRP 100 RARP	195 (115 - 300) 195 (140 - 330)	300 (50 - 900) 300 (50 - 1,000)	1 (1.0) 0 (0)	-	2 (1 - 7) 2 (1 - 5)	12 (12.0) 9 (9.0)
Park 2011 [18]	62 LRP 44 RARP	308 (158 - 456) 371 (240 - 720)	214 (50 - 600) 220 (50 - 700)	0 (0) 1 (2.3)	9 8	7 7	7 (11.3) 5 (11.4)
Park 2013 [19]	144 LRP 183 RARP	290 (158 - 456) 250 (126 - 690)	150 (30 - 600) 200 (30 - 1,500)	1 (0.7) 1 (0.5)	7 (4 - 18) 7 (4 - 13)	7 (5 - 33) 6 (4 - 50)	27 (18.8) 22 (12.0)
Ploussard 2009 [20]	205 LRP 83 RARP	164.7 ± 49.1 145.6 ± 34.4	889 ± 531 469 ± 380	9 (4.6) 2 (2.4)	8.5 ± 2.6 8.1 ± 1.9	4.6 ± 1.7 4.4 ± 2.5	17 (8.3) 3 (3.6)
Ploussard 2014 [21]	1377 LRP 1009 RARP	175.5 128.9	800.3 515.4	65 (4.7) 29 (2.9)	7.2 8.0	5.7 4.0	150 (10.9) 165 (16.4)
Popiglia 2013 [4]	60 LRP 60 RARP	138.1 ± 29.7 147.6 ± 27.1	234.1 ± 150.1 202.0 ± 124.0	-	7.0 ± 0.5 7.5 ± 3.9	4.8 ± 1.9 4.6 ± 2.1	7 (11.6) 10 (16.6)
Rozet 2007 [22]	133 LRP 133 RARP	160 (90 - 270) 166 (90 - 300)	512 (70 - 1,800) 609 (100 - 3,000)	13 (9.8) 4 (3.0)	9.0 (7 - 31) 9.2 (6 - 29)	4.9 (3 - 20) 5.4 (3 - 26)	12 (9.1) 26 (19.4)
Stolzenburg 2013 [23]	100 LRP 100 RARP	128.4 ± 35.4 153.95 ± 38.5	200 ± 125 254 ± 126.9	0 (0) 0 (0)	5.89 (4 - 18) 6.2 (5 - 20)	-	6 (6.0) 14 (14.0)
Trabulsi 2010 [26]	45 LRP 205 RARP	300 (210 - 480) 190 (120 - 330)	299 (50 - 5,500) 259 (50 - 2,500)	2 (4.4) 4 (2.0)	-	2.63 (1 - 8) 1.60 (1 - 6)	-
Willis 2011 [27]	161 LRP 121 RARP	283.2 ± 39.6 280.8 ± 44.4	172.9 ± 95.2 148.4 ± 87.0	-	-	2.1 ± 0.5 2.2 ± 1.6	-
Wolanski 2012 [28]	87 LRP 73 RARP	170 190	200 200	-	-	2 (1 - 14) 2 (1 - 11)	25 (28.7) 12 (16.4)

LRP = laparoscopic radical prostatectomy; RARP = robotic-assisted radical prostatectomy; BMI = body mass index; PSA = prostate-specific antigen; RCT = randomized controlled trial. * Statistically significant

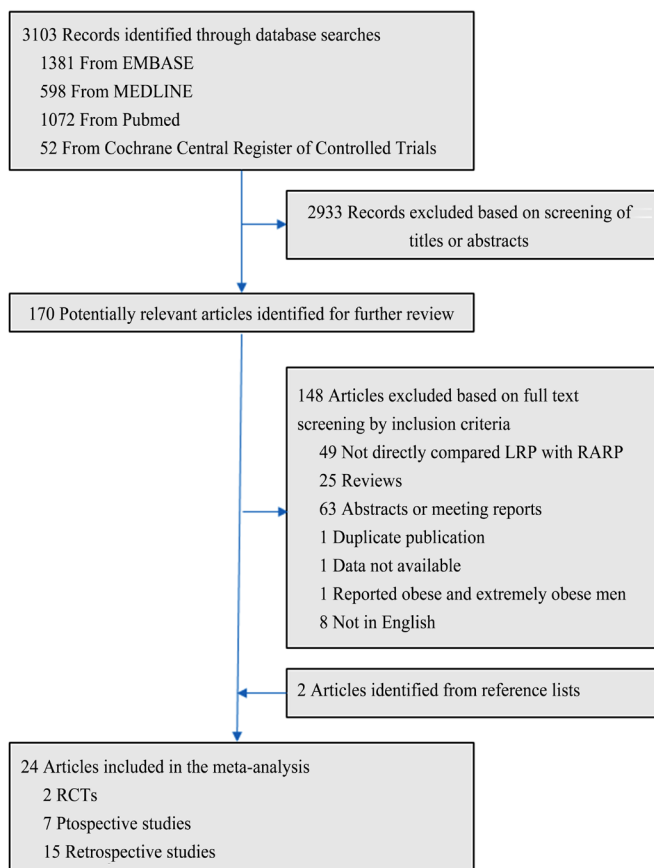


Figure 1. Flowchart of the meta-analysis

图 1. 文献筛选流程图

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Asimakopoulos 2011	+	-	-	+	?	+	?
Porpiglia 2013	+	-	-	?	?	+	?

Figure 2. Risk of bias for eligible randomized controlled trials

图 2. 随机对照试验偏倚风险总结图

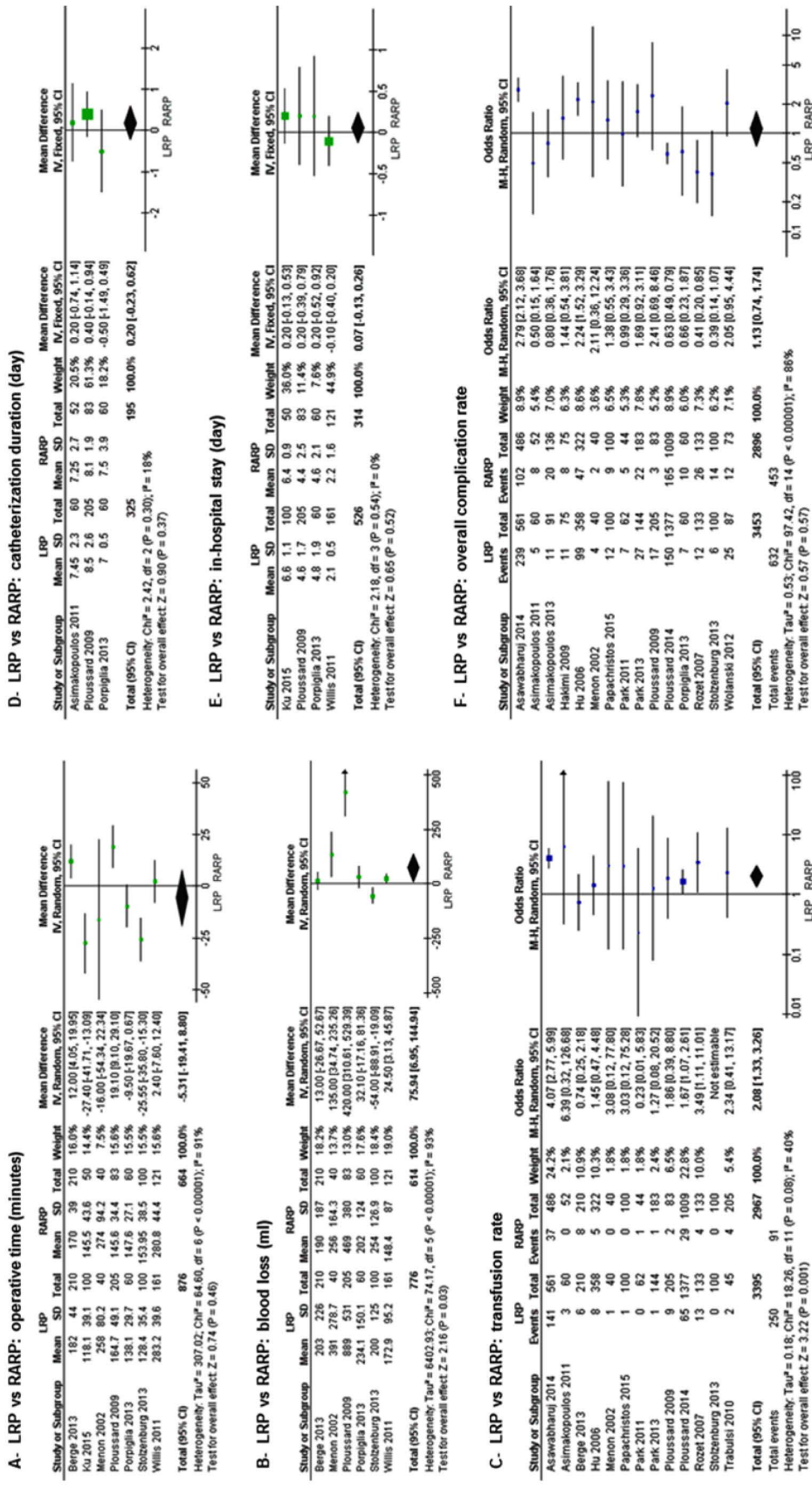


Figure 3. Comparison of perioperative outcomes and complications following LRP and RARP ((A): operative time; (B): blood loss; (C): transfusion rate; (D): catheterization duration; (E): in-hospital stay; (F): overall complication rate)
图 3. LRP 与 RARP 围手术期指标及并发症发生率比较的 Meta 分析结果((A): 手术时间; (B): 出血量; (C): 输血率; (D): 尿管留置时间; (E): 住院时间; (F): 总体并发症发生率)

Table 2. Perioperative outcomes and complications in the comparative studies evaluating LRP and RARP
表 2. LRP 与 RARP 围手术期指标比较

First author	Cases	Operative time, min, mean/median	Blood loss, ml, mean/median	Transfusion n (%)	Catheterization duration d (range)	In - hospital stay d (range)	Overall Complications n (%)
Aswabharuj 2014 [7]	561 LRP 486 RARP	255 (125 - 680) 210 (105 - 730)	766 (40 - 6,000) 449 (20 - 2,600)	141 (25.2) 37 (7.6)	- 7.45 ± 2.3 7.25 ± 2.7	8.6 (3 - 149) 7 (2 - 35)	239 (42.6) 102 (21.0)
Asimakopoulos 2011 [13]	60 LRP 52 RARP	-	-	3 (5.0) 0 (0)	-	-	5 (8.3) 8 (15.4)
Asimakopoulos 2013 [8]	91 LRP 136 RARP	-	-	-	-	-	11 (12.1) 20 (14.7)
Berge 2013 [9]	210 LRP 210 RARP	182 ± 44 170 ± 39	203 ± 226 190 ± 187	6 (2.9) 8 (3.8)	-	-	-
Hakimi 2009 [10]	75 LRP 75 RARP	232 (170 - 385) 199 (75 - 360)	311 (100 - 800) 230 (50 - 1500)	-	-	3.4 (2 - 12) 1.95 (1 - 7)	11 (14.7) 8 (10.7)
Hu 2006 [11]	358 LRP 322 RARP	246 (150 - 768) 186 (114 - 528)	200 (0 - 1,500) 250 (50 - 1,600)	8 (2.2) 5 (1.6)	-	-	99 (27.7) 47 (14.6)
Joseph 2005 [12]	50 LRP 50 RARP	264 277	299 206	-	-	-	-
Kasraeian 2011 [13]	200 LRP 200 RARP	150 (75 - 300) 120 (60 - 240)	400 (50 - 1,300) 350 (50 - 1,500)	-	-	4 (3 - 23) 4 (3 - 11)	-
Ku 2015 [15]	100 LRP 50 RARP	118.1 ± 39.1 145.5 ± 43.6	-	-	-	6.6 ± 1.1 6.4 ± 0.9	-
Menon 2002 [16]	40 LRP 40 RARP	258 ± 80.2 274 ± 94.2	391 ± 278.7 256 ± 164.3	1 (2.5) 0 (0)	-	-	4 (10.0) 2 (5.0)
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Park 2011 [18]	62 LRP 44 RARP	308 (158 - 456) 371 (240 - 720)	214 (50 - 600) 220 (50 - 700)	0 (0) 1 (2.3)	9 8	7 7	7 (11.3) 5 (11.4)
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Stolzenburg 2013 [23]	100 LRP 100 RARP	128.4 ± 35.4 153.95 ± 38.5	200 ± 125 254 ± 126.9	0 (0) 0 (0)	5.89 (4 - 18) 6.2 (5 - 20)	-	6 (6.0) 14 (14.0)
Trabulsi 2010 [26]	45 LRP 205 RARP	300 (210 - 480) 190 (120 - 330)	299 (50 - 5,500) 259 (50 - 2,500)	2 (4.4) 4 (2.0)	-	2.63 (1 - 8) 1.60 (1 - 6)	-
Willis 2011 [27]	161 LRP 121 RARP	283.2 ± 39.6 280.8 ± 44.4	172.9 ± 95.2 148.4 ± 87.0	-	-	2.1 ± 0.5 2.2 ± 1.6	-
Wolanski 2012 [28]	87 LRP 73 RARP	170 190	200 200	-	-	2 (1 - 14) 2 (1 - 11)	25 (28.7) 12 (16.4)

LRP = laparoscopic radical prostatectomy; RARP = robotic-assisted radical prostatectomy

3.3. 围手术期结果及并发症

LAP 和 RARP 两组在手术时间、失血量、输血率、导尿管留置时间、住院时间和总体并发症发生率的比较详见表 2。Meta 分析显示：两组在手术时间上无明显差异(MD: -5.31 分; 95% CI: -19.41 to 8.80; $P = 0.46$) (图 3(A))，而在失血量(MD: 75.94 ml; 95% CI: 6.95 to 144.94; $P = 0.03$)和输血率(OR: 2.08; 95% CI: 1.33 to 3.26; $P = 0.001$)上 RARP 组则明显降低(图 3(B)、图 3(C))。

两组间导尿管留置时间无明显差异(MD: 0.20 天; 95% CI: -0.23 to 0.62; $P = 0.37$)，且具有较低的异质性($P = 0.30$; $I^2 = 18\%$) (图 3(D))。同样，两组间住院时间的差异也无统计学意义(MD: 0.07 day; 95% CI: -0.13 to 0.26; $P = 0.52$)，采用固定效应模型，Q 检验无异质性($P = 0.54$; $I^2 = 0\%$) (图 3(E))。

此外，LRP 组总体并发症发生率为 18.3% (632/3453)，而 RARP 组为 15.6% (453/2896)，Meta 分析显示两组并发症发生率比较无明显差异(OR: 1.13; 95% CI: 0.74 to 1.74; $P = 0.57$) (图 3(F))。

3.4. 功能恢复情况

3.4.1. 控尿功能恢复

LRP 和 RARP 两组术后 3、6 和 12 月的控尿恢复情况详见表 3。在报道控尿恢复的 15 个研究中，有 11 个将不用尿垫或没有漏尿定义为控尿恢复，而其他 4 个则认为不用或每天仅使用 1 片尿垫为控尿恢复。两者相比，前者对控尿的定义更加严格。因此，我们将更控尿定义更为严格的研究纳入 Meta 分析[3] [7] [9] [10] [12] [15] [17] [19] [21] [27] [28]。

LRP 术后 3、6 和 12 月的尿失禁发生率分别为：56.8% (1263/2224)，44.9% (1038/2310)和 29.8% (772/2593)。而 RARP 术后 3、6 和 12 月的尿失禁发生率分别为：44.9% (801/1783)，27.7% (520/1, 879)和 20.8% (442/2, 126)。Meta 分析显示：在术后 3 (OR: 1.73; 95% CI: 1.30 to 2.32; $P = 0.0002$)、6 (OR: 2.20; 95% CI: 1.60 to 3.04; $P < 0.00001$)和 12 月(OR: 1.62; 95% CI: 1.20 to 2.17; $P = 0.001$)的比较中，RARP 术后控尿恢复均具有明显优势(图 4(A)-(C))。

3.4.2. 勃起功能恢复

LRP 和 RARP 两组术后 3、6 和 12 月的勃起功能恢复情况详见表 3。勃起功能恢复定义为性交时阴茎充分的勃起或 IIEF-5 评分 > 17 分。在 13 个报道术后勃起功能恢复的研究中，保留双侧勃起神经 8 个[3] [9] [10] [17] [21] [26] [27] [28]，保留单侧或双侧的 5 个[4] [15] [18] [19] [23]。其中有 1 个研究患者术前勃起功能不详，将该研究剔除[15]。

LRP 术后 3、6 和 12 月的勃起功能障碍发生率分别为：82.5% (1091/1323)，74.5% (872/1170)和 62.7% (801/1278)。而 RARP 术后 3、6 和 12 月的勃起功能障碍发生率分别为：67.4% (809/1201)，54.5% (581/1067)和 40.4% (499/1234)。Meta 分析显示：在术后 3 (OR: 2.20; 95% CI: 1.48 to 3.28; $P = 0.0001$)、6(OR: 2.34; 95% CI: 1.43 to 3.84; $P = 0.0008$)和 12 月(OR: 2.20; 95% CI: 1.41 to 3.43; $P = 0.0005$)，RARP 术后勃起功能恢复优于 LRP (图 4(D)-(F))。

3.5. 发表偏倚

评价发表偏倚，最好是纳入 10 个研究以上绘制漏斗图[29]。因围手术期指标中仅输血率及总体并发症发生率纳入的研究大于 10 篇，绘制漏斗图呈不对称图形，因此发表偏倚不能排除(图 5)。手术时间、出血量、导尿管留置时间、住院时间及术后控尿和勃起功能恢复情况纳入的研究均小于 10 篇，故未做漏斗图评价发表偏倚。

Table 3. Urinary continence and potency recovery in the comparative studies evaluating LRP and RARP
表 3. LRP 与 RARP 术后控尿和勃起功能恢复的比较

First author	Cases, n	Continence definition	Potency definition	Data collection	Urinary continence recovery, n/N (%)			Potency recovery, n/N (%)		
					3 mo	6 mo	12 mo	3 mo	6 mo	12 mo
Asawabharaj 2014 [7]	561 LRP 486 RARP	No pad	-	Questionnaire	-	209/537 (39.0) 328/484 (67.8)	342/537 (63.7) 387/484 (80.0)	--	-	-
Asimakopoulos 2011 [3]	60 LRP 52 RARP	No pad	IIEF-5 score ≥ 17	Interview and questionnaire	38/60 (63.3) 36/52 (69.2)	45/60 (75.0) 46/52 (88.5)	50/60 (83.3) 49/52 (94.2)	8/60 (12.1) 33/52 (63.5)	13/60 (21.7) 39/52 (75.0)	19/60 (31.7) 40/52 (76.9)
Berge 2013 [9]	210 LRP 210 RARP	No pad	ESI	Questionnaire	71/197 (36.0) 81/198 (40.9)	-	151/197 (76.6) 135/183 (73.8)	16/83 (19.3) 16/62 (25.8)	-	38/81 (46.9) 24/58 (41.4)
Hakimi 2009 [10]	75 LRP 75 RARP	No pad	ESI	Questionnaire	41/75 (54.6) 49/75 (65.3)	49/75 (65.3) 56/75 (74.7)	67/75 (89.3) 70/75 (93.3)	9/45 (20.0) 16/51 (31.4)	22/45 (48.9) 34/51 (66.7)	32/45 (71.1) 39/51 (76.5)
Joseph 2005 [12]	50 LRP 50 RARP	No pad	-	Interview	46/50 (92.0) 45/50 (90.0)	-	-	-	-	-
Ku 2015 [15]	100 LRP 50 RARP	No pad	ESI	Interview	81/100 (81.0) 48/50 (96.0)	-	-	12/100 (12.0) 7/50 (14.0)	-	-
Papachristos 2015 [17]	100 LRP 100 RARP	No pad	ESI	Questionnaire	-	-	71/87 (81.6) 89/96 (92.7)	-	-	15/27 (55.6) 31/42 (73.8)
Park 2011 [18]	62 LRP 44 RARP	0-1 pad	ESI	Interview	34/62 (54.8) 39/44 (88.6)	47/62 (75.8) 41/44 (93.2)	59/62 (95.2) 42/44 (95.5)	-	10/21 (47.6) 12/22 (54.5)	27/83 (32.5) 57/156 (36.5)
Park 2013 [19]	144 LRP 183 RARP	No pad	ESI	Interview	66/144 (45.8) 140/183 (76.5)	94/144 (65.3) 153/183 (83.6)	113/144 (78.5) 160/183 (87.4)	5/83 (6.0) 12/156 (7.7)	25/83 (30.1) 49/156 (31.4)	274/866 (31.6) 410/711 (57.7)
Ploussard 2014 [21]	1377 LRP 1009 RARP	No pad	ESI	Questionnaire	543/1377 (39.4) 508/1009 (50.3)	811/1377 (58.9) 726/1009 (72.0)	943/1377 (68.5) 761/1009 (75.4)	141/866 (16.3) 250/711 (35.1)	177/866 (20.4) 300/711 (42.1)	19/35 (54.2) 28/35 (80.0)
Porpiglia 2013 [4]	60 LRP 60 RARP	0-1 pad	IIEF-5 score > 17	Questionnaire	37/60 (61.6) 48/60 (80.0)	44/60 (73.3) 53/60 (88.3)	50/60 (83.3) 57/60 (95.0)	14/35 (40.0) 21/35 (60.0)	17/35 (48.5) 23/35 (65.7)	-
Stolzenburg 2013 [23]	100 LRP 100 RARP	0-1 pad	ESI	Questionnaire	56/100 (56.0) 65/100 (65.0)	-	-	5/61 (8.2) 8/61 (13.1)	-	15/24 (62.5) 85/105 (81.0)
Trabulsi 2010 [26]	45 LRP 205 RARP	0-1 pad	ESI	Interview	28/45 (62.2) 164/205 (80.0)	32/45 (71.1) 187/205 (91.2)	37/45 (82.2) 193/205 (94.1)	-	-	38/57 (66.7) 21/24 (87.5)
Willis 2011 [27]	161 LRP 121 RARP	No pad	ESI	Questionnaire	42/138 (30.4) 38/104 (36.5)	64/117 (54.7) 50/76 (65.8)	84/116 (72.4) 33/44 (75.0)	22/66 (33.3) 23/46 (50.0)	34/60 (56.7) 29/40 (72.5)	-
Wolanski 2012 [28]	87 LRP 73 RARP	No pad	ESI	Unclear	33/83 (39.8) 37/62 (59.7)	-	-	12/24 (50.0) 13/27 (48.1)	-	27/83 (32.5) 57/156 (36.5)

LRP = laparoscopic radical prostatectomy; RARP = robotic-assisted radical prostatectomy; ESI = erection sufficient for intercourse; IIEF-5 = international index of erectile function

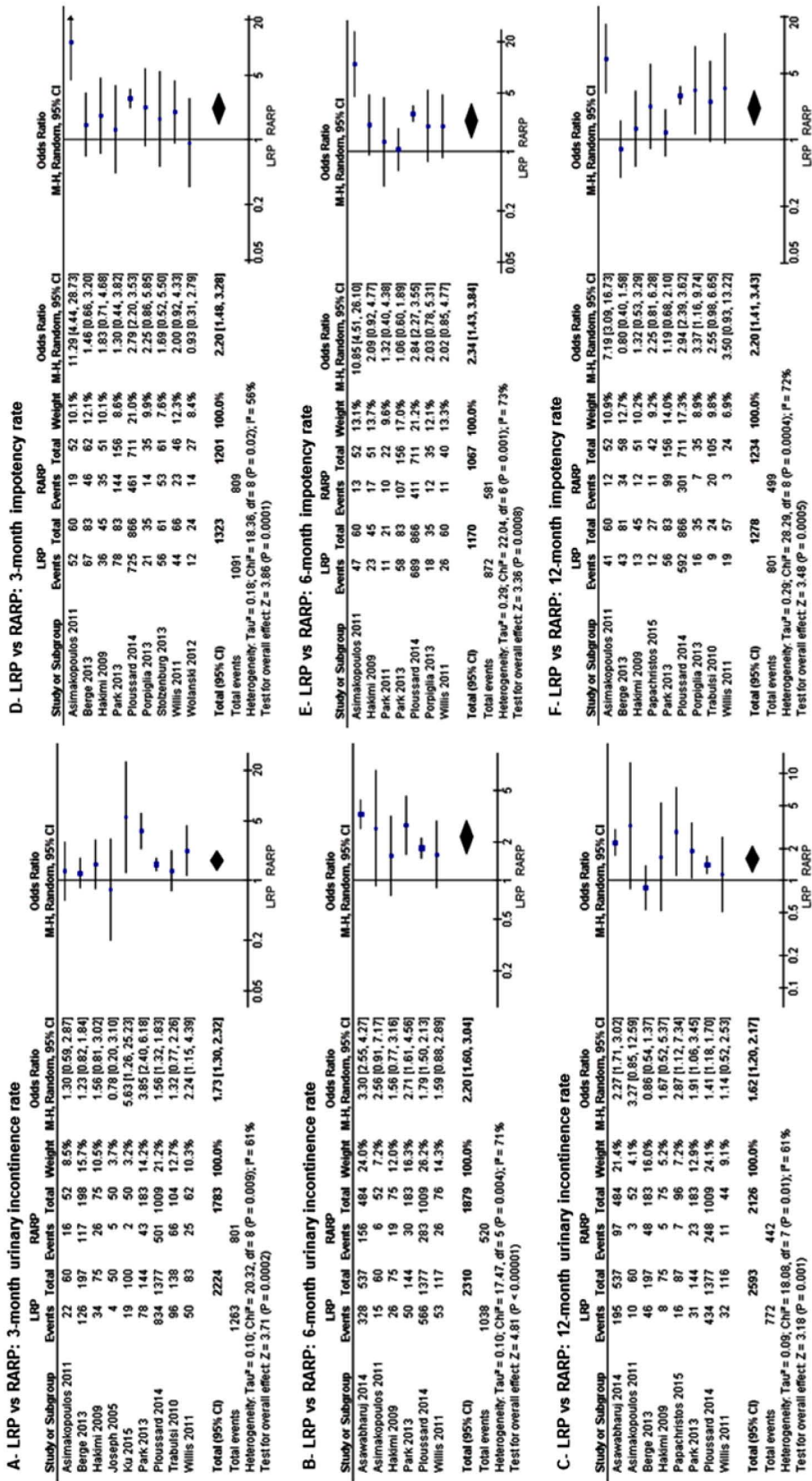


Figure 4. Comparison of functional outcomes following LRP and RARP. (Urinary incontinence rate at 3 (A), 6 (B), and 12 (C) months; impotency rate at 3 (D), 6 (E), and 12 (F) months)

图 4. LRP 与 RARP 术后控尿及勃起功能恢复比较的 Meta 分析。(术后 3 月(A)、6 月(B)和 12 月(C)尿失禁发生率; 术后 3 月(D)、6 月(E)和 12 月(F)勃起功能障碍发生率)

4. 讨论

借助机器人辅助系统, 外科医师能够更加精细、灵活的进行复杂的腔镜手术。与 LRP 相比, RARP 学习曲线更短, 操作更为精细, 有望成为前列腺癌根治术的金标准[30]。但是, 现阶段 RARP 明显优于 LRP 的确切证据尚不充分。迄今为止, 只有 2 个比较 RARP 和 LRP 的 RCTs 显示: 在术后尿控和勃起功能恢复方面 RARP 优于 LRP [3] [4]。但是, 其他系统评价及 Meta 分析又表明二者在围手术期及功能恢复上无明显差异[2] [5] [6]。目前, 关于二者在围手术期和术后功能恢复方面比较的 Meta 分析仍比较少。因此, 本研究采用 Meta 分析方法对二者进行评价, 以期为临床前列腺癌的治疗决策提供循证医学依据。

评价前列腺癌围手术期的指标主要有: 住院时间、出血量、输血率、导尿管留置时间、住院时间和总体并发症发生率等。在我们收集的研究资料中, LRP 组手术时间约 118.1 min~308 min, 而 RARP 组约 120 min~371 min, 两组间没有明显差异。而 RARP 组在出血量和输血率方面更有优势。这与 Novara 等[31] 在 2012 年发表的 Meta 分析基本相符。

两组在导尿管留置时间和住院时间上基本相似。大多数进行 LRP 或 RARP 的患者术后均留置导尿管 7~10 天。住院天数则因不同国家的医疗保险体系和文化背景差异而不同。在美国和澳大利亚, 患者一般在术后 2 天内出院[10] [17] [26] [27] [28], 而在欧洲患者住院时间一般在 4~6 天[4] [13] [20] [21] [22]。亚洲国家的住院时间最长, 一般在一周左右[7] [15] [18] [19]。

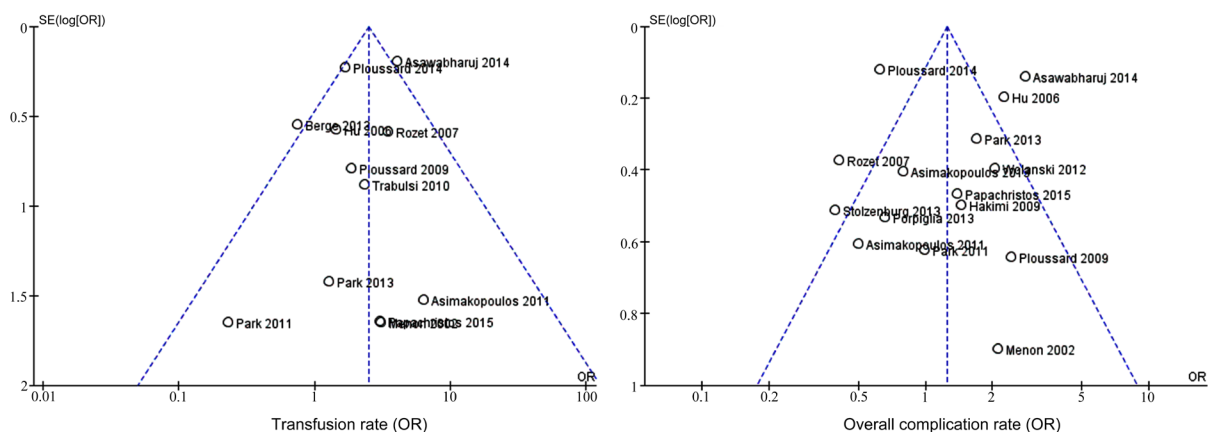


Figure 5. Funnel plot of the studies for transfusion rate and overall complication rate

图 5. 输血率及总体并发症发生率纳入文献的漏斗图

一般来说, 围手术期并发症代表着手术方式的安全性。LRP 组总体并发症发生率为 18.3%, 而 RARP 组为 15.6%, 两组间差异无明显统计学意义。Agarwal 等[32]报道了 2005 年至 2009 年间在三级转诊中心进行 RARP 手术的 3317 例患者, 其总体并发症率为 9.8%, 且大多数均发生在术后 30 天内, 证实 RARP 手术安全可行。Schmitges 等[33]比较了近期(2006~2007)和早期(2001~2005)进行微创前列腺癌根治术的并发症发生率, 发现近期并发症发生率明显降低。因此, 在我们看来, 外科医师的手术经验在很大程度上会影响手术的并发症, 而与手术方式关系不大。

控尿和勃起功能的恢复是前列腺癌根治术后患者最关切的问题。在我们的 Meta 分析中, 将不用尿垫或没有漏尿定义为控尿恢复, LRP 组术后 3、6 和 12 月的尿失禁发生率分别为: 56.8%, 44.9%和 29.8%。而 RARP 组术后 3、6 和 12 月的尿失禁发生率分别为: 44.9%, 27.7%和 20.8%。这提示 RARP 术后控尿的恢复可能更早。同样, 我们发现 RARP 在术后勃起功能恢复方面也优于 LRP。我们的结论与最近发表的仅纳入两个 RCTs 的 Meta 分析结论基本一致[34]。

但是, 在比较二者术后功能恢复方面有些要点也是不容忽略的。首先, 诸如膀胱颈保护、神经保留技术、耻骨前列腺韧带保留、后层及前层筋膜重建等手术技术, 在很大程度上影响了术后控尿和勃起功能的恢复[35]。其次, 大多数研究的术后功能恢复随访资料是通过面谈方式采集的, 在评价功能结果时会导致明显的偏差。第三, 由于目前对控尿和勃起功能恢复尚缺乏标准的定义, 根据不同的定义就会得出不同的结论。因此, 在评估 LRP 和 RARP 术后功能恢复方面需警惕上述情况的存在。

作为一个具有光明前景的手术方式, RARP 已经在世界范围内广泛应用。年青一代的泌尿外科医师需要尽快掌握该技术, 并在今后的工作中加以熟练应用。当然, RARP 也有其自身的缺陷, 比如设备故障, 缺少长期的肿瘤随访数据以及经费昂贵等[36]。在我们 Meta 分析中, 解释结果时也存在一定的局限性。首先, 纳入的研究中, 只有两个是 RCTs, 其他多数研究质量较低。其次, 在评估相关结果时缺乏标准和精确的方法。

综上所述, 与 LRP 相比, RARP 在前列腺癌的治疗中有更少的出血量及输血率, 且在术后控尿和勃起功能恢复上更有优势。由于现阶段纳入的对照研究质量较低, 文章结论存在一定的局限性, 今后仍需更多的高质量、多中心的 RCTs 研究来证实。

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