Laparoscopic Radical Prostatectomy for Localized Prostate Cancer: A Systematic Review of Comparative Studies

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Purpose: We compared the safety and efficacy of laparoscopic and open radical prostatectomy through a systematic assessment of the literature.

Materials and Methods: Literature databases were searched from 1996 to December 2004 inclusive. Studies comparing transperitoneal laparoscopic radical prostatectomy, extraperitoneal endoscopic radical prostatectomy or robot assisted radical prostatectomy with open radical retropubic prostatectomy or radical perineal prostatectomy for localized prostate cancer were included. Comparisons between different laparoscopic approaches were also included.

Results: We identified 30 comparative studies, of which none were randomized controlled trials. There were 21 studies comparing laparoscopic with open prostatectomy with a total of 2,301 and 1,757 patients, respectively, and 9 comparing different laparoscopic approaches with a total of 1,148 patients. In terms of safety there did not appear to be any important differences in the complication rate between laparoscopic and open approaches. However, blood loss and transfusions were lower for laparoscopic approaches. In terms of efficacy operative time was longer for laparoscopic than for open prostatectomy but length of stay and duration of catheterization were shorter. Positive margin rates and recurrence-free survival were similar. Continence and potency were not well reported but they appeared similar for the 2 approaches. There were no important differences between laparoscopic approaches.

Conclusions: Laparoscopic radical prostatectomy is emerging as an alternative to open radical prostatectomy but randomized, controlled trials considering patient relevant outcomes, such as survival, continence and potency, with sufficient followup are required to determine relative safety and efficacy.

Key Words: prostate, laparoscopy, prostatectomy, prostatic neoplasms, endoscopy

Prostate cancer is the most common form of cancer in men (excluding nonmelanoma skin cancer), it increases with age in men older than 50 years and it is the second most common cause of death from cancer in men.[1–3] All available surgical treatments for prostate cancer share the common goal of curing the cancer by removing the prostate gland and seminal vesicles, and sometimes the pelvic lymph nodes, while at the same time preserving continence and sexual function.[4,5] They differ primarily in the extent to which the approach used is more or less invasive. Of the 2 open surgical approaches, namely RRP and RPP, the perineal approach is considered to be less invasive than the retropubic approach, although it is less widely used.[6] Since 1997, a minimally invasive approach has been available in the form of LRP and more recently surgical robotic systems have been used as an additional tool for LRP.

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OPEN PROSTATECTOMY VS LRP

Survival after open RP techniques is up to 95% after 5 years[7] with positive surgical margin rates of 8% to 23% depending on patient selection criteria.[7] However, RP is also associated with significant urinary incontinence (between 5% and 42% depending on the definition of incontinence) and sexual dysfunction (between 22% and 77% depending on whether unilateral or bilateral nerve sparing is possible).[7] Furthermore, up to 30% of 93,986 patients who underwent open RP in the United States between 1991 and 1994 experienced at least 1 complication.[8] Complications included cardiopulmonary failure, rectal and ureteral injury, urinary retention, infection, hemorrhage, hematoma and leaking anastomosis.[6] Significant blood loss (up to 1,500 ml for RRP) has also been reported.[9] The typical length of stay in the United States is 2 to 3 days, whereas in Europe it is 5 to 7 days, primarily due to differences in hospital protocols.[6]

Like all minimally invasive approaches, LRP and endoscopic RP are expected to decrease patient blood loss and postoperative recovery time. In theory laparoscopic approaches should provide improved visualization of the pelvic anatomy with possibly better preservation of anatomical structures, which could lead to improvements in continence and potency. However, currently it is unclear whether these theoretical benefits are realized in practice without compro-

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TABLE 1. *Included studies comparing laparoscopic to open radical prostatectomy*

References	Country	Evidence Level	Procedure (No. pts)	Followup
TLRP vs RRP:				
Bhayani et al[16]	United States	III-2	TLRP (33), RRP (24)	1 Mo
Hara et al[17]	Japan	III-2	TLRP (52), RRP (54)	8.1, 7.9 Mos
Khedis et al[18],* (conference abstract)	France	III-2	TLRP (140), RRP (162)	2 Mos
Martorana et al[19]	Italy	III-2	TLRP (50), RRP (50)	Immediate postop
Brown et al[20]	United States	III-2/3	TLRP (60), RRP (60)	1 Mo
Salomon et al[21],†	France	III-2/3	TLRP (235), RRP (184), RPP (119)	15, 53, 45 Mos
Atallah et al[22],* (letter to editor)	France	III-3	TLRP (59), RRP (115)	Immediate postop
Bickert and Frickel[23]	United States	III-3	TLRP (40), RRP (14)	Up to 2 Mos
Egawa et al[24],‡	Japan	III-3	TLRP (34), RRP (49)	14, 34 Mos
Fromont et al[25]	France	III-3	TLRP (139), RRP (139)	Immediate postop
Mitka[26] (conference abstract)	United States	III-3	TLRP (37), RRP (37)	Immediate postop
Namiki et al[27],‡ (conference abstract)	Japan	III-3	TLRP (34), RRP (78)	12 Mos
Rassweiler et al[28],§	Germany	III-3	TLRP/438, RRP/219	8–30, 67 Mos
EERP vs RRP:				
Kimura et al[29] (conference abstract)	Japan	III-2	EERP/93, RRP/114	12 Mos
Roumeguere et al[30]	Belgium	III-2	EERP/85, RRP/77	12 Mos
Artibani et al[31]	Italy	III-3	EERP/71, RRP/50	10.3, 10.1 Mos
RALRP vs RRP:				
Binder et al[32] (conference abstract)	Germany	III-2	RALRP/50, RRP/50	Immediate postop
Sokoloff et al[33] (conference abstract)	United States	III-2	RALRP/51, RRP/50	12 Mos
Webster et al[34] (conference abstract)	United States	III-2	RALRP/99, RRP/71	Immediate postop
Tewari et al[35],‖	United States	III-2/3	RALRP/200, RRP/100	7.7, 18.3 Mos
Ahlering et al[36]	United States	III-3	RALRP/60, RRP/60	Immediate postop

* There is likely patient crossover in these 2 studies.
† There is likely patient crossover with Ruiz et al[42] (table 2).
‡ Patients with LRP may be the same in these 2 studies.
§ There is likely patient crossover with Erdogru et al[37] (table 2).
‖ There is likely patient crossover with Menon et al[44] (table 2).

mising cancer control, in particular surgical margin rates, cancer recurrence and survival.[10] It is also accepted that the laparoscopic and endoscopic approaches are technically difficult with a significant learning curve and uncertainty exists regarding the number of procedures required to achieve acceptable competence in the procedure.[5,7,11–13]

OBJECTIVES OF THE REVIEW

We compared the safety and efficacy of LRP with those of standard open RP through a systematic assessment of the literature. A secondary objective was to assess the contribution of the learning curve to efficacy outcomes.

MATERIALS AND METHODS

A systematic search was performed of MEDLINE, EMBASE™, Current Contents®, PubMed and The Cochrane Library from 1996 to December 2004. The York (United Kingdom) Centre for Reviews and Dissemination databases, Clinicaltrials.gov, National Research Register, relevant online journals and the Internet were also searched. Searches were done without language restriction. The search terms were ((laparoscopic radical prostatectomy or LRP or (prostat* and laparosc*)) or ((LAPAROSCOPY/or ENDOSCOPY/) and PROSTATIC NEOPLASM)) or (robot* and PROSTATIC NEOPLASM/). Studies were included if they were comparative studies that reported the safety or efficacy outcomes of TLRP, EERP or RALRP compared with those of open RRP or RPP for localized prostate cancer. Comparisons between different laparoscopic approaches were also included. Tables 1 and 2 clearly identify abstracts from conference proceedings and letters to the editor, which were included if they met inclusion criteria. Inclusion criteria were applied by 2 reviewers and any differences were resolved by discussion. The figure shows the results of the searches.

TABLE 2. *Included studies comparing different laparoscopic approaches*

References	Country	Evidence Level	Procedure (no. pts)	Followup
EERP vs TLRP:				
Erdogru et al[37],*	Germany	III-2	EERP (53), TLRP (53)	12 Mos
Cathelineau et al[38]	France	III-3	EERP (100), TLRP (100)	Not reported
Eden et al[39]	United Kingdom	III-3	EERP (100), TLRP (100)	24 Mos
Ghavamian et al[40]	United States	III-3	EERP (20), TLRP (40)	Immediate postop
Nakagawa et al[41] (conference abstract)	Japan	III-3	EERP (90), TLRP (30)	Immediate postop
Ruiz et al[42],†	France	III-3	EERP (165), TLRP (165)	13.1, 33.8 Mos
RALRP vs TLRP:				
Antiphon et al[43],‡	France	III-3	RALRP (16), TLRP (16)	6.9, 18.9 Mos
Menon et al[44],§	United States	III-3	RALRP (40), TLRP (40)	3.0, 8.5 Mos
Wood et al[45] (conference abstract)	United States	III-3	RALRP (10), TLRP (10)	Immediate postop

* There is likely patient crossover with Rassweiler et al[28] (table 1).
† There is likely patient crossover with Salomon et al[21] (table 1).
‡ Patients with TLRP may also be included in Ruiz[42] and Salomon[21] et al.
§ There is likely patient crossover with Tewari et al[35] (table 1).

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