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## Platinum Priority – Review – Kidney Cancer

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# Comparison of Perioperative Outcomes Between Robotic and Laparoscopic Partial Nephrectomy: A Systematic Review and Meta-analysis

Ji Eun Choi<sup>a</sup>, Ji Hye You<sup>a</sup>, Dae Keun Kim<sup>b</sup>, Koon Ho Rha<sup>b,\*</sup>, Seon Heui Lee<sup>c,\*</sup>

<sup>a</sup> Division for Healthcare Technology Assessment Research, National Evidence-based Healthcare Collaborating Agency, Seoul, Korea; <sup>b</sup> Department of Urology, Urological Science Institute, Yonsei University College of Medicine, Seoul, Korea; <sup>c</sup> Department of Nursing Science, College of Nursing, Gachon University, Incheon, Korea

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### Abstract

**Context:** Robotic partial nephrectomy (RPN) is rapidly increasing; however, the benefit of RPN over laparoscopic partial nephrectomy (LPN) is controversial.

**Objective:** To compare perioperative outcomes of RPN and LPN.

**Evidence acquisition:** We searched Ovid-Medline, Ovid-Embase, the Cochrane Library, KoreaMed, KMBase, KISS, RISS, and KisTi from their inception through August 2013. Two independent reviewers extracted data using a standardized form. Quality of the selected studies was assessed using the methodological index for nonrandomized studies.

**Evidence synthesis:** A total of 23 studies and 2240 patients were included. All studies were cohort studies with no randomization, and the methodological quality varied. There was no significant difference between the two groups regarding complications of Clavien-Dindo classification grades 1–2 ( $p = 0.62$ ), Clavien-Dindo classification grades 3–5 ( $p = 0.78$ ), change of serum creatinine ( $p = 0.65$ ), operative time ( $p = 0.35$ ), estimated blood loss ( $p = 0.76$ ), and positive margins ( $p = 0.75$ ). The RPN group had a significantly lower rate of conversion to open surgery ( $p = 0.02$ ) and conversion to radical surgery ( $p = 0.0006$ ), shorter warm ischemia time (WIT;  $p = 0.005$ ), smaller change of estimated glomerular filtration rate (eGFR;  $p = 0.03$ ), and shorter length of stay (LOS;  $p = 0.004$ ).

**Conclusions:** This meta-analysis shows that RPN is associated with more favorable results than LPN in conversion rate to open or radical surgery, WIT, change of eGFR, and shorter LOS. To establish the safety and effectiveness outcomes of robotic surgery, well-designed randomized clinical studies with long-term follow-up are needed.

**Patient summary:** Robotic partial nephrectomy (PN) is more favorable than laparoscopic PN in terms of lower conversion rate to radical nephrectomy, a favorable renal function indexed estimated glomerular filtration rate, shorter length of hospital stay, and shorter warm ischemia time.

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\* Corresponding authors. S.H. Lee, Department of Nursing Science, College of Nursing, Gachon University, 191 Hambakmoero, Yeonsu-gu, Incheon 406-799, Korea. Tel. +82 32 820 4235; Fax: +82 32 820 4201. K.H. Rha, Department of Urology, Urological Science Institute, Yonsei University College of Medicine, 50-1 Yonsei-ro, Seodaemun-gu, Seoul 120-752, Korea. Tel. +82 2 2228 2310; Fax: +82 2 312 2538.

E-mail addresses: [sunarea87@gachon.ac.kr](mailto:sunarea87@gachon.ac.kr) (S.H. Lee), [khrha@yuhs.ac](mailto:khrha@yuhs.ac) (K.H. Rha).

## 1. Introduction

Partial nephrectomy (PN) is the gold standard for the treatment of small renal masses (<4 cm) [1,2]. Evolution has progressed from open radical nephrectomy through open PN to minimally invasive PN including laparoscopic PN (LPN) and robotic PN (RPN) [3]. However, the technical and ergonomic challenge of laparoscopic suturing has limited the dissemination of LPN [3]. Surgical robots were developed to facilitate minimally invasive surgery and to assist surgeons performing surgical procedures [4]. It has been reported that RPN can be performed successfully after a 25-case learning curve [3].

Evaluation of RPN is needed because it does not directly improve patient outcomes. Although some authors [5,6] reported that RPN provided equivalent perioperative outcomes with the added advantage of significantly shorter warm ischemia time (WIT) compared with LPN, the true benefit of RPN over LPN among previous comparison studies [3,5–11] is still controversial. In addition, the renal functional and oncologic advantages of RPN for patients with renal cancer are not well studied because of the lack of studies with which to perform meta-analyses. The numbers of papers on this subject have increased recently, so it appears to be the right time to perform meta-analyses of outcomes such as kidney function, estimated glomerular filtration rate (eGFR), and serum creatinine (sCr) for RPN versus LPN using statistical power even though there are no randomized studies. Although randomized controlled trials are powerful tools, they are limited by ethical issues, patient preferences, and the time and cost for intervention therapy,

especially in robotic surgery. Consequently, our aim was to evaluate the perioperative outcomes of WIT, length of stay (LOS), estimated blood loss (EBL), changes of eGFR and sCr, conversion rate to radical surgery and open surgery, and positive surgical margin (PSM) rates of RPN versus LPN for patients with renal cancer, using recent research.

## 2. Evidence acquisition

### 2.1. Search strategy

We searched Ovid-Medline (1946–2013), Embase (inception–2013), and the Cochrane Central Register of Controlled Trials (in the Cochrane Library) on July 5, 2013. Korean databases (KoreaMed, KMBase, KISS, RISS, and KisTi) were also searched. Search terms combined patient-related terms (*kidney or renal neoplasm, kidney or renal cancer, kidney or renal carcinoma*) and intervention terms (*robotics, computer-assisted surgery, telerobot, remote operation, remote surgery, da Vinci*).

### 2.2. Inclusion criteria and study eligibility

We evaluated the records according to the Preferred Reporting Items for Systematic Reviews and Meta-analysis statement. We defined study eligibility using the patient population, intervention, comparator, outcomes, and setting approach. Inclusion criteria were studies that focused on patients with kidney cancer and those that compared surgical and patient outcomes between RPN and LPN. Exclusion criteria were (1) studies that did not focus on patients with

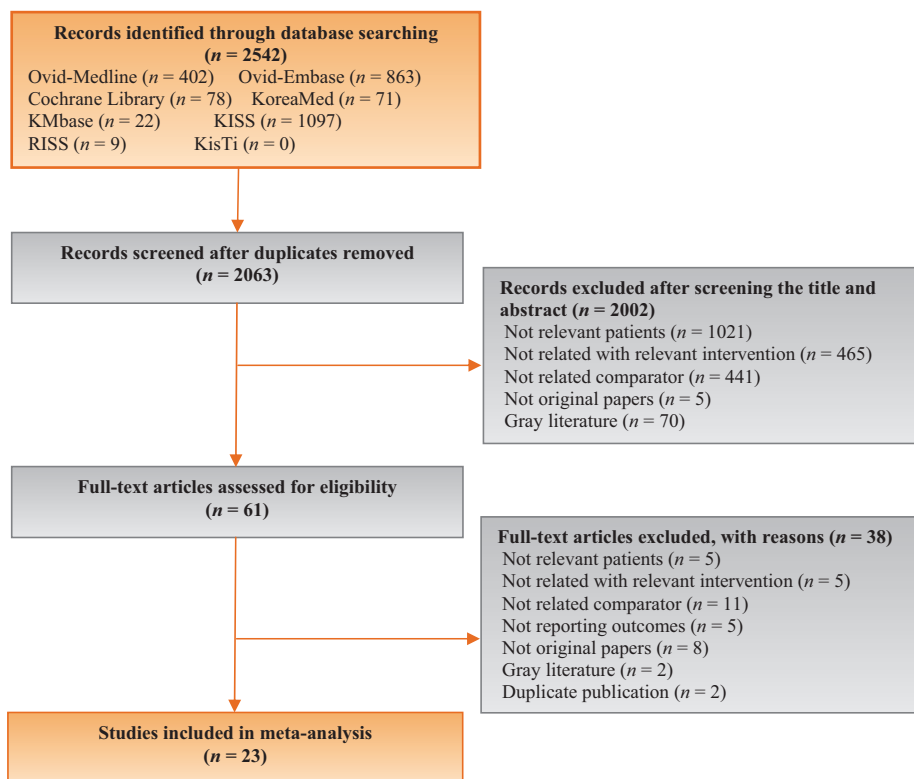


Fig. 1 – Flowchart of study selection process.

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