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Review

Comparison of oncologic outcomes between partial and radical nephrectomy for localized renal cell carcinoma: A systematic review and meta-analysis

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ABSTRACT

To date, there remain uncertainties over the oncological outcomes for partial and radical nephrectomy of localized renal cell carcinoma (RCC). A systematic review and meta-analysis was performed. Eligible studies were retrieved from PubMed, Embase, Cochrane Library and Web of Science databases. The endpoints of oncologic outcomes included overall survival (OS), cancer-specific survival (CSS) and recurrence-free survival (RFS). Multivariable adjusted hazard ratios (HRs) were used to evaluate each endpoint. We used the Newcastle-Ottawa scale to assess risk of bias. Fourteen cohort studies of low to moderate risk of bias involving 28,764 patients were included. Adjusted variables and follow-up length varied between studies. The results showed that patients with localized RCC who underwent partial nephrectomy (PN) had a superior OS (HR: 0.81, 95% confidence interval (CI): 0.74–0.89; $P < 0.001$) compared with those underwent radical nephrectomy (RN). However, the CSS (HR: 0.85, 95% CI: 0.73–1.01; $P = 0.060$) and RFS (HR: 0.66, 95% CI: 0.34–1.31; $P = 0.239$) seem to be similar for patients underwent PN and RN. Most of subgroup analyses according to year of publication, patient population, geographic region and NOS score did not alter the direction of results. PN for localized RCC is associated with better OS, similar CSS and RFS compared with RN based on observational data with low to moderate risk of bias. Methodological limitations of the observational studies included should be considered while interpreting these results.

Contents

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1. Introduction

Renal cell carcinoma (RCC), the second cause of mortality from urological malignances, accounts for 2–3% of malignances in adults [1]. More than 50% of all diagnosed RCCs are in a localized stage [2], and it is speculated that more widespread utilization of multiparametric imaging lead to an increase in the incidental discovery of renal masses [3]. Recently, partial nephrectomy (PN) has been increasingly applied, even in patients with unilateral localized renal tumor and a normal contralateral kidney [4]. Having shown comparable oncologic control to radical nephrectomy (RN) [5,6] presenting controlled perioperative morbidity [7], PN has become the golden standard for treating renal masses <4 cm [8,9]. Furthermore, some studies proposed PN should be favored for any renal mass when technically feasible and oncologically safe, even for pathologic T stage ≥1b tumors and in high-risk [10–12]. These recommendations are partly based on PN can be related to significantly superior overall survival (OS) than RN [13–16], maybe because of the better preservation of renal function [17–19] and the decreased incidence of following cardiovascular events [15].

However, several studies [20–22] showed conflicting results that patient survival are similar for PN and RN. Their findings suggest that aggressive PN may be inappropriate, given the increasing adoption of PN and limited level 1 evidence documenting any relative efficacy [23]. To date, MacLennan et al. [13] systematically reviewed related-studies comparing effectiveness for survival of surgical treatment of localized RCC. They suggested PN should be favored in managing localized RCCs whenever feasible. Nevertheless, meta-analyses were not performed because of low-quality evidence and potential risks of bias. A meta-analysis by Kim et al. [24] published in 2012 identified that PN confers a better oncologic outcomes and a reduced risk of postoperative severe chronic kidney disease for localized renal masses. However, this study included benign and T4 tumors, and only focused on OS and cancer-specific survival (CSS). Moreover, it could not embrace later-published literatures. Hence, we conducted an updated systematic review and meta-analysis to compare the oncological outcomes between PN and RN for localized RCC.

2. Materials and methods

The study was performed in the light of the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) criteria [25]. The PRISMA 2009 checklist is presented in the Supplementary material.

2.1. Search strategy

We searched Pubmed, Embase, Cochrane Library and Web of Science from inception to March 2016. The searches were not limited by language. The search terms used to identify eligible studies from each database combined patient-related terms (*kidney or renal tumor, kidney or renal carcinoma, kidney or renal neoplasm, kidney or renal cancer*) and intervention terms (*partial nephrectomy, nephron sparing surgery or operation, radical nephrectomy, remote operation, remote surgery*). In addition, we screened the references from the related literatures, including all of the identified original researches, reviews, and editorials.

2.2. Inclusion criteria and study eligibility

The study cohort included patients diagnosed with localized RCC (clinical stage T1a–T2N0M0) according to magnetic resonance imaging or computed tomography. Studies embracing pathologic T3 patients were also included if only the clinical stage was T1–2N0M0. Inclusion criteria were studies that compared oncologic outcomes between PN and RN. Exclusion criteria were as follows (1): non-human research (2); studies that did not analyze patients with renal cell carcinoma (3); studies of limited to pediatric patients (age <18 years), hereditary renal cancer syndromes, and Wilm's tumors (4); studies that included patients had lymphatic or distant metastases or venous tumor thrombus (5); studies that included patients with multifocal or bilateral tumors, benign tumors, solitary kidneys (6); non-primary studies (eg, letters, editorials, expert opinions, reviews, meta-analysis, systematic reviews) (7); gray literature (e.g., thesis, abstract only); and (8) studies that can't obtained hazard ratios (HRs) from multivariate analyses and 95% confidence intervals (CIs). When more than one studies analyzing the same patient cohort were retrieved, we selected the more well-designed, recent and informative publication. Two researchers independently screened all abstracts and assessed all full-text articles. The disagreements were resolved through discussion.

The Newcastle-Ottawa Scale were applied to evaluate risk of bias in three domains [26,27]. Studies with scores <4 were deemed to having a high risk of bias, scores of 4–6 to having a moderate risk of bias, and scores ≥7 to having a low risk of bias. The mean or median follow-up exceeded 5 years were considered to be adequate.

2.3. Data extraction

The study outcomes contained overall survival (OS), cancer-specific survival (CSS), and recurrence-free survival (RFS). For each of included literatures in the present study, we extracted data including the first author's last name, year of publication, study design, study period, patient population, country, number of patients, gender and age of study participants, surgical approach, oncologic outcomes, adjusted variables and additional clinical data. Two reviewers independently extracted data. The disagreements were resolved through discussion. At first, the meta-analyses were performed with all included studies for each of the endpoints. Subgroup analyses were performed according to predefined variables including year of publication, patient population, geographic