Comparative effectiveness for survival and renal function of partial and radical nephrectomy for localized renal tumors: a systematic review and meta-analysis


CRD summary
This study suggested that partial nephrectomy produced a survival advantage and a lower risk of severe chronic kidney disease after surgery, compared with radical nephrectomy, for localized renal tumours, but the evidence was of low quality and there was significant heterogeneity across studies. The authors’ cautious conclusions reflect the evidence presented and are likely to be reliable.

Authors’ objectives
To compare the effectiveness of partial versus radical nephrectomy, for patients with localized renal tumours.

Searching
MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL), Scopus and Web of Science were searched for articles from database inception to February 2011, apparently without language restrictions. The search terms were reported.

Study selection
Randomised controlled trials (RCTs), prospective or historical cohort studies, and case-control studies that compared partial nephrectomy with radical nephrectomy, in patients with localized renal tumours, were eligible for inclusion. Studies of patients with hereditary renal cancer syndromes (Birt-Hogg-Dubé, hereditary papillary renal carcinoma, hereditary leiomyomatosis renal cell carcinoma, or Von Hippel-Lindau) and Wilm’s tumours, studies that only included children (under 18 years old), case reports, and systematic reviews were excluded. The primary outcomes were all-cause mortality and cancer-specific mortality. The secondary outcome was severe chronic kidney disease after surgery.

The included studies were of patients with chronic kidney disease stages III to IV or IV to V, as defined by their estimated glomerular filtration rate or by receipt of haemodialysis. The tumour stages ranged from T1 to T4, and the percentage of females ranged from 1.5% to 48%, where reported.

Two reviewers independently selected studies for inclusion. Any disagreements were resolved by consensus with a third reviewer.

Assessment of study quality
Study quality was assessed by the type of study, patient population (institution versus general population), whether the study reported the funding source, the number of patients lost to follow-up, whether the study adjusted for confounding variables, and the duration of follow-up. For RCTs, GRADE criteria were used to assess the quality of the evidence.

Two reviewers independently evaluated study quality. Any disagreements were resolved by consensus with a third reviewer.

Data extraction
Data were extracted to calculate hazard ratios and risk ratios, with 95% confidence intervals.

Two reviewers extracted the data.

Methods of synthesis
Pooled hazard ratios, with their corresponding 95% confidence intervals, were estimated using a fixed-effect model and the inverse-variance method. A random-effects model was used to assess whether the findings were robust. Heterogeneity was assessed using $I^2$.

Subgroup analyses of the outcomes were performed by publication year, patient sample, and renal mass.
Results of the review
Thirty-six studies were included in the meta-analysis; 27 were cohort, eight were case-control, and one was a RCT. There were 41,010 patients in total; 31,729 had radical nephrectomy and 9,281 had partial nephrectomy. For quality, seven studies provided information on loss to follow-up; 23 studies adjusted for confounding variables; 12 studies reported the funding source; and 28 studies were institution based. The quality of the RCT appeared to be low. The duration of follow-up ranged from 0.3 to 9.3 years, where reported.

The meta-analysis showed that partial nephrectomy reduced all-cause mortality (HR 0.81, 95% CI 0.76 to 0.87; I^2=49%; 21 studies), cancer-specific mortality (HR 0.71, 95% CI 0.59 to 0.85; I^2=63%; 21 studies) and severe chronic kidney disease (HR 0.39, 95% CI 0.33 to 0.47; I^2=87%; nine studies, 10 comparisons), compared with radical nephrectomy. Statistical heterogeneity was observed for all outcomes. In the random-effects model, the results were similar for all-cause mortality and chronic kidney disease, but the effect was no longer significant for cancer-specific mortality.

Later published studies (2006 to 2011) and studies using population-based cohorts, favoured partial nephrectomy for all-cause mortality and cancer-specific mortality, compared with earlier studies (1995 to 2005) and institution-based studies. For severe chronic kidney disease, unlike the other two outcomes, a stronger treatment effect for partial nephrectomy was found for institutional cohorts. There was no significant difference in all-cause mortality in studies of patients with benign versus malignant renal masses.

Authors' conclusions
Partial nephrectomy had a lower all-cause mortality, cancer-specific mortality, and risk of severe chronic kidney disease after surgery, compared with radical nephrectomy, for localised renal tumours, but the evidence was of low quality and there was significant heterogeneity across studies.

CRD commentary
This review addressed a clear question and was supported by appropriate inclusion criteria. A range of sources was searched for relevant studies, and no language restrictions appear to have been applied, decreasing the likelihood of missing relevant studies. Attempts were made to reduce the risk of error and bias in the review process. Appropriate methods were used to pool the results and to investigate statistical heterogeneity. The authors acknowledged the limitations of their review, which were the lack of randomised controlled trials, the poor quality of the evidence, and the statistical heterogeneity across studies.

The authors cautious conclusions reflect the evidence presented and are likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that until a high quality study was available, partial nephrectomy remained the preferred treatment for localised renal tumours. Patients should be advised that partial nephrectomy could provide better renal function and survival, but that the evidence was uncertain.

Research: The authors stated that further studies should provide high-quality evidence that partial nephrectomy provided superior survival and renal function.

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