Robotic versus laparoscopic partial nephrectomy: a systematic review and meta-analysis
Aboumarzouk OM, Stein RJ, Eyraud R, Haber GP, Chlosta PL, Somani BK, Kaouk JH

CRD summary
This review concluded that robotic partial nephrectomy was a feasible and safe alternative to laparoscopic partial nephrectomy, with similar outcomes, low complication rates, and significantly shorter warm ischaemic time. Due to the observational nature of the evidence, the conclusions may not be reliable and, as the authors pointed out, they need to be confirmed by data from a randomised trial.

Authors' objectives
To compare robotic partial nephrectomy with laparoscopic partial nephrectomy.

Searching
MEDLINE, EMBASE, CINAHL, Cochrane Central Register of Controlled Trials (CENTRAL), and ClinicalTrials.gov were searched for articles from 2000 to February 2012. Google Scholar was used to search the Internet, and urologic journals and reference lists of included papers were searched. Search terms were reported, and there were no language restrictions.

Study selection
Studies comparing robotic and laparoscopic partial nephrectomy were included. Eligible outcomes were operative and warm ischaemic times, blood loss, hospital stay, conversion rates, positive surgical margin rates, and perioperative complications.

In the included studies, the participant age ranged from 37 to 73 years, 60% were men, and there were more malignant than benign tumours. Most of the studies were published in the previous five years, four were conducted in the USA, two in Korea, and one in Turkey.

Four reviewers independently selected the studies. Disagreements were resolved by consensus with all authors.

Assessment of study quality
Methodological quality was assessed using the Cochrane Collaboration's risk of bias tool, which covered selection, performance, detection, attrition and reporting bias. It was not reported how many reviewers assessed quality.

Data extraction
Mean differences were calculated, for continuous outcomes, and odds ratios, for dichotomous outcomes, both with 95% confidence intervals. Authors were contacted for clarification, if necessary. Results were extracted on an intention-to-treat basis.

It was not reported how many reviewers were involved in the data extraction.

Methods of synthesis
The results were pooled using either fixed-effect or random-effects meta-analysis, depending on the level of statistical heterogeneity, which was assessed using $I^2$ (values over 90% indicated high heterogeneity). Subgroup analyses were used to compare the tumour location, classification of complications, and small versus large studies, and to evaluate the learning curve of the surgeon, by removing studies with less than 25 procedures.

Results of the review
Twelve studies were included in the review (1,054 participants); seven of these (717 participants) were included in the meta-analysis. All the studies were observational cohort studies, without randomisation or blinding. One was considered to be at a high risk of bias due to differences in patient groups, the other six were considered to be at a low risk of bias.

There were no significant differences between the types of surgery, by gender, laterality, malignant pathology, tumour size, tumour location, and positive margins, but the patients undergoing robotic surgery were significantly older than...
those undergoing laparoscopic surgery.

The robotic procedure had a significantly shorter warm ischaemic time than the laparoscopic procedure (seven studies; MD 2.74, 95% CI 1.14 to 4.35); statistical heterogeneity was high (I²=83%). There were no significant differences between robotic and laparoscopic procedures, for operative time, estimated blood loss, conversion rates, length of postoperative hospital stay, complications, and Clavien classification of complications.

Subgroup analyses did not reveal any reasons for the observed heterogeneity. When the studies of less than 25 procedures were removed from the analysis, there was still a significant reduction in warm ischaemic time with the robotic procedure (five studies; MD 2.83, 95% CI 1.13 to 4.53; I²=88%). There were no significant differences between the procedures, for operative time, estimated blood loss, length of stay, and complications.

Cost information
One study reported that robotic surgery was significantly more expensive than both laparoscopic and open procedures, but had a significantly shorter hospital stay, with fewer complications and lower transfusion rates. It was estimated that robotic procedures cost $1,600 more per person or an additional 6% per case.

Authors’ conclusions
Robotic partial nephrectomy was a feasible and safe alternative to laparoscopic surgery, with similar outcomes, low complication rates and significantly shorter warm ischaemic time.

CRD commentary
This review reported some inclusion criteria, but not enough information to enable independent replication. Several databases were searched, without language restrictions, and efforts were made to locate unpublished studies, so the risk of language and publication bias was low. Four reviewers independently selected the studies, but it was not reported how many reviewers extracted the data and assessed their quality, so the chances of error and bias cannot be ruled out. All the studies were observational in design and might be biased due to the lack of randomisation. Study quality was assessed, but the tool was designed for randomised controlled trials, so the validity of the assessment is uncertain.

Due to the observational nature of the evidence, the conclusions of this review may not be reliable and, as the authors pointed out, they need to be confirmed by data from a randomised trial.

Implications of the review for practice and research
Practice: The authors did not make any recommendations for practice.

Research: The authors stated that a large multicentre trial was needed to compare robotic, laparoscopic and open partial nephrectomy, once the robotic learning curve had been overcome. This trial should include a cost analysis and measure convalescence after hospital discharge, return to work, and the patient and surgeon perspectives on pain and satisfaction with the procedure.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.