Bleeding complications of native kidney biopsy: a systematic review and meta-analysis

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CRD summary
This review of native kidney biopsy with automated biopsy devices and real-time ultrasonography concluded that there was a relatively small risk of macroscopic haematuria and erythrocyte transfusion. Due to limitations in the review methods, the lack of randomised trials and presence of considerable heterogeneity the authors' conclusions may not be reliable.

Authors' objectives
To study haemorrhage complication rates after native kidney biopsy performed with real-time ultrasonic guidance and an automated spring-loaded biopsy device.

Searching
PubMed was searched between January 1980 and June 2011 for studies published in English, search terms were reported. Bibliographies of retrieved studies were searched for additional studies.

Study selection
Prospective and retrospective studies were eligible if they included native kidney biopsy performed with an automated spring-loaded biopsy device with real-time ultrasonic guidance. Studies had to report the incidence of macroscopic haematuria or need for erythrocyte transfusion after biopsy. Studies had to include more than 50 patients. Studies of a combination of transplant and native kidney biopsies were eligible if more than 75% of procedures were native biopsies. Studies of manual and automated biopsies were included if more than 50% used an automated needle. Letters to the editor were included if they provided information on the procedures and complication rates.

Where reported mean patient age was 48 years, mean serum creatinine was 2mg/dL and mean blood pressure was 132/80mmHg; 55% of biopsies were performed on women. Most procedures were performed by nephrology staff or fellows, some studies used radiologists and some a combination. Studies used 14, 16 or 18 gauge needles alone or in combination; the mean number of needle passes was two.

All four authors assessed studies for inclusion.

Assessment of study quality
A quality score was developed for the review and assessed: prospective or retrospective study design; sample size more than 200; results reported for both outcomes of interest; 100% native kidney biopsy; and 100% use of automated biopsy devices. The maximum quality score was five.

The authors did not report how many reviewers performed quality assessment.

Data extraction
Rates of macroscopic haematuria, erythrocyte transfusion, angiographic intervention, nephrectomy, bladder obstruction and death were extracted as percentages. All data were independently reviewed and confirmed by all authors.

Methods of synthesis
Results were pooled using DerSimonian and Laird random-effects models. Statistical heterogeneity was assessed with the Q test and I². Meta-regression was used to identify patient and procedural predictors of macroscopic haematuria and erythrocyte transfusion,

Results of the review
Thirty-four studies (9,474 patients, the number of biopsies per study ranged from 77 to 1,120) were included in the review. There was one randomised controlled trial, thirteen prospective and twenty retrospective studies. Out of a possible quality score of five, three studies scored two, 17 scored three, 12 scored four and two scored five.
The overall rate of macroscopic haematuria was 3.5% (95% CI 2.2 to 5.1; 30 studies, 8,042 biopsies) and erythrocyte transfusion was required in 0.9% of the biopsies (95% CI 0.4 to 1.5; 32 studies, 9,456 biopsies). Statistical heterogeneity was high for both outcomes with $I^2$ of 92% for macroscopic transfusion and 84% for erythrocyte transfusion. The rate of perinephric haematoma was 11.6% (95% CI 7.0 to 18.4; 7,487 biopsies) and angiographic intervention was needed in 0.6% of biopsies (95% CI 0.4 to 0.8; 24 studies, 8,445 biopsies). Other complication rates were low: urinary tract obstruction was seen in 0.3% of 2,416 biopsies; unilateral nephrectomy in 0.01% of 8,941 biopsies and two patients died out of 8,971 biopsies.

Results for predictors of macroscopic haematuria and erythrocyte transfusion were reported in the paper.

**Authors' conclusions**
There was a relatively small risk of macroscopic haematuria and erythrocyte transfusion after native kidney biopsy with automated biopsy devices and real-time ultrasonography.

**CRD commentary**
This review reported inclusion criteria for interventions and outcomes and included all study designs that recruited a minimum number of patients. Only one database was searched for papers in English and there were no searches of other sources such as trials registers or conference abstracts. The authors acknowledged potential for publication bias. More than one reviewer selected studies and extracted data, to minimise error or bias. The quality assessment used a tool designed by the authors which was specific to this review and did not cover some relevant aspects of study design and analysis. The analysis methods were appropriate but there were very high levels of statistical heterogeneity for both main outcomes, which affected the reliability of the pooled estimates.

Due to limitations in the review methods, the lack of randomised trials and the presence of considerable heterogeneity the authors' conclusions may not be reliable.

**Implications of the review for practice and research**
**Practice:** The authors stated that the use of large-gauge needles (14 gauge) should be discouraged.

**Research:** The authors stated that research was needed into patient and procedural risk factors for haemorrhagic complications to improve patient selection and biopsy technique. More research was also needed on the impact of needle gauge and number of passes on haemorrhagic risk.

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