CRD summary
This review assessed the effects of needle diameter and image guidance on sample adequacy, accuracy and complication rates associated with percutaneous spine biopsy; it found that imaging method had no effect and needle size effected only complication rates (increasing needle size associated with increasing complications). Limitations in the review methods and analyses mean that these findings should be treated with caution.

Authors' objectives
To assess the effects of needle diameter and image guidance method on the adequacy of tissue sample, accuracy and complication rates associated with percutaneous spine biopsy.

Searching
MEDLINE was searched. Search terms were reported. Bibliographies of retrieved articles were screened for additional studies.

Study selection
Studies that assessed the performance of biopsy using a fine needle or trephine with an identifiable internal diameter and an imaging study (fluoroscopy or computed tomography), in all patients (or a sub-set of patients) in whom a spine lesion had been identified by radiography or computed tomography (CT), were eligible for inclusion. Included studies were required to report adequacy of sampling (the percentage of samples from which the pathologist could make a diagnosis) and/or accuracy (the percentage of diagnosis confirmed by surgery, response to treatment, or clinical follow-up, i.e. the true positives plus true negatives).

Studies included biopsies at all levels (cervical, thoracic, lumbar and sacral) and used a variety of approaches (posterolateral, transcostovertebral, anterolateral, transpedicular). The reference standards used to confirm diagnoses in individual studies were not reported. The diameter of the biopsy needles used in included studies ranged from 0.5 to 3.5mm.

Studies were assessed for inclusion by two reviewers.

Assessment of study quality
The authors did not state that they assessed study validity.

Data extraction
Data were extracted on details of the biopsy procedure, sample adequacy, accuracy and reported complications, for each included study (reported in a supplementary online appendix, see URL for Additional Data).

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
A random-effects model was used to calculate pooled estimates of sample adequacy, accuracy and complication rates, with 95% confidence intervals (CIs).

Regression analysis (with needle diameter as continuous moderator variable and logit event rate as the dependent variable) was used to investigate the effect of needle diameter on sample adequacy, accuracy and complication rates. Data were presented comparing sample adequacy, accuracy and complication rates using CT and fluoroscopy image guidance, but statistical methods used were not reported.
Results of the review

Twenty five studies, with a total of 1,628 participants (range 6 to 410) were included in the review.

Statistical heterogeneity (p<0.001) was present in all data sets.

Method of imaging guidance: The pooled tissue sample adequacy rates were 92.6% (95% CI 86.5 to 96.1) using CT image guidance, and 90.1% (95% CI 87 to 92.5) using fluoroscopy (25 studies). The pooled accuracy rates were 90.2% (95% CI 82.9 to 94.6) using computed tomography image guidance, and 88.1% (95% CI 82.6 to 92.1) using fluoroscopy (14 studies). The pooled complication rates were 3.3% (95% CI 1.6 to 6.8) using CT image guidance, and 5.3% (95% CI 2.1 to 13) using fluoroscopy; 10 studies reported no complications; three studies did not report complication rates. No significant differences between CT and fluoroscopy were identified for any of the outcomes reported.

Needle diameter: Regression analyses found no significant effect of needle diameter of sample adequacy or accuracy. Complication rates were found to increase with increasing needle diameter (p=0.01).

Authors’ conclusions

As outcomes were not significantly different for CT or fluoroscopy imaging, the choice of image guidance technique should consider other factors, such as type and location of lesion and clinician expertise. In situations where the use of a small diameter needle was highly effective (e.g. metastatic lesions), the authors recommended that clinicians should consider using a small diameter needle because of the higher complication rates associated with large-bore needles; however, in cases of sclerotic lesions, where obtaining an adequate sample can be difficult, the use of a larger-bore needle was recommended as desirable.

CRD commentary

The review addressed a clearly stated research question; broad, but appropriate, inclusion criteria were defined. Only one bibliographic database was searched, so it was possible that relevant studies were missed. It was unclear whether any language or publication status restrictions were applied to the search. Reporting of the review process was limited, so the potential for error and/or bias, at study level or review level, could not be assessed.

No assessment of the methodological quality of included studies was reported. Some details of the included studies were reported (as an online supplement). However, no details of the study participants (e.g. pathology under investigation) or the reference standard used to confirm diagnoses were provided, so it was not possible to assess the generalisability of the results reported. Given the apparent between study heterogeneity and the possible inclusion of a variety of pathologies and reference standards, the generation of pooled estimates of outcome measures was unlikely to have been appropriate. In addition, the adequacy of the data sets for accuracy and complication rates to support regression analyses was debatable.

Some of the authors’ conclusions (for example, the effectiveness of different needle sizes in different clinical applications) were not derived from data reported in this study. Overall, the findings of this review should be treated with caution.

Implications of the review for practice and research

Practice: The authors stated that, in situations where the use of a small diameter needle is highly effective (e.g. metastatic lesions), clinicians should consider using a small diameter needle because of the higher complication rates associated with large-bore needles; however, in cases of sclerotic lesions, where obtaining an adequate sample can be difficult, the use of a larger-bore needle is desirable..

Research: The authors did not state any implications for further research.

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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.