Ultrasound-guided radial artery catheterization: A superior technique for expert clinicians?

Dear Editor,

We read with interest the review by Pacha and colleagues[1], which re-enforced the conclusions drawn in several prior meta-analyses.[2,3] These studies have consistently found that the use of ultrasound improves first-attempt success rates compared with palpation. However, none of these studies have performed sensitivity analyses based on clinician skill level, which is a common excuse for not following this evidence-based practice.

The systematic search outlined by Pacha and colleagues was performed using PubMed, Web of Science, Embase, and Cochrane Library to June 2018. Randomized controlled trials investigating ultrasound versus palpation-guided radial artery catheterization performed by expert clinicians were eligible for inclusion. Expert clinician was defined as catheterization performed by attending physicians with experience in radial artery catheterization and ultrasound-guided vascular access. Outcomes to be assessed included first-attempt success rate, failure rate, and hematoma formation. The risk of bias for each study was assessed using the Cochrane Collaboration risk of bias tool. The extracted data were analyzed using RevMan 5.3 software (The Nordic Cochrane Centre, Copenhagen, Denmark). Dichotomous outcomes were evaluated using the relative risk ratios (RRs) with 95% CI. The Mantel-Haenszel (M-H) random effects model was applied. Heterogeneity was assessed using the I^2 statistic. P value of less than .05 provided evidence of significant RR and I^2.

Five studies with 1,146 patients were included.[4-8] The risk of bias is presented in Figure 1. Overall, there was a significant increase in first-attempt success rate with ultrasound (RR 1.37, 95% CI 1.06-1.78; P = .02; Figure 2). This effect was not consistent across the studies, with a significant heterogeneity present (I^2 = 88%; P < .0001). Similarly, there was a significant reduction in failure rate with the use of ultrasound (RR 0.34; 95% CI 0.13-0.93; P = .04; Figure 3) with significant heterogeneity (I^2 = 59%; P = .04). As found by Pacha and colleagues, without heterogeneity (I^2 = 62%; P = .11), there was no significant difference in hematoma formation (RR 0.29; 95% CI 0.08-1.04; P = .06).

Overall, ultrasound improved first-attempt success and failure rates. However, in both the initial study by Pacha and colleagues and this subgroup analysis presented, there was significant heterogeneity. It is unclear as to the cause of heterogeneity; one possibility in regard to the study by Zaremski et al[9] is the much higher first-attempt success (>85%) in both groups. Other possibilities may include factors not controlled for in the design of certain studies such as wrist positioning. Despite this heterogeneity, there is a clear benefit likely to be gained from the routine use of ultrasound on radial artery catheterization, even for expert clinicians.

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Leigh White, MBBS
University of Queensland, Brisbane
Queensland, Australia
Sunshine Coast University Hospital, Birtinya
Queensland, Australia
Reprint requests: Leigh White, University of Queensland
Brisbane, Queensland, Australia
E-mail: lw844@uowmail.edu.au

Ruan Vlok, MBBS
University of Notre Dame, Chippendale
New Southwales, Australia
Wagga Wagga Base Hospital, Wagga Wagga
New Southwales, Australia

Thomas Melhuish, MBBS
Royal Prince Alfred Hospital, Sydney
New Southwales, Australia
University of New South Wales, Sydney
New Southwales, Australia

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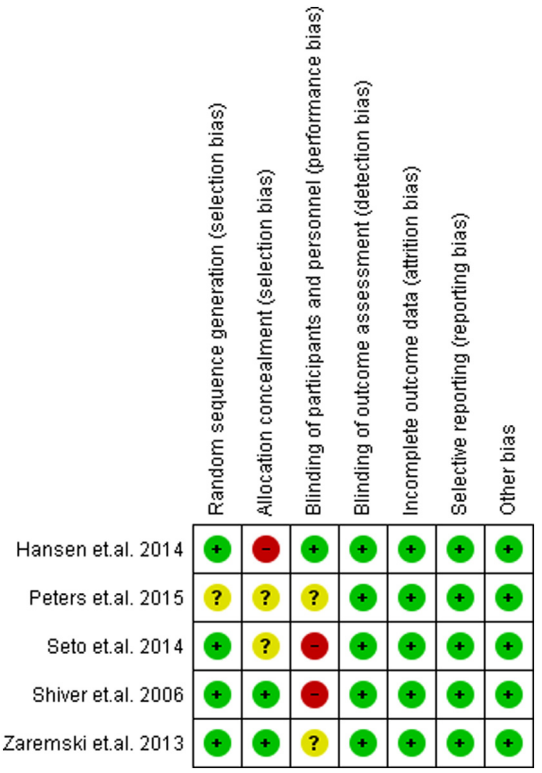
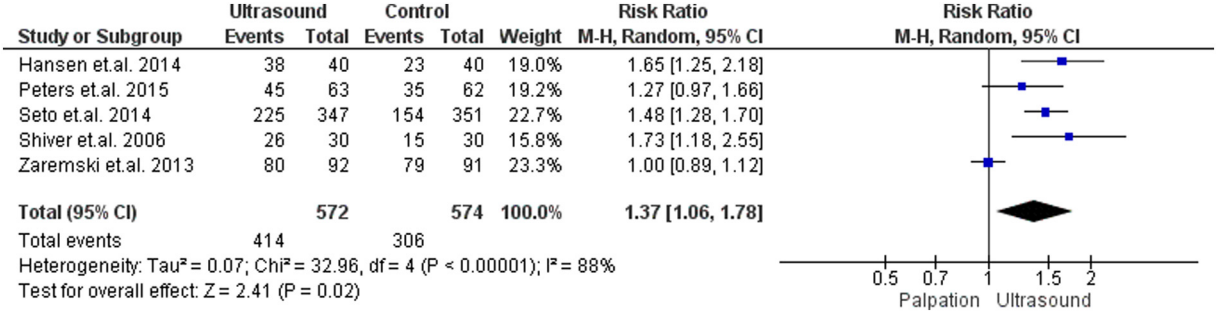
Figure 1



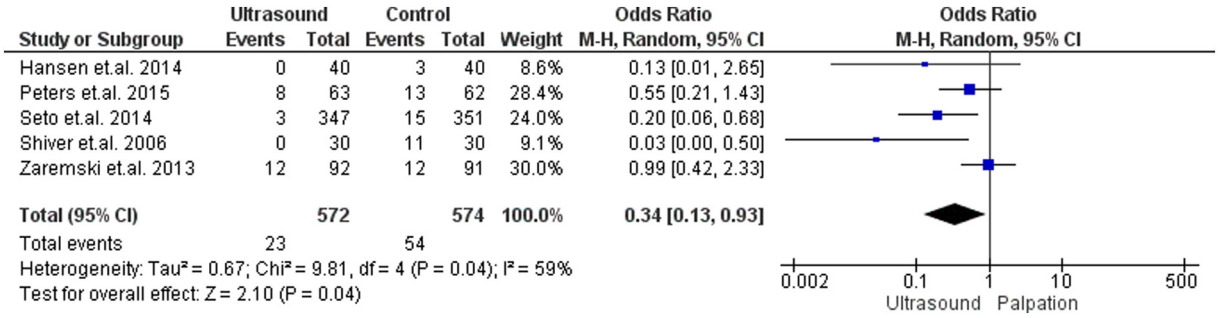
Risk of bias.

Figure 2



First-attempt success rate.

Figure 3



Failure rate.

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