Reply to Letter to the Editor

The Sensitivity and Specificity of Ultrasound for the Diagnosis of Carpal Tunnel Syndrome

A *Meta-analysis*

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We thank Descatha et al. for their interest in our article [3] and their comments. A systematic review and meta-analysis uses a systematic approach to identify evidence from multiple studies to attain an accurate and unbiased estimate of the association between interventions or exposures and events that could be widely applicable to a larger population [4]. By combining patient data from multiple studies appropriately, meta-analyses allow for larger sample sizes and therefore statistical power to determine treatment effects [1, 4]. However, systematic reviews are not without limitations. All reviews are retrospective and observational and therefore are subject to random error and systematic bias [1]. Systematic reviews, when conducted properly, can provide a high level of evidence, improve the precision of the analysis by increasing the sample size, and help to explain differences in study results attributable to heterogeneity [2]. Ultimately, a meta-analysis depends on the quality of the primary studies included in the analysis [2]. We believe that we performed a quality meta-analysis [3], confirmed

by high scores on the Oxman and Guyatt index [5], a validated scoring system for the quality of meta-analyses and systematic reviews.

Drs. Descatha, Huard, and Duval suggest that by combining studies that used different cross-sectional area cutoffs for positive diagnosis of carpal tunnel syndrome, our results may artificially influence the sensitivity and specificity of the sample. All meta-analyses carry this risk, and our study is no different. We agree that obtaining the raw data from all studies included in the analysis would have yielded more accurate results. However, as obtaining the raw data from every study is not possible, including only studies for which we were able to obtain raw data would introduce substantial selection bias. They also suggested that separate analyses should have been performed at each cross-sectional area cutoff value, however, this would decrease the sample size for each value and add more confusion to an already potentially confusing analysis. We thank Drs. Descatha, Huard, and Duval for observing our failure to include the likelihood ratios in the manuscript and have included a table detailing the ratios (Table 1).

We respectfully disagree that the specific transducer and ultrasound equipment used in each study is an important factor in the sensitivity and specificity of ultrasound as a diagnostic tool. We found no literature to support the advantage or disadvantage of one transducer over another. We did identify substantial heterogeneity in the criteria used for electrodiagnostic testing and clinical findings in the diagnosis of carpal tunnel syndrome. This heterogeneity, however, mirrors clinical reality where different institutions and physicians use varying criteria.

We sincerely thank Descatha et al. for their thoughtful comments and hope we have addressed their concerns.

Re: Fowler JR, Gaughan JP, Ilyas AM. The sensitivity and specificity of ultrasound for the diagnosis of carpal tunnel syndrome: a meta-analysis. Clin Orthop Relat Res. 2010 Oct 21. [Epub ahead of print]

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Table 1. Studies included in the meta-analysis [3] and reported likelihood positive and negative ratios

Study*	Reference standard	Cross-sectional area cutoff (mm ²)	Number of wrists	Likelihood ratio positive	Likelihood ratio negative
Pinilla et al. [24]	Clinical	6.5	70	13.5	0.11
Pastare et al. [23]	Clinical	9	84		0.38
Altinok et al. [1]	Clinical	9	80	8.7	0.38
Padua et al. [22]	Clinical	10	54		
Visser et al. [27]	Clinical	10	305	8.7	0.24
El Miedany et al. [5]	Clinical	10	254		0.02
Kwon et al. [14]	Clinical	10.7	82	1.8	0.54
Kele et al. [12]	Clinical	11	110	37.0	0.27
Wong et al. [30]	EDX	9	96	2.7	0.09
Ziswiler et al. [32]	EDX	9	101	2.8	0.20
Wong et al. [30]	EDX	9	124	1.6	0.39
Duncan et al. [4]	EDX	9	170	27.0	0.19
Ashraf et al. [2]	EDX	9	150	3.6	0.26
Yesildag et al. [31]	EDX	10.5	224	17.8	0.12
Sarria et al. [25]	EDX	11	105	1.7	0.44
Weisler et al. [28]	EDX	11	130	5.9	0.11
Moran et al. [17]	EDX	12.3	70	12.4	0.40
Nakamichi and Tachibana [20]	EDX	13	822	19.0	0.44
Lee et al. [15]	EDX	15	100	22.0	0.13

EDX = electrodiagnostic testing. (* Adapted from Table 1 in Fowler JR, Gaughan JP, Ilyas AM. The sensitivity and specificity of ultrasound for the diagnosis of carpal tunnel syndrome: a meta-analysis. *Clin Orthop Relat Res.* 2010 Oct 21 [Epub ahead of print].)

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