**Ustun N, Tok F, et al. Ultrasound-guided vs. blind steroid injections in carpal tunnel syndrome: A single-blind randomized prospective study. Am J Phys Med Rehabil. 2013;92(11);999-1004.**

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Design: randomized clinical trial

Purpose of study: to compare the effectiveness of ultrasound-guided versus anatomical landmark-guided injection of methylprednisolone in patients with carpal tunnel syndrome

Population/sample size/setting:

* 46 patients (41 women, 5 men, mean age 44) treated for CTS at a university physical medicine department in Turkey
* Inclusion criteria were confirmation of moderate CTS with slowing of sensory conduction velocity and abnormal distal motor latency in patients with a clinical diagnosis of CTS
* Exclusion criteria were diabetes, previous steroid injection in the same wrist, peripheral neuropathy, and traumatic nerve injury
	+ Polyneuropathy was ruled out in suspicious circumstances with motor and sensory nerve conduction studies in the arm and leg

Interventions:

* All patients had an injection of 40 mg methylprednisolone in the ulnar side of the median nerve done by the same physician
* Randomization was to anatomic landmark guidance (n=23) or ultrasound guidance (n=23)
	+ Landmark injection was done with a 26-gauge needle inserted into the proximal carpal tunnel at the distal wrist crease just ulnar to the palmaris longus tendon
	+ US guidance was done with a transducer perpendicular to the median nerve and the injecting needle was positioned into the proximal carpal tunnel
* Following the injection, medication, splinting, and other treatments were not allowed until the 12 week evaluation

Outcomes:

* Followup was done at 6 and 12 weeks following the injection
* The primary outcome was improvement in the Boston CTS questionnaire 12 weeks after the injection
* Both groups improved their symptom and function scores at 6 weeks, and the improvements were maintained at 12 weeks
* The Boston CTS symptom scores improved more in the US than the landmark guided group
	+ For the US and landmark symptom scores, the average baseline values were 2.60 and 2.36 points respectively, while the 12 weeks scores were 1.30 and 1.67 points respectively
* The Boston CTS function scores improved equally in the US and the landmark guided group
	+ For the US and landmark function scores, the average baseline values were 2.48 and 2.68 points respectively, while the 12 weeks scores were 1.36 and 1.86 points respectively
* Symptoms were relieved on average in 4.11 days in the US group and 6.23 days in the landmark group
* Procedural pain occurred in 4 patients in the US group and in 8 patients in the landmark group
* Major side effects such as nerve or blood vessel damage did not occur in any patient

Authors’ conclusions:

* Both US and blind steroid injections reduce the symptoms and improve function in the setting of CTS, but these results suggest an earlier onset and greater improvement of symptom relief when the injections are guided with US
* The study was not blinded, which is a limitation of the design; the number of patients was small and there was a high preponderance of women; a blind design and a larger number of patients are necessary to make more reliable inferences

Comments:

* There is a marginally adequate description of the randomization process; a computer was used to generate the sequence, but allocation concealment is not described
* There is no description of how the time to relief of symptoms was determined; if patients kept daily diaries, for example, that was not mentioned, and the time to relief of symptoms should be viewed with caution
* After the injections were done, additional interventions such as splinting and medication were not allowed; this is a departure from usual clinical practice, and limits the relevance of the study to everyday settings, and classifies the study as an “explanatory” rather than a “pragmatic” trial
	+ Explanatory trials are set up to resemble laboratory conditions, in which a single variable is isolated and tested without “contamination” by other variables; pragmatic trials are set up to resemble likely conditions in the community in which the intervention will probably be delivered when adapted by clinicians practicing in that community
	+ While not a source of biased comparison between groups, there remains a possibility that allowing such treatments as splinting and medication could equalize the symptom outcomes between the groups
* The clinical importance of the difference in symptom scores is not discussed, but the groups appear to differ at 12 weeks by about half a standard deviation, which is consistent with a moderate effect size
	+ The authors report having compared the Boston score improvements with nonparametric tests; because the Boston scores were slightly worse in the US than in the landmark group, the comparison of improvement scores could be a mix of treatment effect and regression to the mean in the US group; if the distribution of the outcome data permitted it, analysis of covariance with baseline scores as covariates could have been a better way to compare the groups on symptom and function data
* Although not a primary outcome, the difference in procedure pain, 4 patients in the US group and 8 in the landmark group, could be an important outcome which is likely to be directly related to the improved accuracy of the injection when guided by US; even though the median nerve was not damaged in any patient, the difference in frequency of injection pain is relevant to consider, and this group difference may be more persuasive than the difference in the primary outcome

Assessment: Adequate for some evidence that in the setting of moderately severe CTS in which a corticosteroid injection is being done, both ultrasound-guided and landmark guided techniques lead to substantial functional and symptomatic improvement, but ultrasound guidance reduces the frequency of procedure-related pain by about one half compared to injection guided by using the available anatomic landmarks, which may result in moderately greater symptom improvement 12 weeks after the steroid injection has been done.