ANATOMY-GUIDED INJECTIONS OF BOTULINUM NEUROTOXIN IN CERVICAL DYSTONIA: HOW ACCURATE IS THE NEEDLE PLACEMENT?

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INTRODUCTION. Botulinum neurotoxin (BoNT) is the first line therapy for cervical dystonia; some patients are however bad responders. Several factors can modify the response to this treatment, such as the age, the existence of a head tremor, the main subtype of the dystonia or the muscle selection[1,2]. The accuracy of needle placement may also play a part. Previous studies underlined the low accuracy of anatomy-guided injections in the lower limb[3-5]. The objective of the present study was to assess the accuracy of anatomy-guided BoNT injections in cervical muscles.

METHODS. We studied consecutive patients receiving cervical injections of BoNT under anatomic (*i.e.* palpatory and visual) guidance in routine. After the needle was inserted, ultrasonography was used to localize the placement of the needle tip (Figure 1) and/or of the BoNT pool (Figures 2 and 3). The injections were performed by a single physician, with a 15 years' experience in BoNT injections.

RESULTS. Thirty patients were included. BoNT was injected in 146 muscles; the mean number of injections per muscle was 1.34. The results are summarized in Table 1. The lowest accuracy was observed in the *Splenius capitis* and the *Levator scapulae* muscles. We were unable to visualize correctly the needle tip or the BoNT pool for less than 7% of the injections.

| Target muscle	Number of injections	Correct accuracy	Too deep	Too superficial	Unknown
Splenius capitis (n=43)	64	65,57%	16,39%	13,11%	4,92%
Semispinalis capitis (n=9)	10	84,62%	7,69%	0%	7,69%
Semispinalis cervicis (n=1)	1	100%	0%	0%	0%
Sternocleidomastoideus (n=30)	41	78,05%	9,76%	4,88%	7,32%
Trapezius (n=31)	44	80,00%	6,67%	8,89%	4,44%
Levator scapulae (n=31)	35	67,65%	14,71%	5,88%	11,76%
Scalenus medius (n=1)	1	100%	0%	0%	0%
All (n=146)	196	73,47%	11,73%	8,16%	6,63%

Table 1. Accuracy of anatomy-guided injections of Botulinum neurotoxin in the muscles of the neck.
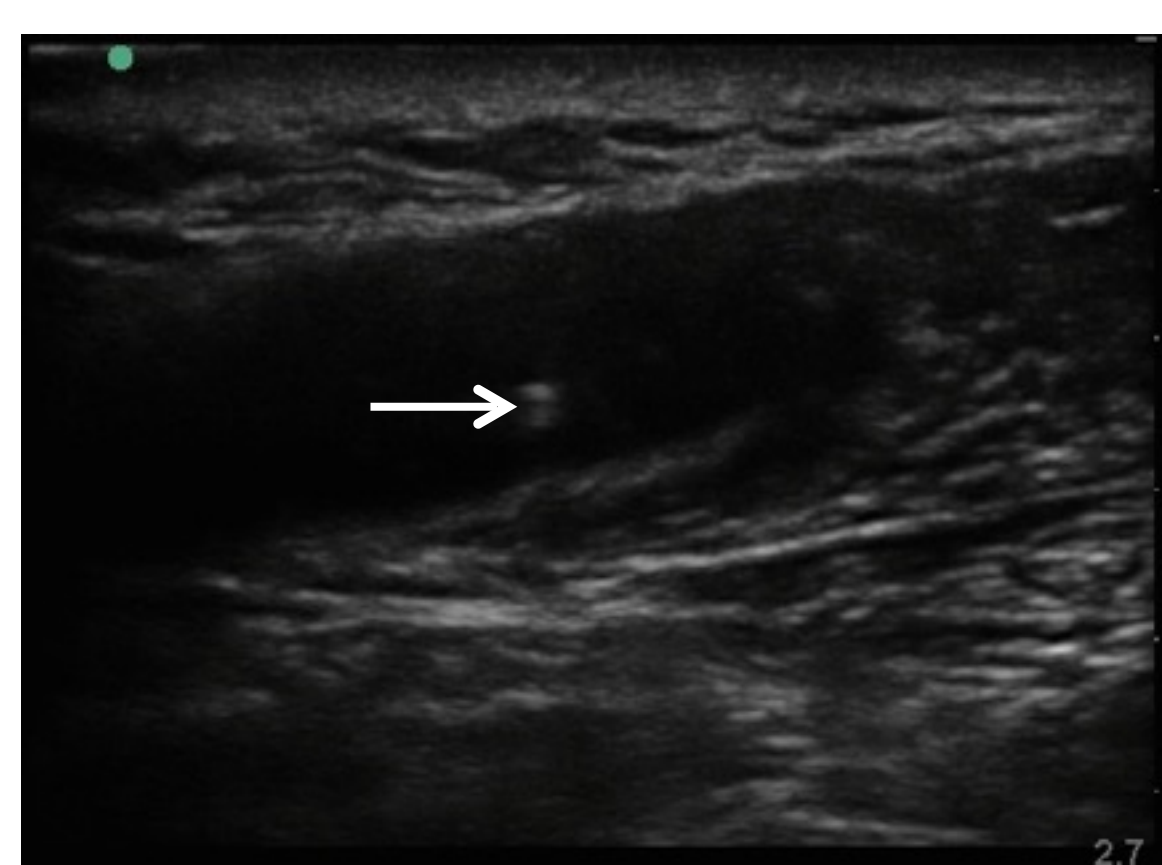
Figure 1. Needle tip (arrow) in the *Trapezius* muscle.
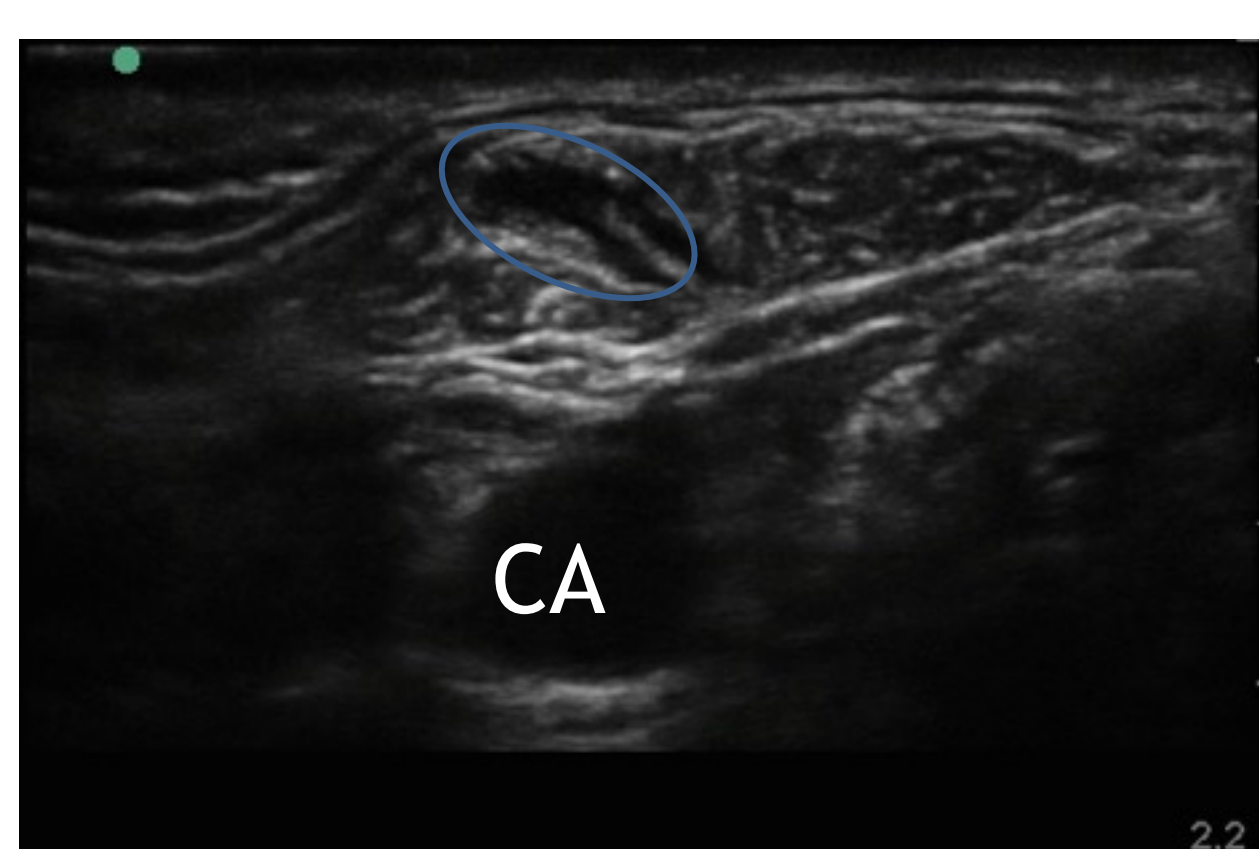
Figure 2. BoNT pool (circle) in the *Sternocleidomastoideus* muscle. The pool is hypoechogenic, as usual. CA: carotid artery..
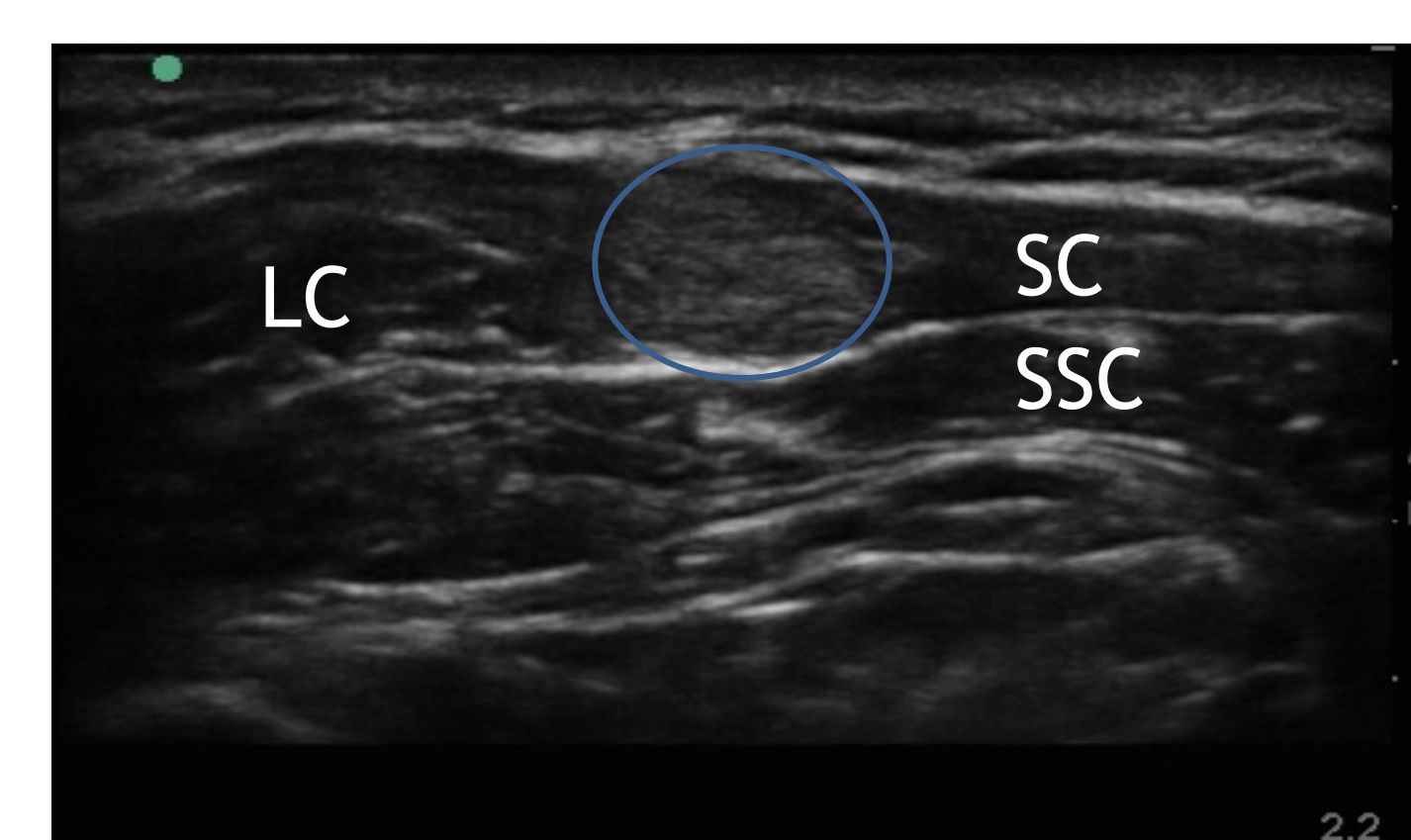
Figure 3. BoNT pool (circle) in the *Splenius capitis* muscle. The hyperechogenicity of the pool is uncommon. LC: *Longissimus capitis*; SC: *Splenius capitis*; SSC: *Semispinalis capitis*.

CONCLUSIONS. Even into the hands if a trained physician, anatomic guidance of BoNT injections in cervical muscles is often inaccurate. This emphasizes the importance of imaging-guided injection protocols. Ultrasonography may improve the accuracy of the injections (*cf.* poster P.9.12).

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