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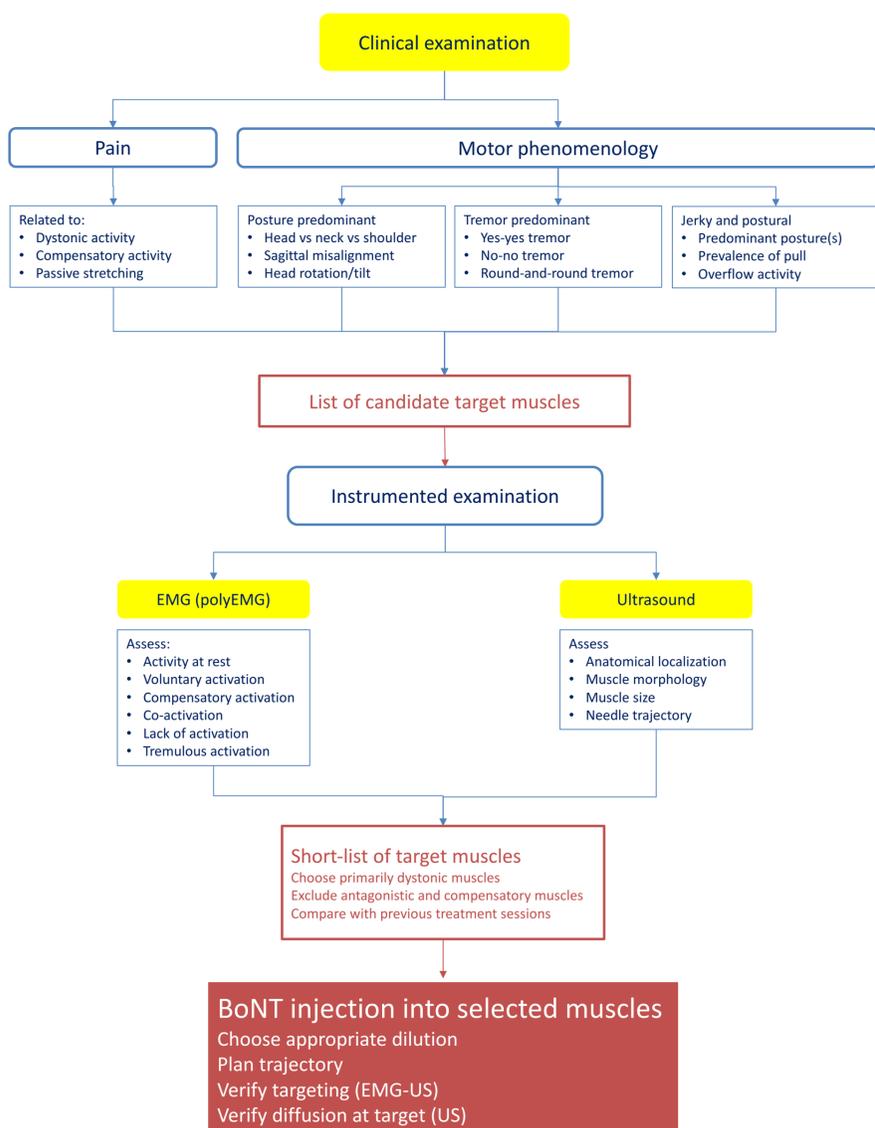
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Background

Botulinum neurotoxin (BoNT) injections are considered the gold standard treatment for patients affected by cervical dystonia (CD)¹, but only 60% of the patients are satisfied². Recently it has been demonstrated that, apart from guidance using electromyography (EMG), ultrasound (US)³ can improve BoNT efficacy in CD and reduce adverse effects especially in targeting deep neck muscles and managing complex cases. There is currently no consensus on the practical issues involved in performing guided injections⁴.



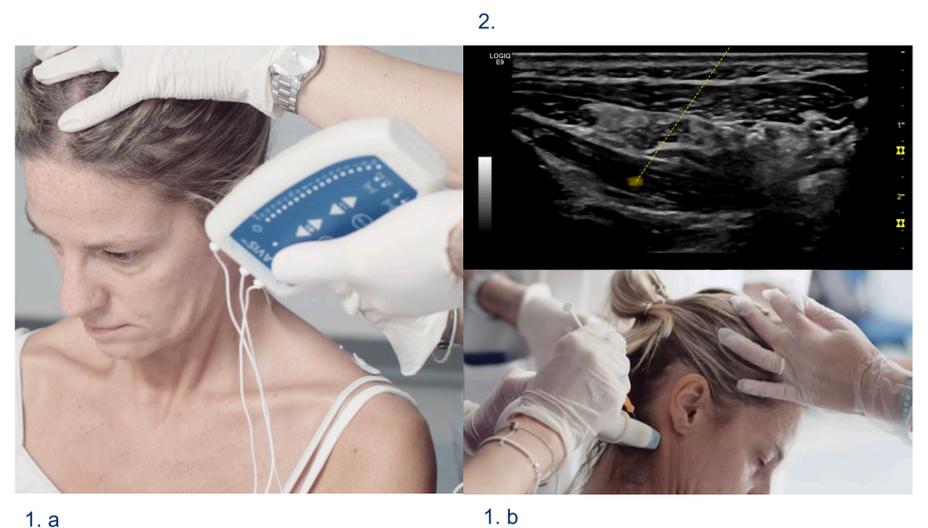
Practical algorithm for BoNT injections into selected muscles in CD.⁵

Methods

Population: 14 consecutive CD patients (7 males, 7 females), aged 52.2 years (± 12.5 years) were recruited in the BoNT clinic. They received BoNT treatment according to the protocol. The patients were assessed at baseline, 6 weeks (T1), and 12 weeks after treatment (T2), using the Toronto Western Spasmodic Torticollis Rating (TWSTRS) Scale.

Data analysis

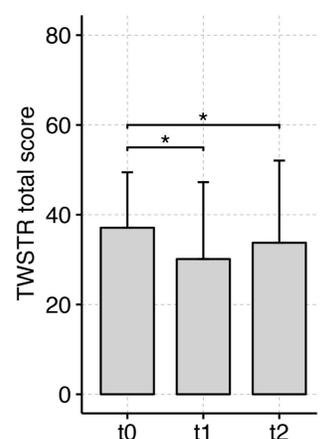
Statistical analysis was performed using the Friedman rank sum test followed by Wilcoxon signed rank test.



1. Decision making process of BoNT injection using bipolar needle connected to acoustic EMG (a.) combined to ultrasound scanner (b.) (15MHz probe)
2. Trajectory of the needle in the Obliquus Capitis Inferior muscle and BoNT liquid diffusion.

Results

The Friedman rank sum test showed a significant time effect for the TWSTRS total score (Friedman's chi-square test = 25.986, degree of freedom [df] = 4, $P < 0.001$). At the expected BoNT peak effect time (T1), the median TWSTRS total score was significantly lower than at baseline (37.1 vs 30.1, $P < 0.001$). At T2, the median TWSTRS total score was still significantly reduced (33.8, baseline vs 12 weeks, $P = 0.004$). There was no significant difference between 6 and 12 weeks for TWSTRS total scores ($P = 0.51$). No adverse events were recorded.



Conclusions

Combined EMG/US-guided BoNT injections can be performed according to a new algorithm. The treatment is efficacious and appears to last longer than 12 weeks without appreciable side effects. A controlled clinical trial comparing traditional and protocol-based BoNT treatments in CD patients is warranted.

Relevant references

1. Simpson DM, Hallett M, Ashman EJ, et al. Practice guideline update summary: botulinum neurotoxin for the treatment of blepharospasm, cervical dystonia, adult spasticity, and headache: report of the Guideline Development Subcommittee of the American Academy of Neurology. *Neurology*. 2016;86:1818-1826.
2. Comella C, Bhatia K. An international survey of patients with cervical dystonia. *J Neurol*. 2015;262:837-848.
3. Schramm A, Huber D, Mobius C, Munchau A, Kohl Z, Baumer T. Involvement of obliquus capitis inferior muscle in dystonic head tremor. *Parkinsonism Relat Disord*. 2017; 44:119-123.

4. Albanese A, Abbruzzese G, Dressler D, et al. Practical guidance for CD management involving treatment of botulinum toxin: a consensus statement. *J Neurol*. 2015;262: 2201-2213.
5. Castagna A, Albanese A. Management of cervical dystonia with botulinum neurotoxins and EMG/ultrasound guidance. *Neurol Clin Pract*. 2018. In press.