



Letter to the Editor

Counter reply: Impact of instrumental analysis of stiff knee gait on treatment appropriateness and associated costs in stroke patients

To the Editor

We are grateful to Drs Picelli, Sandrini, Cisari, Paolucci, Smania, and Baricich for their valued replies to our manuscript [1,2].

Their first criticism to our study relates to the lack of information regarding the past and future history of patients in terms of toxin treatments, compared to the date of their instrumental evaluation. Picelli and colleagues stated that "without considering these variables no definitive conclusion can be drawn about the appropriateness of BoNT-A treatment for SKG in light of gait instrumental analysis" [1]. In our view, this statement is correct only if we refer to the possible increase in appropriateness determined by instrumental analysis. As the patient's treatment history is not known, we cannot state whether the instrumental analysis led to the modification of a potentially inappropriate treatment or the selection of a more appropriate one. Instead, we remain convinced that providing the referring professional (e.g. PMR doctor, neurologist, neuro-orthopaedic surgeon, PT) with information about the presence or absence of muscle activity in the quadriceps femoris (and triceps surae) during walking is of utmost importance in identifying the causes of SKG (and equinus) in the individual patient. This can integrate the clinical assessment to promote the selection of the most appropriated treatment. Moreover, the concept of measuring pathophysiological patterns while walking is in line with the recommendations by the European Consensus Table cited by Picelli and colleagues, where it is stated that: "A single muscle is rarely treated in isolation and it is important that the pattern of muscle under- and overactivity, at rest and while moving, is understood, so that relevant muscles can be appropriately treated" [3]. Indeed, the same altered joint kinematic can be obtained as the result of different pathological muscle patterns in stroke patients [4]. The increasing use of diagnostic blocks, cited by Picelli and colleagues, is in line with this reasoning. These blocks have the further advantage of simulating the effects of the focal inhibition, both in term of knee flexion during swing and of knee support ability during stance. On the other hand, this method, as the instrumental gait analysis, is not always available in all centers and clinics, and requires time and specialized staff.

The second criticism relates to the misinterpretation, on our part, of the results reported in a recent survey by Picelli and colleagues [5]. Dr Picelli and colleagues properly highlighted that we misinterpreted their results. Consequently, we were mistaken when we indicated a number of 100 treatments as a reasonable average amount of treatments delivered by a generic center treating SKG following stroke. On the other hand, the average cost/year we used in our study was based on the work done by Schnitzler and colleagues that did not include any rehabilitation treatment following the inoculation and may underestimate the overall cost of a single treatment in everyday practice [6]. Therefore, the savings estimate proposed in our manuscript in the two hypothetical scenarios

must be scaled proportionally to the volume of treatments in individual centers and further adjusted to include post-inoculation costs. We agree with Drs Picelli, Sandrini, Cisari, Paolucci, Smania, and Baricich that further "ad hoc" studies are needed to evaluate the long-term costs and benefits of a more accurate definition of the individual's pathophysiological pattern during walking, in post-stroke patients. In our opinion, such studies should be promoted and funded by the national healthcare authorities, so as to avoid the use of funding by industrial stakeholders, and should be led by experts in health management and in health technology assessment.

Furthermore, it is interesting to point out that the manuscript and the reply lay out two points of view that seem to be opposed in relation to the contribution of spasticity in walking alterations in patients who have had a stroke, and for whom, instead, a synthesis is desirable. Picelli and colleagues seem to identify spasticity as the cornerstone of the issue. In the reply, they introduced the term post-stroke spasticity (PSS) patients when referring to our sample, cited a recent review stating that "Post-stroke lower limb spasticity impairs balance and gait leading to reduced walking speed" [7], and indicated that "inaccurate selection and identification of the correct muscle for injection is a major cause for the loss of botulinum toxin type A (BoNT-A) response" when citing from the *European consensus table on the use of botulinum toxin type a in adult spasticity* [3], choosing this specific issue among the five listed in the paper [3].

We, on the other hand, indicated that the presence of spasticity during the clinical assessment is not a reliable predictor of the presence of spasticity during gait, thus requiring direct measurements, referred to muscle overactivity to distinguish between spasticity and other forms of muscle abnormal activity [4,8,9], and would focus on the "Development of changes in the muscle (fibrosis, contracture, etc.)" resulting in possible "Inaccurate injections", among the causes for the loss of BoNT-A response listed by Wissel and colleagues [3].

Given that both groups have extensive expertise in the clinical assessment and treatment of post-stroke patients and in the instrumental assessment of post-stroke patients' gait, respectively, we are glad this reply and counter-reply set the foundations for a constructive discussion. As indicated in the European Consensus Table cited by Picelli and colleagues, "Spasticity management must be undertaken by a multidisciplinary team, since optimal treatment involves physical therapy in conjunction with intermittent pharmacological treatment" [3]. In our opinion, experts in motion analysis should be included in these teams. This multi-professional approach, inclusive of PRM physicians, neurologists, PTs, biomedical engineers, neuro-orthopedic surgeons, kinesiologists and human movement scientists can promote the sharing among professionals of both issues and knowledge, paired with a greater degree of bidirectional osmosis between the clinical and the research

<https://doi.org/10.1016/j.gaitpost.2020.11.003>

Received 9 September 2020

Available online 5 November 2020

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environments [4]. In Italy, this effort has been carried out since 2000 by the Italian Society of Motion Analysis in Clinics, the referring scientific society for the clinical use of instrumental human movement analysis.

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Andrea Merlo*, Isabella Campanini
*LAM-Motion Analysis Laboratory, San Sebastiano Hospital, Correggio,
 Neuromotor and Rehabilitation Department, Azienda USL-IRCCS di Reggio
 Emilia, Reggio Emilia, Italy*

* Corresponding author.

E-mail address: andrea.merlo@ausl.re.it (A. Merlo).