

Post-Stroke Spasticity (PSS) Setting up a PSS Clinic: Experience and Results

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ABSTRACT

Stroke is a leading cause of long-term disability. As a consequence of stroke and associated upper motor neuron (UMN) syndrome, stroke survivors are often left with muscle overactivity, including spasticity.

Spasticity is characterized by over- activity in muscles after injury to the central nervous system. When left untreated, post-stroke spasticity (PSS) can lead to contractures, pain and deformity, involuntary movement, and greater functional impairments (eg, reduced mobility, self-care, dressing). Spasticity is a common symptom after stroke, arising in about 30% of patients, and usually occurs within the first few days or weeks [6]. However, the onset of spasticity is highly variable and can occur in the short- medium or long-term post-stroke period [1].

Post-stroke hemiparesis, together with abnormal muscle tone, is a major cause of morbidity and disability. Patients with post-stroke spasticity often demonstrate recognizable antigravity postural patterns (Fig 1) characterized by shoulder adduction, elbow and wrist flexion in the upper limb, hip adduction, knee extension and ankle plantar flexion in the lower limb. This “hemiplegic” posture, which is thought to result from increased motor neuron activity in antigravity muscles, significantly interferes with body image, balance and gait. BoNT-A, one of the most potent biologic toxins known to man [2] acts by blocking neuromuscular transmission via inhibiting acetylcholine release. BoNT-A treatment in post-stroke upper and lower limb spasticity is a safe and effective procedure to decrease muscle tone and increase the range of motion. More recent studies are demonstrating the importance for the rehabilitation therapist intervention to work alongside the physician to create more positive and significant effects on active function [3].

Daily stretching exercise is the key for the long-lasting benefits. BoNT-A Injections, Ultrasound guided technique [4], performed by a Physician in combination with physiotherapy and outcomes measurements are used to improve upper and lower limb function in stroke patients with spasticity in the clinical setting. We would like to share our experience on the benefit of the ultrasound guided technique to target the muscles and our results in setting up a spasticity clinic for post-stroke patients.

Presentation

Post-stroke spasticity is a common complication associated with other signs and symptoms of the upper motor neuron syndrome, including agonist/antagonist cocontraction, weakness, and lack of coordination. Together, they result in impairments and functional problems that can predispose to costly complications. Spasticity is a well-known motor dysfunction arising from upper motor neuron lesions due to stroke, spinal cord injury, multiple sclerosis and traumatic brain injury. Clinically, it is diagnosed with the velocity-dependent resistance felt by passive examination of joint motion [5].

In 1980, Lance defined spasticity as a motor disorder characterized by a velocity- dependent increase in tonic stretch reflexes (muscle tone) with exaggerated tendon jerks, resulting from hyper-excitability of the stretch reflex as one component of the upper motor neuron syndrome. UMN syndrome results in both positive and negative motor effects. The positive features include muscle overactivity including spasticity, clonus, flexor/extensor spasm, and hyper-reflexia. Negative features consist of weakness, loss of dexterity, and decreased co-ordination. The combination of these effects often leads to complications of contractures at the involved joints. Spasticity can be beneficial occasionally but usually is

detrimental to a patient's function.

Several factors need to be considered in the evaluation and management of these patients. The goal of PSS management should take into consideration not only reduction of muscle hypertonia but also the impact of PSS on function and well-being.

Setting up a new service is always challenging and for us starting the spasticity service for post-stroke patients has a challenging task. First of all we had to discuss with our managers about the importance of the use of BoNT-A injections to treat focal spasticity post-stroke, which is worldwide considered a gold standard procedure to prevent and treat focal spasticity post-stroke. We had to present a business case about an estimate annual cost of this procedure and discuss the cost-effectiveness. Our physician was trained overseas to perform this procedure with an ultrasound guided technique, which is considered a new method to target the muscles. This meant that we had to find an ultrasound available for the clinic. At the time, we were planning to start the clinic, 27Gauge needles were not available in the hospital. We had to go through a process to have these type of needles approved by the hospital commission. Creating a spasticity team was easier as the physiotherapist, physician and occupational therapist were all part of the same acute community rehabilitation service. Therefore, we could link our spasticity service to the community team for rehabilitation programs after the injections.

We created a specific referral form to be completed only by a physiotherapist. In the referral form, the physiotherapist is asked to provide general clinical information (type and date of the stroke); identify the patient's goals, perform the initial measurements: Arm A section A- Arm A section B, Leg section A- Leg section B - Modified Ashworth scores and Tardieu score. Our patients were then assessed in the clinic by the physician and the physiotherapist. Outcome measurements were re-performed (Ashworth modified score - Tardieu score - Arm A section A and Arm A section B). Patient's goals and the compliance were discussed with the patient. Patients were asked for a written consent to take photographs for teaching and learning purpose. Risk and benefits of BoNT-A injections with the possible outcome were explained to the patients. After a verbal consent from the patient, the BoNT-A was injection into to muscle by the Physician under ultrasound guided technique.

Patients were then reviewed by the community physiotherapist approximately 10 days post-injection for assessment and stretching exercises. They had to continue to perform the exercises with the help a relative or carer at home. The compliance of the daily work at home was the key for longstanding effect of the treatment. Twenty patient were referred to our spasticity clinic in the last 9 months.

60% of the patients referred to our service were considered eligible for BoNT-A injections. Female Mean age was 57.8, Male Mean age was 68. Overall mean age was 63.83% had spasticity post- ischaemic stroke, 17% had spasticity post-ICH.



Figure 1: Common postures of spasticity.

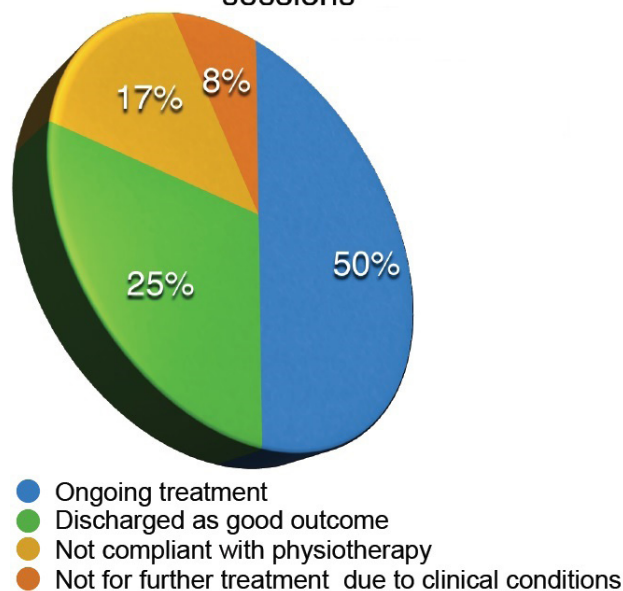
92% treated for upper limb spasticity. 8% treated for lower limb spasticity. 75% of the patients who received BoNT-A improved after the first session. 50% of the patients treated have been discharge from our service, of these, 25% discharged as not requiring further injections due to significant improvement in the subjective scores Arm A section A and B and objective scores Tardieu score and Modified Ashworth score with no more spasticity present (Figure 2).

17% of the patients have been discharged because they were not complaint with physiotherapy. Although in 8% improvement was seen after the first session, the decision was made not for further sessions due to high risk of skin infection secondary to atypical rash in a diabetic patient.

Both physical and occupational therapy were involved in maximizing function with a focus on mobility and activities of daily living.

Patients we are currently reviewing and treating are highly motivated patients, with improvement of their scores at each review. Improvements were shown in the ease of care for the patients, reduced pain and reduced burden of care on carers.

Fig 2: Outcome of Patients after 3 sessions



Discussion

Spasticity in the upper limb has been found to be associated with reduced arm function and lower levels of independence, and with

an astounding four-fold increase in direct care costs during the first year poststroke [6]. It seems as if spasticity in patients with stroke is more common in the upper extremity than in the lower limbs [7]. Spasticity is a common symptom after stroke, arising in about 30% of patients, and usually occurs within the first few days or weeks [6]. However, the onset of spasticity is highly variable and can occur in the short, medium or long term post-stroke period. A study by Wissel et al. [8] showed that 25% of patients with stroke suffer from spasticity within the first 6 weeks of the event. They also observed that spasticity primarily affects the elbow (79% of patients), the wrist (66%) and the ankle (66%) [8]. In the upper limbs, the most frequent pattern of arm spasticity is internal rotation and adduction of the shoulder coupled with flexion at the elbow, the wrist and the fingers [9,10]. In the lower limbs, adduction and extension of the knee with an equinovarus foot is the most observed pattern.

Patients with spasticity post-stroke often present with characteristic antigravity postural patterns with shoulder adduction, elbow and wrist flexion, hip adduction, knee extension, ankle plantar flexion, and foot inversion. Symptoms vary in localization and severity and may include hypertonicity (increased muscle tone), clonus (a series of rapid muscle contractions), exaggerated deep tendon reflexes, muscle spasms, scissoring (involuntary crossing of the legs), and fixed joints. The degree of spasticity may vary from mild muscle stiffness to severe, painful, and uncontrollable muscle spasms. When left untreated, post-stroke spasticity can lead to contractures, pain and deformity, involuntary movement, and greater functional impairments (eg, reduced mobility, self-care, dressing) and medical complications (eg, skin maceration and pressure sores). The effects of poststroke spasticity can interfere with daily activities that include tasks such as walking, picking up objects, washing, dressing, and sexual activity. In addition, the presence of post-stroke spasticity can negatively affect mood, self-image, and motivation, which in turn is a likely contributor to a post-stroke patient's psychosocial burden and depression. Spasticity can also have an impact on the care-giver burden in patients who are dependent on others for their basic activities of daily living [9-11].

Early intervention for spasticity may be critical for the preservation of muscle reactivity. Post-stroke rehabilitation is important to reduce disability and BoNT-A injections is considered a gold standard treatment for focal spasticity. BoNT-A is a neurotoxin that acts on the neuromuscular junction at the presynaptic site. It inhibits the release of acetylcholine, thus leading to muscle weakness and reduced muscle tone. Side effects of BoNT-A include local skin reaction and the spread of weakness to the adjacent non-injected muscles [12]. Contraindications to BoNT-A include pregnancy, lactation, neuromuscular junction disorders, and concurrent use of aminoglycosides. Ultrasound guided technique enables to visualize in real time the needle's progress, resulting in a precise localization of the target muscle, while avoiding certain structures like blood vessels and nerves. In addition, this technique allows a passive manipulation of the limb in order to distinguish the muscular body of the target muscle from other adjacent muscular structures.

Improvement of spasticity and functional muscle activity depends on the duration of the spasticity, motivation of the patient and family. In our clinic, stretching exercise is the key for the success of the rehabilitation programme. We discharged 16% of the patients from our service, after the first session, because they were not compliant to the physiotherapy programme. BoNT-A capacity to release the muscles with high tone does not always translate to any increased muscle activity in the antagonist muscles. In some of our cases the muscle activity did not return, but it did allow for increased ease of care and passive movement. It is important therefore, when selecting a patient for BoNT-A, to establish what the goals and expectations are beforehand. This information can be applied to our practice in the future, when discussing goals and outcomes with patients. With patients showing activity in the antagonist muscles prior to the injection, such as wrist and finger extensors, we may be able to discuss goals of improving active function. However, with those with minimal muscle activity, our goal setting may be based more around passive goals for caregiving. 75% of our patients achieved improvement after the first session, of these 25% did not required further sessions to maintain the results. We are starting to receive referrals from the acute stroke unit for acute stroke patients who are beginning to develop spasticity. This is important, as BoNT-A injections performed at an early stage could prevent the development of spasticity and help the patient to achieve the goals during physiotherapy sessions.

Conclusion

Spasticity is a common problem in post-stroke patients. Proper assessment of the patient with spasticity is crucial for treatment guidance and monitoring of the outcomes. BoNT-A injections is worldwide considered a gold standard procedure to prevent and treat focal spasticity post-stroke. BoNT-A is a safe and effective procedure to decrease muscle tone and increase the range of motion [13-14]. Recent studies are demonstrating the importance for the rehabilitation therapist intervention to work alongside the physician to create more positive and significant effects on active function. Setting up a spasticity clinic can be challenging and we learned from our experience that it is important to set realistic goals and expectations based on the patient's status prior to the injection. It is important to explain to the patient that BoNT-A is not a cure-all treatment, and that different patients can expect different results. We found that in literature, different outcomes measures are used in different studies to evaluate spasticity post-stroke [15].

We used three different scores in our patients: Arm A section a/b, Tardieu score and Ashworth modified scale [16] to give subjective and objective data. Further studies need to use the same standardized functional outcome measures so that the results can be compared to each other. The use of ultrasound, is the key of our service, as it enables to visualize in real time the position of the needle, resulting in a precise localization of the target muscle, avoiding certain structures like blood vessels and nerves. Our spasticity service is now considered part of the multidisciplinary stroke rehabilitation programme.

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