

## Enzyme hyaluronidase shows promise as treatment for muscle stiffness caused by brain injury

## September 26 2016

A naturally occurring enzyme called hyaluronidase may be an effective alternative treatment for spasticity, or muscle stiffness, a disabling condition in people who have had a stroke or other brain injury.

That is the finding of a study from NYU Langone Medical Center published in the July print issue of <u>*EBioMedicine*</u>, with a <u>corresponding</u> <u>commentary on the study</u> published in the same issue.

The study found that injections of hyaluronidase reduced muscle stiffness in patients with <u>neurological injury</u> without causing <u>muscle</u> <u>weakness</u> like conventional treatments such as <u>botulinum toxin</u>.

"These findings fill a critical gap in the understanding of muscle stiffness, and present a promising treatment for spasticity, a vexing problem that affects millions of people worldwide," says lead study author <u>Preeti Raghavan, MD</u>, assistant professor in the Department of Rehabilitation Medicine and director of <u>Motor Recovery Research</u> at Rusk Rehabilitation at NYU Langone.

Spasticity refers to hyperactive reflexes after neurological injury, but a major problem occurs when the spastic muscles become stiff or rigid and impede joint movement, causing pain, muscle contracture, and disability. Along with stroke, common causes of spasticity include traumatic brain injury, spinal cord injury, cerebral palsy, brain tumors,



and multiple sclerosis.

Although a well-established symptom of neurological injury, the factors that worsen spasticity remain poorly understood. Current treatments include central nervous system depressants taken orally, and injectable medications like botulinum toxin, but both cause muscle weakness, which can further impede movement without addressing the stiffness patients feel.

Raghavan and colleagues developed an alternative theory for the cause of muscle stiffness following a central nervous system injury they call the "Hyaluronan Hypothesis." It postulates that the accumulation of hyaluronan—a sugar molecule and common lubricant in joints and muscles—promotes the development of muscle stiffness. When a brain injury limits a person's mobility, hyaluronan thickens like honey, which can lead to abnormal sliding of muscle fibers and result in stiffness. Therefore, the researchers believed that an enzyme that breaks down such molecular sugar chains, called hyaluronidase, may reduce their concentration in muscles to reduce stiffness and increase joint movement.

To test this theory, researchers enrolled 20 patients between 10 and 77 years of age, who experienced moderate to severe upper limb stiffness in more than one joint following a neurological injury and had exhausted all available conventional treatments with limited benefits. Each received injections of hyaluronidase at NYU Langone's outpatient hand clinic located at the Hospital for Joint Diseases.

Patients underwent video-recorded neurological and musculoskeletal assessments to document their movement restriction and muscle stiffness at four points: prior to injection, 2 weeks post-injection, 4 to 6 weeks after injection, and within 3 to 5 months of injection. Unbiased nurses not involved in the study documented any complaints in medical records.



Prior to the injections, 50.6 percent of the joints tested showed moderate stiffness and 44.4 percent of the joints tested showed severe stiffness, as captured by the Modified Ashworth Scale, a standard measure of stiffness. This number dropped to 15.3 percent with moderate stiffness and 5.8 percent with severe stiffness within 2 weeks of the injections.

Hyaluronidase took effect within days to two weeks, with effects that lasted for at least three months. The treatment did not produce muscle weakness or clinically significant side effects in the reported case series.

Hyaluronidase may provide a relatively less expensive option for patients with spasticity, according to Raghavan. One vial of hyaluronidase typically costs \$50, and a single treatment may require 4 to 8 vials, while one vial of botulinum toxin may cost at least \$500, and treatment may require up to 4 or more vials.

Raghavan plans to begin a clinical trial to further study the effects of hyaluronidase in a greater number of patients, and adds that more research is needed to determine the effects of repeated hyaluronidase administrations overtime, although 15 of the 20 patients returned for additional injections.

"This case series provides preliminary evidence for the safety and potential efficacy of hyaluronidase injections as a treatment for muscle stiffness that may enhance recovery in the spastic upper limb. More research may determine whether such a treatment is applicable to other disorders characterized by muscle stiffness," says Raghavan.Hyaluronidase treatment for muscle spasticity is considered off-label. No pharmaceutical funding was received, and NYU Langone has filed a patent for hyaluronidase for <u>muscle stiffness</u>.

In addition to Raghavan, the co-authors of the paper are Ying Lu, Mona Mirchandani, and Antonio Stecco.



**More information:** Preeti Raghavan et al, Human Recombinant Hyaluronidase Injections For Upper Limb Muscle Stiffness in Individuals With Cerebral Injury: A Case Series, *EBioMedicine* (2016). DOI: 10.1016/j.ebiom.2016.05.014

## Provided by New York University School of Medicine

Citation: Enzyme hyaluronidase shows promise as treatment for muscle stiffness caused by brain injury (2016, September 26) retrieved 6 May 2024 from https://medicalxpress.com/news/2016-09-enzyme-hyaluronidase-treatment-muscle-stiffness.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.