CASE REPORT

Ultrasound-guided Perineural Vitamin B\textsubscript{12} Injection for Peripheral Neuropathy

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The objective of this article is to present an innovative treatment for peripheral neuropathy using ultrasound-guided perineural vitamin B\textsubscript{12} injection. A 37-year-old patient presented with a progressive dropped foot for 2 months. Preceding trauma was denied. On examination, severe weakness of ankle dorsiflexion was revealed. Ultrasound showed peroneal nerve swelling. Nerve conduction velocity and electromyography study showed results compatible with peroneal neuropathy. Under the diagnosis of peroneal neuropathy, the patient was given 500 \textmu g of methylcobalamin around the peroneal nerve under ultrasound guidance two times, with an interval of 2 weeks. The patient showed improvement of muscle power within 2 weeks. Full muscle power was regained after 3 months. There was no adverse symptom after ultrasound-guided perineural vitamin B\textsubscript{12} injection. Ultrasound-guided perineural vitamin B\textsubscript{12} has the advantage of precise delivery of high-dose vitamin B\textsubscript{12} directly around the defective nerve.

Introduction

Vitamin B\textsubscript{12} is a water-soluble vitamin that is essential for the normal functioning of the peripheral nervous system [1]. Vitamin B\textsubscript{12} is required for many methylation reactions, including those involving DNA and myelin basic protein [10]. In previous studies, local application of vitamin B\textsubscript{12} to treat the peripheral nerve has shown efficacy in animals with peripheral neuropathy [11]. Only a small proportion of the vitamin B\textsubscript{12} gets absorbed when it is taken orally. Therefore, a precise delivery technique is required for treatment of peripheral nerves with high-dose vitamin B\textsubscript{12}. Ultrasound-guided perineural vitamin B\textsubscript{12} injection has the advantage of high-dose B\textsubscript{12} delivery to defective nerves.
With the advent of high-resolution ultrasound, there has been a widespread use of ultrasound in peripheral nerve assessment and ultrasound-guided peripheral nerve block [2,4]. Using a similar technique such as ultrasound-guided peripheral nerve block [2,12], vitamin B12 can be given precisely around the nerve. This article presents an innovative strategy of treating peripheral neuropathy using ultrasound-guided perineural vitamin B12 injection.

Case Report

Patient

A 37-year-old patient presented with progressive dropped foot for 2 months. Preceding trauma was denied. On examination, severe weakness of ankle dorsiflexion was revealed. Ultrasound showed focal peroneal nerve swelling at the level of popliteal fossa (Fig. 1). Nerve conduction velocity and electromyography study reports showed active denervation over the right anterior tibialis muscle compatible with peroneal neuropathy. Urgent treatment was desired to prevent Wallerian degeneration.

Perineural vitamin B12 injection

Under the diagnosis of peroneal neuropathy, the patient was given 500 μg of methylcobalamin around the peroneal nerve (at the location just outside the epineurium), under ultrasound guidance, two times with an interval of 2 weeks. The patient showed improvement of muscle power within 2 weeks. Full muscle power was regained after 3 months. Ultrasound imaging more than 3 months after treatment demonstrated a reduction in peroneal nerve swelling (Fig. 2). There was no adverse symptom after ultrasound-guided perineural vitamin B12 injection.

Discussion

Ultrasound-guided perineural B12 injection is an innovative therapy for peripheral neuropathy. Vitamin B12 promotes myelination and transport of the axonal cytoskeleton, helps maintain the nervous system, facilitates axonal maturation, and regenerates peripheral nerves [5–8]. An inspiring study shows that direct B12 injection at the injured site of the nerve promotes peripheral nerve repair [11]. A high dose of 500 μg/kg shows significantly faster compound muscle action potential recovery in acrylamide neuropathy [3]. From the two studies, either a direct B12 injection at the nerve or a systemic high dose can promote nerve regeneration. Although B12 is considered to pose no risks to humans, as a rule, a local high dose is preferable to a systemic high dose. With the development of high-resolution ultrasound guidance technique, B12 could be delivered directly and safely around the defective nerve. The differential diagnosis of a swelling of the nerve includes entrapment neuropathy, traumatic neuroma, and inflammatory disorder [4,9]. The pathology is either demyelination or axonal degeneration. Vitamin B12 is beneficial in either pathology [7,8].

Improvement of neurological function was seen within 2 weeks after the administration of perineural vitamin B12 in the presented case of peripheral neuropathy. However, the definite value of perineural vitamin B12 needs more clinical data to confirm.

Ultrasound-guided perineural injections have been applied for various indications. It has been used in the treatment of carpal tunnel syndrome [13], intractable pain due to sciatic nerve injury [12], peripheral nerve block [2], and cervical spine radicular pain [14]. With ultrasound guidance, blood vessels can be visualized and avoided in the trajectory of the needle. Ultrasound may help avoid the complication of a vascular injection [14].

In conclusion, ultrasound-guided perineural vitamin B12 has the advantage of precise delivery of high-dose vitamin B12 directly around the defective nerve.
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References