



Taking shots to treat migraine pain: the effects of BOTOX injections on pediatric patients

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Migraine is a complex and a painful disorder. In fact, it is the third most common disorder that people have worldwide¹, and it is subcategorized into two main types: migraine with aura and migraine without aura². Put simply, migraine is a type of headache that can cause severe dysfunction in a person's daily life³. Not all migraine experiences are the same, however. This is especially evident when comparing them between men and women. To give a simple example, more men tend to transition from episodic migraines (less than 15 headache days per month) to chronic migraines (15 or more headache days per month) than women⁴. Regardless of sex, migraine pain, in general, can range from moderate to severe. The pain is often characterized by pulsating-throbbing pain on one side of the head, with the pain worsening following any physical exertion⁵. The pulsating-throbbing pain can also be accompanied by nausea, and vomiting, and an increased sensitivity to light and sound⁶. It is common for migraine patients to suffer from neck pain. What is strange, however, is that neck stiffness and neck pain are considered to be a symptom of migraine, rather than a cause⁷.

It appears that the symptoms of migraine are better known than the actual cause. Therefore, while it is not entirely clear what causes migraine or the aura accompanying it, one thing is clear – a migraine is able to impair neurological and even gastrointestinal functioning³. Of these two, neurological problems have received more attention. One hypothesis that is out there is that migraine aura results from cortical spreading depolarization and then hyperpolarization⁸. As a result, symptoms of aura can include visual changes, tingling, numbness, or dyspraxia⁸; dyspraxia, in short, is the inability to execute planned or skilled movements⁹. Problems with language and memory are also common⁸. Another interesting symptom of aura, although more rare than other symptoms, is olfactory hallucinations¹⁰. Finally, in addition to the pain, hypoperfusion associated with migraines is also associated with a reduction to the blood supply to the retina microcirculation and the death of ganglion cells¹¹. This could be one explanation as to why migraine patients experience visual problems.

Migraines are a serious and painful disorder that many people experience, but there are treatments available for them. Currently, migraine pain is treated by using nonsteroidal antiinflammatory drugs (NSAIDs), acetaminophine, triptans, and several other classes of drugs¹². A fairly new treatment is onabotulinumtoxin A, or as it is more commonly known as, BOTOX. Botox has been used to treat migraines in adult patients for several years now, but not much is known about its effects on pediatric patients. Therefore, the purpose of this paper is to dive deeper into how BOTOX can be used to treat pediatric patients.

In a paper recently published by Shah, Calderon, Wu, Grant, and Rinehart (2018), the researchers investigated the effects of BOTOX on 11 pediatric patients over a span of 5 years. This study is

important because over 9 % of the pediatric population is estimated to suffer from migraines, and it is a leading cause for visits to the emergency department and for school absences¹².

The researchers selected participants that had refractory migraine. Refractory migraine was defined as having 15 or more migraine days per month (for at least three months) with the added criteria that neuropathic medication or other abortive or preventive medication did not help resolve the migraine symptoms. Once they were deemed candidates for the treatment, parental consent was obtained and the participants were administered the BOTOX injections throughout the head, neck, and shoulders¹². See Figure 1 for common locations where a patient is likely to receive their BOTOX injections.

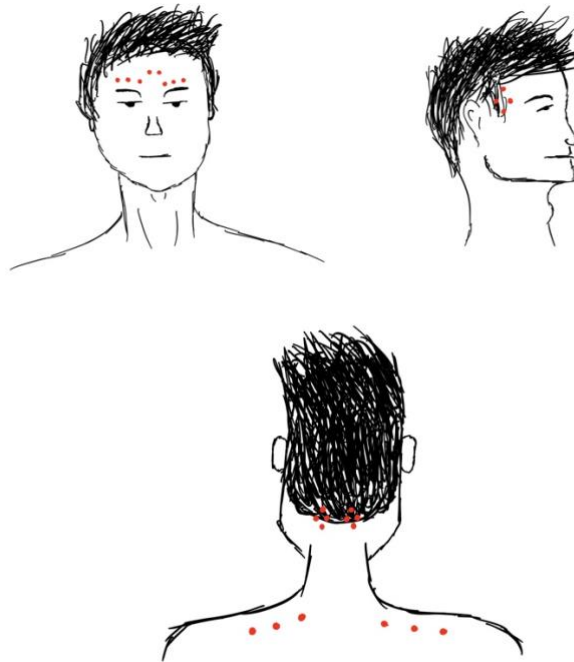


Figure 1. When BOTOX injections are given, they are given in the general locations where the red dots are. The qualified specialist administering the BOTOX can change the locations of the injection sites slightly to better treat each individual's migraines.

Essentially, BOTOX's method of action involves targeting neuromuscular junctions and by inhibiting the release of migraine related neuropeptides (like substance P) and glutamate¹². Therefore, it serves as a preventative treatment more so than an abortive one. When the researchers administered the BOTOX to the patients, they found a statistically significant improvement, specifically in the frequency, intensity, and duration of the migraines¹². The researchers were concerned about a potential placebo effect, but the results showed a great enough improvement that they were clinically significant as well. When compared to standard treatments, the participants who received the BOTOX treatment showed a 30% decrease in median head pain scores. An important consideration with any treatment, especially new ones, is the side effects that they entail. Standard medications currently used to treat migraines, like triptans, may cause undesirable side effects like sedation, rebound migraines, or even withdrawal.

BOTOX does not have any of these side effects and so far, there are no known serious side effects¹².

Considering that this study is one of the first to test the effects of BOTOX on pediatric patients, more studies with larger samples need to be conducted to really get a true assessment of how effective BOTOX is in these patients. The study was conducted well, and it provided a solid starting point for what could potentially be a widely used treatment for migraines. Future research into the effects that BOTOX may have on migraines with aura may also be beneficial; as aura brings with it a whole host of symptoms that many migraine sufferers are familiar with. This study did not state if the patients were diagnosed with migraine with aura or migraine without aura, and it is possible that patients that have migraine with aura may respond differently than those without it.

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