

CONTENTS

Foreword George H. Kraft	xi
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Preface Ib R. Odderson	xiii
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The Use of Botulinum Toxin in Pediatric Disorders Deborah Gaebler-Spira and Gadi Revivo	703
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Botulinum toxins have an important role in the management of children with hypertonia. This article reviews the impact of spasticity on growth and development and the orthopedic uses of botulinum toxins and their expected outcomes. Specific considerations for injecting children are discussed, including evaluation, dosing, sedation, localization of the affected muscle, timing of physical modalities such as electrical stimulation, casting, use of physical therapy, and some unique applications of botulinum toxin for children with neurologic problems.

The Management of Oromandibular Motor Disorders and Facial Spasms with Injections of Botulinum Toxin Glenn T. Clark	727
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The fact that a toxin produced by the anaerobic bacterium *Clostridium botulinum* is able to block motor nerve conduction was discovered and converted to therapeutic use more than 3 decades ago. This block lasts 8 to 16 weeks with botulinum toxin type A. This article discusses the various disorders in the orofacial region for which botulinum toxin has been used.

Botulinum Toxin Therapy for Cervical Dystonia

749

Francis O. Walker

Botulinum toxin revolutionized the treatment of cervical dystonia. In contrast to systemically active medications, the effect of botulinum toxin results from selective administration to weaken muscles involved in the dystonic posturing of the head. This article reviews the pathophysiologic basis of symptoms in cervical dystonia and how botulinum toxin alleviates them. Other therapeutic options are reviewed for comparison. This article discusses strategies for maximizing the clinical benefit of botulinum toxin in this disorder and reviews muscle selection and identification with electromyography.

Botulinum Toxin for Spasmodic Dysphonia

767

Arthur A. Rodriquez

Botulinum toxin is the accepted method of managing spasmodic dysphonia and has given most patients with adductor spasmodic dysphonia the ability to develop satisfactory vocal function. Results have been less satisfactory in abductor spasmodic dysphonia. Management is accomplished best with a team approach. The physiatrist with experience in electromyography and botulinum toxin usage can be a prominent member of this team.

The Importance of Electromyographic Guidance and Electrical Stimulation for Injection of Botulinum Toxin

781

Martin K. Childers

The importance of electromyography (EMG) or electrical stimulation for guiding injections of botulinum toxin is based primarily on preclinical data rather than on controlled clinical trials. Questions remain about preferred administration methods. With this in mind, the following injection techniques can be categorized: (1) areas of most active EMG motor unit firing (continuous noise of motor unit firing), (2) motor end plates found in any muscle by EMG, and (3) motor points in the following muscles-biceps, deltoid, flexor carpi radialis, flexor digitorum sublimis, vastus intermedius, sternocleidomastoid, palmaris longus, tibialis anterior, and brachioradialis.

Botulinum Toxin in the Management of Bowel and Bladder Function in Spinal Cord Injury and other Neurologic Disorders

793

Dennis D. Dykstra

Botulinum toxin inhibits release of acetylcholine and other neurotransmitters. It has been used successfully to treat pain and abnormal skeletal and smooth muscle activity in patients. This article discusses its use in patients with bladder and bowel disorders.

Botulinum Toxins in Pain Management

805

Mike A. Royal

The anaerobic bacterium *Clostridium botulinum* can produce seven distinct botulinum toxins (BTs) that block acetylcholine release from cholinergic nerve terminals, including preganglionic sympathetic and parasympathetic neurons, postganglionic parasympathetic neurons, and, perhaps most important from a therapeutic perspective, at the neuromuscular junction to produce a dose-dependent flaccid paralysis. When used therapeutically at appropriate doses, BTs produce temporary effects with minimal risk of systemic adverse events. Although the cosmetic application (reduction of facial wrinkling) of BTs has become the most widely known use, there has been tremendous interest in their potential for producing efficacy in various chronic pain syndromes. This article discusses findings applicable to this growing area.

Use of Botulinum Toxin Type A and Type B for Spasticity in Upper and Lower Limbs

821

Kathleen R. Bell and Faren Williams

Botulinum toxin is likely effective in controlling spasticity in the smaller muscles of the arm and hand, although there has been only one large controlled trial. For lower limb spasticity, the outcomes are more mixed. No large randomized, controlled trials have been done, and the larger size of the muscles results in a decreased ability to treat widespread spasticity. For more focal treatment in the legs and feet, however, and when combined with other denervating agents or physical modalities, botulinum toxin is probably effective. Careful analysis is warranted before performing any chemodenervation on a limb muscle or muscles.

Treatment of Hyperhidrosis and Drooling with Botulinum Exotoxin

837

Ib R. Odderson

Botulinum toxin is a new and effective treatment for focal hyperhidrosis of the axillae, palms, forehead, and scalp, as well as treatment of gustatory sweating and drooling. This article reviews the current treatments and outcomes achieved with chemodenervation of the eccrine sweat glands and salivary glands. Intracutaneous injections of botulinum toxin offer a simple, safe, and effective alternative to other conservative and surgical options.

Muscle Overactivity and Movement Dysfunction in the Upper Motoneuron Syndrome

855

Nathaniel H. Mayer and Alberto Esquenazi

The upper motoneuron syndrome (UMN) is a collective term that refers to different types of motor behaviors produced by patients who have lesions of the descending corticospinal system. Lesions

involving the upper motoneuron, its pathways, and its connections can occur at the level of the cortex, internal capsule, brain stem, or spinal cord. The clinical features of UMN have traditionally been classified as “positive” phenomena, referring to overt behaviors generated by various forms of muscle overactivity, and “negative” phenomena, referring to loss of overt behaviors secondary to impaired muscle activation, impaired control of motor behavior, and impaired motor performance. The clinical impact of UMN on patients is broad and tends to limit functional capacity. The negative and positive signs lead to reduced mobility and limb usage.

Botulinum Toxins in the Treatment of Migraine and Tension-type Headaches

885

Paul Winner

Botulinum toxins are promising preventive treatments for patients with moderate to severe episodic and chronic migraine and chronic daily headache. The recommended indications for botulinum toxins as preventive therapy lend themselves to the following patient types: those who demonstrate a lack of improvement from preventive (prophylactic) pharmacotherapy; those who experience severe and intolerable adverse events from preventive medications; those who refuse to use daily medications; those who have contraindications to acute migraine therapy, and elderly patients with chronic migraine. Both open-label and double-blind placebo-controlled studies using fixed-site, “follow the pain,” or a combination approach have demonstrated significant reduction in migraine frequency, severity, and duration, as well as decreased use of acute medications.

Spinal Cord Injury and Use of Botulinum Toxin in Reducing Spasticity

901

Guy W. Fried and Karen Mandzak Fried

Spinal cord injury is a devastating neurologic condition, with spasticity being a common and often disabling sequela. The treatment of spasticity in patients with spinal cord injury should be specific for each patient and based on function. If conservative measures such as range of motion activities, and splinting do not adequately control spasticity, drug therapy is often undertaken. The use of botulinum toxin is being explored as a treatment option, and it has been used successfully in selected cases to control spasticity and improve patient functioning with a duration of efficacy of approximately 3 months.

Cumulative Index 2003

911

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Inside back cover