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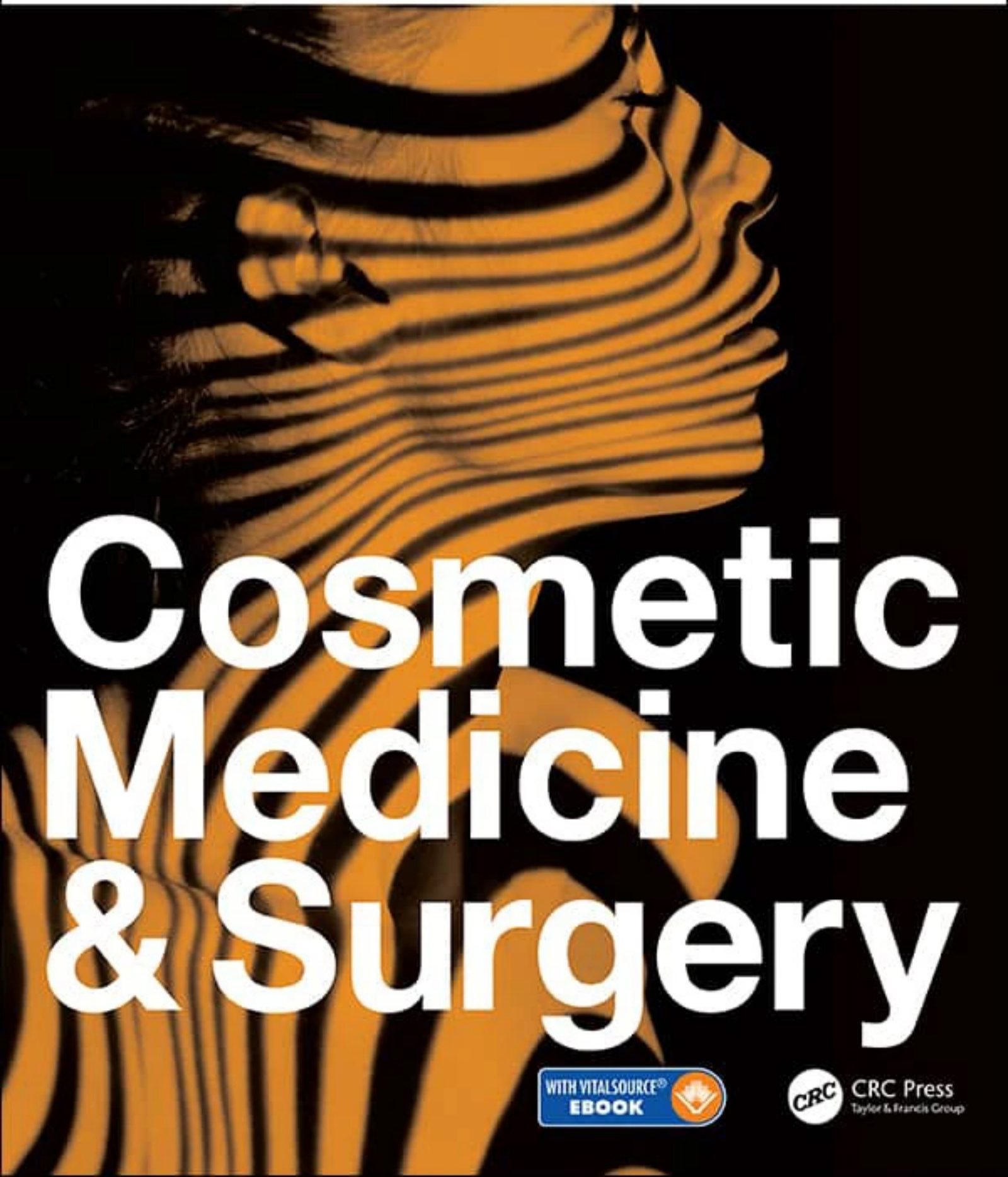

Cosmetic Medicine & Surgery

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Cosmetic botulinum toxin treatment

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INTRODUCTION

Botulinum (BTX) provides many opportunities for therapeutic benefit. Apart from dynamic rhytids, BTX can benefit focal hyperhidrosis, migraine, and tension headache as well as many other disorders, as wide ranging as cerebral palsy, stroke with upper motor neuron spasticity, blepharospasm, strabismus, torticollis, myofascial pain, esophageal spasm and achalasia, anal fissure, bladder detrusor overactivity, vaginismus, temporomandibular joint dysfunction, bruxism, masseter muscle hypertrophy (MMH), and even depression.

BTX not only diminishes unwanted muscular hyperactivity and hyperhidrosis, it also results in measurable improvements in skin quality, for example, BTX treatment decreases transepidermal water loss (TEWL) and increases stratum corneum hydration [15].

HISTORY

In nature, BTX is produced by the bacterium Clostridium BTX. BTX is the chemical mediator of botulism, which is a food poisoning-induced muscular paralysis.

In 1980, Alan Scott used BTX on a patient for the treatment of strabismus [14]. In 1992, Carruthers and Carruthers reported the use of BTX for the treatment of glabellar wrinkles caused by frowning [2]. The cosmetic use of BTX has been well recorded (e.g., [5,6,11]).

MODE OF ACTION

At the neuromuscular junction, stimulated nerve endings release a neurotransmitter, acetylcholine (ACh). ACh binds to the ACh receptor on the muscle fiber, stimulating a cascade that eventuates in muscle contraction. BTX blocks the release of ACh from the nerve ending and so inhibits muscle contraction.

The release of ACh is triggered by the action of membrane proteins located within the terminal nerve endings. By binding to these specific proteins, BTX blocks the release of ACh. Each of the BTX serotypes cleaves to a different membrane protein, thus, exerting a different clinical effect. Only five serotypes of BTX affect the human nervous system: BTX-A, B, E, F, and G.

The clinical effect of BTX-A begins to be apparent after 48 hours, reaches its maximum after 1–2 weeks, and lasts for 3–6 months. Its action wanes as new collateral nerve endings sprout from the original damaged nerve endings. This begins 4 weeks after treatment. Later, the damaged original nerve endings themselves regenerate and regain their function. Then the new collateral sprouts retract and disappear.

WRINKLES AND RHYTIDS

Not all wrinkles or rhytids are undesirable, for example, in the case of Sir Winston Churchill (1874–1965), determination and empathy were conveyed by contraction of the corrugator.

A wrinkle may be defined as a skin crease that disappears at rest; a rhytid may be defined as a skin crease that persists at rest.

Wrinkles and rhytids may result from

1. Gravity (*gravitational*)
2. Sleep (*compression*)
3. Muscle contraction (*dynamic*)

Wrinkles and rhitids due to gravity or sleep are not the concern of this chapter.

Dynamic facial wrinkles are skin creases that occur when a facial muscle contracts and disappear when it relaxes. Dynamic *wrinkles* disappear because the muscle relaxes and skin quality is unimpaired.

Dynamic facial *rhytids*, on the other hand, are skin creases that occur when the muscle contracts but do not entirely disappear when it relaxes. They persist at rest because of

1. Excessive muscular contraction
2. Impaired skin quality

Excessive muscular contraction may be the result of excessive resting muscle tone or repeated and/or prolonged muscle contractions. Normal healthy striated muscles, including facial muscles, have the capacity to contract at the conscious will of the subject, e.g., closing the jaw or creating a facial expression. In full extreme contraction, the jaw is very tightly closed and the face contorted. At rest, the muscles relax but not completely; there is some unconscious residual contraction, known as resting tone, which occurs without the conscious will of the subject. If they were not, the jaw would fall open and the face would look featureless, as in death. Resting tone is greater in those who are subject to stress or suffering from anxiety or depression; in these people, muscle tone may be excessive at rest. Muscular contraction is repeated and prolonged in patients with hyperdynamic faces (such patients also often suffer from stress) and also in those who have repeatedly screwed up their eyes when being exposed to strong sunlight or other adverse weather conditions. Furthermore, constant and repeated unconscious contraction leads the muscles to hypertrophy, so gradually worsening the rhytids.

Impaired skin quality is usually mainly due to photodamage, with thinning of the dermis and reduced elasticity. Intrinsic ageing (chronoageing) also thins the skin somewhat. In a small minority of patients, impaired skin quality is due to scarring, such as acne scars. In photodamaged skin with its UV-induced loss of dermal thickness, when the facial muscles cease contracting, the skin is less able to spring back to an unwrinkled