Atlas of Botulinum Toxin Injection

Dosage | Localization | Application

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Treatment with botulinum toxin

Within the last 30 years, the use of local injection with botulinum toxin has proven to be effective in the treatment of increased tonicity in both skeletal and smooth muscle, as well as in illnesses presenting with increased secretion from glands. Following local injection, the botulinum toxin reduces muscle tone effectively for several months and also reduces secretion from sweat, lacrimal and salivary glands. The prerequisite for therapeutic success, of course, is the proper application of the drug.

The required information for its successful use concerning topography, dosage, muscle action, localization and injection technique is presented clearly in this atlas. In this atlas we limit ourselves to the three most important botulinum toxins:

- **Botox® (toxin serotype A)**
- **Dysport® (toxin serotype A)**
- **Xeomin® (toxin serotype A)**

There are various ways of designating the types of botulinum toxins, e.g. with reference to the non-toxic protein content, the advantages and disadvantages of which have not yet been clearly defined. For determination of the dosage, the biological activity of the serotype is the determining factor. This is determined using a mouse lethal assay and is designated in biological units (mouse units: MU). One MU corresponds to the amount of BoNT needed to kill half of a population of treated mice injected intraperitoneally with the BoNT (LD 50). In the meantime, a mouse lethality assay usually is dispensed with.

Additional information on clinical indications, contraindications, side effects, dosage, application and warnings can be found in the product information provided by the suppliers and in monographs and brochures as well as on pages 274 ff, which are mandatory reading.

Licensed Medication and Clinical Indications

Abobotulinum toxin A (Dysport®)
Licensed for the following indications:

- Idiopathic blepharospasm (at the start of treatment: 40 units per eye, up to a maximum of 120 units per eye; minimum interval between treatments 12 weeks)
- Hemifacial spasm and coexisting focal dystonias (up to a maximum of 12 units, minimum interval between treatments 12 weeks)
- Cervical dystonia (spasmodic torticollis) (start with 500 units, up to a maximum of 1000 units per session, no more than 300 units into the sternocleidomastoid muscle; minimum interval between treatments 12 weeks)
- Focal spasticity of the upper limb (up to 1000 units, or 1500 units if up to 500 of those units are injected into the shoulder muscles; minimum interval between treatments 12 weeks)
- Focal spasticity of the ankle in adult patients following a stroke or head injury (up to 1500 units; minimum interval between treatments 12 weeks)
- Focal spasticity of the lower limbs with dynamic equinus foot deformity in ambulatory patients with infantile cerebral palsy (ICP) from two years of age (maximum 15 units/kg unilaterally or 30 units/kg bilaterally or up to 1000 units; minimum interval between treatments 12 weeks)

Incobotulinum toxin A (Xeomin®)
Licensed for the following indications:

- Blepharospasm (up to a maximum of 100 units; every 12 weeks; treatment intervals should be determined according to each patient's individual need)
- Cervical dystonia of with a predominant rotational component (spasmodic torticollis) (start with 200 units, up to a maximum of 300 units per session, no more than 50 units per injection site; treatment intervals of less than 10 weeks are not recommended; the treatment intervals should be determined according to each patient's individual need)
- Spasticity of the upper limbs (up to a maximum of 500 units per session, individual muscles no more than 500 units per session, shoulder muscles no more than 250 units; treatment intervals of less than 12 weeks are not recommended; the treatment intervals should be determined according to each patient's individual need)

Onabotulinum toxin A (Botox®)
Licensed for the following indications:

- Focal spasticity associated with dynamic equinus foot deformity as a consequence of spasticity in ambulatory patients with infantile cerebral palsy who are aged two years or above (recommended initial dose: 4 units/kg in hemiplegia or 6 units/kg in diplegia; total dose up to 200 units; minimum treatment interval 3 months)
- Focal spasticity of the wrist and hand in adult stroke patients (200–240 units; every 12 weeks)
- Focal spasticity of the ankle in adult stroke patients (300 units, divided into 3 muscles, reinjection no sooner than in 12 weeks)
- Blepharospasm/hemifacial spasm and coexisting focal dystonias (initially 25 units, a total dose of 100 units every 12 weeks must not be exceeded for subsequent injections)
- Cervical dystonia (spasmodic torticollis) (a total dose of 300 units must not be exceeded; treatment intervals of less than 10 weeks are not recommended)

- Symptomatic relief in adult patients who fulfil the criteria of chronic migraine (headache on ≥ 15 days per month, including at least 8 days with migraine) and who have responded inadequately to prophylactic migraine medication or were unable to tolerate it (155–195 units; every 12 weeks)

- Idiopathic overactive bladder syndrome with symptoms including urinary incontinence, compelling urge to urinate and urinary frequency in adult patients who have responded inadequately to anticholinergics or were unable to tolerate them (100 units; repeat no sooner than 3 months from prior injection)

- Urinary incontinence in adults with neurogenic detrusor overactivity in neurogenic bladder due to a stable sub-cervical spinal cord injury or multiple sclerosis (200 units; repeat no sooner than 3 months from prior injection)

- Severe, persistent primary axillary hyperhidrosis which has disruptive effects on the activities of daily life and cannot be controlled adequately with topical treatment (50 units per axilla, minimum interval between treatments 16 weeks)

Off-label use

In Germany, there is no official license for the use of botulinum toxin in a variety of different disorders, even though scientific evidence of its efficacy in these conditions has been obtained, and licenses for these indications have been granted in some European countries. Case law relating to off-label prescribing is inconsistent.

Since judicial opinion has also ascribed an important role to the assessment of a potential indication by "relevant expert groups", the view of the German Neurological Society's "Botulinum Toxin Working Group" (as the scientific expert panel in this respect), in consensus with the medical literature, is that the prerequisites for the use of botulinum toxin for a series of indications have been fulfilled.

Dystonias

As with the licensed forms of focal dystonia, the local injection of botulinum toxin is also the treatment of first choice for symptomatic relief in all of the following, not officially licensed, forms of focal and segmental dystonia. The successful mechanism of action is plausible by analogy with the licensed indications alone, while the benefit has been tested scientifically in controlled studies or case series.

In the "Dystonia" guidelines of the German Neurological Society (Deutsche Gesellschaft für Neurologie, DGN), the treatment of focal dystonias is recommended with reference to the high level of evidence (DGN, Leitlinie "Dystonie", 2012). These forms of dystonia include:

- Oromandibular or lingual dystonia (Tan et al., 1999) ←→

- Laryngeal dystonia (spasmodic dysphonia; Botsen et al., 2002; Benninger et al., 2001) ↑

- Limb dystonias involving the leg/foot and arm/hand, especially task-specific dystonias (e.g. writer's cramp, musician's dystonia; Cole et al., 1995; Tsui et al., 1993; Wissel et al., 1996) ↑↑

- Dystonia of the trunk (e.g. camptocormia; Reichel et al., 2001; Comella et al., 1998) ←→

In multifocal dystonias, unilateral or generalized dystonias, a specific focus is generally determined for the injection, which then corresponds to one of the aforementioned indications (↑).

Spasticity

Just as botulinum toxin works in the licensed indication of post-stroke arm or hand spasticity, or in the licensed indication of spastic equinus foot deformity in infantile cerebral palsy, it works by analogy, for plausible reasons, in arm or hand spasticity with causes other than stroke, and in leg spasticity with causes other than infantile cerebral palsy. Examples of these other causes include head injuries, inflammation of the brain (e.g. in multiple sclerosis), brain tumors or damage to/disorders of the brain and spinal cord. The treatment's benefits have been tested scientifically in controlled studies or case series (Moore, 2002; Burbaud et al., 1996; Hyman et al., 2000; Pavesi et al., 1998; Reichel, 2002; Smith et al., 2000; Simpson, 1997; Yablon et al., 1996).

In the "Spasticity" guidelines of the German Neurological Society, the treatment of focal dystonias is recommended with reference to the high level (↑↑) of evidence available (DGN, Leitlinie "Spastik", 2012). For logical reasons, other European countries have granted licenses for "spasticity" as a syndrome, regardless of its cause. Happily, licenses in Germany have also been extended in recent years.

Glandular secretion

Excessive secretion by various glands (sweat glands = hyperhidrosis; salivary glands = hypersalivation; lacrimal glands = hyperlacrimation) can lead to appreciable symptoms of clinical significance. Botulinum toxin blocks this oversecretion safely and effectively (Heckmann et al., 2001; Naumann et al., 2001; Palmar Saadia et al., 2001; Giess et al., 2002; Pal et al., 2000).If other treatment options fail, and provided that a critical appraisal of the indication and severity of the disorder is carried out, botulinum toxin injection is indicated and should be regarded as cost-efficient and appropriate.

In Germany, the product "Botox®" is licensed for axillary hyperhidrosis, if it is "severe and persistent" and cannot be controlled adequately with topical treatment. In the U.S., the product "Xeomin®" is licensed for chronic sialorrhea in adults. A similar license is expected in Europe. The following evidence levels apply:

- Axillary hyperhidrosis ↑↑
- Frey's syndrome ↑↑
- Palmar hyperhidrosis ↑↑
- Hypersalivation ↑↑
- Hyperlacrimation ↑

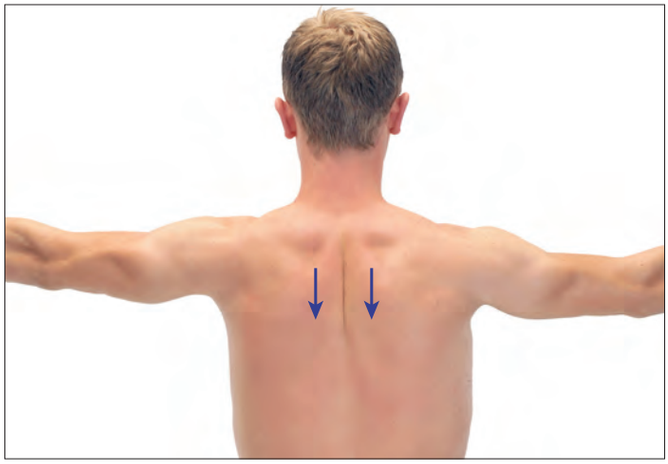
Trapezius muscle, ascending part

Nerve supply
Accessory nerve (XI)
Origin
Spinous processes of the 4th to 12th thoracic vertebrae
Supraspinal ligament
Insertion
via an aponeurosis inserting in the medial spine of the scapula

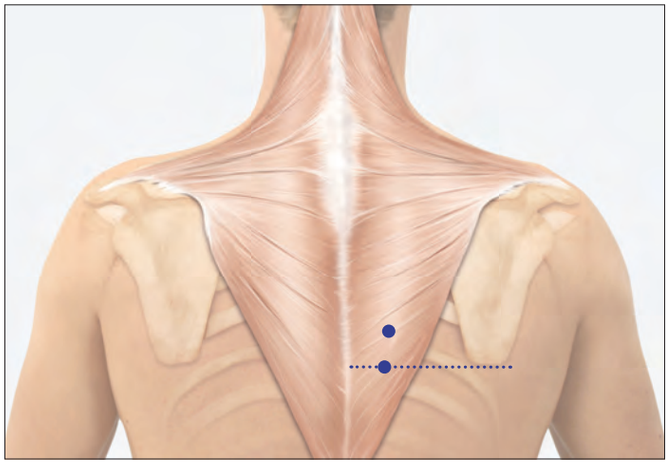
Dosage/Needle size

Xeomin®:	5–10 MU / injection site
Botox®:	5–10 MU / injection site
Dysport®:	20–40 MU / injection site
Injection sites:	2–4 / side
Needle length:	20–40 mm / 27 gauge

⚠ Follow instructions for each prescription drug, the off-label therapy (see p. 3) and the pertinent product information (see p. 274 ff.).



Action
The lower fibres of the trapezius pull down the scapula. Simultaneous contraction of the lower and upper fibres will produce lateral rotation of the scapula so that the glenoid cavity points up and the inferior angle to the side (elevation position).



Injection protocol
Number of puncture sites: 2–4

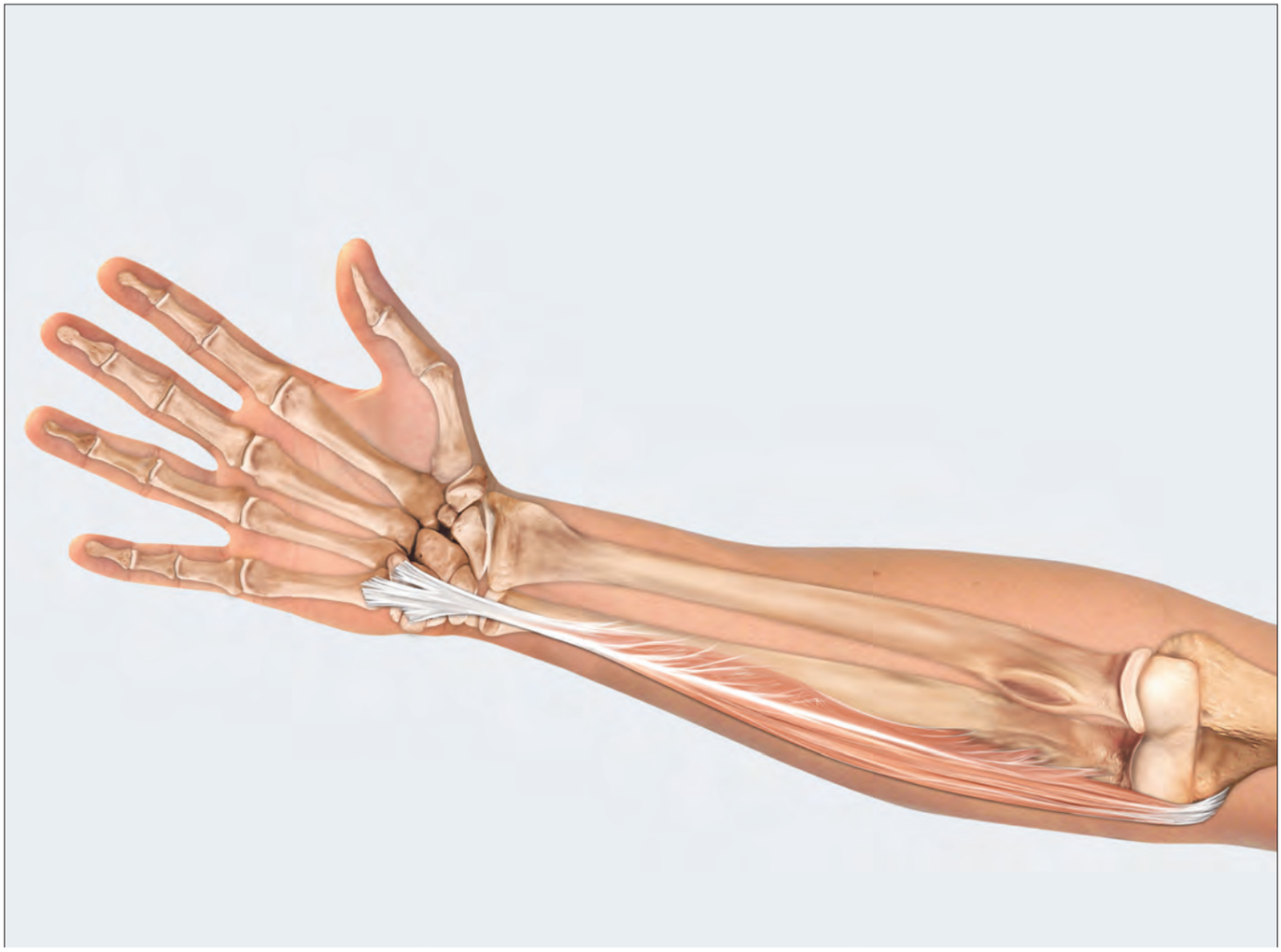
During pain therapy, the trigger points, which can be palpated, are injected directly. The trapezius is an exceptionally large muscle and is not treated as a whole with botulinum toxin, but only its individual components.

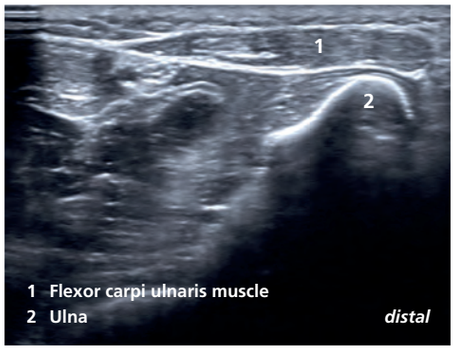
Topographical indication
When injecting too low and too deep, the latissimus dorsi may be injured. Theoretically, extremely deep and vertical injection bears the risk of pneumothorax.

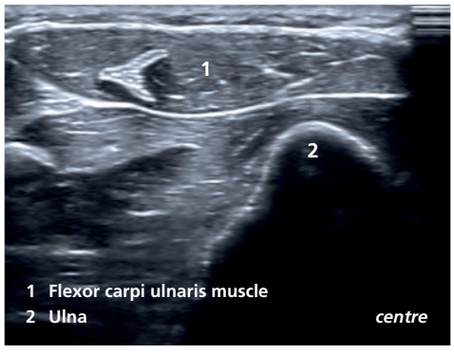
Injection technique
Injection site: injection into the lower fibres of the trapezius is carried out at the height of the inferior angle of scapula, approximately 3–4 cm lateral to the spine.
Injection direction: vertically or in the direction of the course of the fibres
Patient position: sitting or prone, the arm flexed, allowing the inferior angle to move farther to the side.

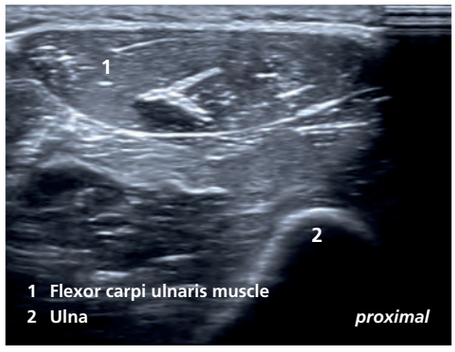
Clinical application
Paralysis of the trapezius after lesion to the accessory nerve leads to a characteristic protrusion of the scapula (scapula alata). This is most prominent during abduction of the arm. The ascending part of the trapezius is rarely injected. Impairment of the trapezius impedes abduction and elevation of the upper arm over shoulder level. Active trigger points are often found in the muscle.

Flexor carpi ulnaris muscle









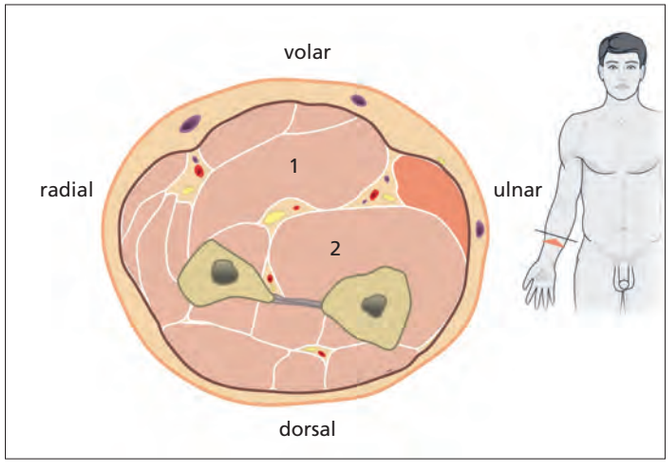
Nerve supply
Ulnar nerve, C7–T1
Origin
Humeral head: medial epicondyle of humerus
Ulnar head: olecranon, proximal shaft of ulna, forearm fascia
Insertion
Hamate, pisiform and 5th metacarpal

Dosage/Needle size

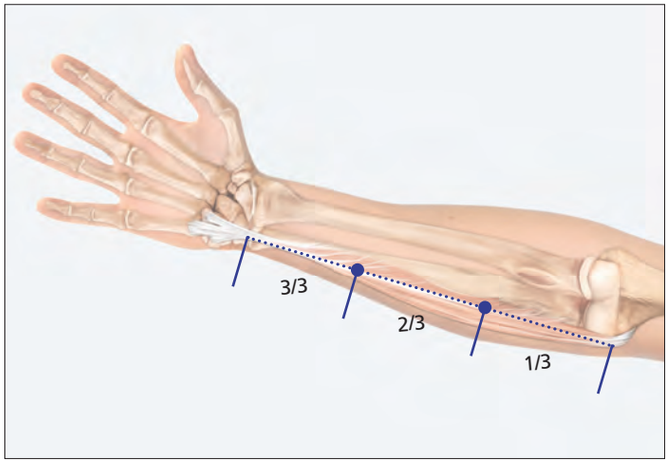
Xeomin®:	5–80 MU (rarely higher)
Botox®:	5–80 MU (rarely higher)
Dysport®:	20–300 MU
Injection sites:	1–4
Needle length:	20–40 mm / 27 gauge

⚠ Follow instructions for each prescription drug, the off-label therapy (see p. 3) and the pertinent product information (see p. 274 ff.).

Action
The flexor carpi ulnaris flexes the wrist and adducts the hand (ulnar deviation) in synergy with the extensor carpi ulnaris.

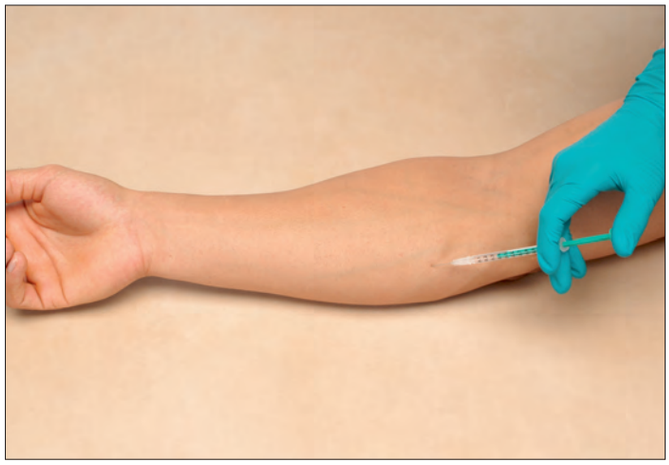


Topographical indication
When injection is too deep, the flexor digitorum superficialis (1) is pierced. Sometimes flexor carpi ulnaris becomes very thin near the wrist, thus by injecting too deeply the flexor digitorum profundus (2) can be infiltrated.



Injection protocol
Number of puncture sites: 1–2

Ultrasound is helpful for injection. Since the muscle reaches very far to the distal end, it is not enough to inject only at one site proximally (see ultrasound on page 58, from distal to proximal).



Injection technique
Injection site: at the border between the 1st and 2nd thirds of a line between the medial epicondyle and the styloid process of ulna; the injection is made into the proximal third of the muscle, which is easily palpable and inectable.
Injection direction: vertical or in the direction of the fibres and not too deep
Patient position: elbow flexed and supinated; wrist relaxed

Clinical application
The muscle is often involved in spasticity or dystonia. It should be viewed in synergy with the other flexors of the wrist. When treating for spasticity of the flexors, the carpi radialis and the ulnaris are usually treated. The palpable flexors of the hand above the wrist are (from radial to ulnar, i.e. lateral to medial):
– Flexor pollicis longus (see p. 78)
– Flexor carpi radialis (see p. 54)
– Palmaris longus (see p. 56)
– Flexor digitorum superficialis (see p. 72)
– Flexor carpi ulnaris

Adductor magnus muscle

Nerve supply
Obturator nerve L2–L4 anterior or linea aspera part of adductor magnus
Sciatic nerve L4–S1 posterior or adductor tubercle part of adductor magnus

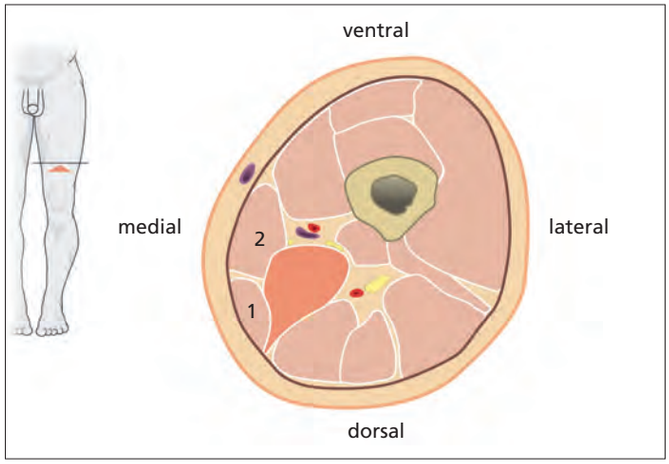
Origin
Inferior ramus of pubis and ramus of ischium (medial border) onto lower part of tuberosity of ischium

Insertion
Anterior part: medial lip of linea aspera (proximal two-thirds), gluteal tuberosity
Posterior part: adductor tubercle of femur (adductor hiatus between both insertions)

Dosage/Needle size

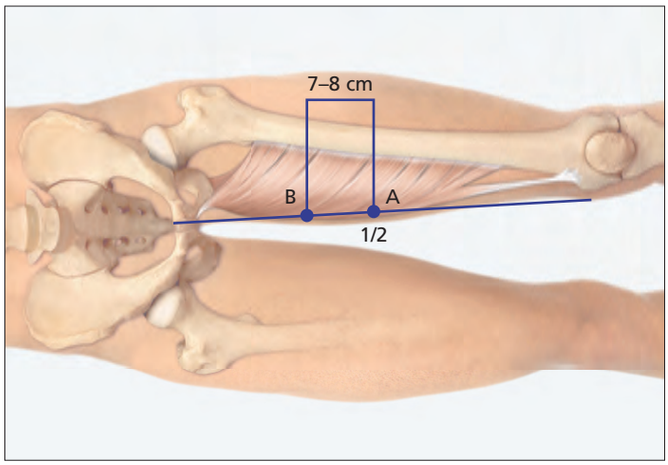
Xeomin®:	30–120 MU (rarely higher)
Botox®:	30–120 MU (rarely higher)
Dysport®:	100–400 MU (rarely higher)
Injection sites:	1–3
Needle length:	at least 40 mm / 27 gauge

⚠ Follow instructions for each prescription drug, the off-label therapy (see p. 3) and the pertinent product information (see p. 274 ff.).



Action
The adductor magnus adducts the free-swinging thigh. Standing with the legs spread wide apart, the adductor magnus prevents the legs from giving way under the load of the body weight. On the weight-bearing leg, together with the small gluteal muscles it balances the pelvis on the head of femur, thereby aligning the center of body weight forces.

Topographical indication
The adductor magnus is a very strong muscle and can be readily palpated. An arched opening occurs (adductor hiatus) in the distal portion of the muscle between the two areas of insertion. This area should be avoided when injecting. By injecting too far medially, the hamstring muscles can be infiltrated, too superficially, the gracilis (1) and too far anteriorly the sartorius (2).

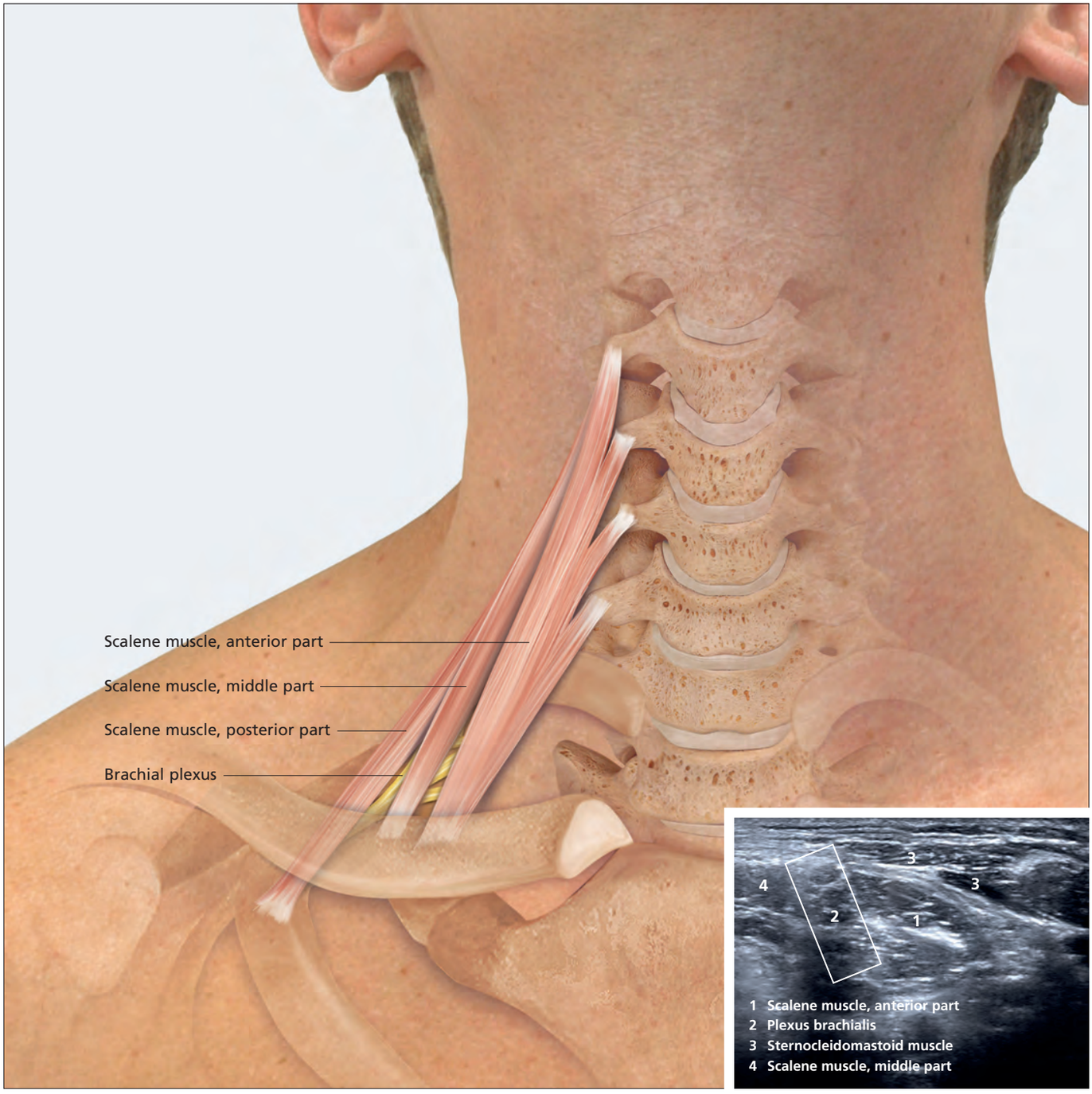


Injection protocol
Number of puncture sites: 1–3
Note: Multiple injections should not be undertaken solely in the long axis of the muscle but also into its cross-section, which is not difficult due to the thickness of this strong muscle.

Injection technique
Injection site: when injecting at two sites, the positions should lie on a line between the medial condyle of femur and the pubic tubercle: the first one in the middle of this line (A) and the second 4 fingers' width (7–8 cm) above (B) the middle point
Injection depth: 10–13 cm, depending on the thickness of the muscle and fatty tissue.
Patient position: supine; the leg slightly flexed, abducted and rotated laterally; the knee slightly flexed

Clinical application
The most important action of the adductor magnus is on the femur, together with the tensor fasciae latae preventing the femur from breaking under lateral body weight forces. When the hip joint is flexed or strongly extended and after an extreme rotation position the muscle guides the leg to the neutral position. The adductor hiatus lies between the two parts of the muscle distally, through which the femoral artery and vein pass on their course to the popliteal fossa.
The dosage indicated is for treatment of a spastic situation and when the other adductors are simultaneously treated. If the adductor magnus is to be treated individually, the higher dosage is also appropriate.

Scalene muscles: Anterior, middle and posterior

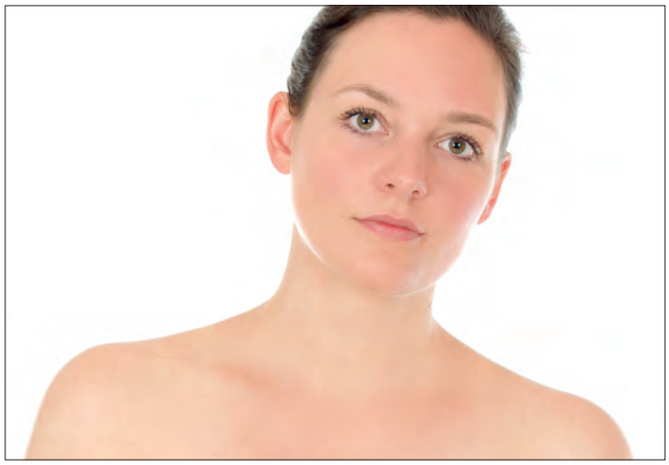


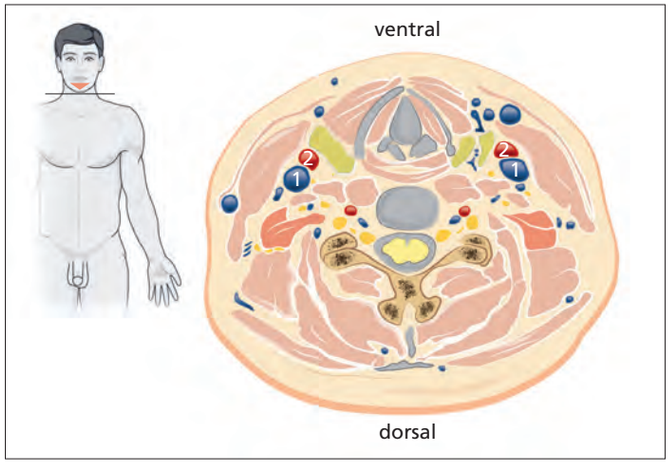
Nerve supply
Direct branches of cervical and brachial plexus
Anterior: C5–C8, *middle:* C4–C8, *posterior:* C7–C8

Origin
Anterior scalene: anterior tubercules of transverse processes of cervical vertebrae 3–6
Middle scalene: anterior tubercules of transverse process of cervical vertebrae 2–7
Posterior scalene: posterior tubercules of cervical processes of cervical vertebrae 5 and 6

Insertion
Anterior scalene: scalene tubercle of 1st rib
Middle scalene: lateral to anterior scalene behind a groove for a subclavian artery
Posterior scalene: superior margin of 2nd rib

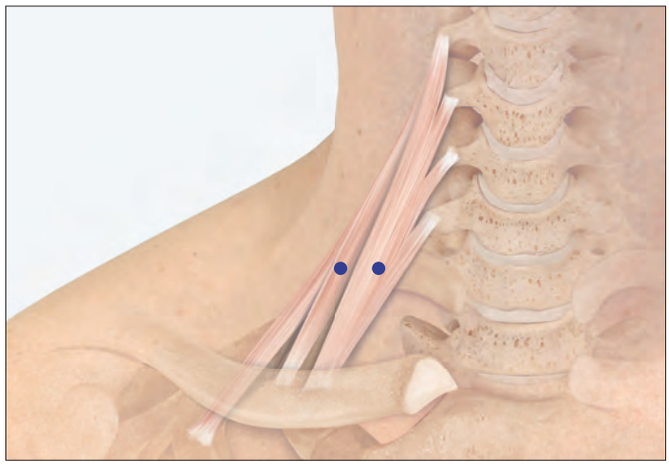
Dosage/Needle size
Xeomin®: 5–25 MU / muscle
Botox®: 5–25 MU / muscle
Dysport®: 20–100 MU / muscle
Injection sites: 1–3
Needle length: 20–40 mm / 27 gauge

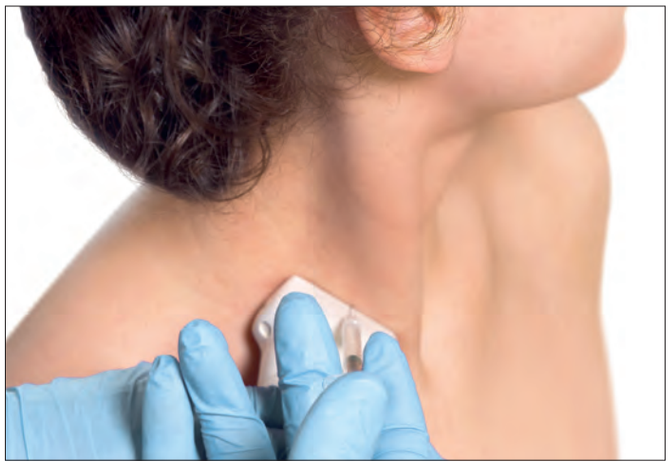




Action
The anterior and middle scalenes raise the 1st rib, the posterior the 2nd rib (respiratory inspiration) when the cervical vertebra are fixed. All three on both sides acting together, flex the neck laterally, the three acting together on one side, they laterally flex the neck and rotate slightly to the same side.

Topographical indication
It is often difficult to differentiate the scalene muscles. Special attention should be made to the vessels and nerves running in their proximity, especially the jugular vein (1) and the carotid artery (2). The subclavian vein runs in front of the muscles, the subclavian artery and brachial plexus run behind the muscles to the arm. The brachial plexus and the subclavian artery run between the anterior and the middle scalene muscles, in the so-called scalene space.



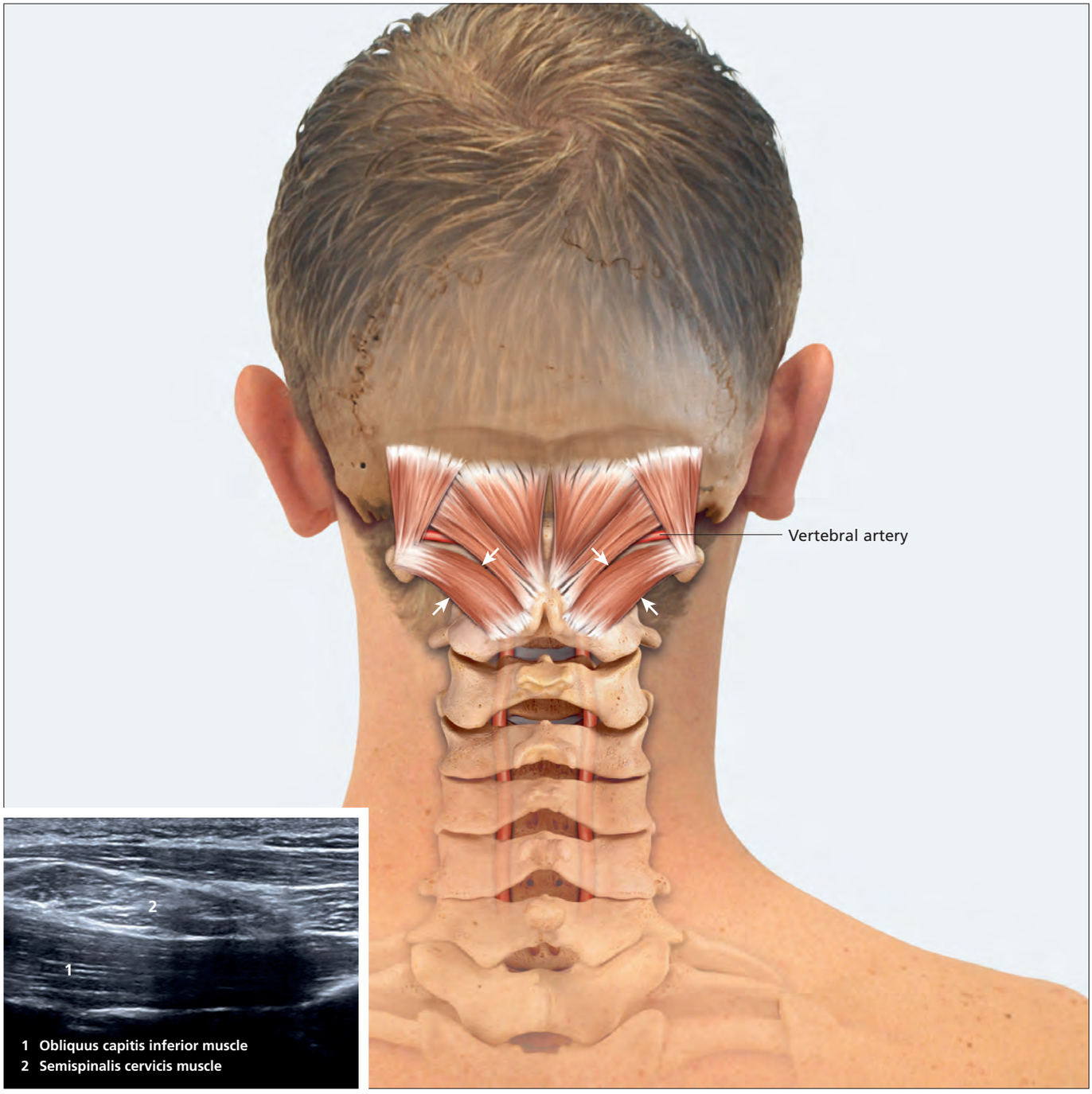


Injection protocol
Number of puncture sites: 1–3; usually the injection is undertaken on one side only, usually with ultrasound guidance.

Injection technique
Injection site: into the belly of the scalene medius which can be palpated, perpendicular to the skin
Note: since the muscles are difficult to differentiate from each other, it is advisable to inject with ultrasound guidance, especially the scalene anterior.
Patient position: sitting or supine

Clinical application
The anterior scalene forms the medial border of the scalene space. The brachial plexus protrudes through this space and can be compressed here – for example when carrying a heavy load over the shoulder – leading to scalenus syndrome. The plexus can also be overstretched when passing over the 1st rib. The brachial plexus is a good orientation to delineate the different parts of the scalene muscle. The scalene anterior is usually covered by the sternocleidomastoid.

Obliquus capitis inferior muscle

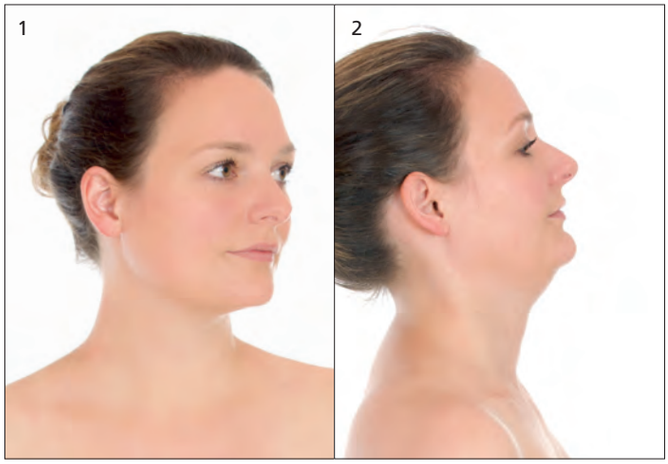


Nerve supply
Suboccipital nerve, C1
Origin
Spinous process of the 2nd cervical vertebra (axis)
Insertion
Transverse process of the atlas

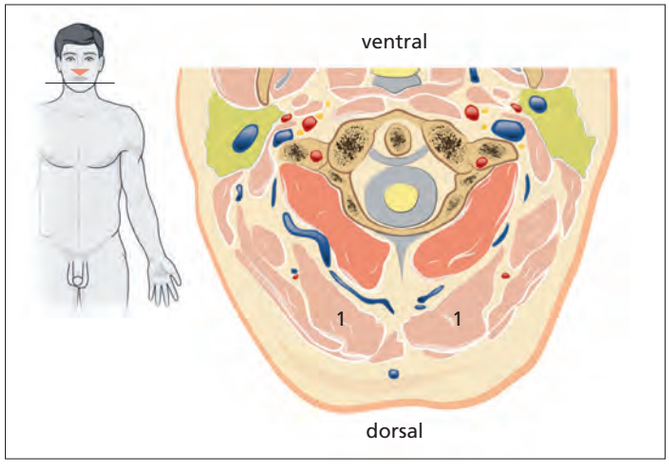
Dosage/Needle size

Xeomin®:	10–50 MU (rarely higher)
Botox®:	10–50 MU (rarely higher)
Dysport®:	40–200 MU (rarely higher)
Injection sites:	1–2
Needle length:	40 mm / 27 gauge

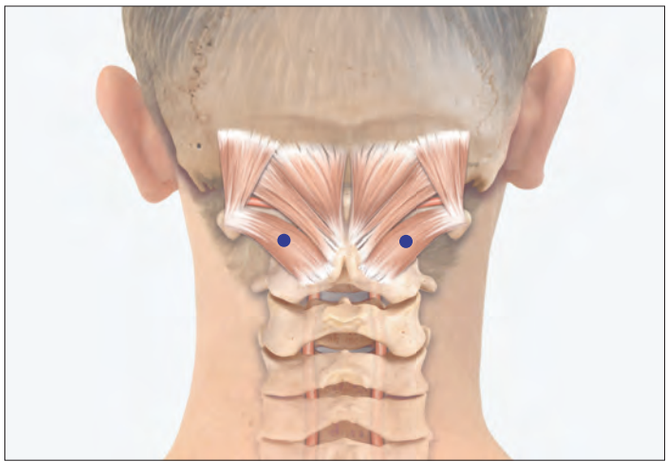
⚠ Follow instructions for each prescription drug, the off-label therapy (see p. 3) and the pertinent product information (see p. 274 ff.).



Action
When contracting unilaterally, the obliquus capitis inferior muscle rotates the atlas, and therefore also the head, to the same side (1). It also causes extension in the atlanto-axial joint, which leads to retrocaput, particularly as a result of bilateral contraction. The OCI ist the strongest rotator of the head.



Topographical indication
The obliquus capitis inferior is the most distal short muscle of the neck, and the only one not inserted at the occipital bone. Between the short neck muscles and the semispinalis capitis (1), there is a connective tissue gap, which has smaller nerves and blood vessels passing through it. The muscle is generally located at a depth of about 2–3 cm and is relatively thick.



Injection protocol
In most cases one injection site, close to the midline. A lateral injection should be avoided due to the close proximity of the vertebral artery.

Injection technique
It is best for the injection to be given under ultrasound guidance. The probe should be placed between the spinous process of the axis (first palpable process) and the transverse process of the atlas.
The injection should be given close to the midline. The trapezius is visible below the skin at that point, with the semispinalis capitis passing below it, followed by the connective tissue gap (mind the gap!) and finally the obliquus capitis inferior.

Clinical application
The obliquus capitis inferior (OCI) is one of the intrinsic muscles of the back. The other short muscle of the neck include the rectus capitis posterior (RCP) minor and major, and the obliquus capitis superior (OCS). At present, these three muscles are rarely injected. Together with the OCS and RCP major, the OCI forms the triangle of the vertebral artery (deep triangle of the neck). In this triangle, the vertebral artery lies on the posterior arch of the atlas. The greater occipital nerve passes around the OCI. The obliquus capitis inferior is often involved in head tremor, both the yes-yes and no-no forms. The OCI is important in retrocaput, torticaput and head tremor.

Orbicularis oculi muscle

Nerve supply
Temporal and zygomatic branches of facial nerve (VII)

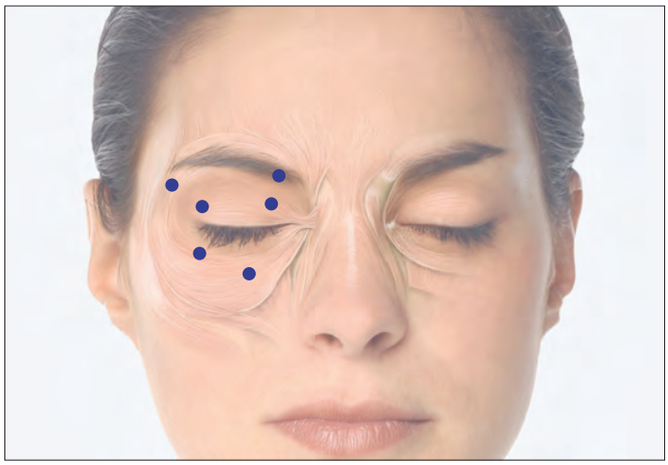
Origin
Orbital part: nasal part of frontal bone, frontal process of maxilla, lacrimal bone (medial margin of orbit), lacrimal sac, medial palpebral ligament
Palpebral part: medial palpebral ligament lacrimal sac
Lacrimal part: posterior lacrimal crest of lacrimal bone

Insertion
Orbital part: lateral palpebral ligament, sphincter-like around orbital aditus
Palpebral part: lateral palpebral ligament
Lacrimal part: lacrimal canaliculi, palpebral margin, lacrimal gland

Dosage/Needle size
Xeomin®: 1.25–5 MU / injection site (rarely higher)
Botox®/Vistabel®: 1.25–5 MU / injection site (rarely higher)
Dysport®: 5–20 MU / injection site (rarely higher)
Injection sites: 3–5
Needle length: 10–20 mm / 30 gauge

⚠ Follow instructions for each prescription drug, the off-label therapy (see p. 3) and the pertinent product information (see p. 274 ff.).

Action
The orbicularis oculi with its two components, the palpebral and the orbital parts, narrows the palpebral fissure, and is thus an antagonist to the superior levator palpebrae and the superior and inferior tarsal muscles. The palpebral part is responsible for the blinking reflex, the lacrimal part serves the directional drainage of the tear fluid.



Topographical indication
Injection too close to the superior levator palpebrae can cause ptosis. When injected too deeply into the nasal part of the upper eyelids above the eyebrows, the BoNT can reach the corrugator supercilii. Injection into the pars lacrimalis can cause disturbance in the flow of lacrimal fluid. Injecting too closely to the lower margin of the lid can cause ectropion, which may be cosmetically desirable because it often leads to the appearance of having larger eyes.

Injection protocol
Number of puncture sites: 3–5

The protocol and dosage depends on the indication and can differ greatly (blepharospasm, hemifacial spasm, wrinkles). The illustrated case here is by blepharospasm with 4 injection sites:
upper site: middle and lateral
lower site: middle and lateral

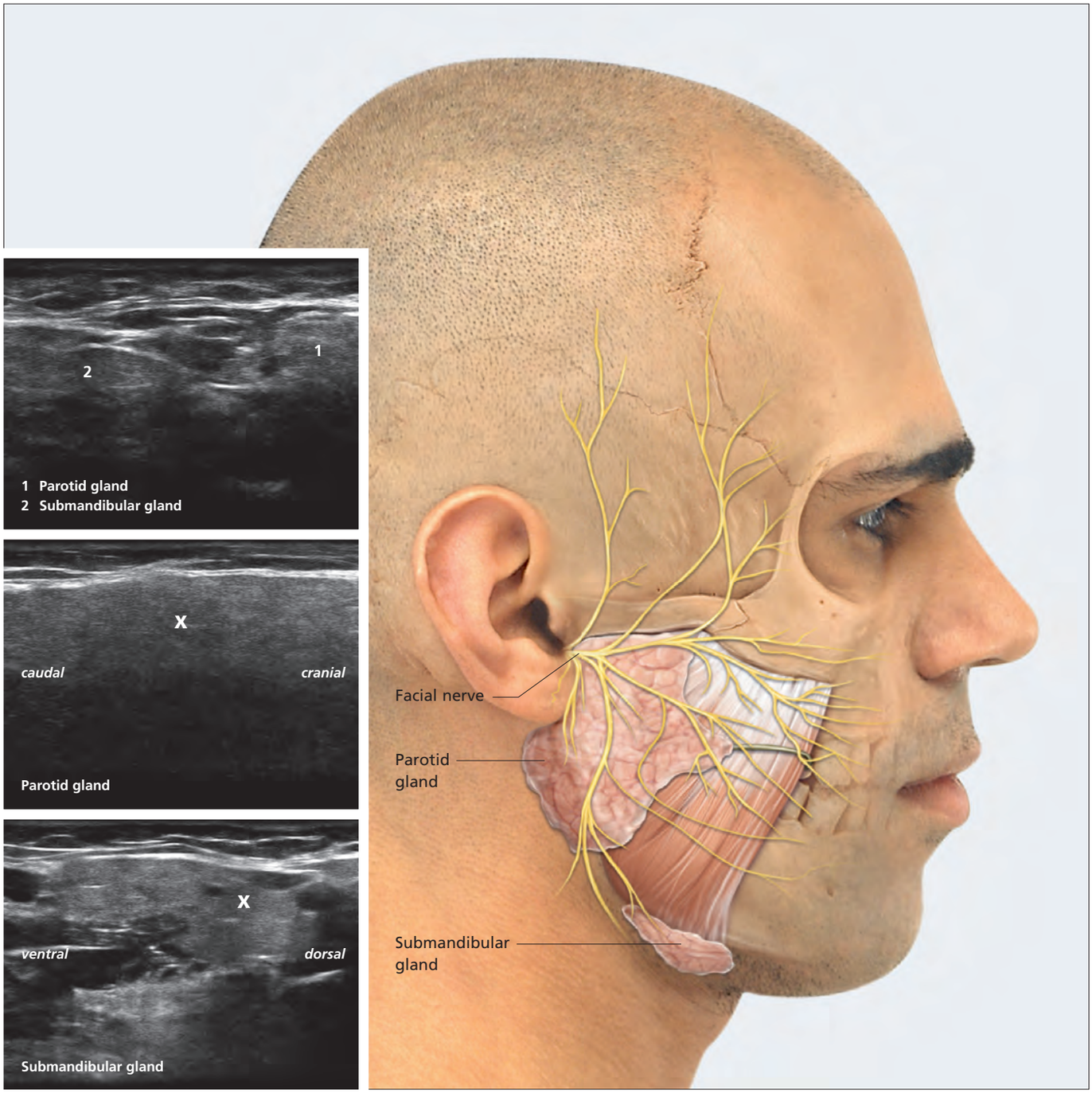
Injection technique
Injection site: as a general rule the injection is subcutaneous, only rarely intramuscular. In the region of the upper eyelid, injection is directed toward the nose or laterally away from the eye. Note:

- Avoid injecting in the direct continuation of the lateral angle of the eye.
- Injection into the middle of the upper eyelid can cause ptosis by diffusion of the BoNT into the levator palpebrae.
- Injecting too close to the lower border of the lid can cause ectropion.
- Injection in the medial region of the lower eyelid can cause functional disturbance in the lacrimal gland and can cause double vision (diplopia) by diffusion of the BoNT into the inferior oblique or the inferior rectus.
- Do not wipe excess fluid flowing from the injection site in the direction of the levator palpebrae because this can cause ptosis.

The illustration given in the photo is representative of the injection given by the palpebral type of lid-opening inhibition.

Clinical application
Injection is given into the orbital part in cases of blepharospasm and into the palpebral part by the so-called lid-opening inhibition (palpebral type). To delineate is apraxia of lid opening, in which an injection does not make sense. As well as the inhibition of lid-opening, in which only a small improvement can be achieved. Crow's feet at the lateral corner of the eye are produced by the action of the orbicularis oculi and can be readily avoided by low doses of the BoNT. The middle fibers of the orbital part radiate into the upper eyelid in the direction of the eyebrows (depressor supercilii). Patients suffering from a paralysis of the orbicularis oculi are not able to close their eyes (lagophthalmus). When attempting to close the eye, an upward physiological rotation of the eyeball becomes evident (Bell's sign). Care must be taken by the injection with older patients who generally possess more prominent vessels in the upper eyelids. The possibility of hematomas in the upper eyelids following injection must always be taken into account.

Parotid and submandibular glands



Nerve supply

Parasympathetic:

– *parotid gland:* glossopharyngeal nerve (IX) via otic ganglion

– *submandibular gland:* chorda tympani of the facial (intermedius) nerve (VII) via submandibular ganglion

Sympathetic:

– *parotid gland:* external carotid plexus

– *submandibular gland:* internal carotid plexus

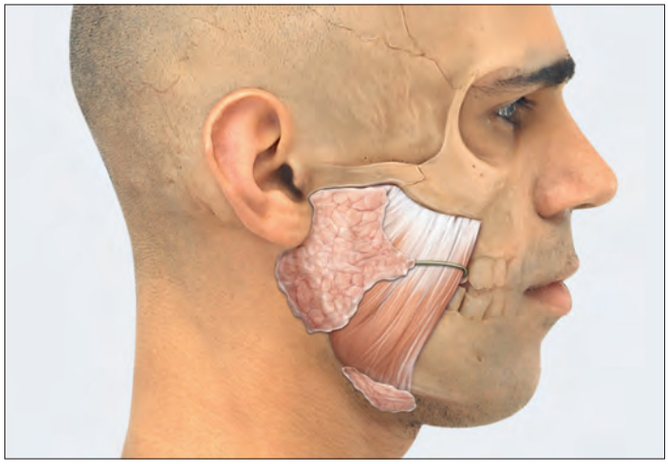
Indication

Excess production of saliva (drooling), especially in cases of dysphagia, e.g. in patients with Parkinson's, ALS (amyotrophic lateral sclerosis), stroke or paraplegia

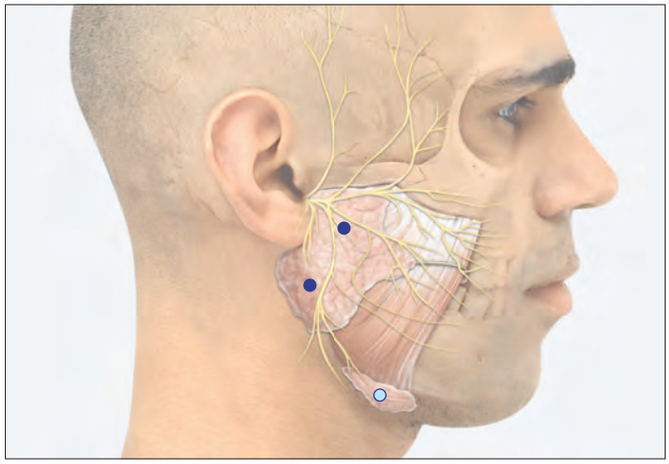
Dosage/Needle size

Xeomin®:	20–50 MU / side
Botox®:	20–50 MU / side
Dysport®:	100–200 MU / side
Injection sites:	2–4 / side
Needle length:	40 mm / 27 gauge

⚠ Follow instructions for each prescription drug, the off-label therapy (see p. 3) and the pertinent product information (see p. 274 ff.).



Function
The parotid gland is a serous salivary gland capable of producing over one liter of saliva per day. The submandibular gland is mainly serous.



Injection protocol
Number of puncture sites: 2–4 / side
It is usually sufficient to inject the parotid gland and the submandibular gland at one site each.
Parotid gland (●); submandibular gland (○)

Injection technique for the parotid gland
The gland can be easily palpated with a little experience. The injection is given into the upper and lower halves of the main glandular body. Alternatively the injection can be carried out under ultrasound guidance.

Injection technique for the submandibular gland
The submandibular gland is more difficult to inject without ultrasound compared to the parotid gland. Although the submandibular gland is not palpable, its anatomical position is well defined. The injection is given, albeit very rarely, parallel to the excretory duct (not shown).

Clinical application
The parotid and the submandibular glands are usually treated first in cases of drooling. The dosage is often divided 60:40, means 60% into the parotid gland. The third large salivary gland, the sublingual gland, is mostly mucous. The smaller glands do not play a role during the therapy of drooling.

Attention
The parotid plexus of the facial nerve lies within the body of the parotid gland and can be injured easily along with accompanying vessels. By injecting too deeply or too far anteriorly, the masseter may be injured.