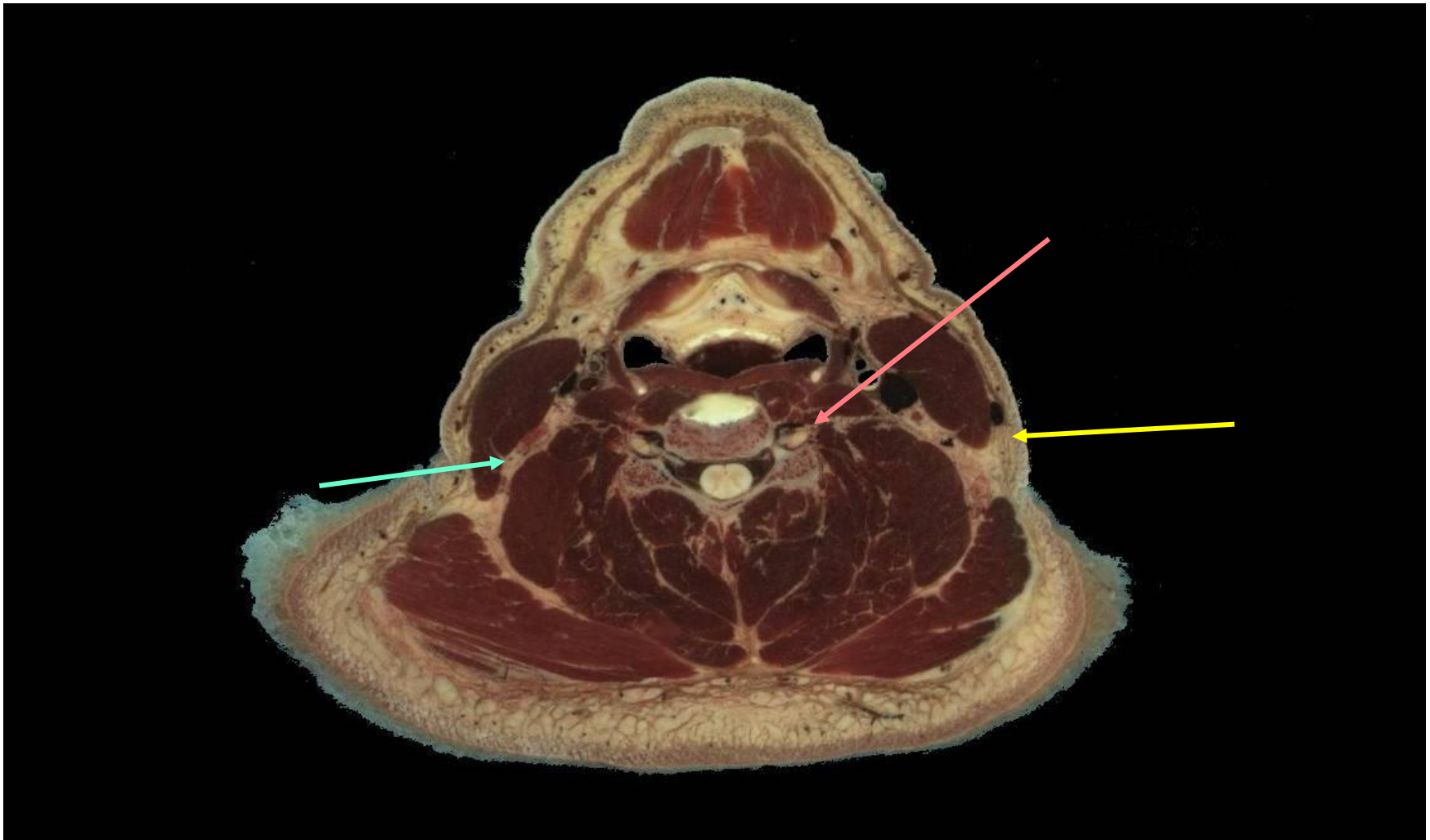
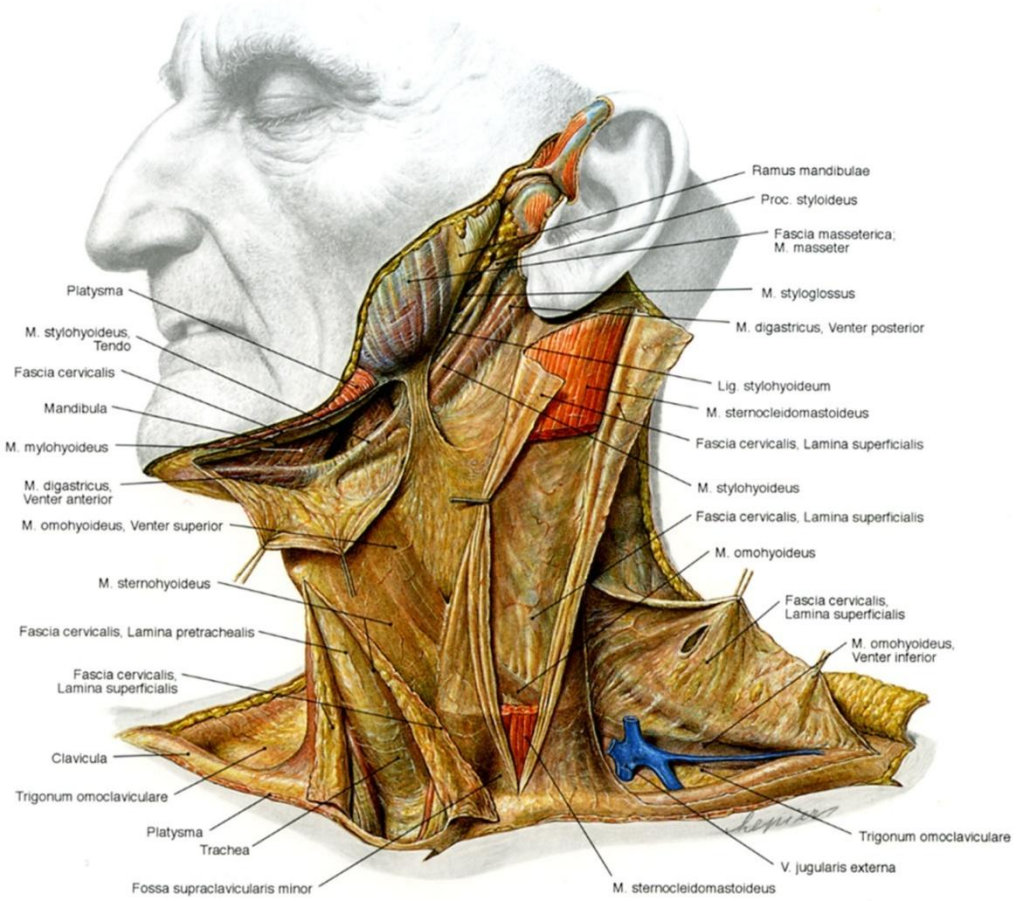
Ultrazvukem naváděný mediální cervikální blok

D. Nalos, M. Nováková, D. Bejšovec, M. Derner a dobrovolní lékaři ARO

Bloky cervikálního plexu

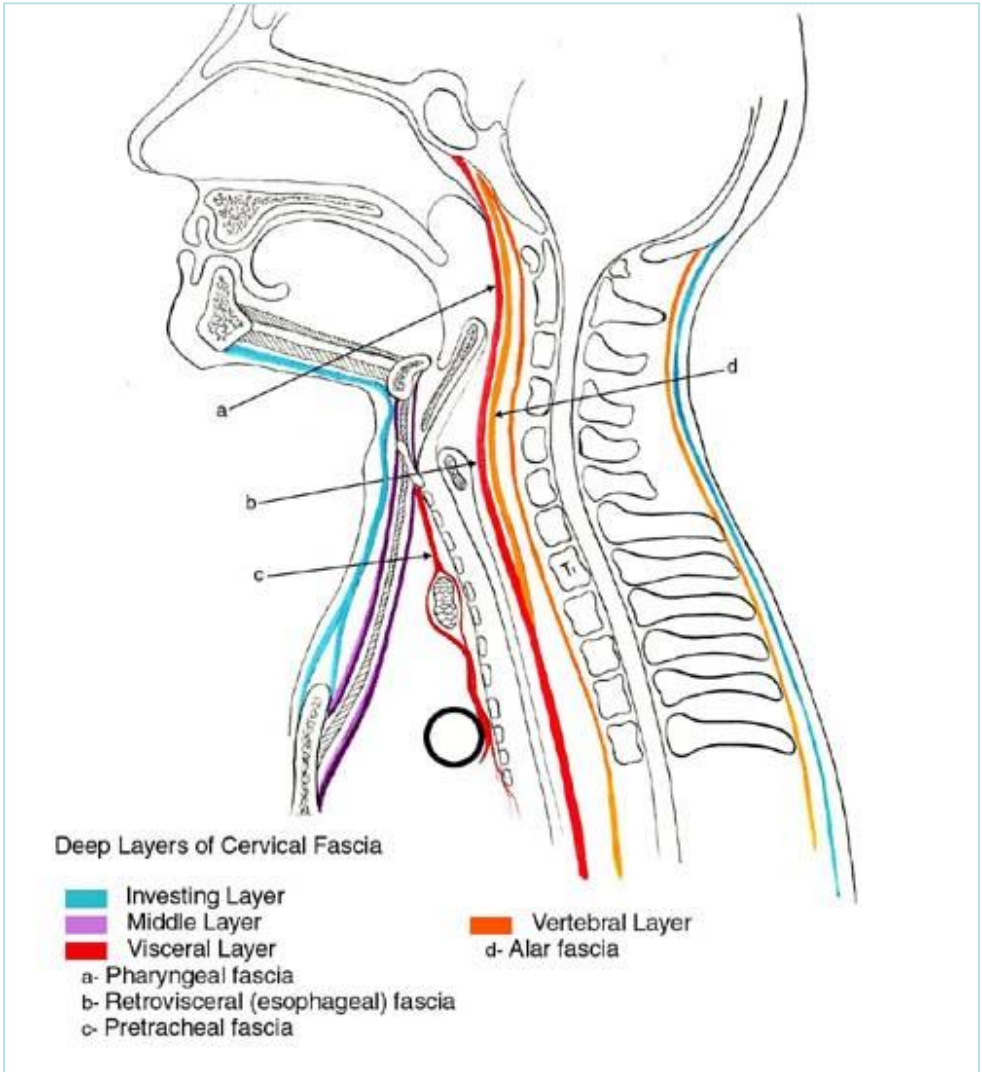


Střední krční fascie

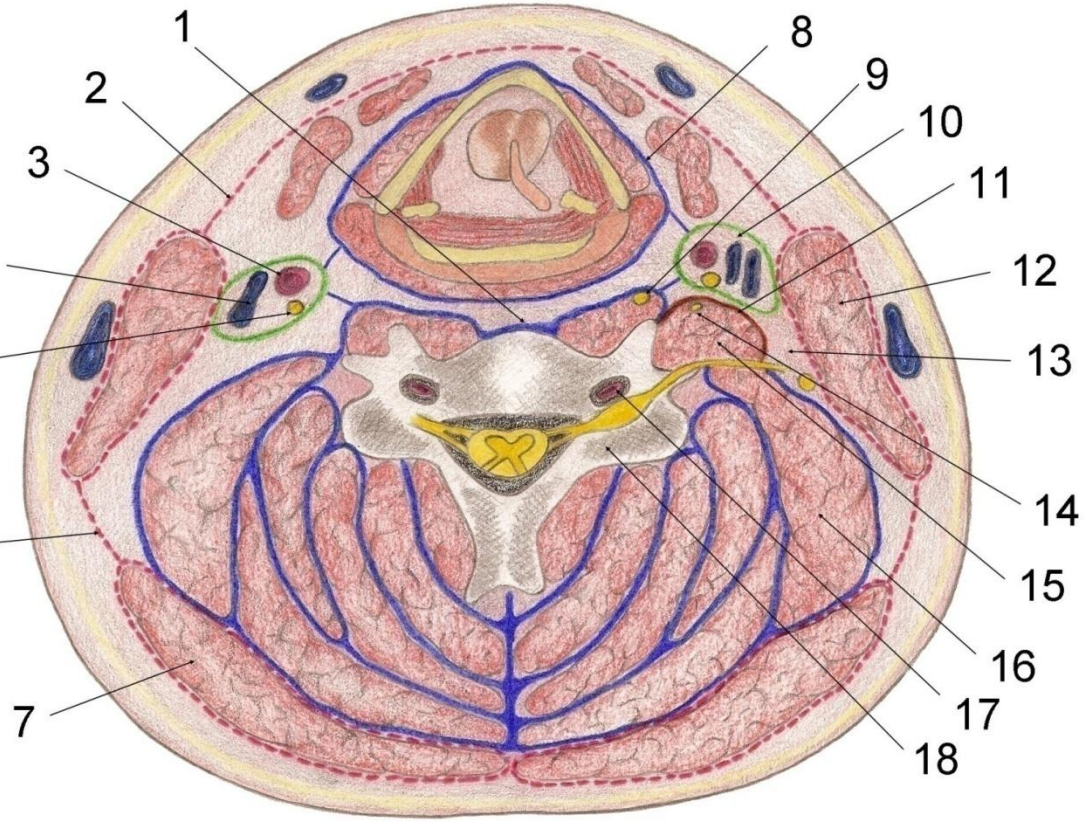


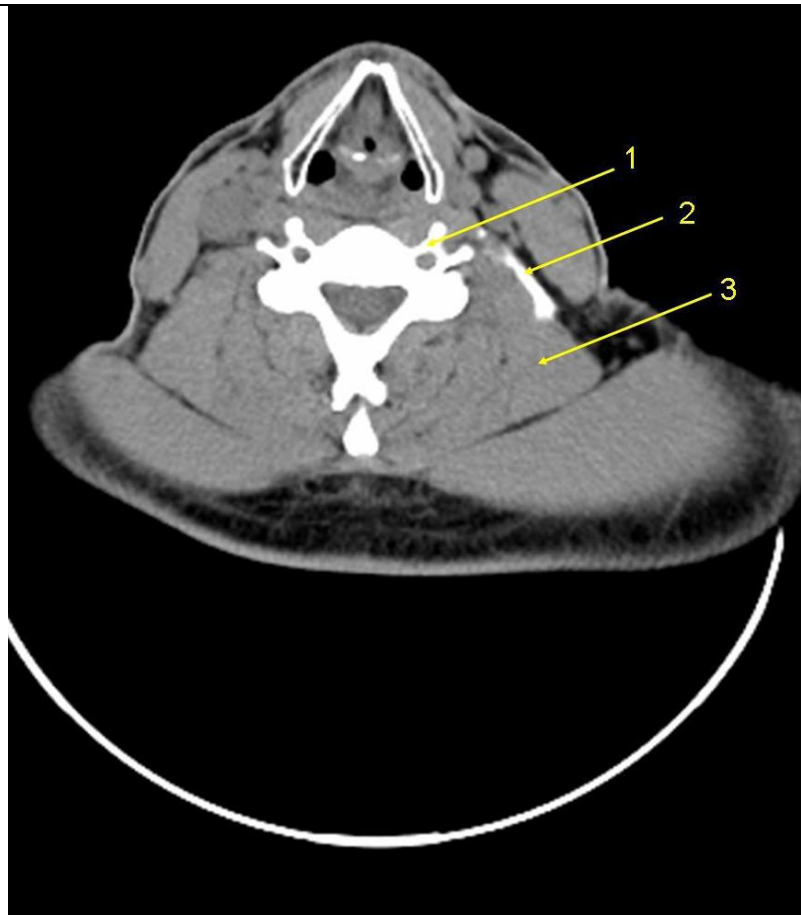
Obr. 206 Krční fascie, fascia cervicalis.

Vertikální průběh krčních fascii

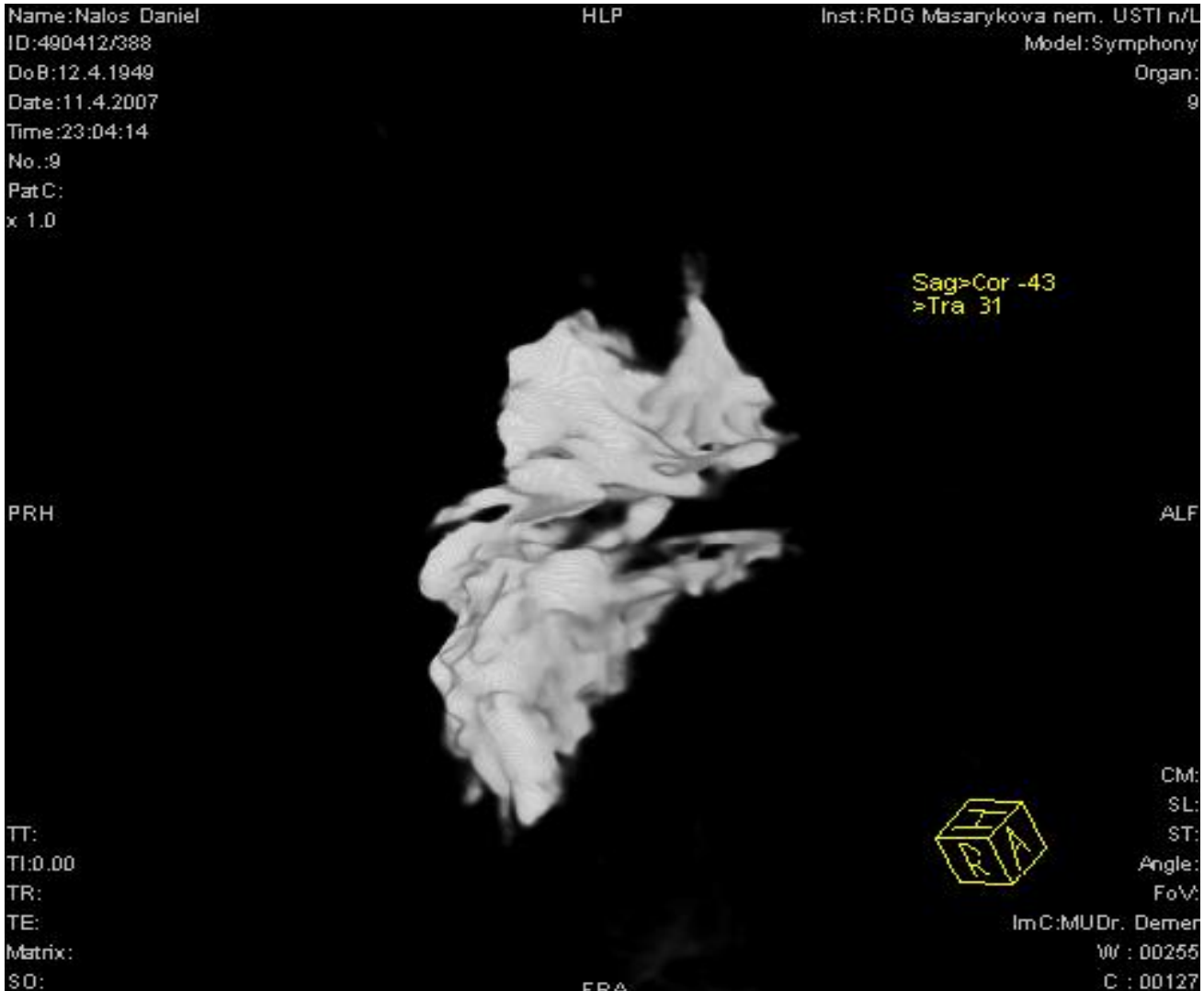


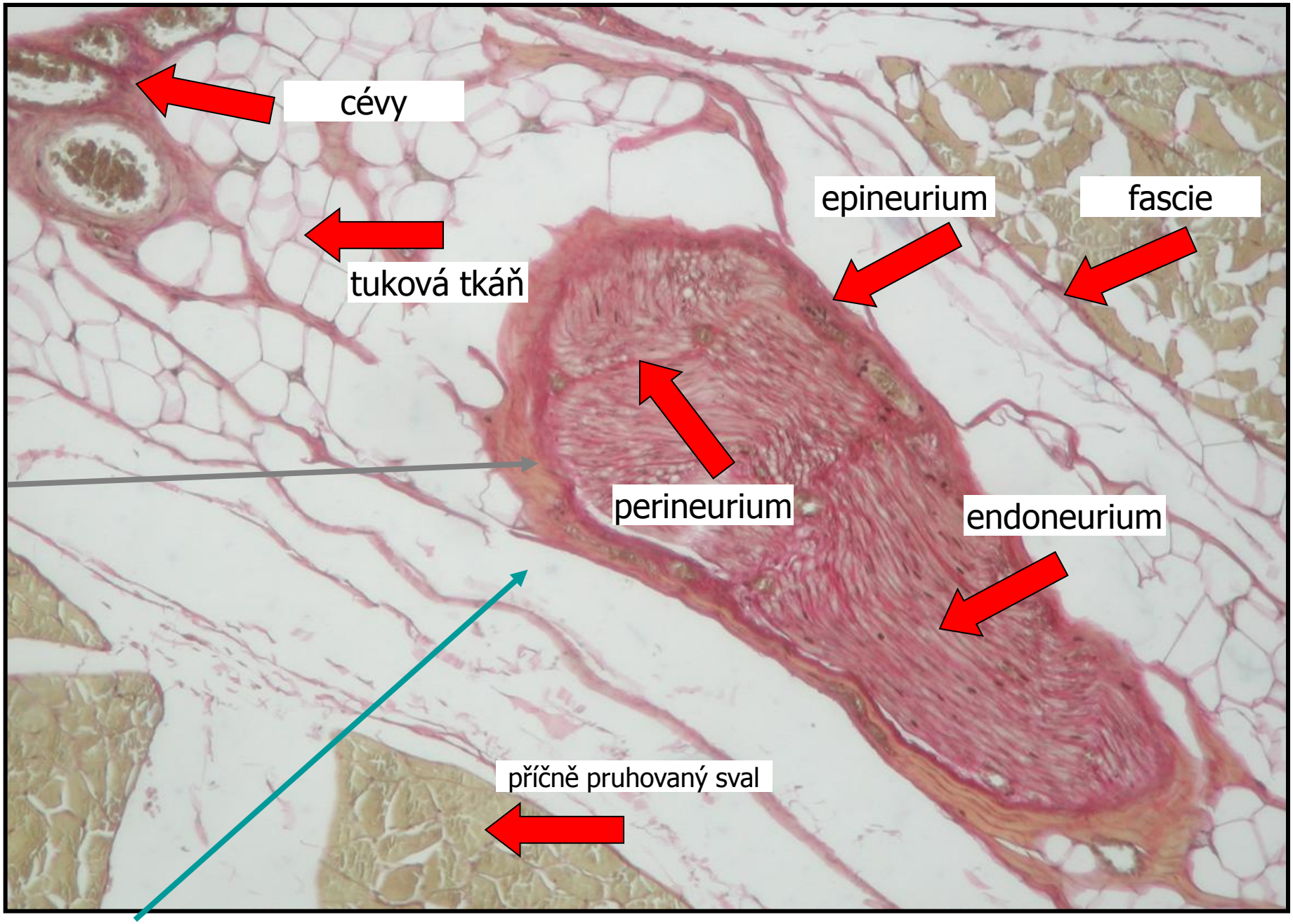
Skalenická fascie

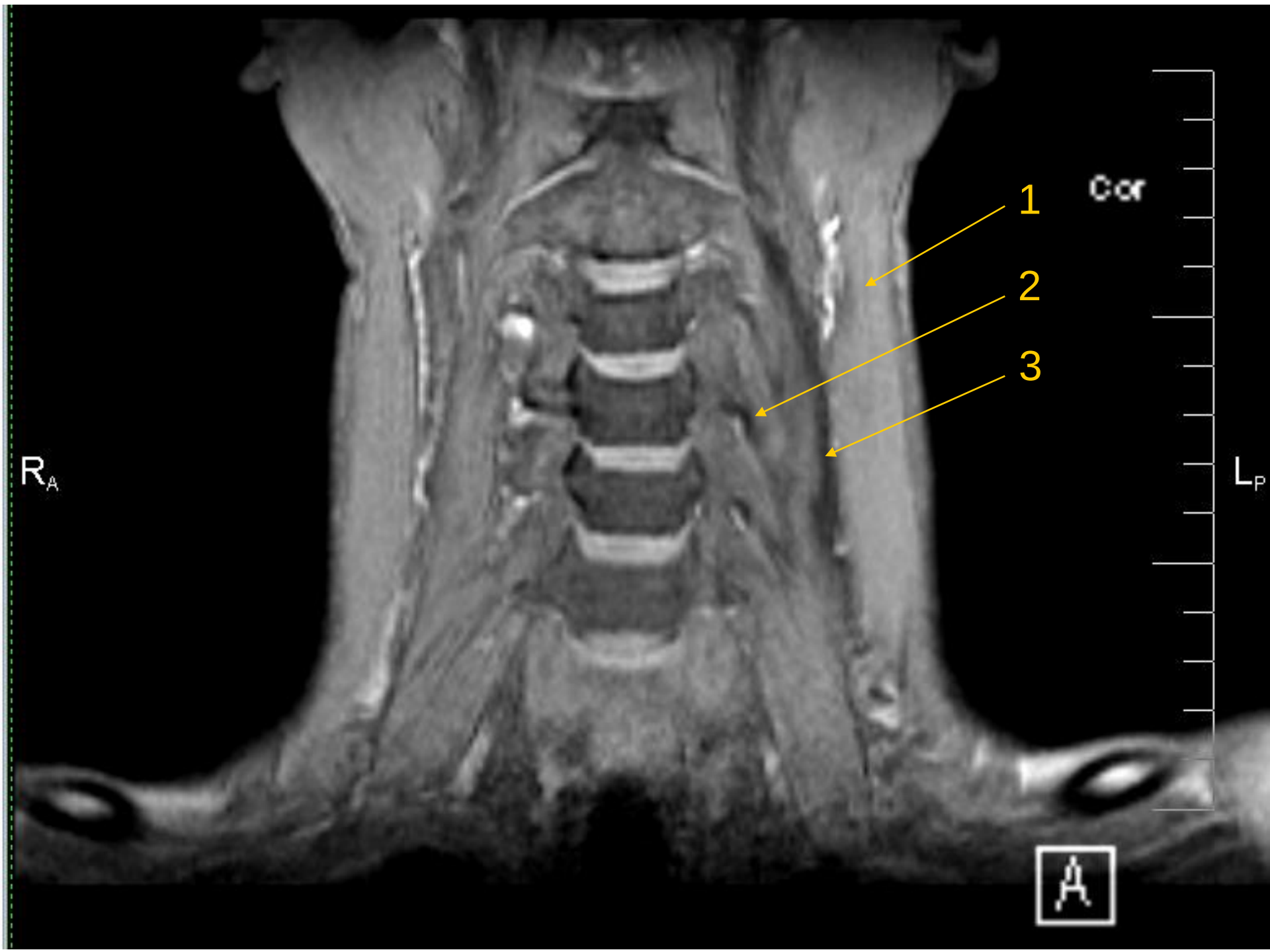




Odlitek perineurálního prostoru brachiálního plexu




cévy
tuková tkáň
epineurium
fascie
perineurium
endoneurium
příčně pruhovaný sval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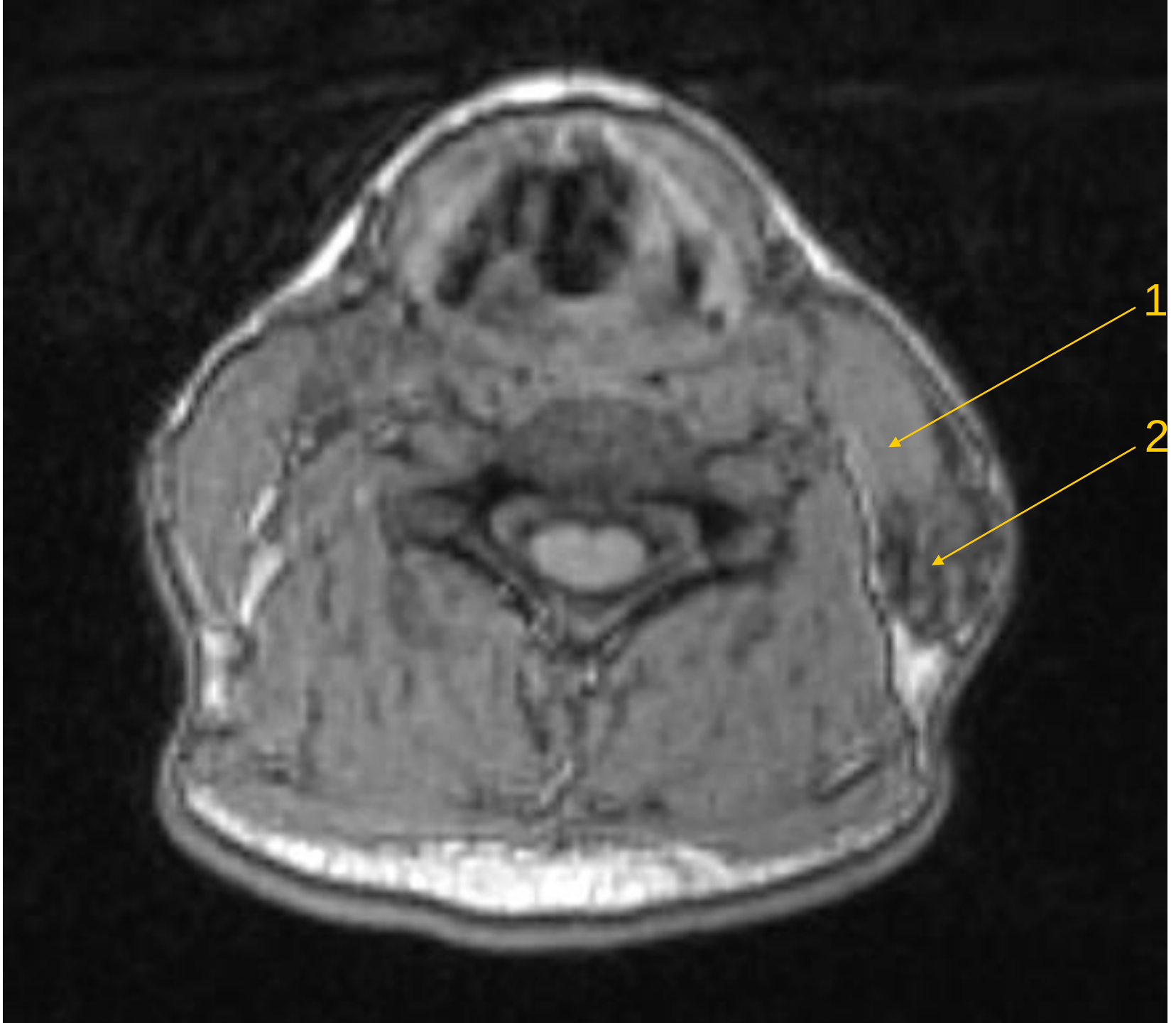
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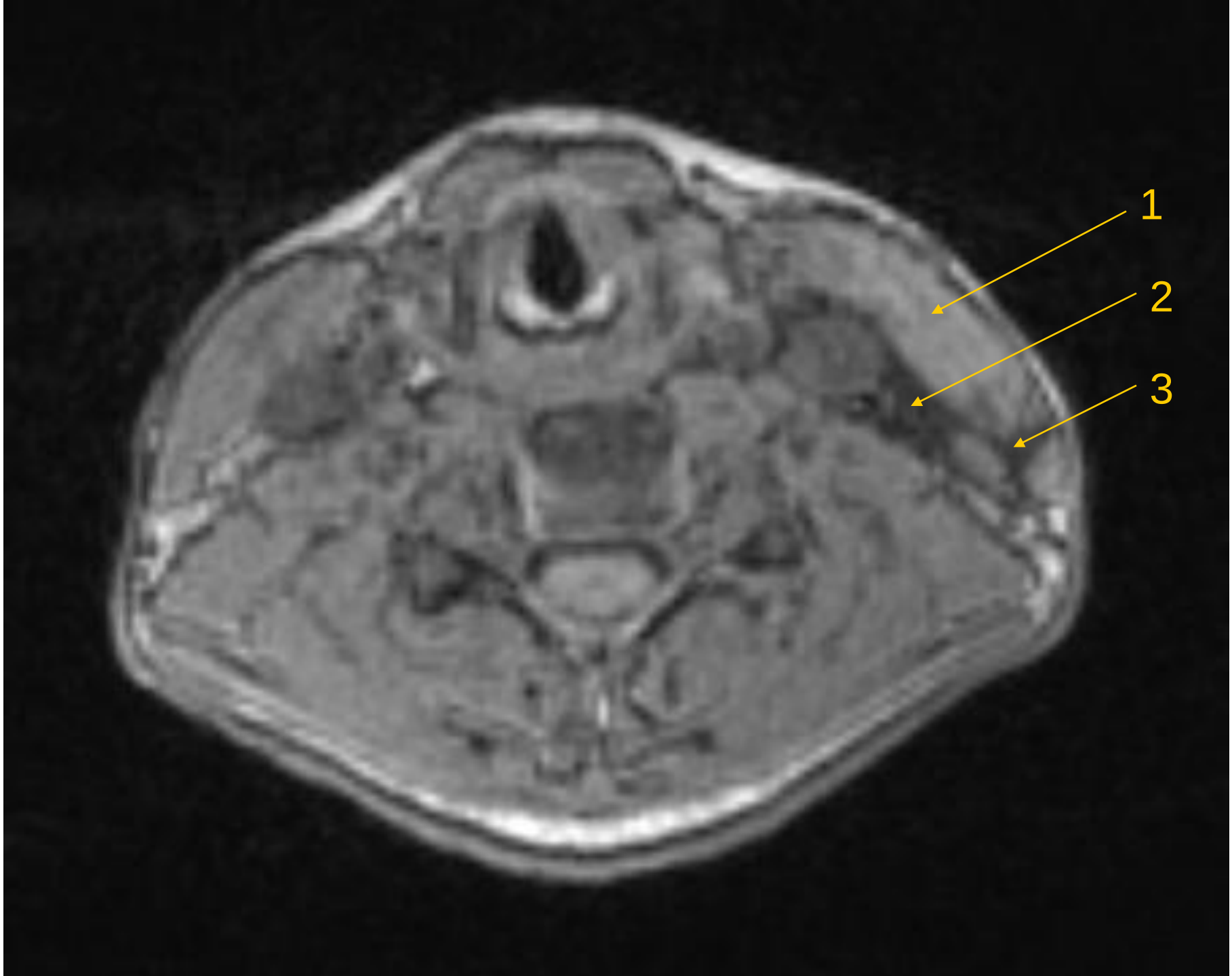
1
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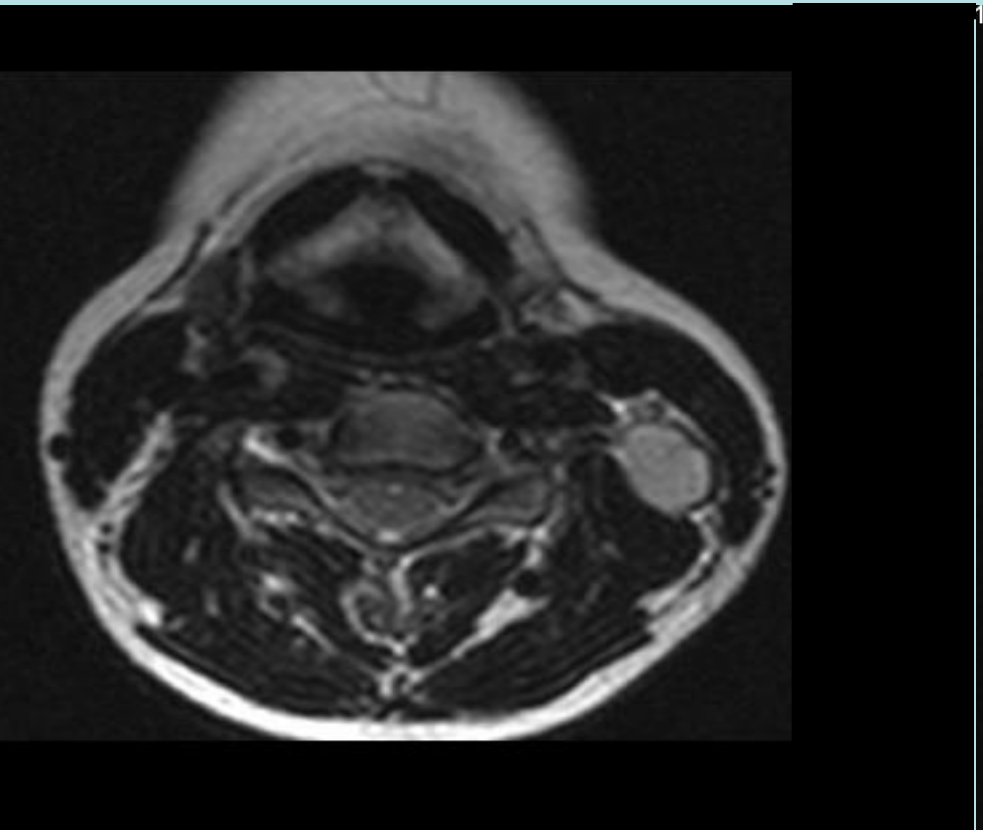
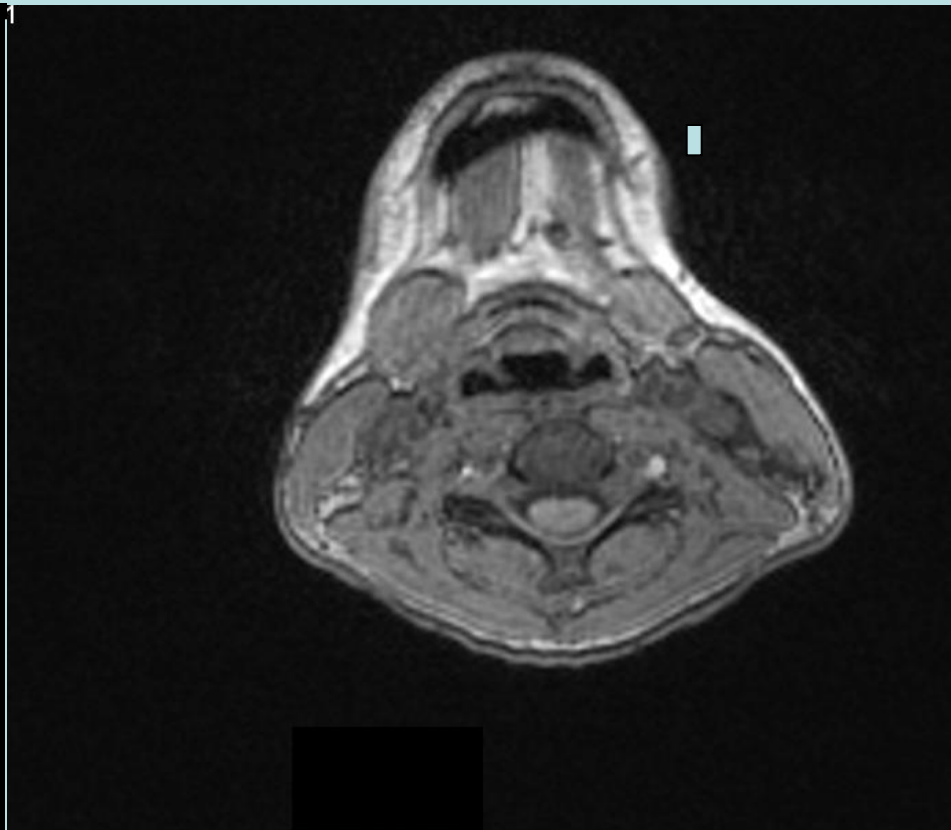
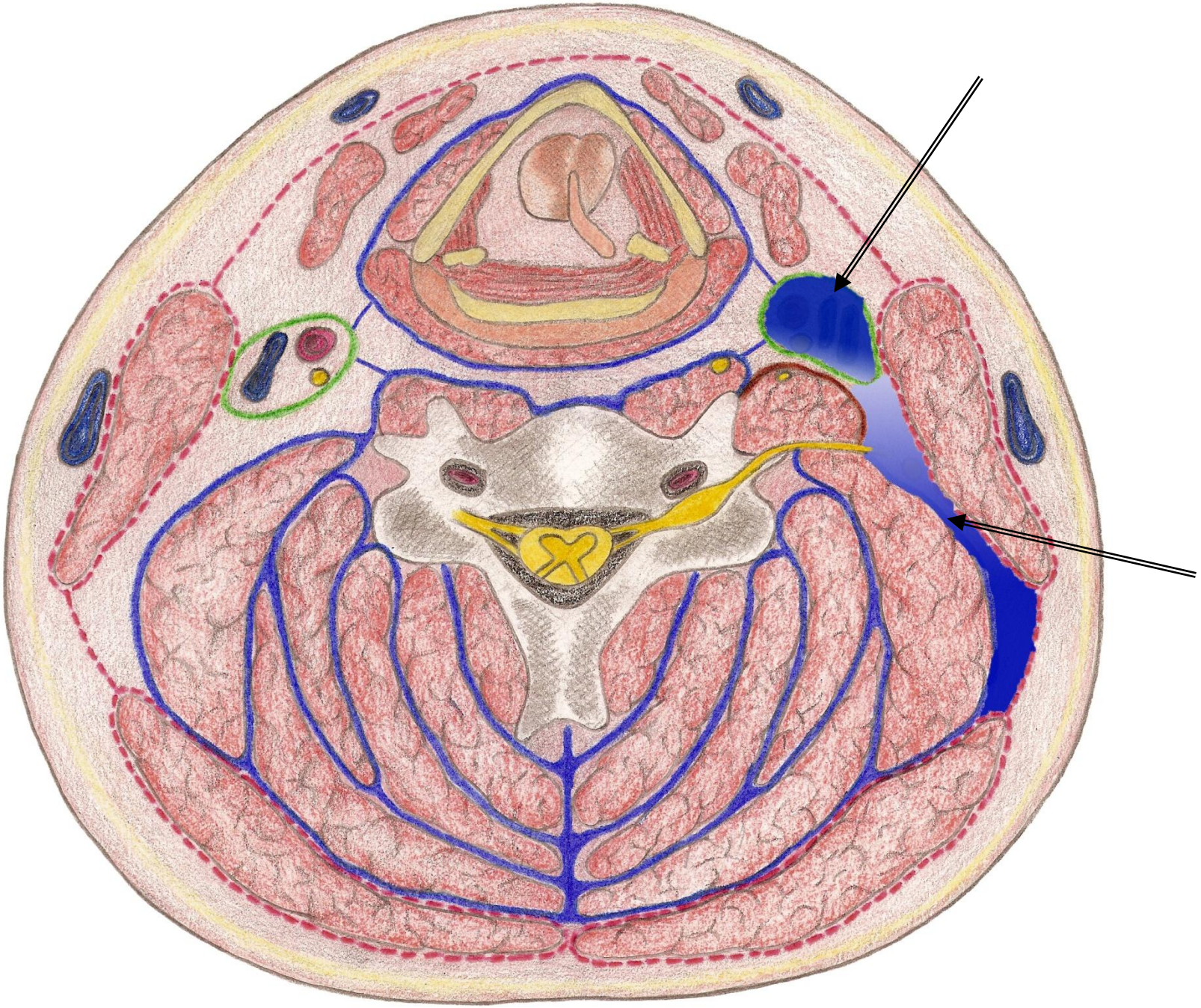
MRI interfasciálního prostoru







Superficial and interfascial cervical block – MRI study

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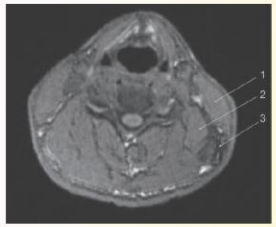
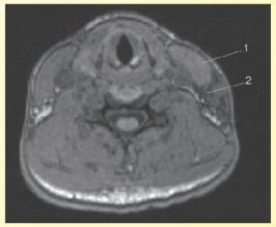
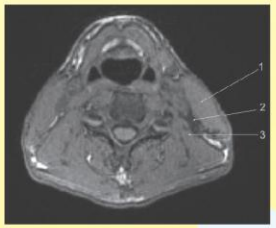
[1] *Dept. of Anaesthesia and Intensive Care, Masaryk Hospital, Ústí nad Labem, Krajská zdravotní, a.s., Czech Republic.*
[2] *Faculty of Biomedicine Engineering, Czech Technical University Prague*
[3] *Dept. of Radiology, Masaryk Hospital, Ústí nad Labem, Krajská zdravotní, a.s., Czech Republic*
[4] *Musgrave Park Hospital, Royal Victoria Hospital, Belfast UK*
[5] *Dept. of Anaesthesia and Intensive Care, Nové Město na Moravě, Czech Republic*



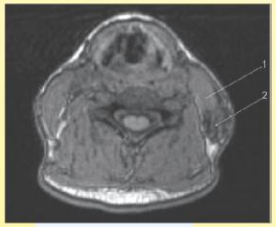
Pic. 2. 1. M. sternocleidomastoideus, 2. M. levator scapulae, 3. Injected solution



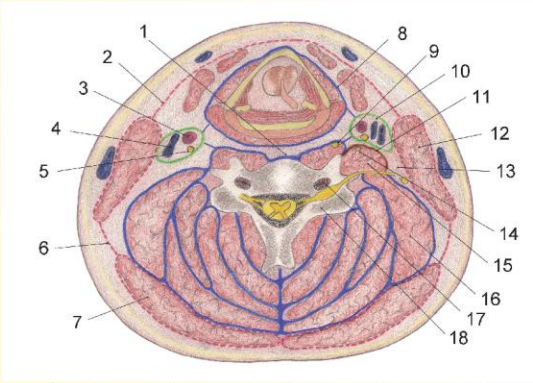
Pic. 3. 1. M. sternocleidomastoideus, 2. Injected solution



Pic. 4. 1. M. sternocleidomastoideus, 2. Injected solution, 3. M. levator scapulae



Pic. 1. 1. M. sternocleidomastoideus, 2. Injected solution



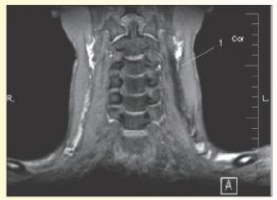
1. Fascia colli profunda, 2. Fascia colli superficialis, 3. A.carotis, 4. V.jugularis interna, 5. Nervus vagus, 6. Investingfascia, 7. M. trapezius, 8. Fascie visceralis, 9. Sympatetic ganglion, 10. Fascie alaris, 11. Fascia scalenica, 12. M. sternocleidomastoideus, 13. Interfascial space, 14. N.phrenicus, 15. MM. scalenii, 16. M. levator scapulae, 17. A.vertebralis, 18. Vertebra

Regional anesthesia is a form of applied anatomy. In an effort to obtain satisfactory block sufficient quantity of local anesthetic solution needs to be injected in the appropriate place surrounding the nerves. Local anesthetic solution spread after its administration is dependent on two significant factors: the compliancy of surrounding tissues and the permeability of surrounding fascias. (1) In addition spread of liquid in tissues relies on the position of the tip of the needle during injection, total volume of local anesthetic solution and pressure applied during the injection.

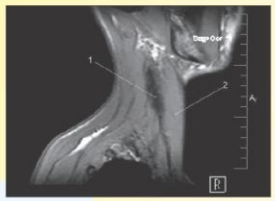
Routine anesthetic technique in carotid surgery comprises a combination of superficial and deep cervical plexus (DCP) blocks with a minimal sedation to enable simple and reliable neurological monitoring. In contrast to superficial cervical plexus block, DCP block is potentially associated with serious complications (2). Some recent studies proposed using only superficial block in carotid surgery with satisfactory results. (3)

Methods:
The aim of the study was to clarify the distribution of injected solution during cervical plexus block. After ethics committee approval and obtaining written informed consent 12 volunteers were randomly assigned to receive either a single injection superficial cervical plexus block – Murphy(4) (group A) or a single injection interfascial cervical plexus block at C3 Nalos(5) (group B). Puncture site for this block is in the middle of the posterior border of sternocleidomastoid muscle and needle is inserted approximately 5 mm bellow the muscle. This technique was described as medial cervical block. (6, 7) In both groups we used 20ml of normal saline solution. C1-T1 MRI was done 20 minutes after the injection. In MRI suite we made transverse, coronal and oblique (in the course of plexus) images and finally 3D reconstructions of this region. Distribution of solution in interfascial space at C3 level was assessed and described in all scans. We specifically examined mode Turbo inversion recovery T1W scans at this level for standard comparison.
Distribution of solution in interfascial space at C3 was described as

1. Solution was not found in interfascial space and is distributed along the posterior part of sternocleidomastoid muscle (pic.1.)
2. Solution was found partially in interfascial space but did not reach medial scalene muscle (pic.2.)
3. Solution was found in interfascial space and reached medial scalene muscle. (pic.4.)



Pic. 6. 1. Interfascial space



Pic. 7. 1. Interfascial space, 2. M. sternocleidomastoideus

Pic. 5. 1. M. sternocledomatoideus, 2. Perivertebral space, 3. Interfascial space

Results:
Group A: Normal saline solution did not reach interfascial space in two volunteers (pic.1). In four volunteers solution was distributed in interfascial space, but did not reach the front part of the space (pic.2, 3).
Group B Normal saline solution was found distributed in whole interfascial space in all volunteers (pic.4). Solution reached attachment of medial scalene muscles to cervical vertebrae which is the space of proper deep cervical nerve block. (pic.5)

Conclusion:
In some patients superficial cervical block is associated with the leak of local anesthetic underneath the medial cervical fascia and distributes in interfascial space. Intended injection of water solution below the medial cervical fascia just below sternocleidomastoid muscle is able to fill the interfascial space up and provide successful block of cervical plexus without the necessity of the deep cervical block. Localization of the right space is more important than distance of the tip of the needle from the nerve. Leak of the local anesthetic beneath medial cervical fascia explains efficacy of superficial block in some patients undergoing carotid surgery.

MEDIAL CERVICAL BLOCK FOR CAROTID ENDARTERECTOMY

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[1] *Dept. of Anaesthesia and Intensive Care, Masaryk Hospital, Ústí nad Labem, Krajská zdravotní, a.s., Czech Republic.*
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[4] *Musgrave Park Hospital, Royal Victoria Hospital, Belfast UK*
[5] *Dept. of Anaesthesia and Intensive Care, Nové Město na Moravě, Czech Republic*

Objective:

To assess the reliability and safety of ultrasound guided medial cervical plexus blockade

Design:

Prospective observational study

Materials and Methods:

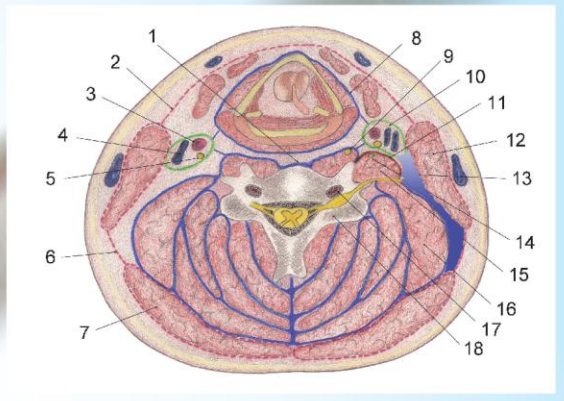
We studied 50 ASA II-III patients (28 males and 22 females, average age 62 years) undergoing carotid endarterectomy. Medial cervical plexus blockade was performed under ultrasound guidance using the „in plane" technique. We injected 20 ml of 0.375% bupivacaine in between the fasciae dividing the sternocleidomastoid and levator scapulae muscles. All patients received 100 mcg of intravenous fentanyl after application of the block. We documented the incidence of satisfactory blockade for carotid artery surgery, need for supplementary infiltrative local anaesthesia with 1% trimecaine, need for conversion to general anaesthesia and incidence of complications.

Results:

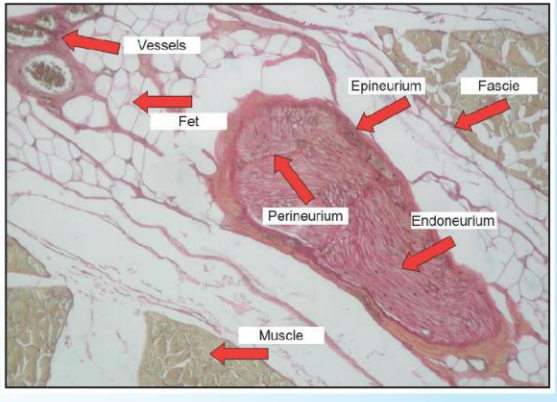
Medial cervical block without any supplementary local anesthesia was achieved in 32 (64%) patients. Supplementary infiltration of local anesthetic into the operative area was required in 17 (34%) patients. Only one patient required repeated local anesthetic supplementation. Conversion to general anesthesia was not necessary in any of our patients. The following complications were encountered: transient unilateral reccurent nerve block in two patients and transient phrenic nerve block in one case.

Conclusions:

The described ultrasound guided „in plane" technique of medial cervical plexus blockade enables the application of local anesthetic around the roots, trunks and divisions of cervical plexus nerve fibres. It provides satisfactory anesthesia for carotid endarterectomy in reasonable number of cases. When supplemented with local anesthetic infiltration of the operative wound the success rate is 100%. The frequency of complications is relatively low.



1. Fascia colli profunda, 2. Fascia colli superficialis, 3. A.carotis, 4. V.jugularis interna, 5. Nervus vagus, 6. Investingfascia, 7. M. trapezius, 8. Fascie visceralis, 9. Sympatetic ganglion, 10. Fascie alaris, 11. Fascia scalenica, 12. M. sternocleidomastoideus, 13. Interfascial space, 14. N.phrenicus, 15. MM. scalenii, 16. M. levator scapulae, 17. A.vertebralis, 18. Vertebra



Discussion:

The effectiveness of the medial cervical block may be explained by the fascial concept, a novel philosophical concept of fluid distribution in the vicinity of peripheral nerves. Based on histological, CT and MRI studies performed on the author himself, on healthy volunteers, and clinical studies using ultrasound imaging we propose that "fascial concept" enhances the safety of peripheral nerve blocks. In brief, the muscular fascias surrounding peripheral nerves create an enclosed space, where their elasticity is crucial in forming the size and shape of the space thus affecting the distribution of local anesthetics. We suggest that application of local anesthetic into "optimal" space outlined by the fascial planes, in particular under ultrasound guidance, largely determines the quality of the peripheral nerve block. In contrast, an effort to apply local anesthetics as close as possible to the peripheral nerve increases the risk of peripheral nerve damage.

Krajská zdravotní, a.s.
- Masarykova nemocnice v Ústí nad Labem, o.z.

České publikace ve vztahu k mediálnímu bloku

- Nalos D, Bejšovec D, Nováková M, Derner M: Fascie brachiálního plexu. Anest intenziv Med 2010; 21: 185-190
- Nalos D, Bejšovec D, Nováková M, Derner M, Mach D: Superficial and interfascial cervical block – MRI study Anest intenziv Med 2011; 22: 204-8.
- Nalos D, Humhej I: Ultrazvukem naváděný mediální krční blok. Anest intenziv Med 2011; 5: 249 - 252
- Nalos D, Mach D: Fasciální concept. (Fascial Plane Concept). Anest intenziv Med 2011; 22: 317-319

Souhrnné výsledky

2010 - Metoda zavedena zkušebně - 50 aplikací

2011 - Srovnávací studie 50 pacientů

2012 - Uvolněna k rutinnímu použití

Výhody ultrazvukově asistovaného mediálního bloku

- Poloviční dávka anestetika
- Vyloučení komplikací spojených s hlubokým blokem
- Poloviční čas aplikace bloku
- Bezpečnost daná kontrolou polohy hrotu jehly a šíření aplikované látky.
- Srovnatelná účinnost s kombinovaným hlubokým a povrchním blokem