Cervicogenic Headache ultrasound guided Nerve Blocks

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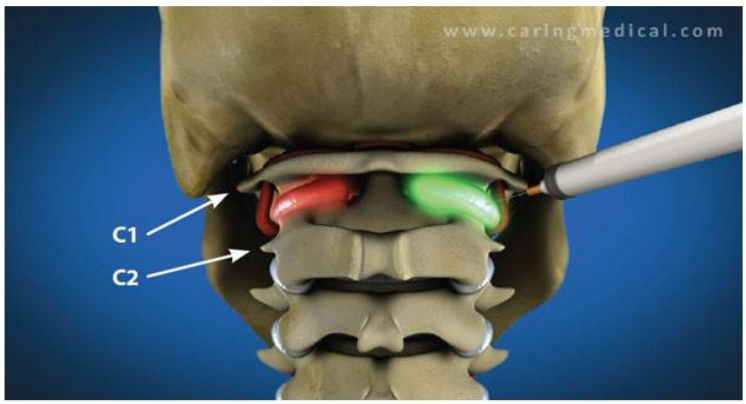
What is a cervicogenic headache ?

- Chronic headaches that result from musculoskeletal dysfunction in the cervical spine (zito et.al, 2006)



- ❖Muscles
- ❖Joints
- ❖Nerves; C1 - C3
- ❖Discs

Prevalence

- General Population; 0.4-2.5%
- All Headache Patients; 15-20%
- Cervical Acceleration-Deceleration Injuries; 25%
- Sleep Apnea; 10%
- Females 4X more likely than males

Dignosis

- No established gold standard
- Sjaastad's Diagnostic Criteria (1998)

1. Misaligned vertebra can pressure blood vessels or irritate spinal nerves
2. Pressured blood vessels reduce blood flow for brain, irritated nerves may tell vessels to narrow, further reducing blood flow
3. Blood vessels in head expand to offset reduced blood supply, sudden expansion irritates surrounding nerves – the throbbing pain of a migraine

Sjaastad's Diagnostic Criteria (1998)

1. Sx and signs of Neck Involvement

◆Precipitation of head pain by;

➢ Neck movement and/or sustained awkward head positioning

➢ External pressure over the upper cervical or occipital region on the symptomatic side

◆Decreased neck ROM

◆Ipsilateral neck, shoulder, or arm pain of vague nonradicular nature on arm pain or radicular nature

Sjaastad's Diagnostic Criteria (1998)

2. Positive anesthetic blockade effect

3. Unilateral headache without sideshift

4. Head Pain Characteristics;

➢ Moderate-severe, non-throbbing, and non-lancinating pain, usually starting at the neck OR

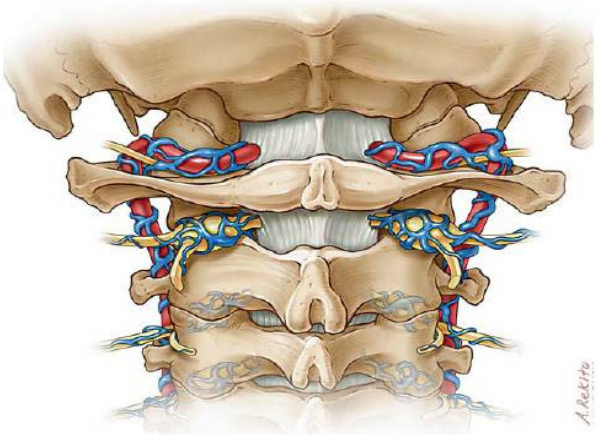
➢ Episodes of varying duration OR

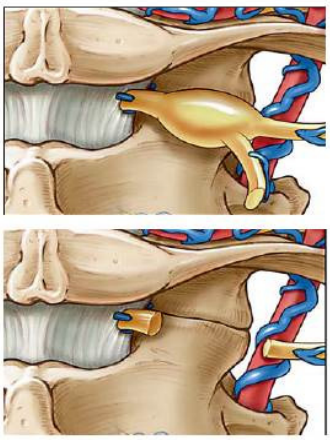
➢ Fluctuating, continuous pain

Common Sign/Symptoms

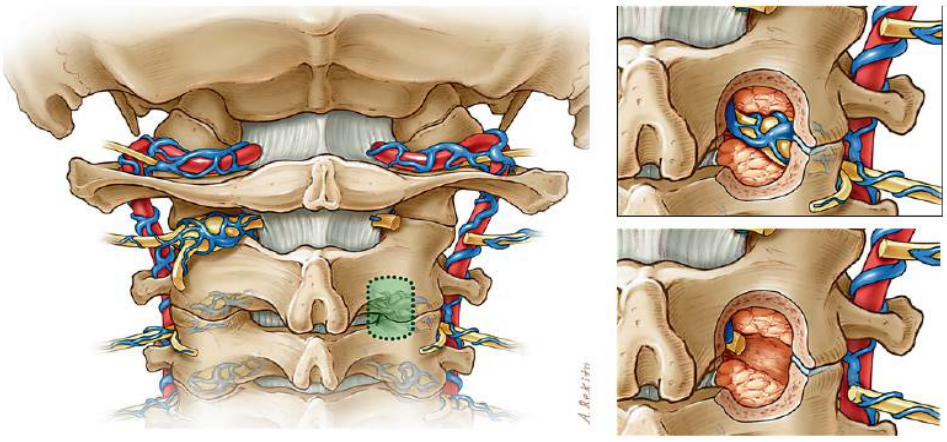
- Decreased cervical ROM
- Mechanical precipitation of head pain
- S/S similar to those of migraines;
  - ➢ Nausea
  - ➢ Sensitivity to light
  - ➢ Sensitivity to sound
  - ➢ Dizziness
  - ➢ Ipsilateral blurred vision
  - ➢ Ipsilateral facial pain

Pain Relief after Cervical Ganglionectomy (C 2 and C 3) for the Treatment of Medically Intractable Occipital Neuralgia



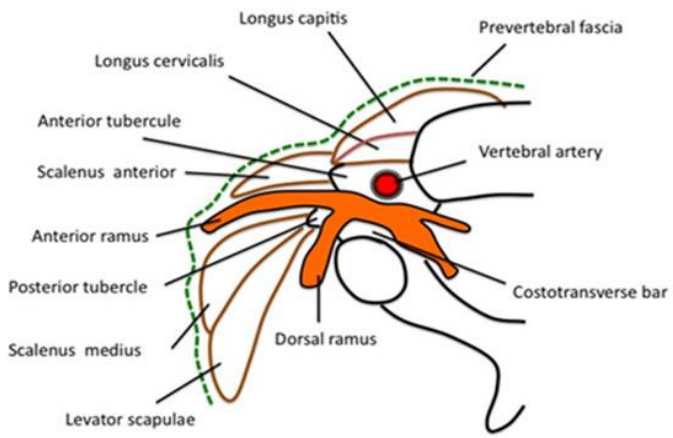


Pain Relief after Cervical Ganglionectomy (C 2 and C 3) for the Treatment of Medically Intractable Occipital Neuralgia



Cervical Plexus

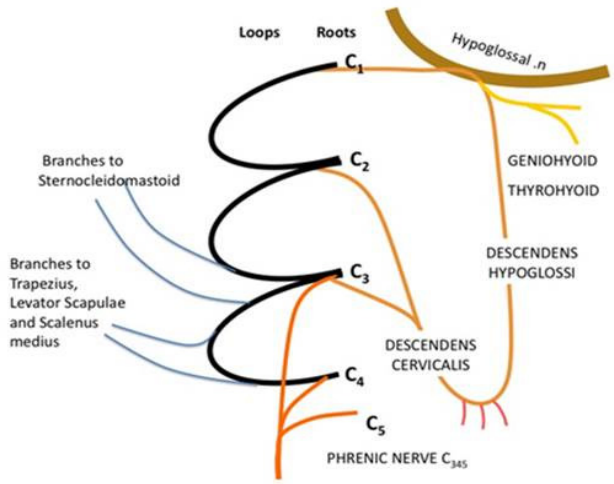
anatomy and ultrasound guided blocks



The primary rami of the cervical roots lying on the costo-transverse bar between the anterior and posterior tubercle

Cervical Plexus

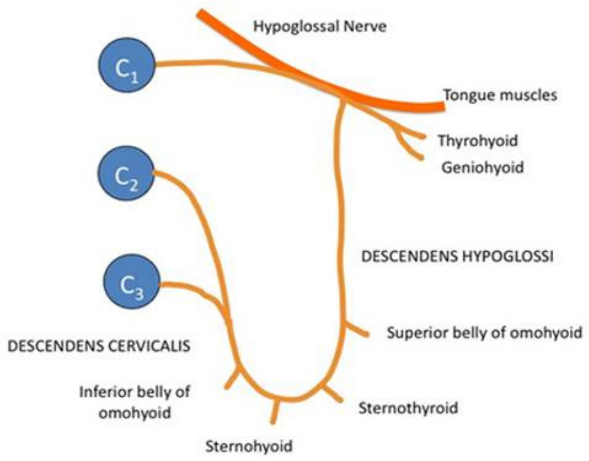
anatomy and ultrasound guided blocks



Formation of the ansa cervicalis by the descendens hypoglossi and descendens cervicalis and the motor branches (modified from Ellis and Feldman)

Cervical Plexus

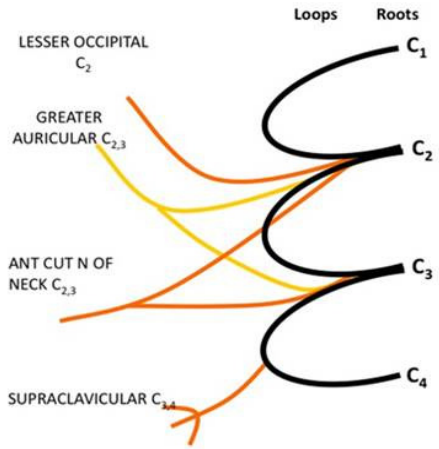
anatomy and ultrasound guided blocks



The ansa cervicalis and its branches to the strap muscles of the neck (modified from Ellis and Feldman)

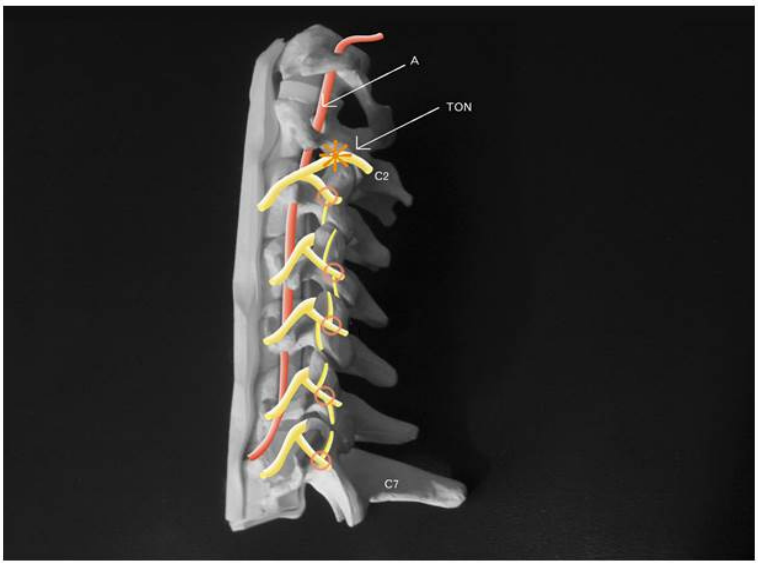
Cervical Plexus

anatomy and ultrasound guided blocks



Superficial branches of the cervical plexus

Ultrasound-guided interventional procedures for cervical pain



The cervical zygapophysial joints are innervated by articular branches derived from the medial branches of the cervical dorsal rami (orange circle). Cervical zygapophysial joint below C2-C3 has dual innervations, each joint receives a double innervation that comes from the superior and inferior medial branches The superficial medial branch of C3 is large and known as the third occipital nerve (TON). A, vertebral artery. (Color version of figure is available online.)

11.2.1 경부인성두통

진단기준:

A. 진단기준 C를 충족하는 두통

B. 두통을 유발할 수 있다고 알려진 경추 또는 경부연조직 질환 또는 병소의 임상, 검사실 검사 그리고/또는 영상 증거

C. 다음 중 최소한 두 가지로 인과관계가 입증됨:

1. 두통이 경부 질환의 시작 또는 병소의 발병과 시간연관성을 가지고 발생
2. 경부 질환 또는 병소의 호전 또는 소실과 동시에 두통이 현저히 호전 또는 소실됨
3. 경부운동 범위가 감소하고 유발수기에 따라 두통이 현저히 악화됨
4. 경부구조물 또는 신경에 진단 목적의 마취를 했을 때 두통이 사라짐

D. 다른 ICHD-3 진단으로 더 잘 설명되지 않음.

❖대부분 경추와 그 부속뼈, 디스크, 연조직 질환에 의한 두통이지만, 항상 목통증을 동반하지는 않음.

13.4 후두신경통

진단기준:

A. 진단기준 B-E를 충족하는 편측 또는 양측 통증

B. 통증은 큰뒤통수신경, 작은뒤통수신경 그리고/또는 제3번뒤통수신경 영역에 위치

C. 다음의 세 가지 통증의 특성 중 두 가지:

1. 수초에서 수분까지 지속되는 돌발발작의 반복
2. 심한 강도
3. 쏘이고, 찌르거나 날카로운 양상

D. 통증은 다음의 두 가지 모두를 동반:

1. 두피 그리고/또는 머리카락의 무해한 자극에 의해 이상감각 그리고/또는 무해자극통증이 발생
2. 다음 중 한 가지 또는 두 가지 모두:
   a) 침범된 신경분지의 압통
   b) 큰뒤통수신경이 나오는 부분이나 C2 신경 영역에 유발점이 있음

E. 통증이 침범된 신경의 국소마취에 의하여 일시적으로 완화됨

F. 다른 ICHD-3 진단으로 더 잘 설명되지 않음.

❖편측 혹은 양측의 발작성으로 쏘이고 찌르는 통증이 큰뒤통수신경, 작은뒤통수신경 또는 제3번뒤통수신경 영역에 발생하며, 때때로 침범된 부위의 감각저하나 감각이상이 동반되고, 흔하게 연관된 신경 위쪽으로 압통이 있음.

A11.2.5 경부근막통증에 기인한 두통

진단기준:
A. 진단기준 C를 충족하는 두통 또는 목통증
B. 유발점을 포함하여 경부근육의 근막통증이 입증함
C. 다음 중 최소한 두 가지로 인과관계가 입증됨:
1. 다음 중 한 가지 또는 두 가지 모두:
   a) 통증이 경부근막통증질환과 시간연관성을 가지고 발생함
   b) 경부근막통증의 호전에 따라 두통도 현저히 호전됨
2. 환자가 호소하는 통증을 따라 경부근육의 확실한 압통이 관찰됨
3. 유발점에 국소마취주사 또는 마사지를 하면 통증이 일시적으로 호전됨

D. 다른 ICHD-3 진단으로 더 잘 설명되지 않음.

A11.2.4 경추상부신경뿌리병증에 기인한 두통

진단기준:
A. 진단기준 C를 충족하는 두통 또는 목통증
B. C2나 C3 신경뿌리병증의 임상 또는 영상증거
C. 다음 중 두 가지 모두로 인과관계가 입증됨:
1. 다음 중 최소한 두 가지:
   a) 통증이 신경뿌리병증의 발생과 시간연관성을 가지고 발생하거나, 두통으로 인하여 질환이 발견됨.
   b) 통증이 신경뿌리병증의 호전 또는 악화와 동시에 현저히 호전 또는 악화됨
   c) 통증이 연관된 신경뿌리의 국소마취에 의해 일시적으로 호전됨
2. 두통이 신경뿌리병증의 동측에 나타남

D. 다른 ICHD-3 진단으로 더 잘 설명되지 않음.

11.2.2 인두뒤힘줄염에 기인한 두통

진단기준:

A. 진단기준 C를 충족하는 두통

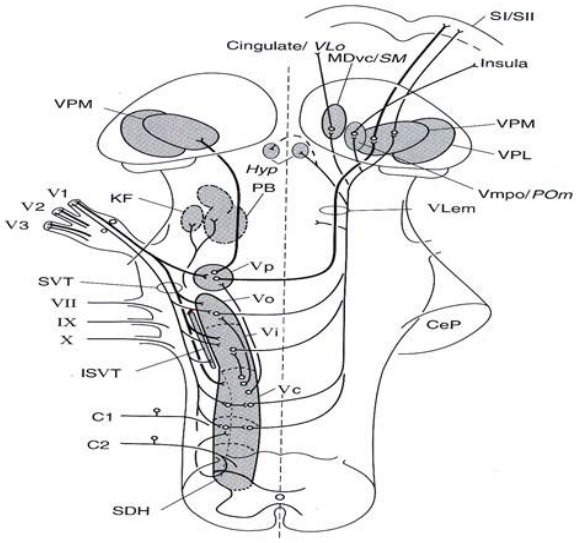
B. 상부척추부위 척추앞연조직의 비정상적인 부종이 영상으로 입증된 인두뒤힘줄염

C. 다음 중 최소한 두 가지로 인과관계가 입증됨:

1. 두통이 인두뒤힘줄염의 발병과 시간연관성을 가지고 발생
2. 다음 중 한 가지 또는 두 가지 모두:
   a) 인두뒤힘줄염의 진행과 동시에 두통이 현저히 악화됨
   b) 인두뒤힘줄염의 호전과 동시에 두통이 현저히 호전됨
3. 두통이 목의 신장, 머리 회전 그리고/또는 삼킴에 의해 현저히 악화됨
4. 경추 1-3번의 가시돌기 부위에 압통이 있음

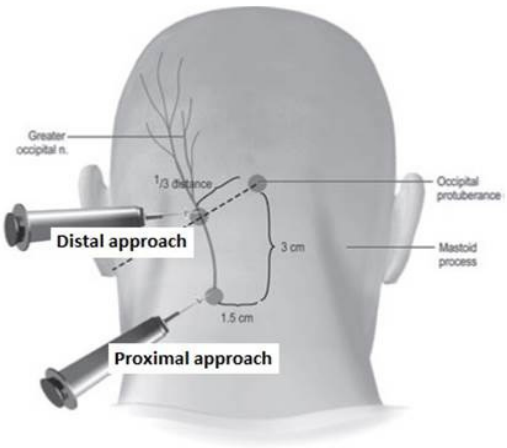
D. 다른 ICHD-3 진단으로 더 잘 설명되지 않음.

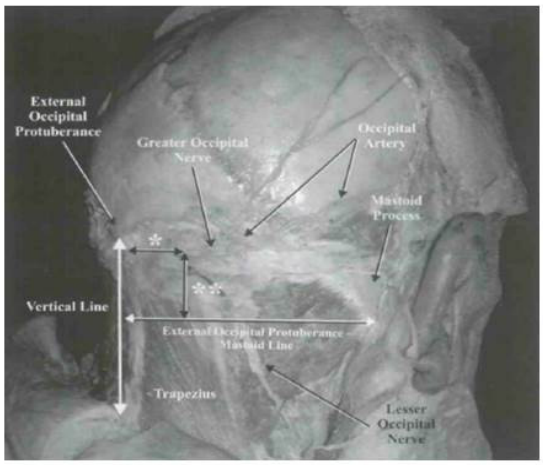
❖인두뒤 연조직의 염증 또는 석회화로 인한 두통으로 보통 상부 경추의 척추앞근육이 당겨지거나 눌릴 때 발생.



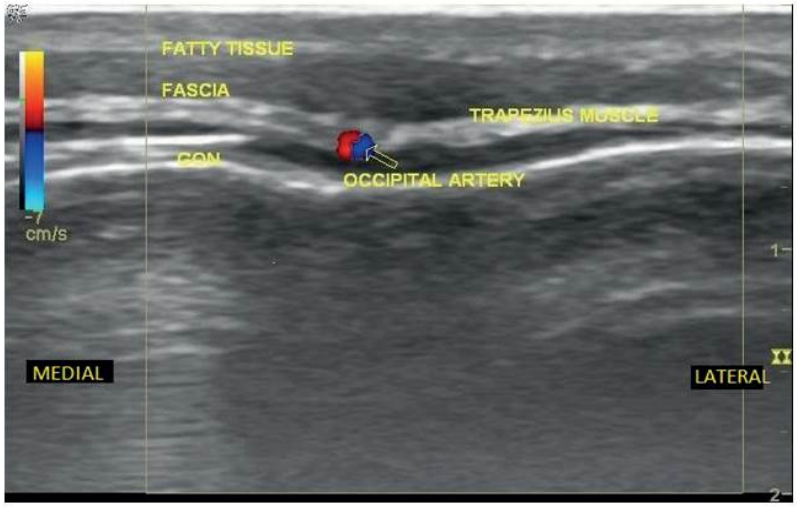
Schematic representation of ascending pathways of the central trigeminal system with priority to nociception. The figure is based on a representation of the human trigeminal system by Nieuwenhuys et al(137) but includes trigeminal structures found in other species, which may differ In part from the trigeminal system of primates. Contours of nuclei are simplified; symbols for single cell bodies and nerve fibers represent populations of neurons. The TBNC includes subnucleus principalis (Vp) and the spinal trigeminal nucleus, which consists of subnuclei oralis (Vo), interpolaris(Vi) and caudalis (Vc). Primary afferents from the trigeminal divisions (V1-3) project to all subnuclei of the TBNC, thick myelinated fibers mainly to Vp, and thin A and C fibers preferentially to caudal subnuclei and the first spinal segments (C1-2). Minor projections to the spinal trigeminal nucleus run through nerves VII, IX, and X (not further described). Intersubnuclear connections are shown originating form Vc but may connect all subnuclei of the TBNC. Neurons from Vp ascend to the ipsilateral and to the contralateral thalamus, forming the trigeminal lemniscus (Vlem). Trigeminothalamic neurons Involved in nociception project via a crossed pathway mainly to the VMpo (in primates), the ventroposterome-dial nucleus (VPM), the medial region of the Pom, and the ventrocaudal medial dorsal nucleus (MDvc;in primates) or nucleus submedius (SM; in rat and the ventrocaudal medial dorsal Nucleus (MDvc; in primaes) or nucleus submedius (SM; in rat and cat) in the medial thalamus. There is also a significant projection from the TBNC to the hypothalamus (Hyp) and to the pontine parabrachial (PB) and Kolliker-Fuse (KF) nuclei. *Abbreviations:* ceP, cerebellar pedunculus; SDH,spinal dorsal horn, SI, primary somatosensory cortex"; SVT, spinal trigeminal tract; ISVT, interstitial nucleus of the SVT; VPL, ventroposterolateral thalamic Nucleus. The main cortical projections from these thalamic nuclei are to the cingulate cortex (in primate) or ventrolateral orbital cortex (Vlo, in cat and Rat), the insula, and the primary and secondary somatosensory cortices (SI and SII)

Occipital Nerve Block (for occipital neuralgia)



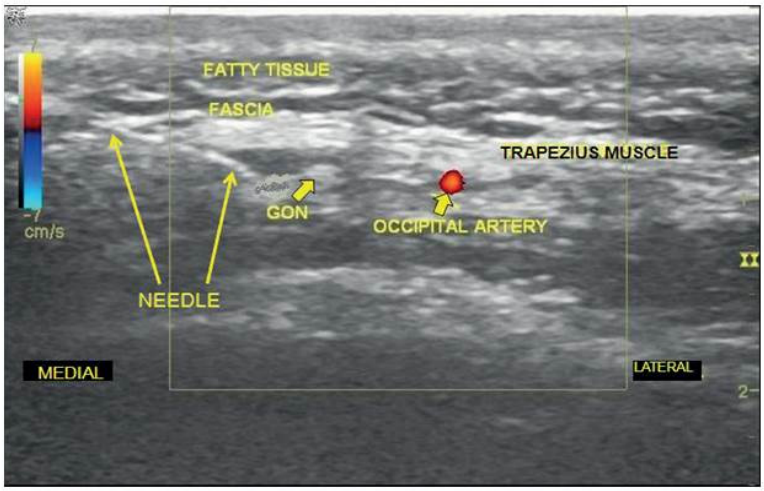


Ultrasound-Guided Diagnostic GON Block

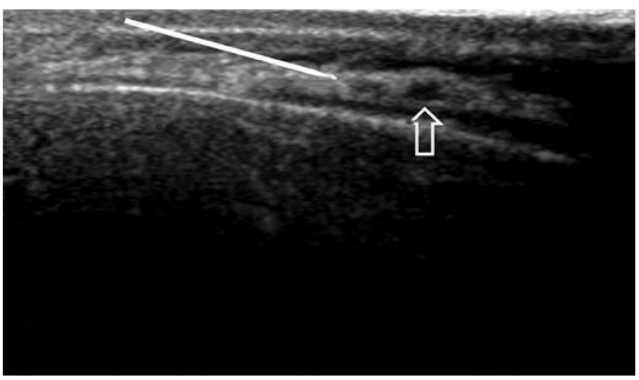


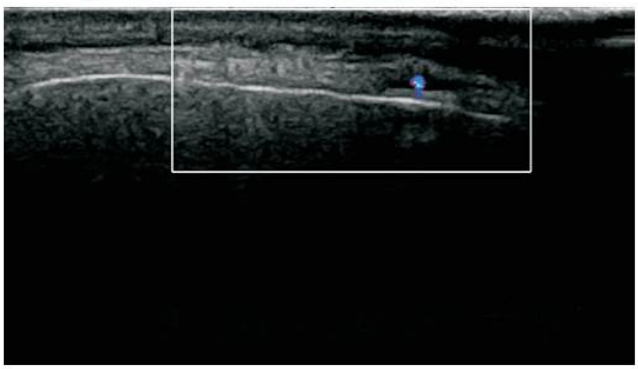
Ultrasound Image of the Greater Occipital Nerve in Relation to the Occipital Artery, Fatty Tissue, Fascia, and the Trapezius Muscle. GON = Greater occipital nerve

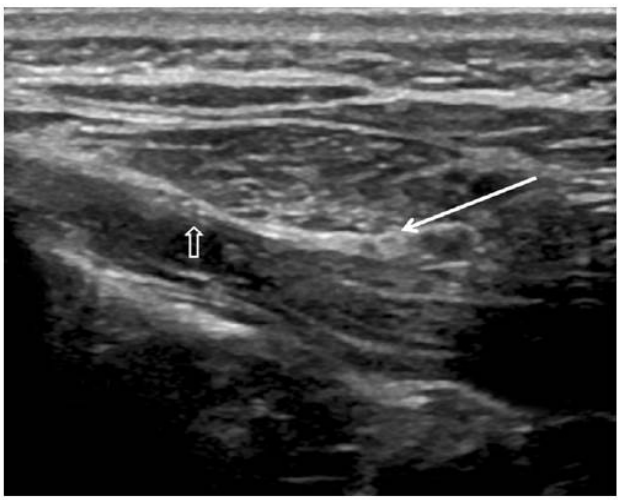
Ultrasound-Guided Diagnostic GON Block

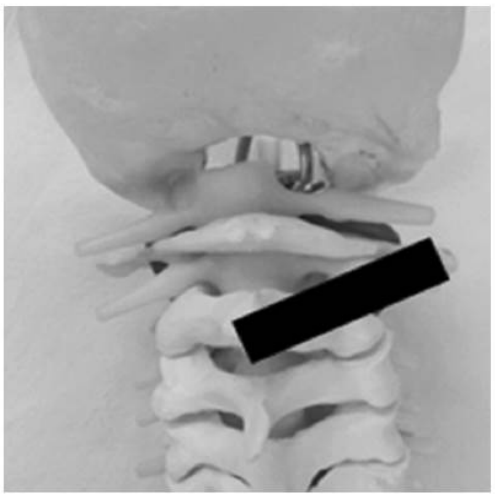


Ultrasound Image Showing the Needle Adjacent to the Greater Occipital Nerve Immediately Before Injection of Local Anesthetic/Steroid Mixture During Ultrasound-Guided Diagnostic Greater Occipital Nerve Block. GON = Greater Occipital Nerve



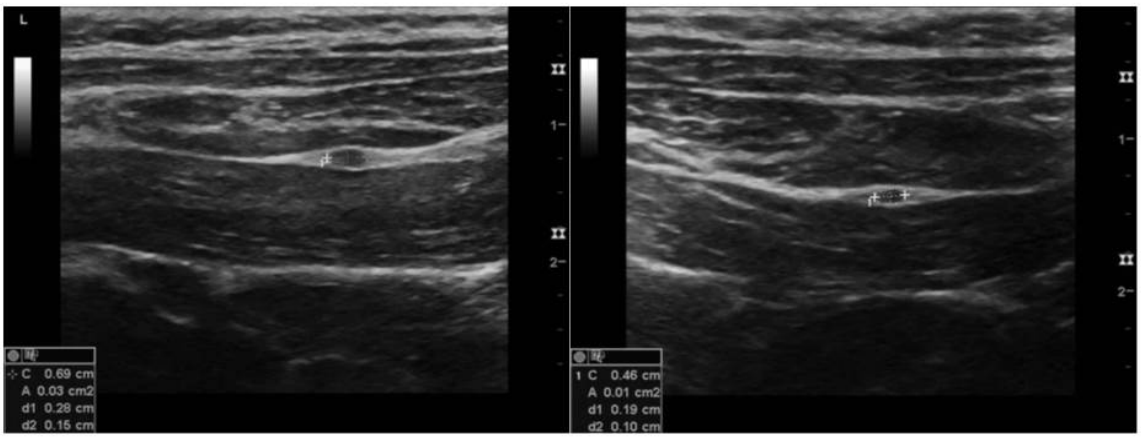






(A) Oblique transverse scan between C2 spinous process and C1 transverse process. Arrow indicates greater occipital nerve in the intermuscular plane between obliquus capitis inferior and semispinalis capitis and the direction of the needle for block. Open arrow indicates the 3rd occipital nerve. (B) Position of probe for (A) at artificial spine model. OCI, obliquus capitis inferior; SC, semispinalis capitis; SP, splenius capitis; C2 SP, spinous process of axis.

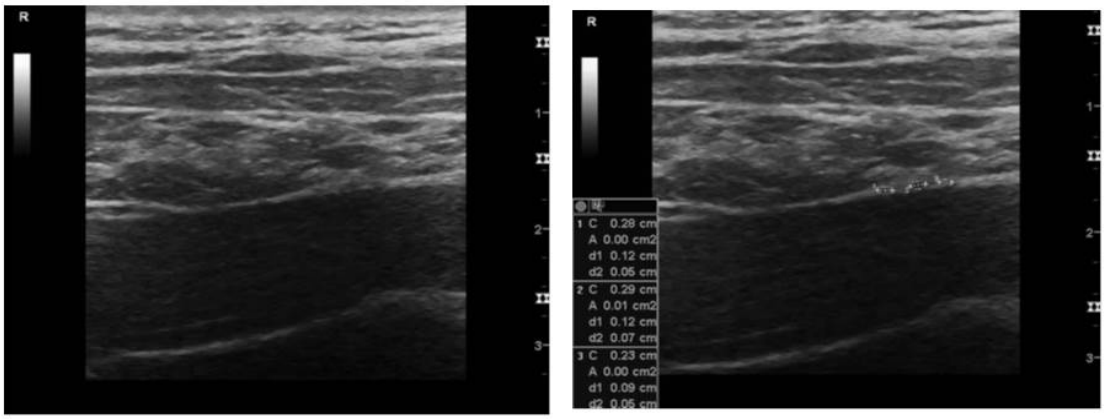
Sonographic Evaluation of the Greater Occipital Nerve



A, Transverse image of the greater occipital nerve on the symptomatic side. The cross-sectional area and circumference measured 3.0 mm2 and 6.9 mm.

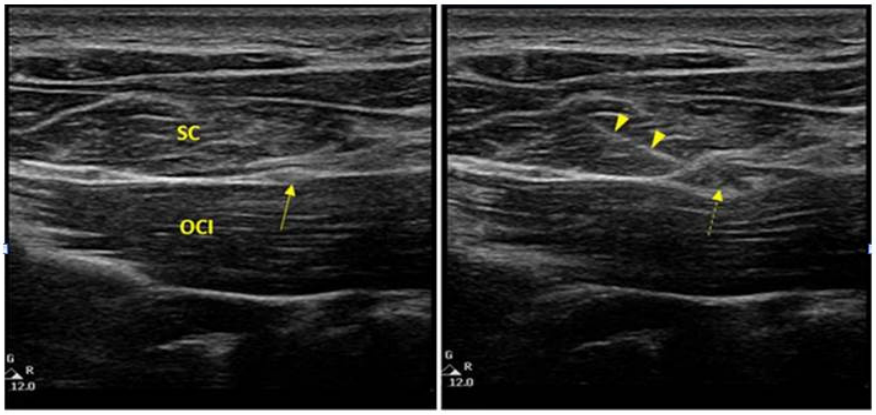
B, Transverse image of the greater occipital nerve on the asymptomatic side in the same patient. The cross-sectional area and circumference measured 1.0 mm2 and 4.6 mm.

Sonographic Evaluation of the Greater Occipital Nerve



A and B, "Multiple" branches of nerves at the fascial plane between the semispinalis capitis and obliquus capitis inferior muscles. The multiple hypoechoic nerves (ellipses) are probably the branches from the suboccipital nerve, third occipital nerve (least), and lesser occipital nerve that anastomose with the greater occipital nerve.

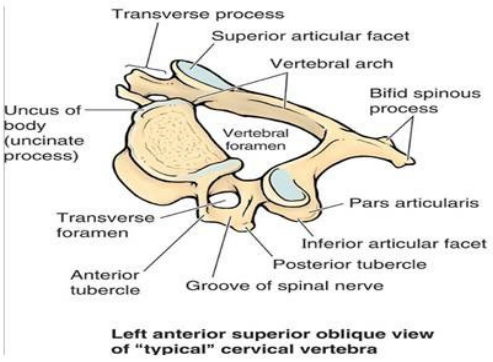
Ultrasound-Guided Greater Occipital Nerve Block at a Novel Proximal Location: A Feasibility Study



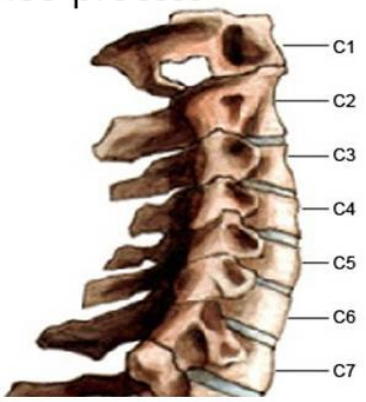
Nerve visualization for a novel proximal approach to ultrasound guided greater occipital nerve (GON) blocks. SC-Semispinalis capitis, OCI-Obliquus capitis inferior, Solid arrow-GON, Dashed arrow-Injectate surrounding GON, Arrowheads-Shaft of needle.

Features Typical for Cervical Vertebrae

- ❖Smallest of the 24 movable vertebrae
- ❖Relatively larger intervertebral discs
  discs are thin, but relative to their small size; thick
- ❖Greatest range & variety of movement of all the vertebral regions
- ❖Foramen transversarium in the transverse process

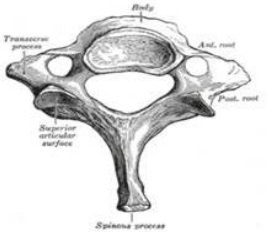


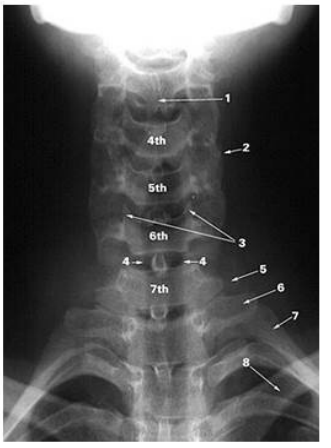
Left anterior superior oblique view of "typical" cervical vertebra



C7-vertebra prominens

Most prominent spinous process in 70% of people



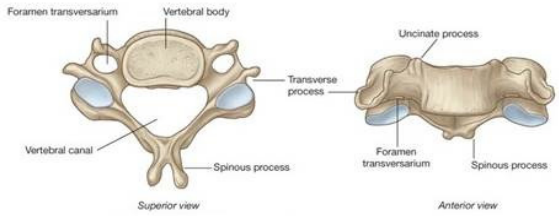


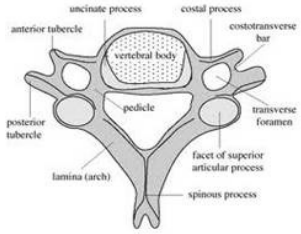
Vertebrae C3-C7

typical cervical vertebrae

Large vertebral foramina
restricted rotation

Superolateral margin
uncus of the body ; uncinate process

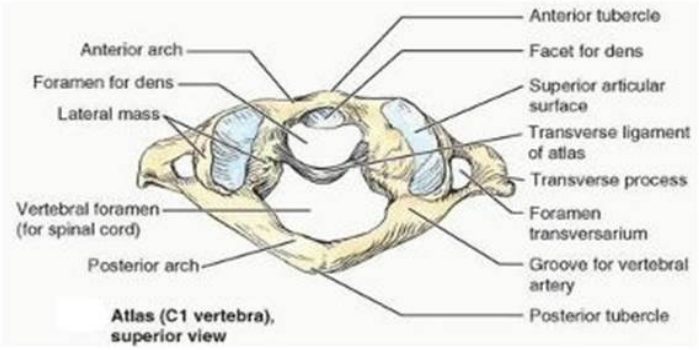




Atlas (C1)

❖ Anterior and posterior arches
❖ A tubercle in the center of its external aspect
extend between the lateral masses forming a complete ring.

Posterior arch
❖ A wide groove for the vertebral artery on its superior surface.
❖ C1 nerve also runs in this groove

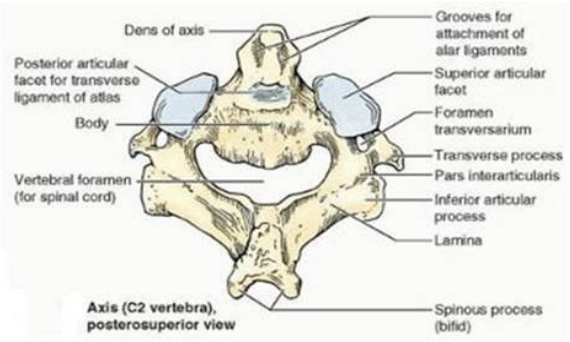


Axis (C2)

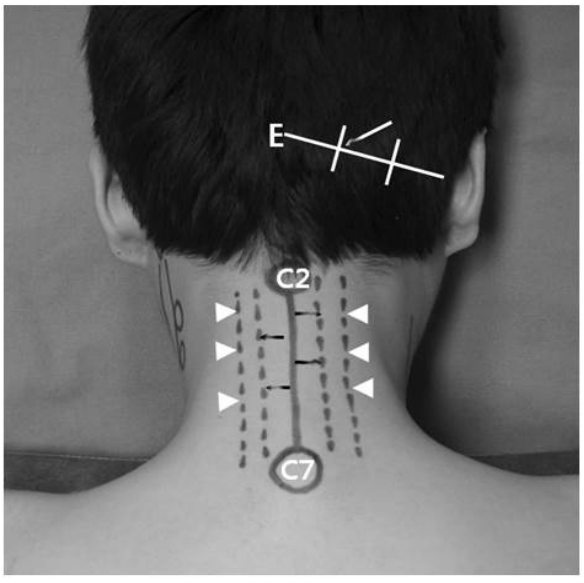
strongest of the cervical vertebrae

C1, carrying the cranium, rotates on C2 (when a person turns the head to indicate "no").

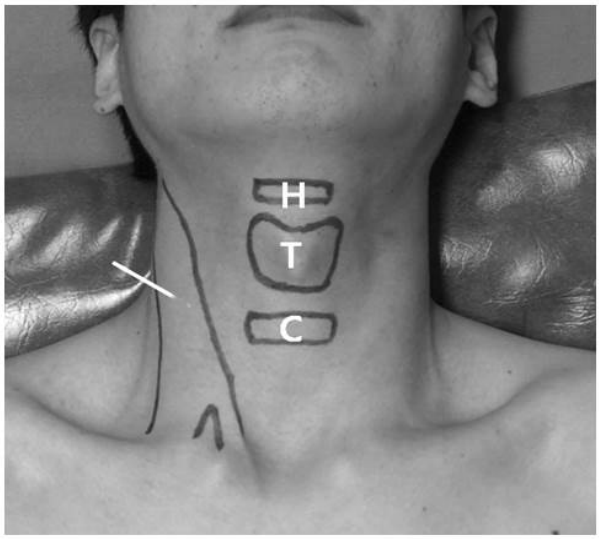
- ❖ Lies anterior to the spinal cord.
- ❖ The distinguishing feature blunt tooth-like dens
- ❖ Serves as the pivot about which the rotation of the head occurs.



Large bifid spinous process



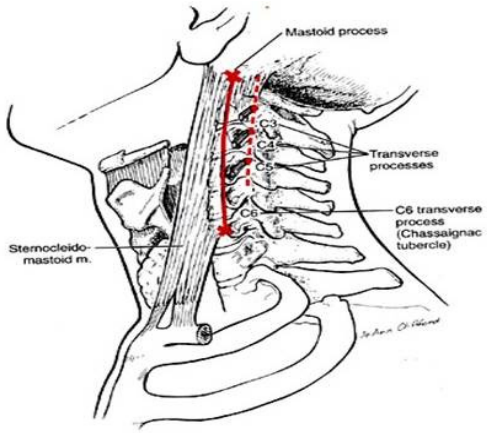
Surface anatomy of the posterior neck region. After dividing the line from external occipital protuberance to mastoid process into 3 sections, greater occipital nerve usually runs the point at the junction of its middle and medial thirds (white arrow). Drawing the line one finger breadth laterally from midline, there are laminae on this line (black arrows). Two finger breadths laterally, facet joints are on this line (arrowheads). E, external occipital protuberance; C2, spinous process of the 2nd cervical vertebra; C7, spinous process of the 7th cervical vertebra.

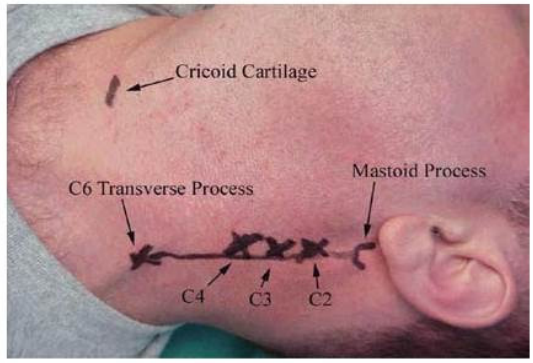


Surface anatomy of the anterior neck region. Below the chin, hyoid bone (H) situated opposite the 3rd cervical vertebra can be easily palpated at midline. A finger's breadth below, there is the laryngeal prominence of the thyroid cartilage (T). The outlines of the thyroid cartilage are readily palpated. Below its lower, anterior part of the cricoid cartilage (C) forms an important landmark on the front of the neck because it lies opposite the 6th cervical vertebra. Arrow indicates sternocleidomastoid muscle.

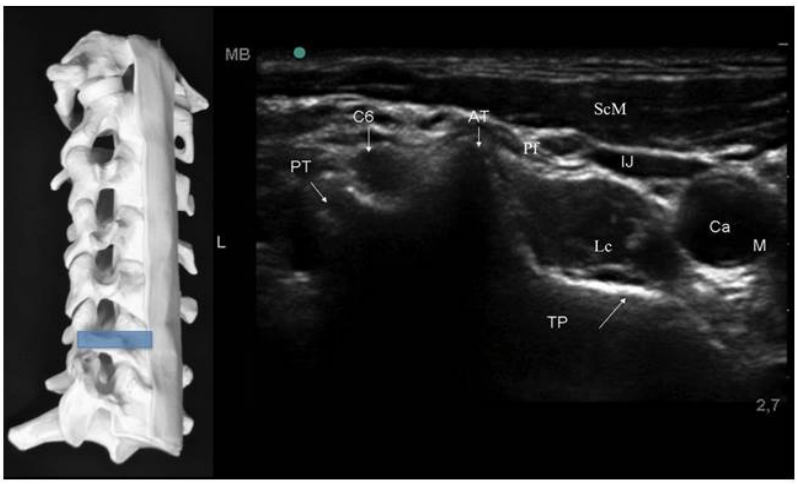
Features Typical for Cervical Vertebrae

Anterior tubercles of vertebra C6 ;
Carotid tubercles, Chassaignac tubercles



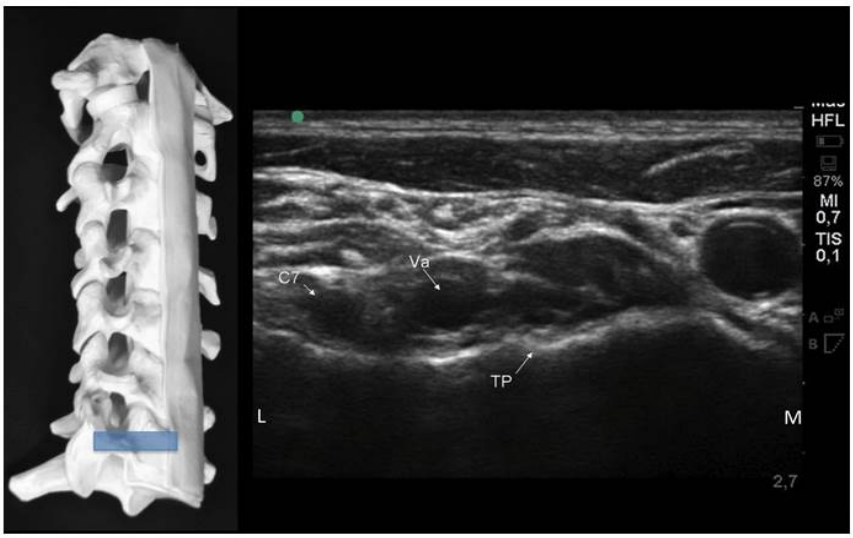


Ultrasound-guided interventional procedures for cervical pain



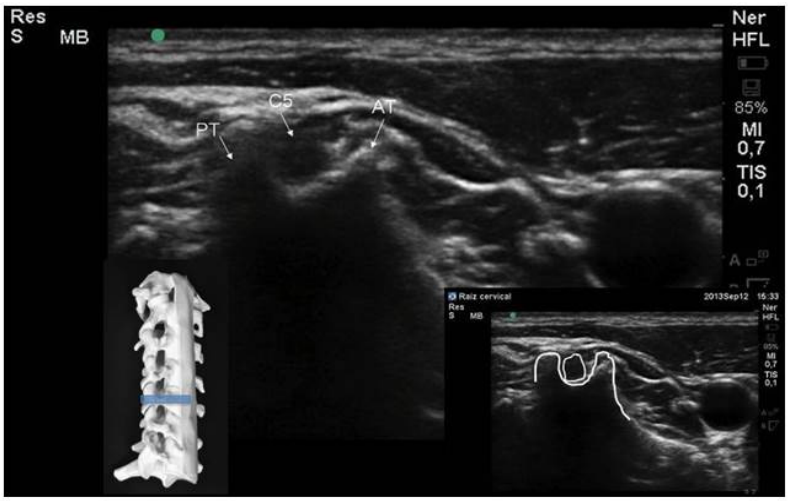
Probe placement (blue bar) at C6 (cervical spine model anterior oblique position). Short-axis transverse ultrasound image showing the anechoic and oval shape of the C6 root between both the tubercles. IJ, internal jugular vein; Ca, carotid artery; TP, transverse process of C6; AT, anterior tubercle; PT, posterior tubercle; C6, sixth nerve root; ScM, sternocleidomastoid muscle; Pf, fascia prevertebral; Lc, longus colli muscle; M, medial; L, lateral. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



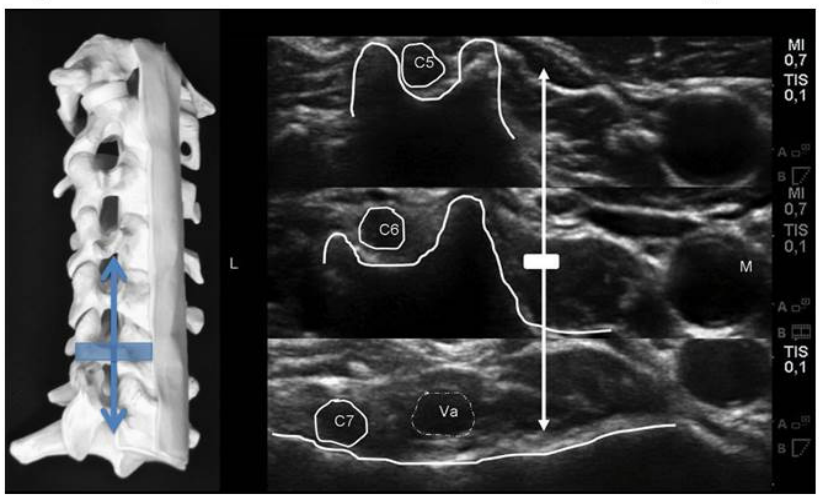
Probe placement (blue bar) at C7. The transverse apophysis of C7 is characterized by the absence of an anterior tubercle and the presence of the vertebral artery, it is merely a hyperechogenic line that is differentiated from the rest of the transverse apophyses with a cup-shaped image. TP, transverse process of C7; Va, vertebral artery; C7, seventh nerve root. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



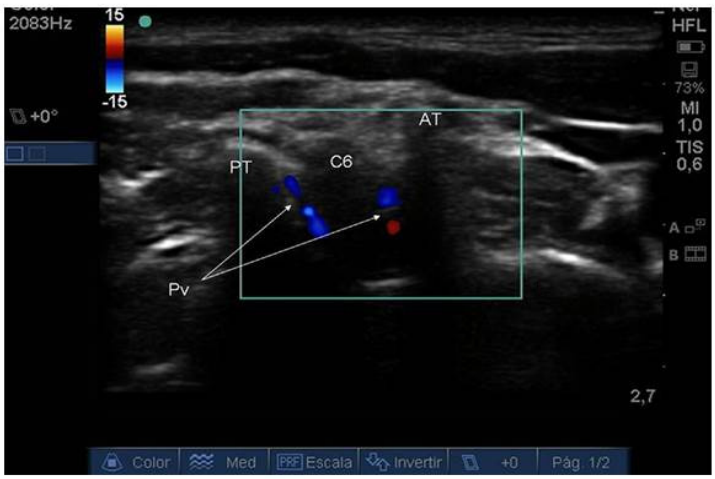
Probe placement (blue bar) at C5. Short-axis transverse ultrasound images showing the anterior tubercle (AT) and the posterior tubercle (PT) of the C5 transverse process as the "2-humped camel" sign. C5, fifth cervical nerve. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



Probe placement (blue bar) at C6. The cervical level is determined by identifying the transverse process of the seventh and sixth cervical vertebrae (C7 and C6.) The seventh cervical transverse process (C7) differs from the levels above. Moving the transducer cranially, the sixth cervical vertebra (C6) with its corresponding tubercles, both anterior (Chassaignac tubercle) and posterior, can be identified. At higher levels than C6, the anterior tubercle becomes shorter and equal to the posterior. Va, vertebral artery.

Ultrasound-guided interventional procedures for cervical pain

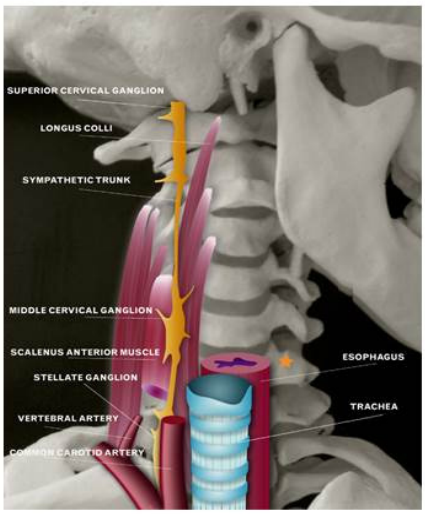


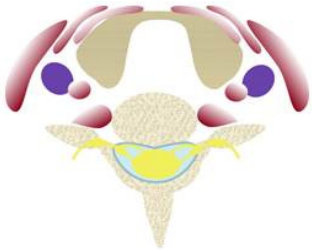
Short-axis transverse ultrasound image with color Doppler showing a small vessel (Pv) at the intravertebral foramen of C6. AT, anterior tubercle; PT, posterior tubercle, C6, sixth cervical vertebra.

Ultrasound-guided interventional procedures for cervical pain

Short-axis transverse ultrasound image showing the needle path to the posterior aspect of the intervertebral foramen. N, needle path.

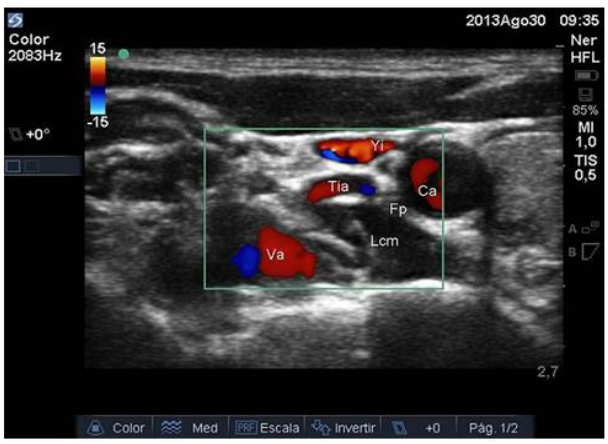
Ultrasound-guided interventional procedures for cervical pain





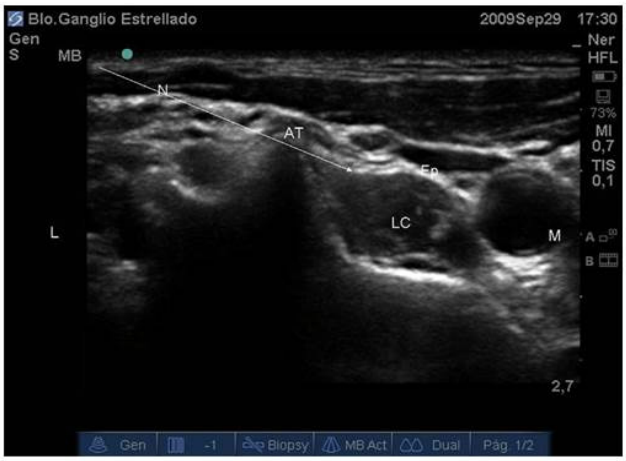
(A) Prevertebral region of the neck. The target site for the classical approach to the stellate ganglion is marked as orange star. (B) Cross-section of the neck at the sixth cervical vertebra level. The target site for ultrasound-guided stellate ganglion block is marked as orange star under the prevertebral fascia. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



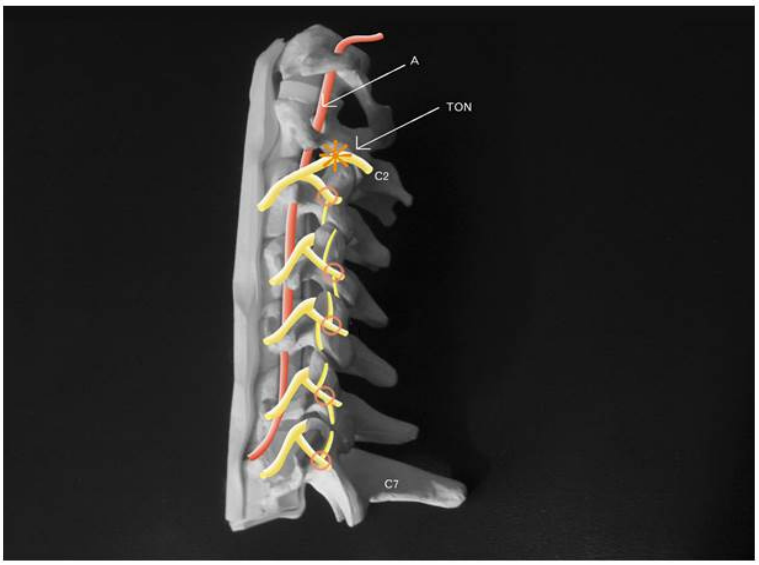
Ultrasonographic image with color Doppler showing the inferior thyroidal artery (ITa), prevertebral fascia (Fp), vertebral artery (Va), longus colli muscle (LC), internal jugular vein (IJ), and carotid artery (Ca). (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



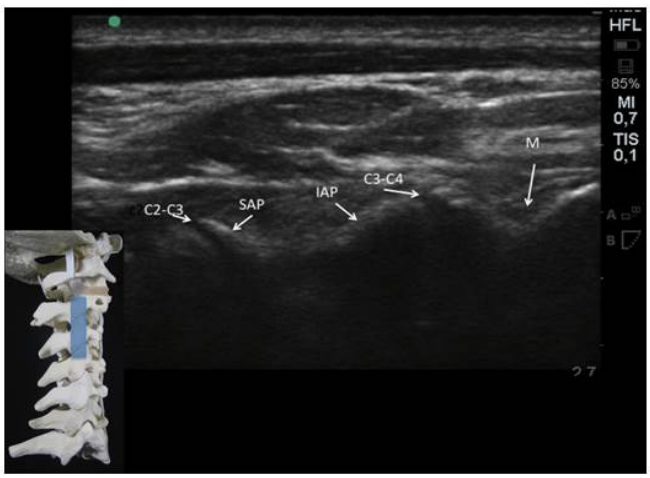
Short-axis transverse ultrasound image showing the needle path to the prevertebral fascia (Fp) for stellate ganglion block. N, needle path; AT, anterior tubercle; LC longus colli muscle; M, medial; L, lateral. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



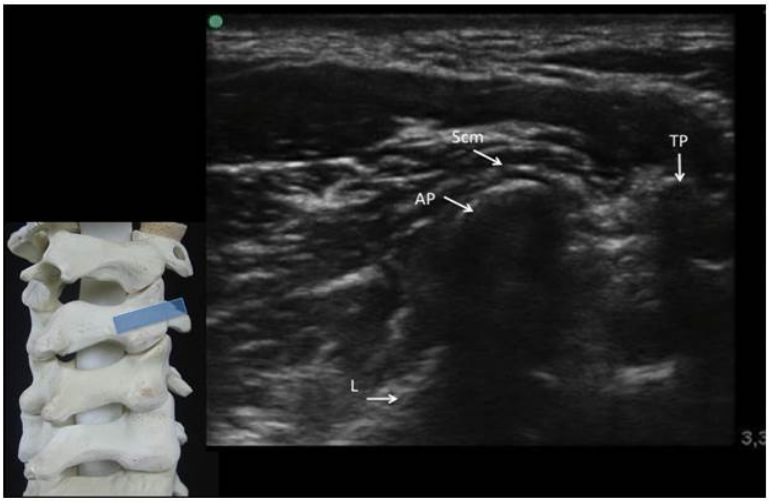
The cervical zygapophysial joints are innervated by articular branches derived from the medial branches of the cervical dorsal rami (orange circle). Cervical zygapophysial joint below C2-C3 has dual innervations, each joint receives a double innervation that comes from the superior and inferior medial branches The superficial medial branch of C3 is large and known as the third occipital nerve (TON). A, vertebral artery. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



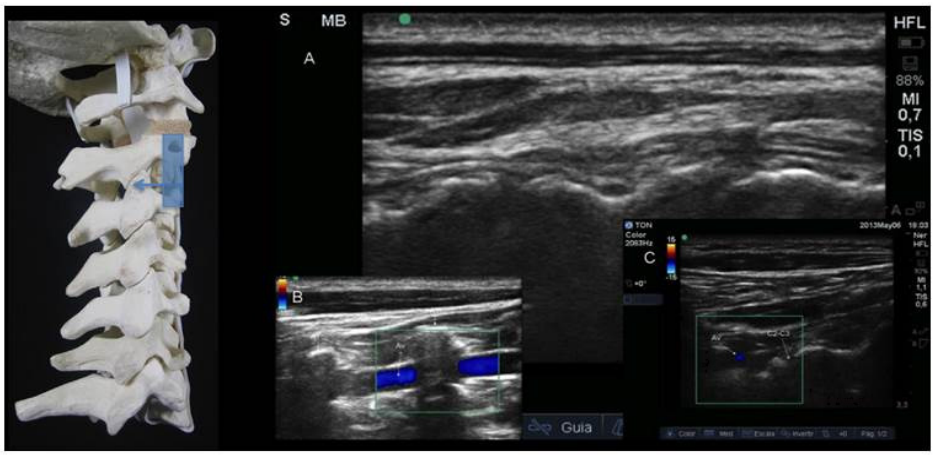
Probe placement (blue bar) at C2-C3 and C3-C4, Z-zygapophysial joints. SAP, superior articular process of C3; IAP, inferior articular process of C3; M, medial branch of C4. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



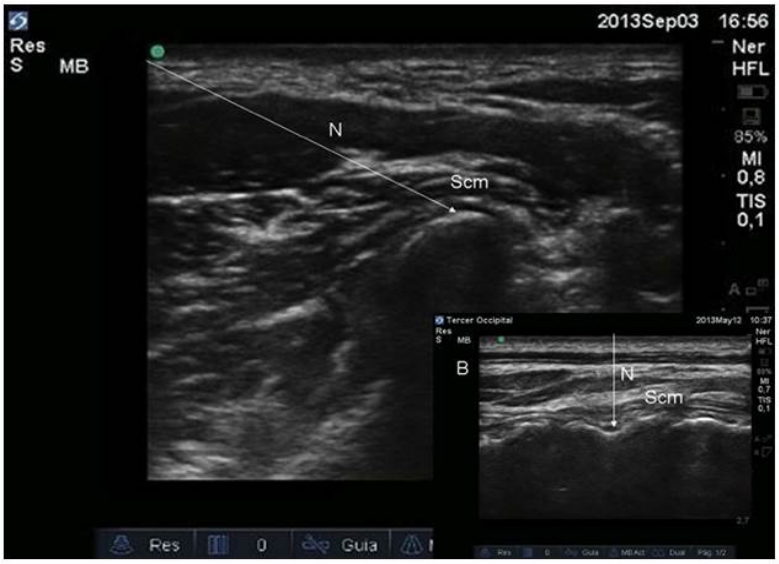
Probe placement (blue bar) at AP, articular pillar; L, lamina; Scm, semispinalis capitis muscle; and TP, transverse process. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



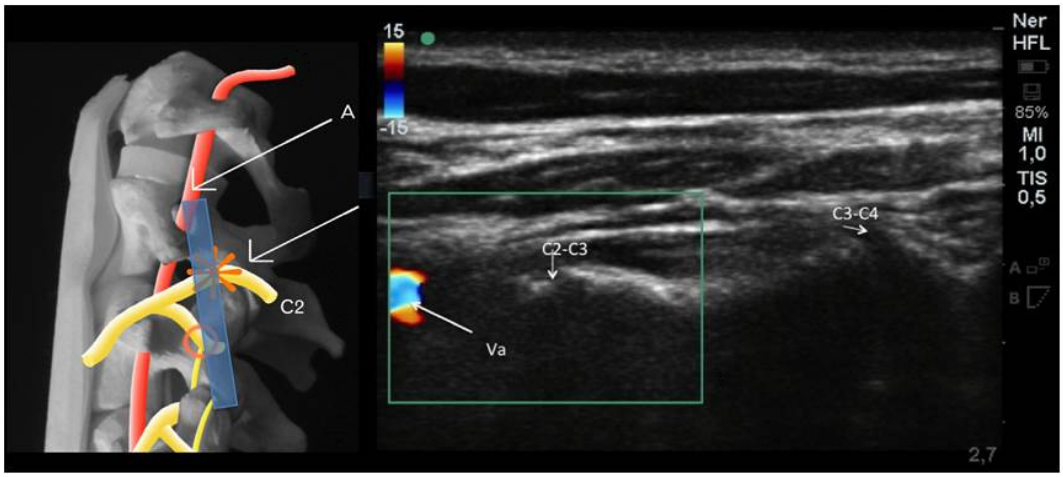
Probe placement (blue bar) coronal plane from (B) the transverse processes view to (A) the column of the facets and showing in (C) C2-C3 joint with the vertebral artery (Av). (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



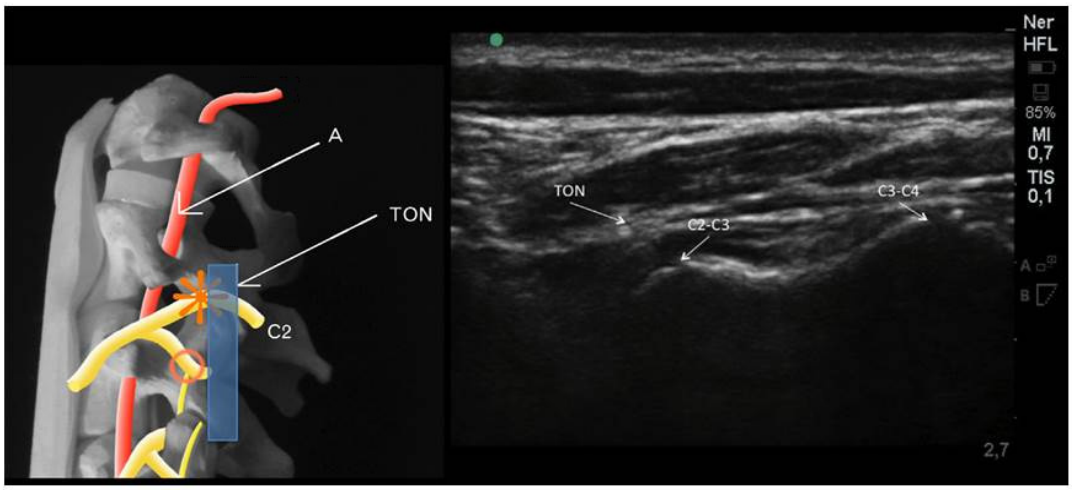
(A) Tranverse plane for cervical medial branch block in-plane approach. N, needle path; Scm, semispinalis capitis muscle. (B) Coronal plane of the cervical facets, out-of-plane approach. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



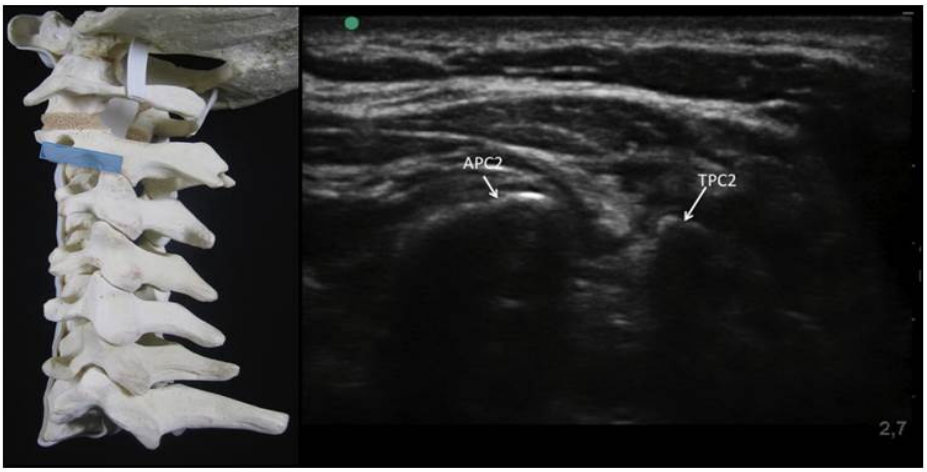
Probe placement (blue bar) C2-C3 and C3-C4 articulations in the center of the ultrasound picture, deeper pulsation of the vertebral artery can be seen. The use of Doppler sonography may facilitate the identification of this important landmark. Va, vertebral artery; C2-C3, zygoapophyseal joint C2-C3; C3-C4, zygapophysial joint C3-C4. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



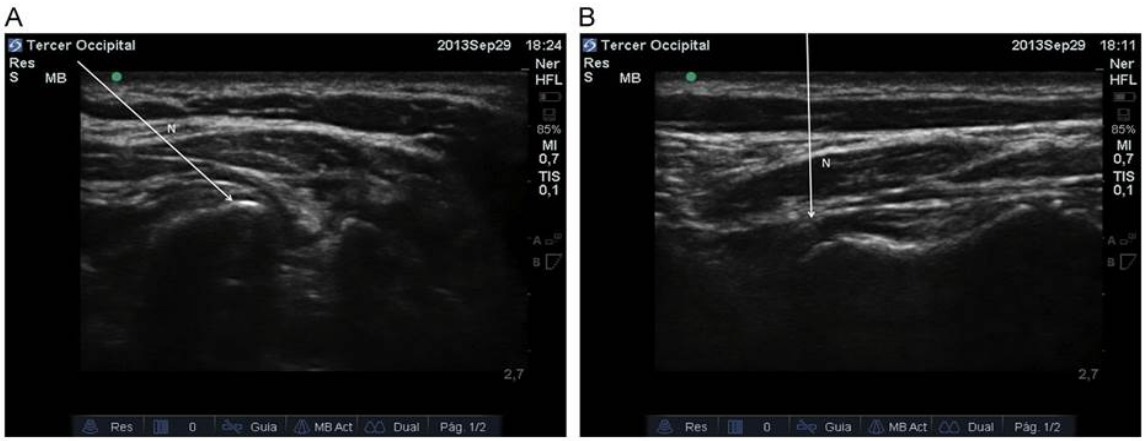
Probe placement (blue bar) at C2-C3. TON crosses the C2-C3 zygapophysial joint in this plane at an average distance of 1 mm from the bone, we search the typical sonomorphologic appearance of a small peripheral nerve. A, vertebral artery; TON, third occipital nerve. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



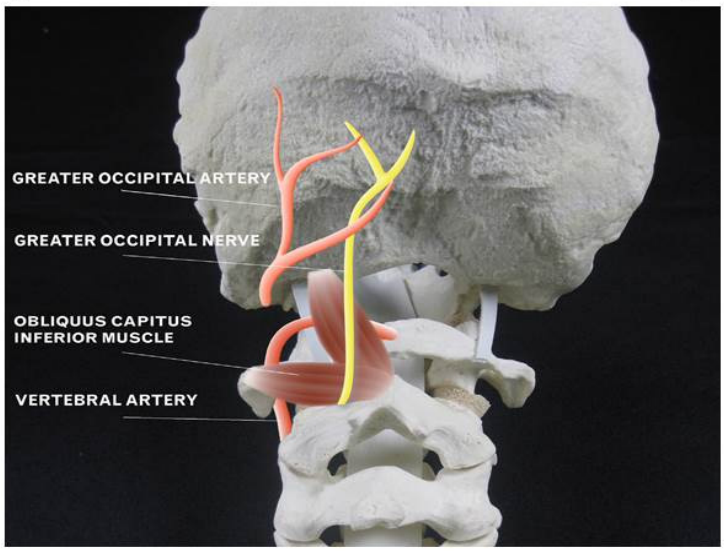
Probe placement (blue bar) at C2-C3 short-axis view at APC2, inferior articular process of C2; TPC2, transverse process of C2. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



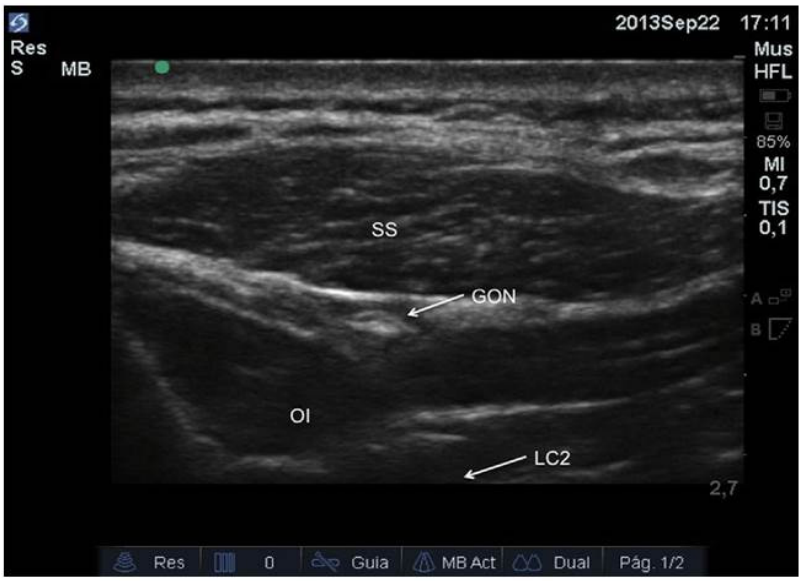
(A) Short-axis transverse ultrasound image at C2-C3 showing needle path in plane to the inferior articular process of C2. (B) Longitudinal ultrasound image at C2-C3 showing needle path out of plane to block TON. N, needle path; TON, third occipital nerve. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



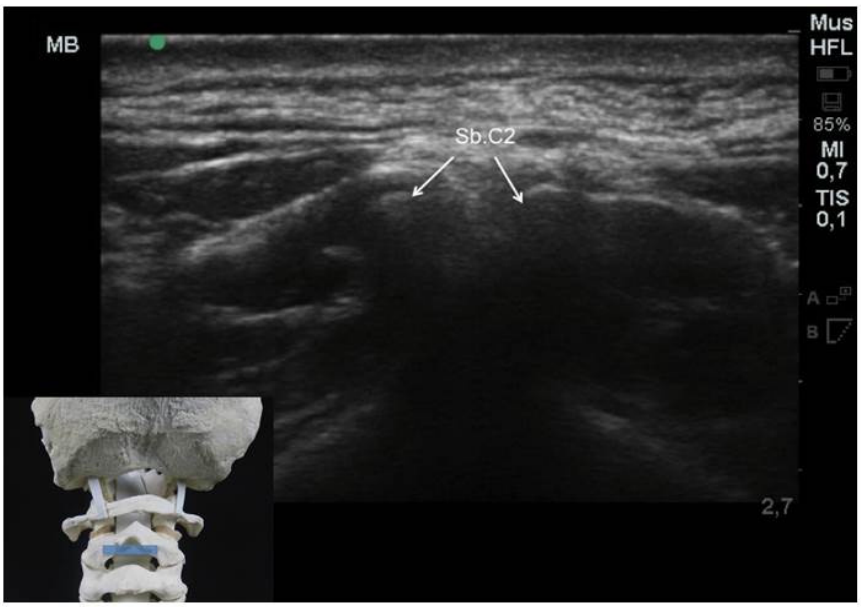
The greater occipital nerve (GON) arises from C2 dorsal ramus and curves around the inferior border of the obliquus capitis inferior muscle to ascend on its superficial surface next to the greater occipital artery. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



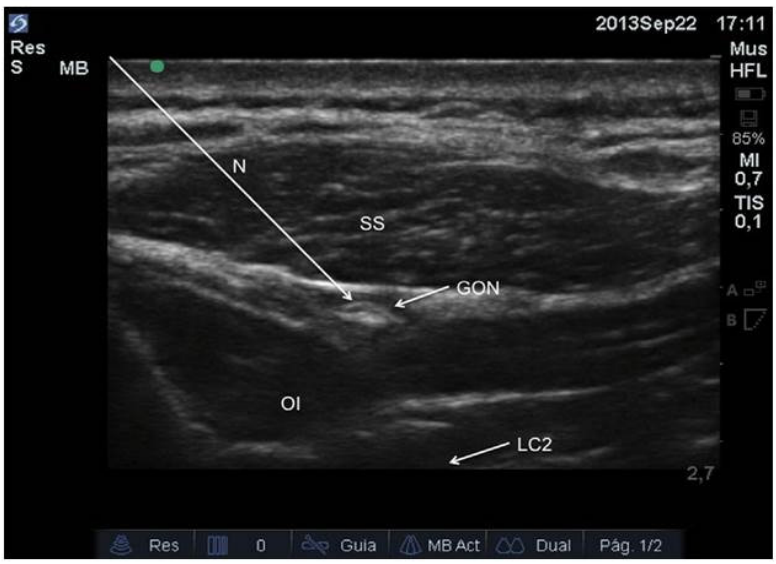
Probe placement at C2 level. SS, semispinalis capitis muscle; OI, obliquus capitis inferior muscle; LC2, lamina of the C2; GON, greater occipital nerve. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



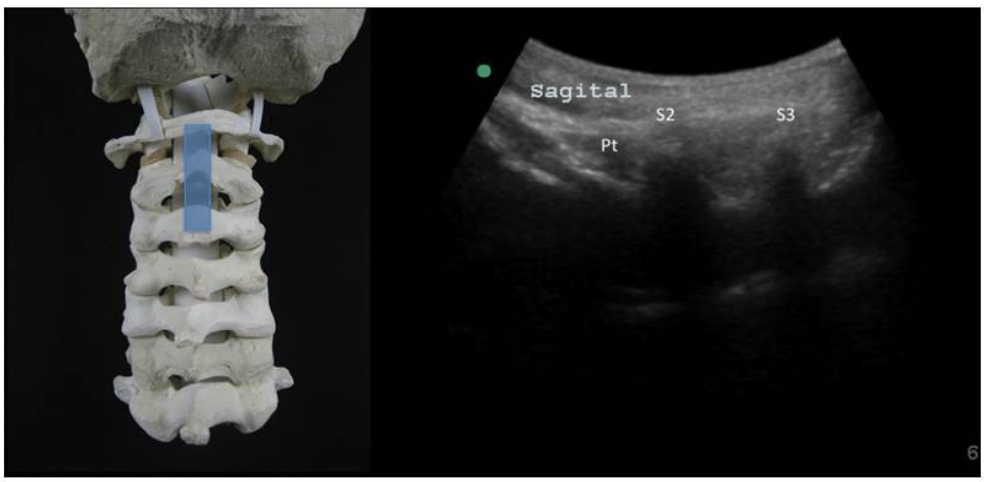
Probe placement (blue bar) at second cervical spinous process level. SbC2, spinous bifid process of C2. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



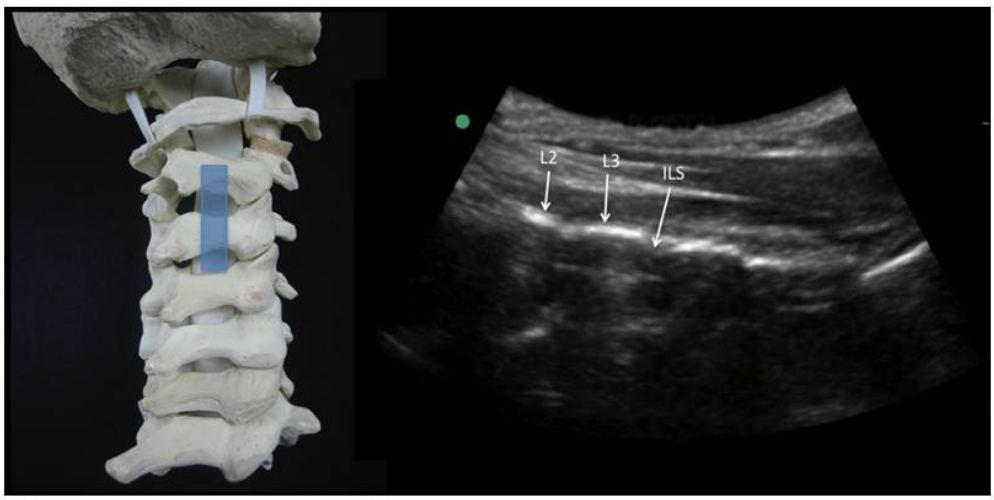
The arrow indicates the direction of the needle (N). SS, semispinalis capitis muscle; OI, obliquus capitis inferior muscle; LC2, lamina of the C2; GON, greater occipital nerve. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



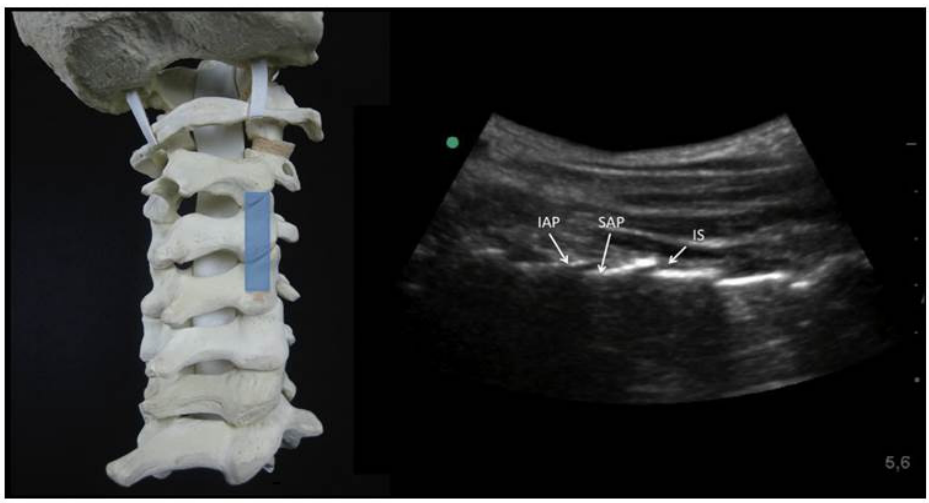
Probe placement (blue bar) at cervical spinous process. Pt, posterior tubercle of the C1; S2, spinous process of the C2 (bifid); S3, spinous process of the C3. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



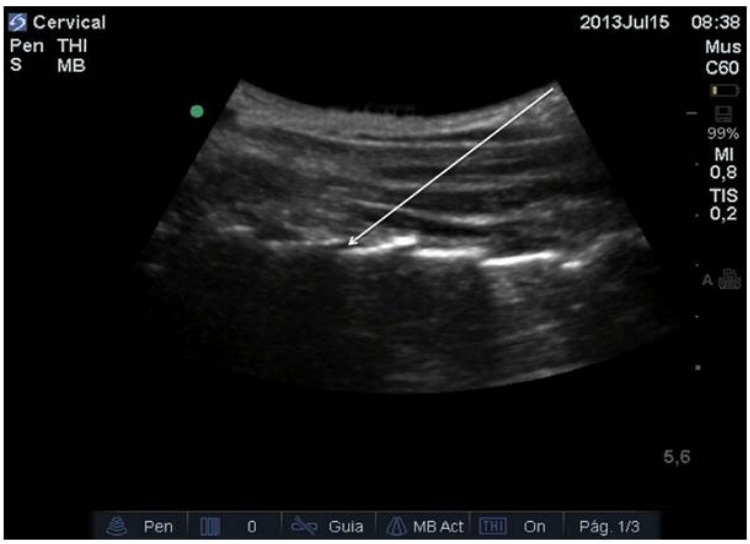
Probe placement (blue bar) at cervical lamina. L2, L3, lamina; ILS, interlaminar space. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



Probe placement (blue bar) at facet joints. IAP, inferior articular process; SAP, superior articular process; IS interarticular space. (Color version of figure is available online.)

Ultrasound-guided interventional procedures for cervical pain



The arrow indicates the needle path in plane to block cervical facet joints. (Color version of figure is available online.)