



28th Annual Gabor Racz Advanced Interventional
Pain Conference and Workshop
Budapest, Hungary **August 25-27, 2025**

PERCUTANEOUS CORDOTOMY

MA
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MERKEZİ



Conflicts of Interest

- None



- Cancer pain is One of the most frequent and distressing side effects of cancer.
- A meta-analysis revealed that nearly one-thirds of patients with locally advanced or metastatic cancer **suffer from moderate to severe pain**, whether during treatment or during advanced stages of their disease.

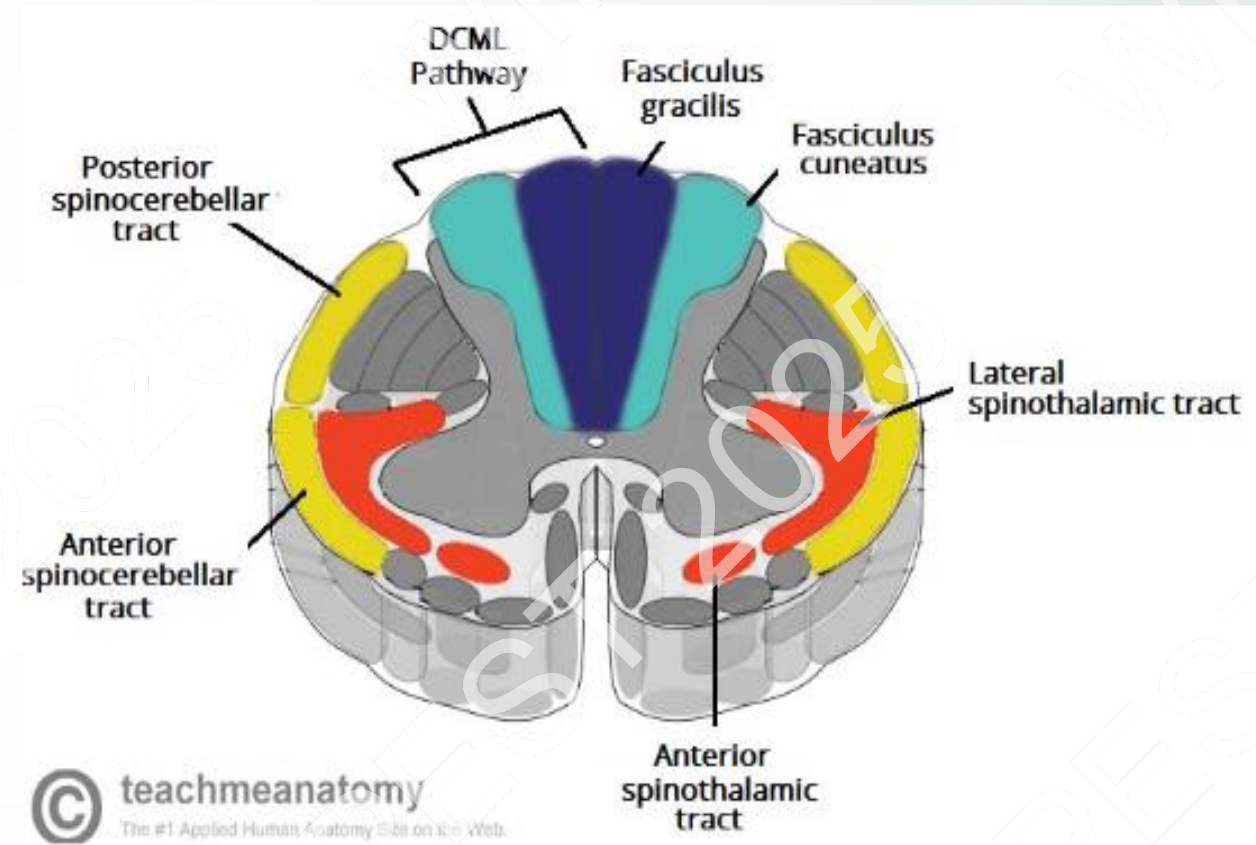
¹Van den Beuken-van Everdingen MHJ, de Rijke JM, Kessels A, Schouten HC, van Kleef M, Patijn J. (2007). Prevalence of pain in patients with cancer: a systematic review of the past 40 years. *Annals of Oncology* 2007; 18(9):1437-1449.

- Thus, **pain control** may be considered as a matter of **the highest priority** in the care of



- Pain may be caused by the progression of the tumor or the treatment itself, including surgery, chemotherapy and radiation.
- Cordotomy is a procedure used to destroy the **lateral spinothalamic tract** in patients with cancer pain.

- This ascending tract carries information **chiefly about pain** and temperature and relays some tactile information.





- Spinothalamic cordotomy aims to interrupt the spinothalamic tract ascending contralaterally



Interventional Pain Management:

Image-Guided Procedures

SECOND EDITION. EDITOR-IN-CHIEF: P. Prithvi Raj, EDITORS: Leland Lou, Serdar Erdine, Peter S. Stoats, Steven D. Waldman, Gabor Racz, Michael Hammer, David Niv, Ricardo Ruiz-Lopez, James E. Heavner.

Saunders, Elsevier Inc. 2008

CERVICAL CORDOTOMY

HISTORY

Early in 1912, Spiller and Martín³⁷ concluded that based on the clinical model of Brown-Sequard studies of cord hemisection, despite the fact that pain physiology at that time was poorly understood at the spinal cord level, they performed a cordotomy through a laminectomy, with incision of the anterolateral cord in a patient with pain caused by a tuberculoma of the cord. Since then, the operation of open cordotomy has become a standard surgical procedure for the relief of certain types of pain. In later studies, various authors used different-sized lesions in the anterolateral quadrant in the attempt to alleviate contralateral pain. At first, open cordotomy was performed in the thoracic area, but by 1932 open cordotomy had been carried out in the high cervical area as well. Although open cordotomy was effective in many patients,³⁸⁻⁴⁰ the advent of percutaneous cordotomy enabled less-invasive treatment.

Many modifications and technical refinements appeared, like percutaneously applied strontium-90 in the C1-C2 space by Mullan et al.,⁴¹ electrolytic lesions,⁴² or impedance monitoring to detect cord penetration.⁴³ Onofrio⁴⁴ added imaging of electrode position by the use of myelography for guidance. Rosomoff and colleagues⁴⁵ introduced RF lesion-making cervical cordotomy. More recently, computed tomography-guided cordotomy has been described by Kanpolat et al.,⁴⁶ for a more accurate localization of the electrode system in a specific part of the spinothalamic tract.

ANATOMY

The interruption of pain fibers in the spinothalamic tract, the major ascending pathway for information about pain and temperature, leads to sensory deficits to skinfold pinch and temperature sensitivity (Figure 8-20).

Afferent information from Rexed's lamina II is transmitted to second-order projection neurons in laminae IV, V, and VI, the neurons of which also receive some direct innervation from the terminals of the first-order neurons. The axons of these second-order neurons in laminae brain stem IV-VI cross the midline and ascend all the way to the brainstem and thalamus in the anterolateral quadrant of the contralateral half of the spinal cord. These fibers, together with axons from second-order lamina I neurons, form the spinothalamic tract or anterolateral system (Figure 8-21). The mechanosensory pathway is located in the dorsal aspect of the cord and is referred to as the dorsal column-medial lemniscus system.

The location of the spinothalamic tract is particularly important clinically because of the characteristic sensory deficits that follow certain spinal cord injuries and is essential for the cordotomy procedure. Since the pathways for pain and temperature cross the midline to ascend on the opposite side of the cord, diminished sensation of pain below the lesion will be observed on the side opposite the lesion.

According to topographic representation, sacral segments are mostly located posterolaterally and cervical segments more medially and anteriorly within the lateral spinothalamic tract. In addition to the basic topographical organization, there is also a large amount of scattering of the fibers from different segments through the area of the spinothalamic complex.

The fibers responsible for pain sensation at C2 lie between the line of the dentate ligament dorsally and a line drawn perpendicularly from the medial angle of the ventral horn. In close proximity to the spinothalamic tract lie many other ascending and descending tracts, damage to which results in many complications associated with cordotomy. The corticospinal tract is located posteriorly, and injury to it may produce ataxia of the ipsilateral arm. Fibers mediating respiration lie adjacent to the anterior horn in close proximity to the cervical spinothalamic fibers, and its lesion can cause respiratory dysfunction.

The *spinal dura mater* forms a loose sheath around the spinal cord. It is separated from the wall of the vertebral canal by the epidural space, which contains a quantity of loose areolar tissue and a plexus of veins. On each side are the double openings that transmit the two roots of the corresponding spinal nerve, the dura mater being continued in the form of tubular prolongations on them as they pass through the intervertebral foramina.



FIGURE 8-20
Analgesic effect of C1-C2 cordotomy on the contralateral hemibody.



- The anterolateral sensory system has a somatotopic relationship, with fibers from higher levels laminating medially and ventrally and fibers from lower levels laminating laterally and dorsally within the lateral spinothalamic tract.
- So, anteromedial lesions denervate the contralateral arm, leg and upper chest region...

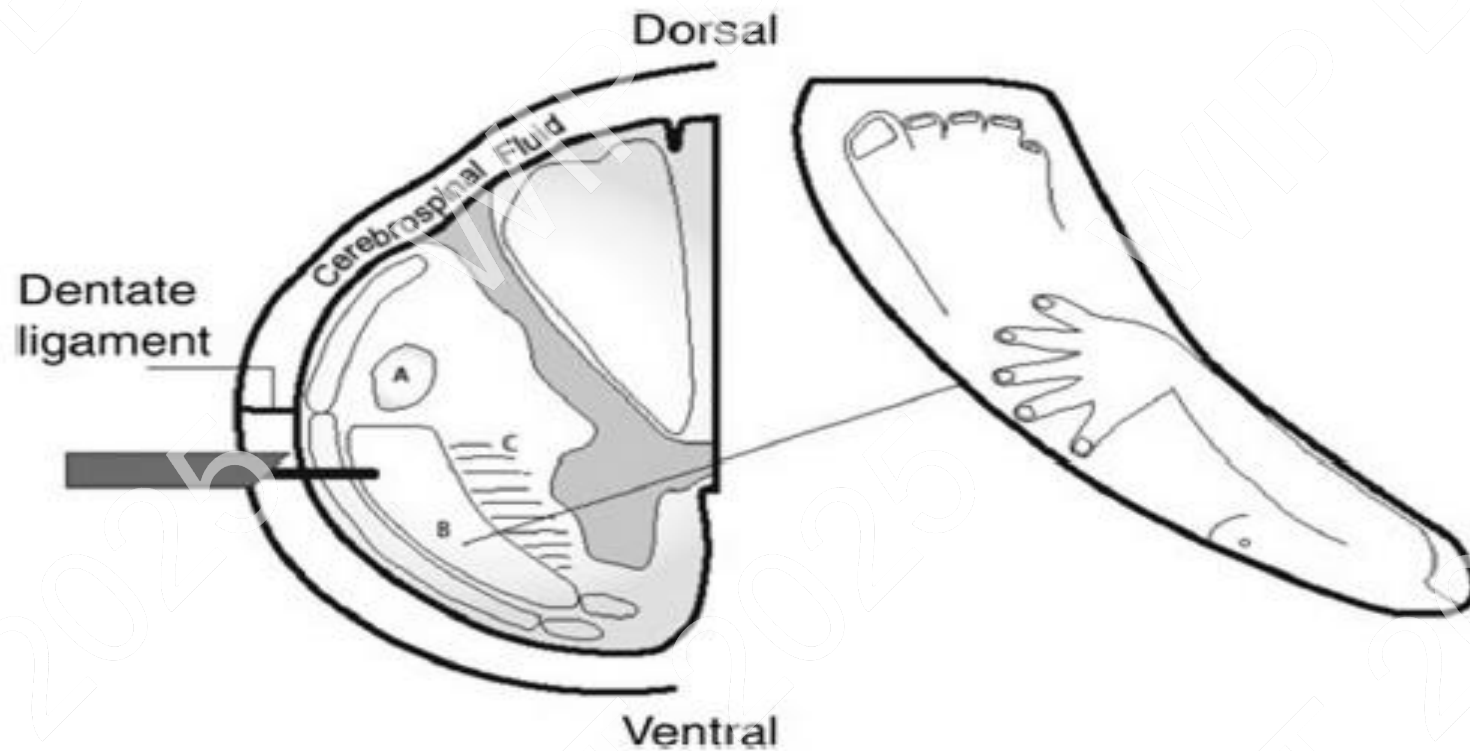
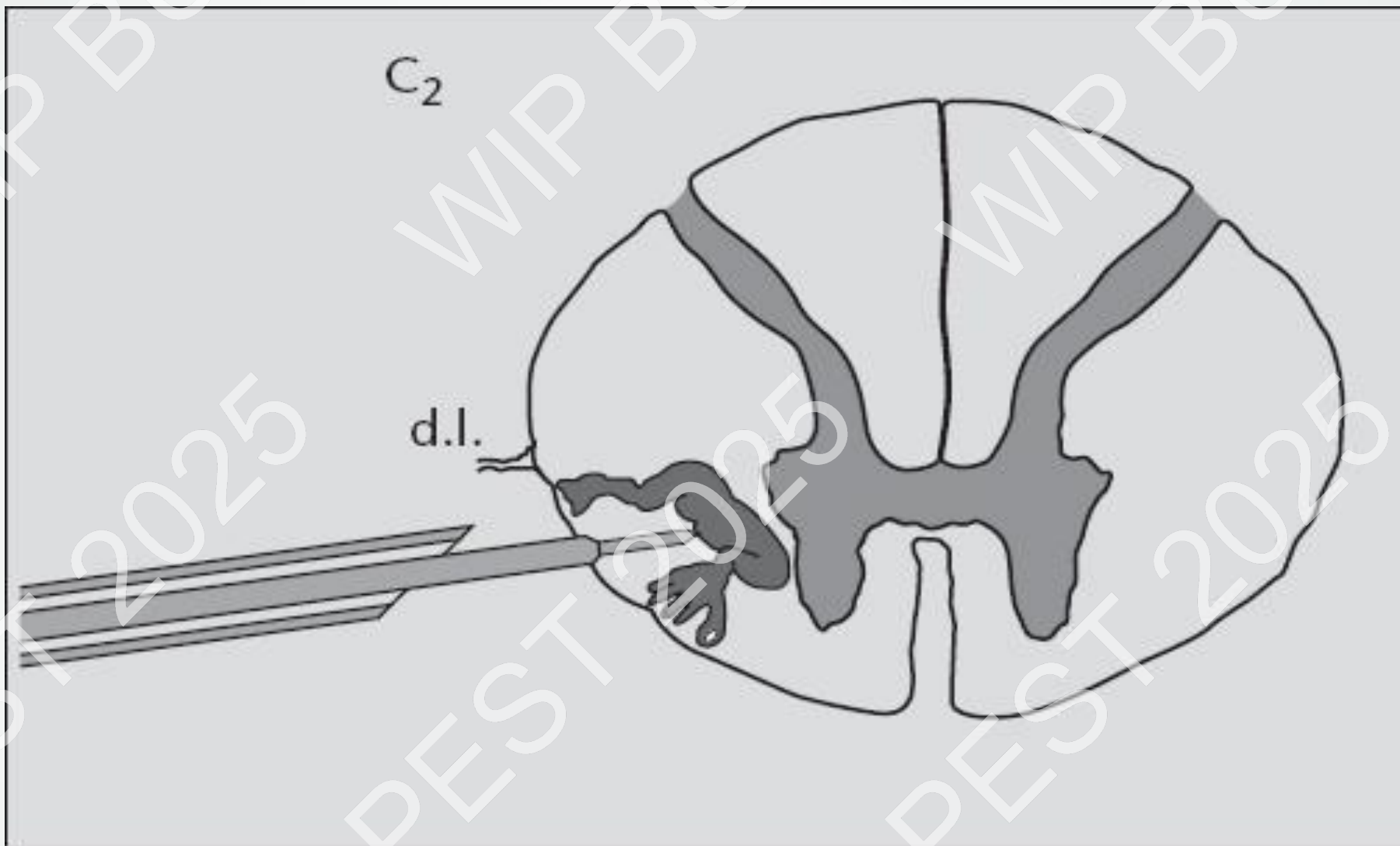


Fig 1 Schematic representation of a cross-section of the spinal cord at C2. A, cortico-spinal tract; B, lateral spino-thalamic tract; C, diaphragmatic reticular fibres. Callout shows somatotopic arrangement of fibres within the lateral spino-thalamic tract.



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Percutaneous Cordotomy

365

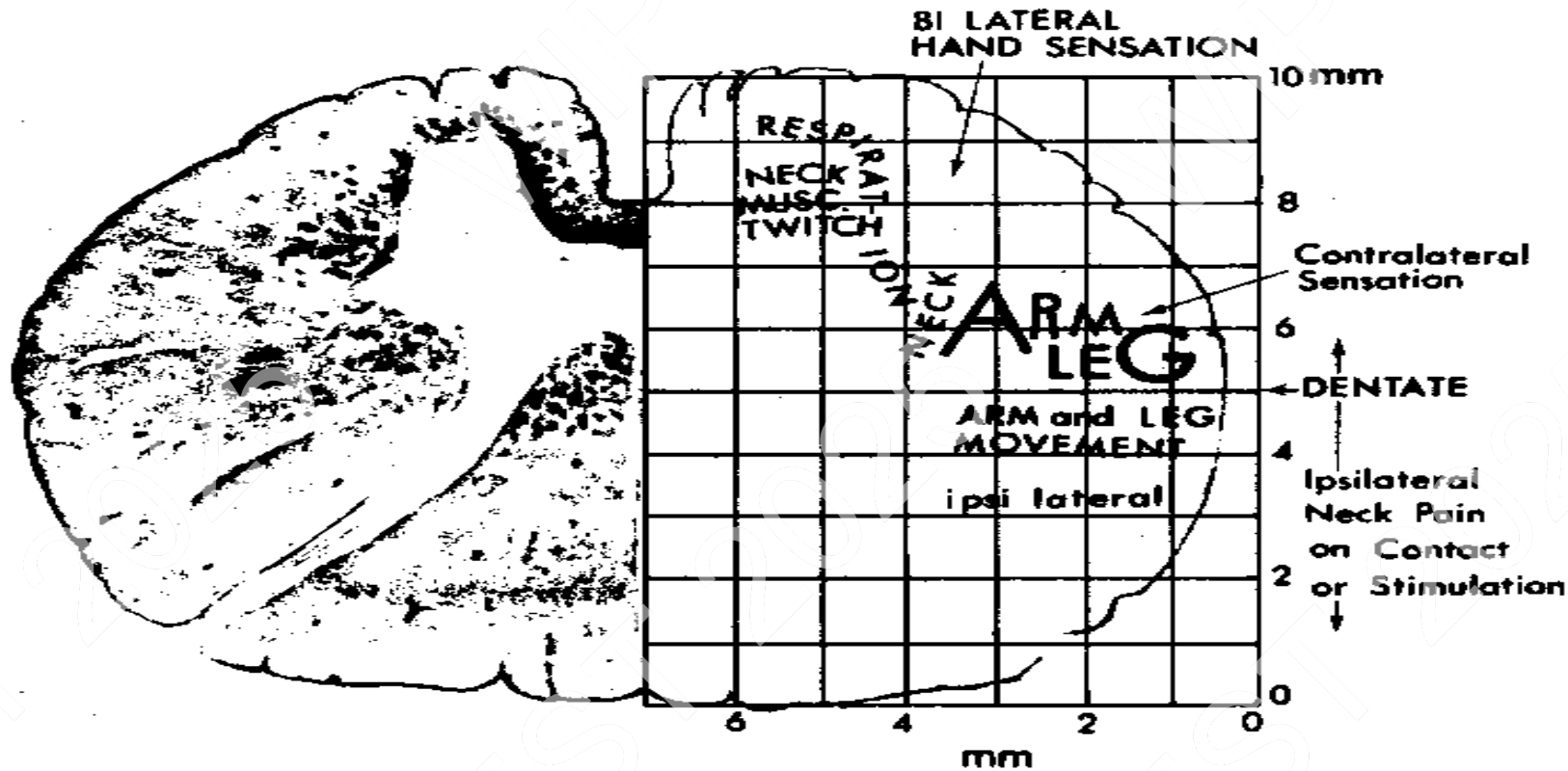


FIG. 7. Theoretical diagram to indicate where the pain fibers might be found, not where they actually are. They are where electrical stimulation locates them. "Arm" seems to occupy a larger area than "leg" and is often easier to locate. The large cut required by surgical cordotomy may mean that the pain fibers can occupy any location within that wide area rather than that they occupy the total area.

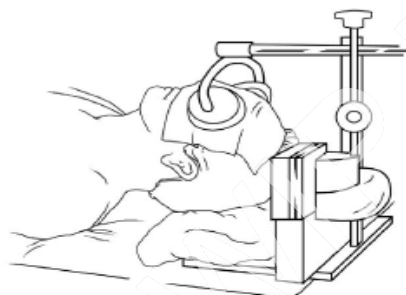


FIGURE 8-22

Patient position for percutaneous cervical cordotomy C2 with Rosomoff's head holder.

- Local anesthesia of skin and deep muscle structures.
- General anesthesia should be administered in selected populations (children, elderly, or confused patients). In these instances, CT-guided cordotomy should be performed.

PROCEDURE

Only the unilateral x-ray-guided percutaneous cervical technique will be described. CT-guided technique may also be performed.^{47,48} Bilateral procedures can be used in selected cases of bilateral pain, with increased risk.⁴⁹

Radiologic Localization

After suitable preparation of the skin and, if necessary, wetting and retraction of the hair, the tip of the puncture needle is positioned horizontally, and with x-ray guidance, a true image of the C1-C2 interspace is obtained (Figure 8-23). The C1-C2 interspace should be placed in the center of the radiographic image in order to avoid double contours. The spinothalamic tract is located anterior to the dentate ligament at approximately the midpoint of the AP extent of the spinal canal. The anteromedial part of the lateral spinothalamic tract must be targeted (Figure 8-24).

After local anesthesia (lidocaine 2%), an RF needle with a 1-mm active tip is advanced horizontally, and ligamentum flavum and dura are penetrated. At this point, the stylette of the lumbar puncture needle is periodically withdrawn to check for flow of CSF (Figure 8-25), which is normally encountered at a mean depth of 5.7 (± 0.3) cm from the skin in men and 5.2 (± 0.2) cm in women.⁴⁷ Loss of CSF should be avoided by locking the electrode inside the needle or lumbar cannula.

After obtaining CSF, a nonionic (iohexol) water-soluble contrast medium is injected⁵⁰ (oil-based dye for

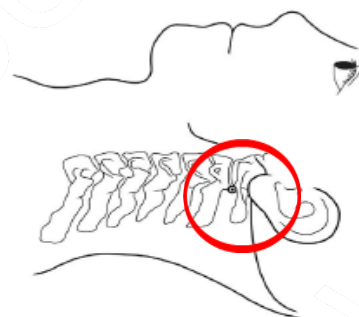


FIGURE 8-23

Line drawing of lateral X-ray position and entry point of cannula at left C1-C2 level.

myelography is increasingly difficult to obtain). The surgeon can use a length of intravenous extension tubing long enough to keep his hands out of the radiation field while injecting under fluoroscopy. When a sufficient amount of contrast is present in the subarachnoid space, the radiographic image can be "trapped" on the screen for review (Figure 8-26). Well-defined linear images such as the ventral and dorsal root lines may be confused with the dentate ligament, and contralateral structures may be visualized as well, adding to the confusion. If the fine line of the dentate ligament is not seen, the cannula must be repositioned and a second injection of dye can be made. The tip of the needle should be immediately anterior to the dentate ligament (Figure 8-27). Failure to visualize the dentate ligament usually means that the needle is too posterior. It should be withdrawn and redirected more anterior. The electrode is connected, followed by stimulation. The electrode is then advanced, and when it penetrates the cord, the electrical impedance increases dramatically as it leaves the spinal fluid and enters neural tissue.

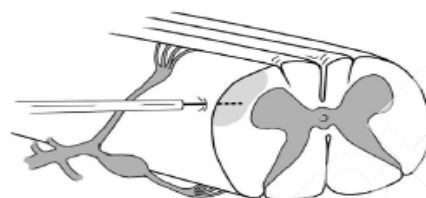


FIGURE 8-24

Cannula position in the spinal cord.



- Mullan et al. developed the percutaneous chordotomy technique in 1963 and later in 1965 Rosomoff et al. used radiofrequency (RF) current to produce the lesion.

Rosomoff HL, Brown CJ, Sheptak P. Percutaneous radiofrequency cervical cordotomy: technique. J Neurosurg, 1965;23:639-644.

Mullan S, Harper PV, Hekmatpanah J, et al. Percutaneous interruption of the spinal-pain tracts by means of a strontium-90 needle. J Neurosurg, 1963;20:931-939.

- Computed tomography (CT) guidance, which was described by Kanpolat et al. has led to greater safety and efficacy.

Kanpolat Y, Deda H, Akva S, Bilgic S. CT-guided percutaneous cordotomy. Acta Neurochir Suppl, 1989;46:67-68.



When do we have to prefer Cordotomy?

- Cancer pain
- Better unilateral
- Not good for midline-pain



The best candidates for cordotomy

- Patients with unilateral somatic cancer pain and
- Compression of the plexus, roots, or nerves
- Unilateral upper body pain (secondary to lung carcinoma, mesothelioma, or Pancoast tumors)
- Bilateral somatic intractable pain in the lower body and extremities



The best candidates are those

- with unilateral localized intractable nociceptive-type somatic cancer pain
- as seen in mesothelioma or malignancy of the lower extremities and those with unilateral localized pain



Secondary candidates are patients with

- Nociceptive pain at the onset of the disease, but in whom the pain may evolve to neuropathic form when the tumor spreads the brachial plexus, as in Pancoast tumors.



Contra-indication

- Respiratory failure
- Vertebral abnormalities
- Psychiatric disorders
- Mental disorders
- **Thecnique you choose!**



- Patients with severe pulmonary dysfunction in whom **partial oxygen saturation is lower than 80%** are not suitable candidates for cordotomy.
- The cordotomy procedure should be considered carefully if the patient is receiving chemotherapy or radiotherapy.

Summary of ideal patient for cordotomy, contraindications, and specific additional material risks to the procedure		
Ideal Patient	Contraindications	Additional Risk
Unilateral nociceptive pain from extremity	Bilateral upper extremity pathology	Ondine's curse (apnea during sleep) if bilateral ablation
pO ₂ > 80% on room air	Severe pulmonary dysfunction	Insufficient reserve to tolerate decreased function
Life expectancy between 3 and 12 mo	Survival <3 mo ^a or >12 mo	Deafferentation pain ≥6 mo after procedure
Normal ICP	Intracranial metastasis and/or mass effect	Brain herniation during procedure
Absence of psychiatric comorbidities	Opiate dependence or emotional problems	Persistent pain control problems after cordotomy
Intact autonomic system	Sympathetic dysfunction ^a	Hypotension, Horner syndrome, bladder dysfunction
Comfortable in supine position	Orthopnea ^a	Inability to be supine long enough to complete procedure



Which parameters can be use for safety ?

- No clear datas. Patients with lung cancers, better to have a respiratory function tests
- FEV1m  1.2 L
- Roughly if patients lies in supine easily then you can do the procedure....



Can we repeat the P.Cordotomy ?

Cancer is a systemic and progressive disease if the pain occurs at the same or in another region, can be repeated.



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Complications of Percutaneous Cordotomy



- Headache – Dizziness
- Nausea – vomiting
- Postcordotomy disesthesia
- Neck pain
- Mirror pain
- Muscle weakness
- Urinary retention
- Respiratory failure



- ipsilateral motor weakness (5%–10%) ,
- ataxia (8%–34%) ,
- bladder dysfunction (1.5%–17%)
- postcordotomy dysesthesia (2–5%)
- hypotension (4%)
- respiratory problems (4%)
- Sleep-induced apnea is the most dangerous complication after bilateral cordotomy



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Cordotomy

Cordotomy can be an effective method of pain control, especially when pain is related to malignancy, and especially for individuals with short life expectancies for whom it is difficult to justify the costs of implantation of drug infusion systems. The rationale of cordotomy is to disrupt nociceptive afferent fibers ascending in the spinothalamic tract in the anterolateral quadrant of the spinal cord. Cordotomy offers the advantage, compared to neuraxial analgesic administration, of being a onetime procedure with no required long-term follow-up or maintenance. This is important for individuals who may find it difficult to return to a medical facility for refilling of an infusion system or for whom costs of ongoing medical care can become burdensome. Cordotomy is used most commonly for the treatment of cancer-related pain below mid- to low cervical dermatomes. It is not generally used for treatment of patients with pain of non-cancer origin because pain typically recurs over months to years in patients with long life expectancies, and there is significant risk of post-cordotomy dysesthesias or neurological complication [25]. Cordotomy can be performed as an open [25] or closed (percutaneous) [26, 27] procedure. Percutaneous techniques are less invasive, but open techniques remain viable options because most surgeons lack the expertise and equipment required for percutaneous procedures.

Pain relief varies with pain characteristics and location. Laterally located pain responds better than midline or axial pain (e.g., visceral pain). Midline and axial pain may require bilateral procedures to achieve pain relief. Lancing, paroxysmal neuropathic pain and evoked (allodynic or hyperpathic) pain that sometimes occurs following spinal cord injury or as part of peripheral neuropathic pain syndromes can improve following cordotomy, but continuous neuropathic pain does not improve [26].

There is a significantly greater risk of complication with bilateral procedures, including weakness, bladder, bowel, and sexual dysfunction, and respiratory depression (if the procedure is performed bilaterally at cervical levels) [25, 26]. Bilateral percutaneous cervical cordotomies are usually staged at least 1 week apart to reduce the likelihood of a serious complication. The risk of respiratory depression subsequent to a unilateral high cervical procedure mandates that pulmonary function be acceptable on the contralateral side. For example, a patient who has undergone a previous pneumonectomy for lung cancer should not be subject to cordotomy that would compromise pulmonary function on the side of the remaining lung [26].

Cordotomy provides good pain relief in approximately 60–80 % of patients [26, 28], but loss of pain relief tends to occur over time. Approximately, one-third of patients have recurrent pain in 3 months, half at 1 year, and two-thirds at longer follow-up intervals [28, 29].

Comprehensive Treatment of Chronic Pain by Medical, Interventional, and Integrative Approaches

the AMERICAN ACADEMY of PAIN MEDICINE

Textbook on Patient Management

Timothy R. Deer

Editor-in-chief



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Thecnique



Anterolateral Cordotomy

The lateral spinothalamic tract, located in the lateral funiculus of the spinal cord, is a crossed pathway that transmits the majority of pain and temperature input in the CNS, and a number of procedures have been described to interrupt this pathway including open or percutaneous cordotomy and commissural or midline myelotomy. Open cordotomy, as first described in 1912 by William Gibson Spiller and Edward Martin, is performed with the patient under general anesthesia through a laminectomy. However, the open procedure has largely been supplanted by percutaneous techniques that are less invasive, generally associated with less morbidity, and consequently usually better tolerated by patients with advanced cancer who may be ill and debilitated.^{24–28} Mullan and colleagues²⁸ initially described percutaneous C1–2 cordotomy. Although the procedure has evolved considerably since the initial description, it remains an excellent option for the treatment of refractory cancer pain.

In considering a patient for cordotomy, or midline myelotomy for that matter, the severity of the pain should be sufficient to justify the procedure and the attendant risks. In this sense, it is important to attempt to segregate physical pain (biologic) due to the underlying cancer and the emotional suffering related to depression and other socioeconomic and secondary gain issues (psychosocial). Also, as with any destructive procedure, all reasonable noninvasive methods for pain control should have been attempted and failed to provide adequate pain relief.

The most common indication for percutaneous cordotomy is in the patient with opiate-resistant or opiate-tolerant cancer pain. Indeed, most candidates for cordotomy have failed to respond adequately to high doses of long-acting oral opiates and/or intraspinal opiates. In some patients, for a variety of reasons, intraspinal opiates may not be a practical or viable option for pain management, in which case percutaneous cordotomy remains an excellent alternative. Percutaneous cordotomy has also been utilized in other pathologic conditions such as spinal cord injury pain, radiation plexitis, postamputation stump pain (phantom pain does not respond to cordotomy), pain from tabes dorsalis, and even in intractable pain from failed back surgery.²⁴

Cordotomy is carried out with the patient supine using local anesthesia with light intravenous sedation in order to obtain feedback from the patient.²⁴ Lateral fluoroscopy is used to image the C1–2 level, and a subarachnoid puncture is performed. After confirming flow of CSF, several milliliters of preservative-free contrast are injected to identify the dentate ligament, which defines the horizontal equator of the spinal cord. The spinothalamic pathway is located just ventral to the dentate ligament. A temperature-monitoring cordotomy electrode (similar to the DREZ electrode) is then

inserted into the spinal cord just ventral to the dentate ligament. Intraoperative stimulation is performed for physiologic localization of the electrode. Keep in mind that the spinothalamic tract is somatotopically organized such that the sacral and lumbar fibers are located more dorsal and laterally whereas the cervical fibers are somewhat more ventral and medial. In general, with the electrode properly positioned, the patient will describe either a painful or a warm sensation in the distribution of the pain. Once the target is confirmed, an RF lesion is made usually for about 60 seconds at 75°C to 80°C. The end-point is reduction or elimination of pain and temperature sensation overlapping the area of pain and extending several dermatomes rostrally. The most significant complication of unilateral cordotomy is ipsilateral leg weakness due to damage of nearby corticospinal fibers. Other complications include meningitis and postcordotomy dysesthesias (10%–15%).

CURRENT THERAPY IN PAIN

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CORDOTOMY

The none-too-subtle premise of cordotomy is the interruption of the spinothalamic and spinoreticular pathways in the anterolateral quadrant of the cord carrying pain inputs

to the brain from the periphery. These lesions are intended to preserve fine touch and proprioceptive tracts. Within the spinothalamic tract, the sacral fibers are located more dorsolaterally and the cervical fibers more ventromedially. Moreover, at any spinal level, axons composing the spinothalamic tract are primarily projections from cells located in the contralateral cord beginning two or three spinal segments below the specific level. Therefore, a lesion should produce pain relief beginning two or three dermatomes below the level of the lesion. Caution must be taken in lesioning the upper cervical cord, however, due to respiratory fibers of the reticulospinal tract lying medial to the spinothalamic tract. For this reason, bilateral upper cervical cordotomy is often not performed and patients with tenuous respiratory function are often considered unsuitable candidates. This procedure has found most utility in the treatment of refractory malignant pain. While open cordotomy was first performed by Spiller in 1912, Mullan⁴⁶⁻⁴⁸ pioneered the percutaneous approach, which enabled even medically fragile patients with advanced malignancies to undergo the procedure.

ESSENTIALS OF PAIN MEDICINE, Third Edition

Honorio T. Benzon, Scott M. Fishman, Srinivasa N. Raja, Steven P. Cohen,
Spencer S. Liu (Editors), Elsevier Saunders, Philadelphia, **2011**

PROCEDURE

In the open procedure, intradural exposure is first accomplished, followed by sectioning of the dentate ligament at the appropriate level. Grasping the free end of the dentate ligament allows the surgeon to gently rotate the cord away from the operative side and expose the ventral cord. A cordotomy hook with a 45-degree angle is inserted into the anterolateral quadrant and may be taken to the medial pia before sweeping ventrally. Care is taken to not violate the medial pia and risk injury to the anterior spinal vessels.

Percutaneous cordotomy is often performed in the upper cervical (C1–C2) region to treat hemibody malignant pain. This may be done using either CT or fluoroscopic guidance combined with contrast myelography. Following dural puncture from a lateral approach, contrast is instilled into the CSF, allowing identification of the dentate ligament and definition of the ventral hemicord. A stimulating/lesioning electrode is advanced through the needle and impedance mapping is used to signal entry into the cord. Pial penetration is heralded by an increase in the impedance from around 300 ohms to over 500 ohms. Patients may also report pain with this maneuver. Low frequency electrical stimulation is used to obtain a motor threshold for approximation of the distance to corticospinal tract. High frequency stimulation should produce contralateral sensations covering the painful region. Serial RF lesions are then created until the area of pinprick analgesia encompasses the patient's area of pain.



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Myths and Realities Concerning Percutaneous Cordotomy

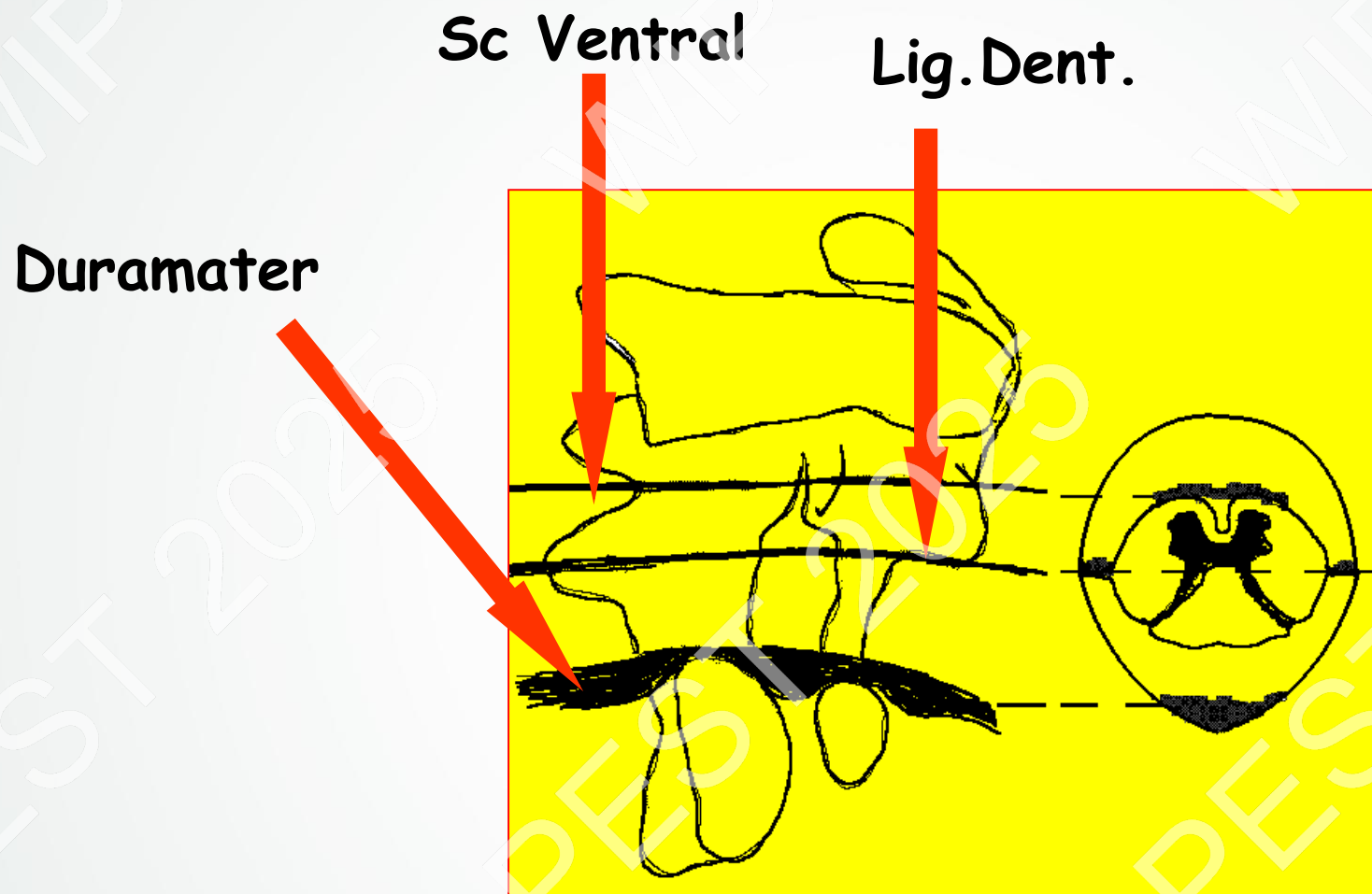
**Fluoroscopic
guidance**



CT - guidance

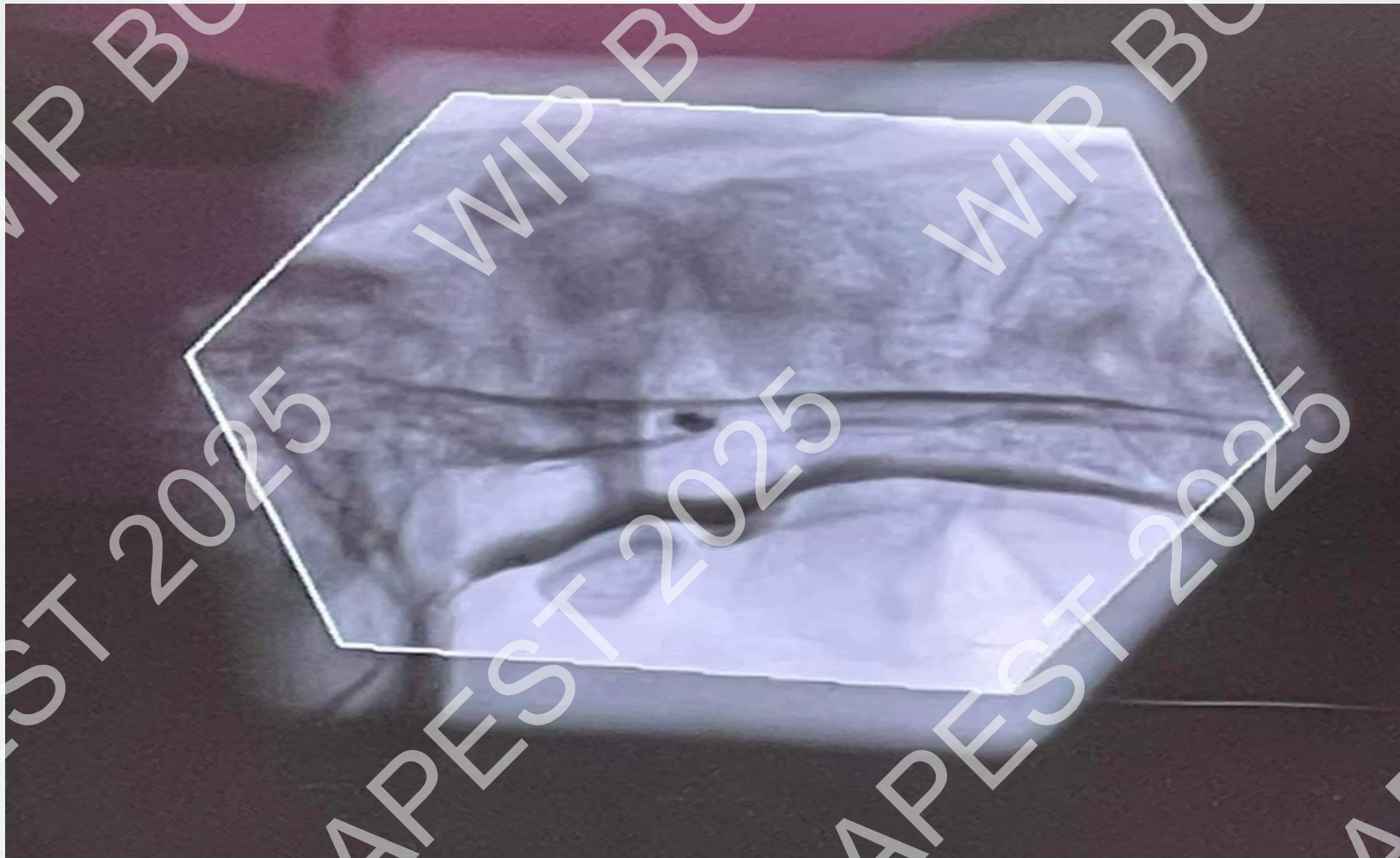


PC under carm





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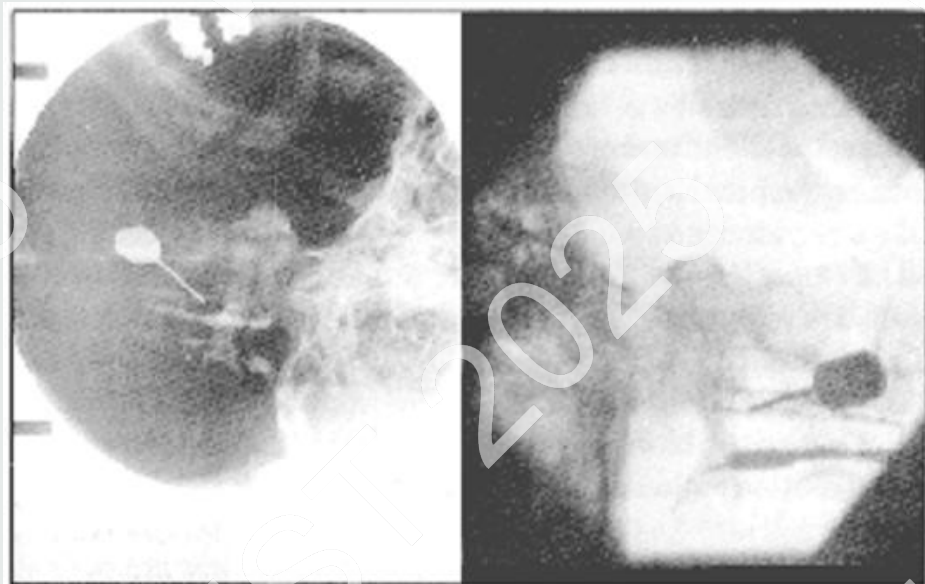
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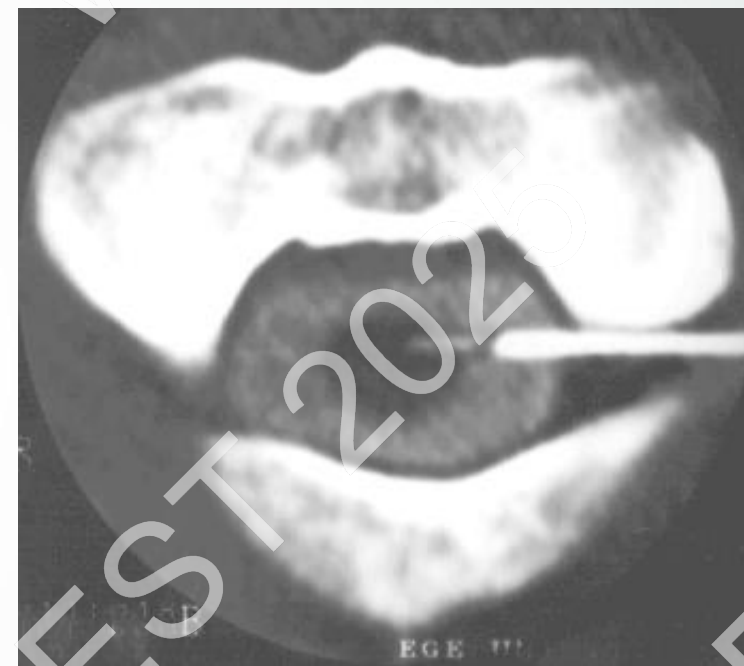




fluoroscopic guidance

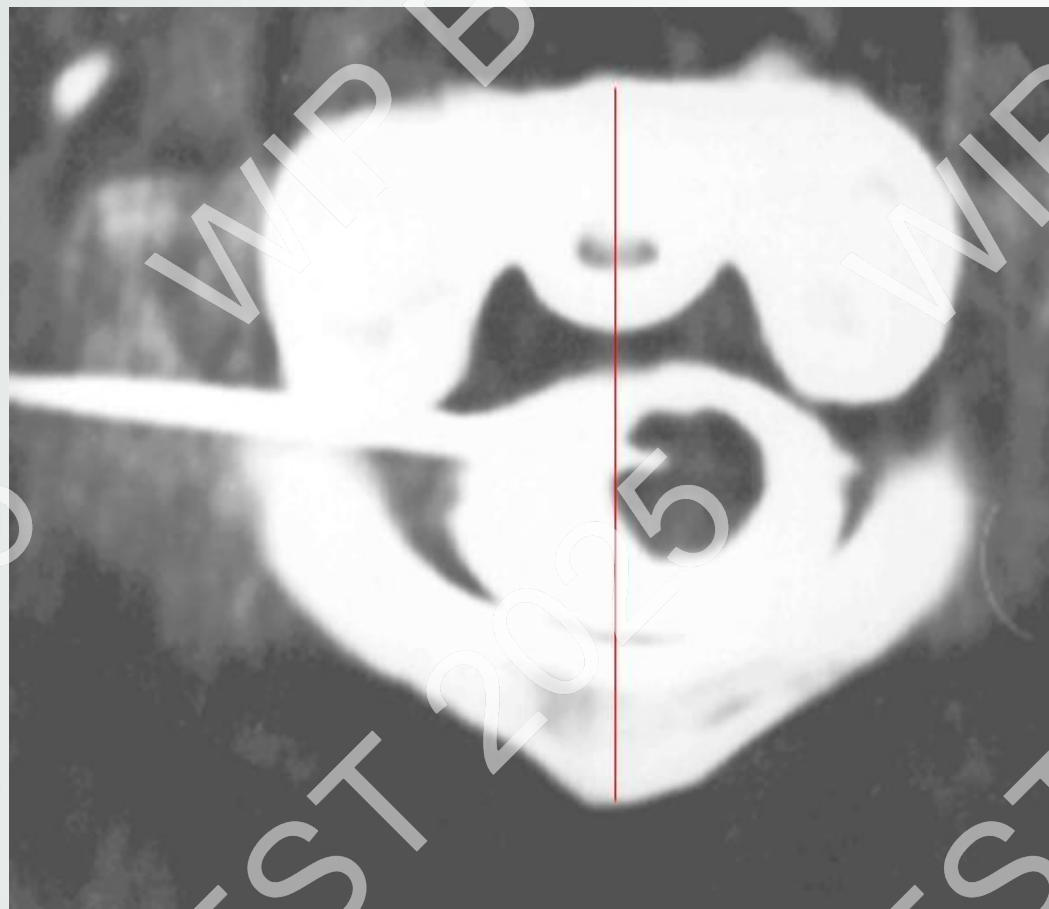


CT - guidance





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**Pulmonary and cerebral embolism can result from inadvertent
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RECENT MAJOR CHANGES

Indications and Usage (1)	4/2014
Dosage and Administration, Dosage Guidelines (2.1)	4/2014
Contraindications (4)	4/2014
Warnings and Precautions (5)	4/2014

INDICATIONS AND USAGE

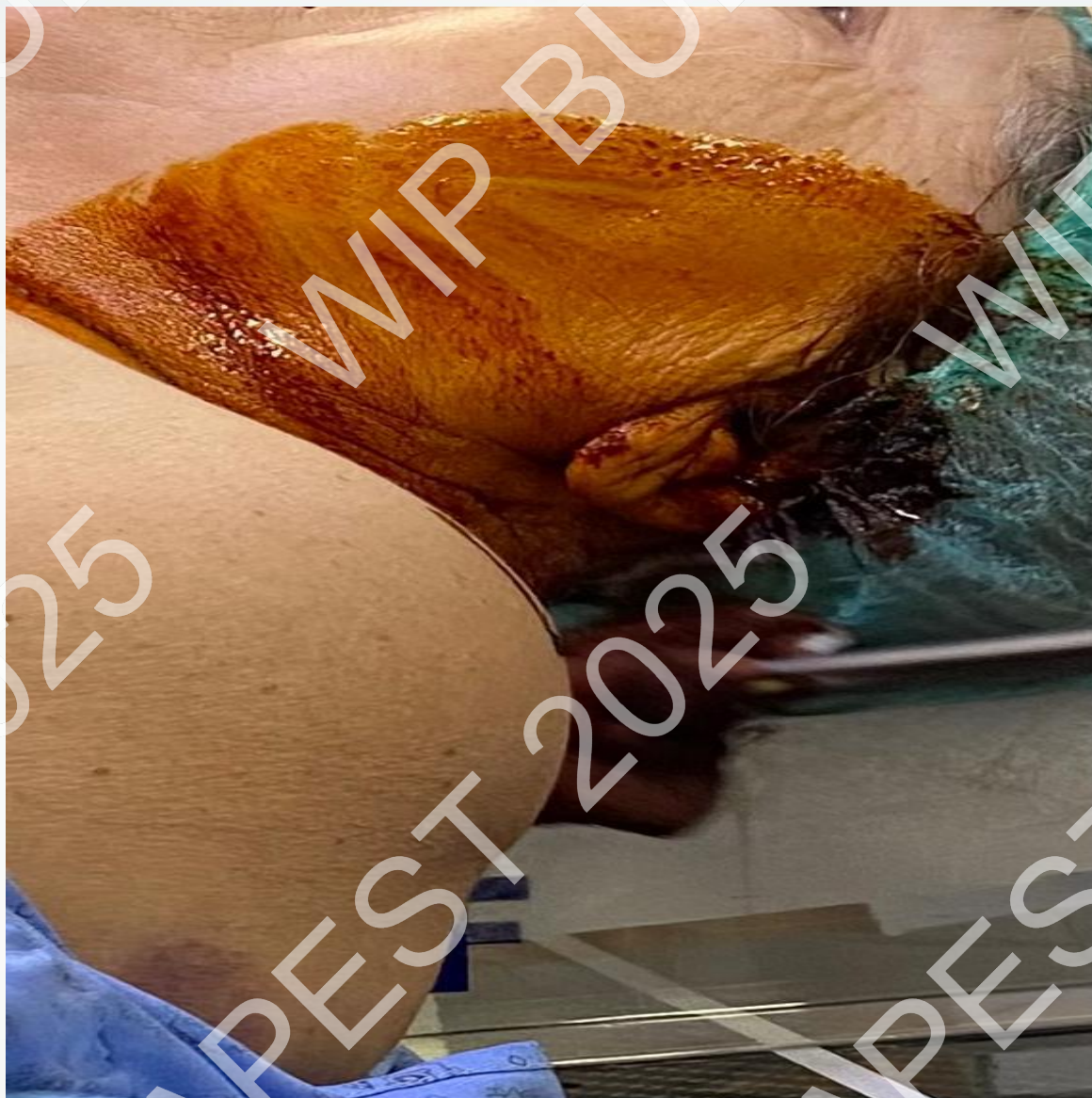
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- lymphography in adult and pediatric patients
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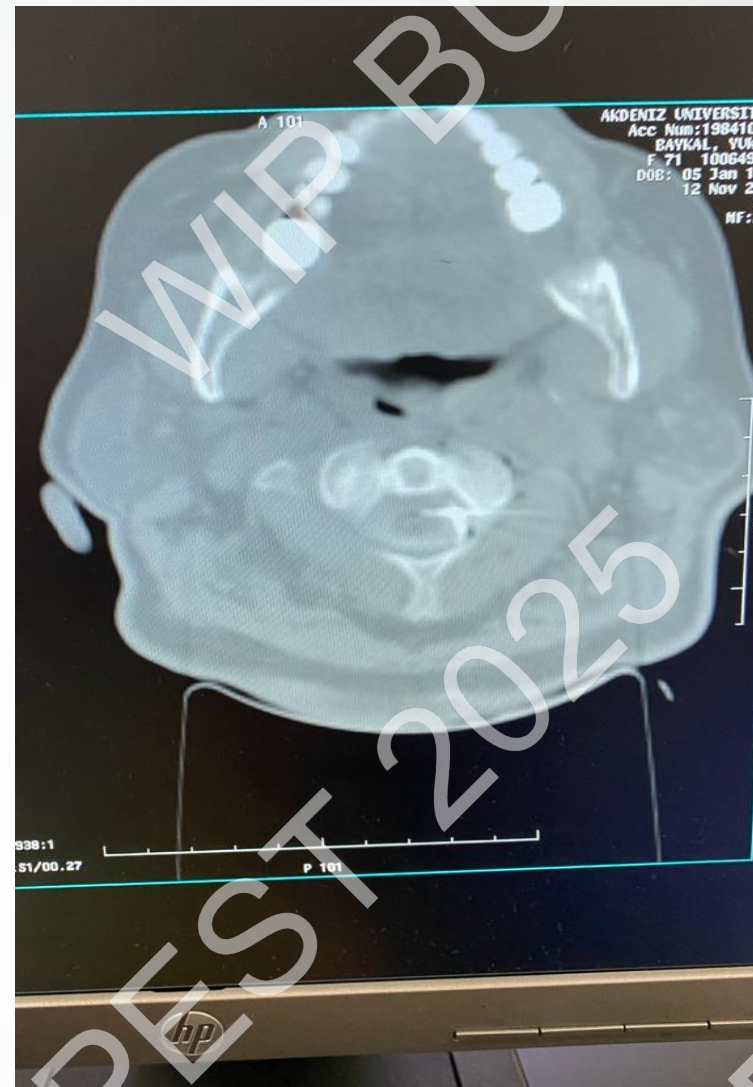


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RF lesion: 10-20-30 sc, 80°C !!!

!!! 600-800 ohm, 50-60 V

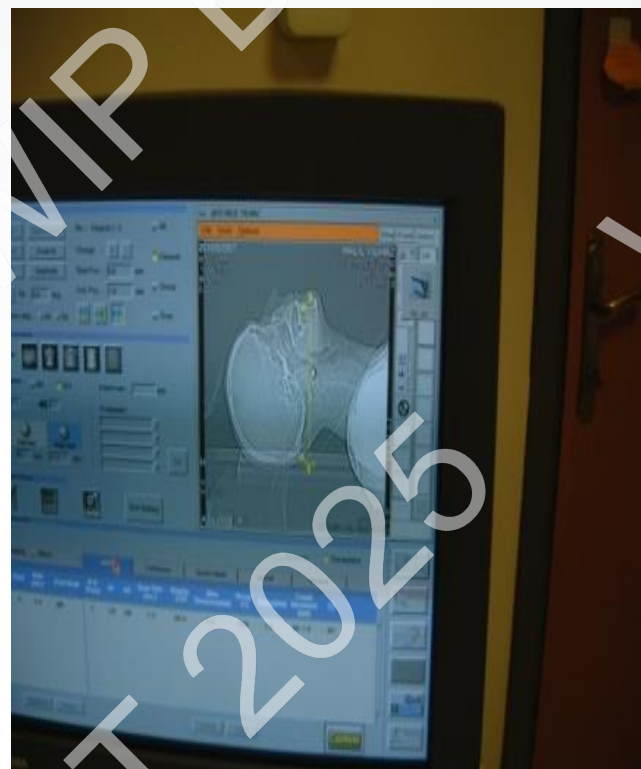


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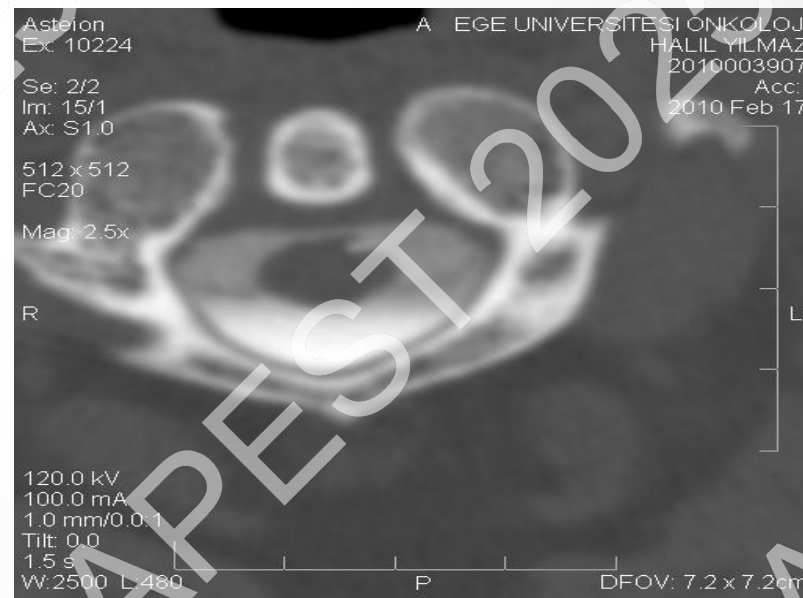
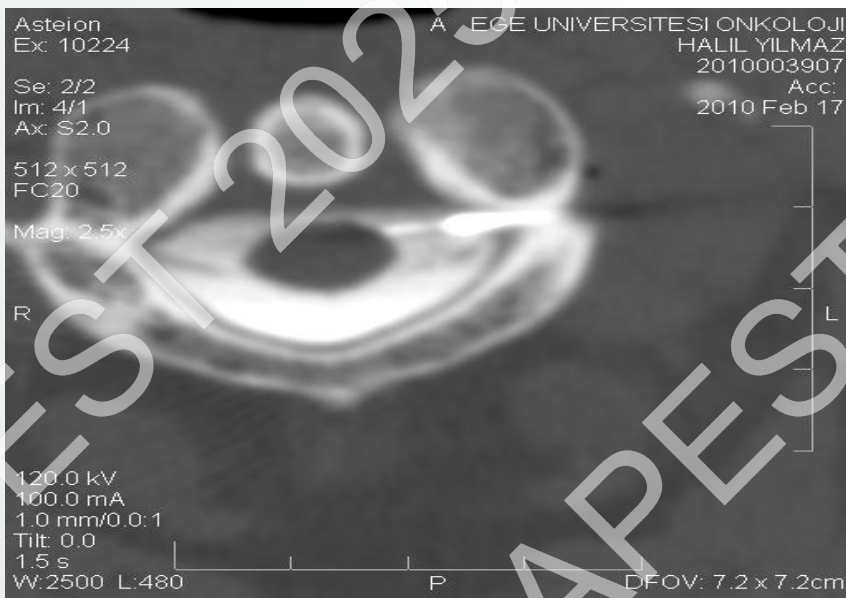
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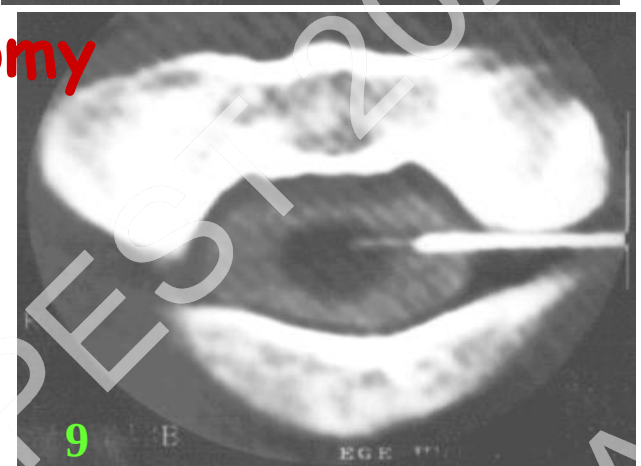
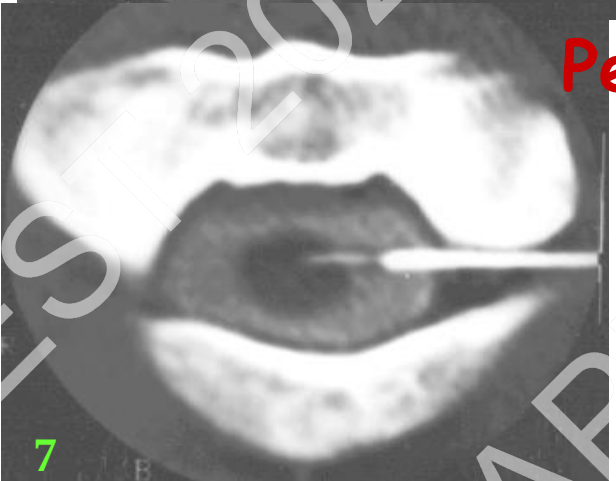
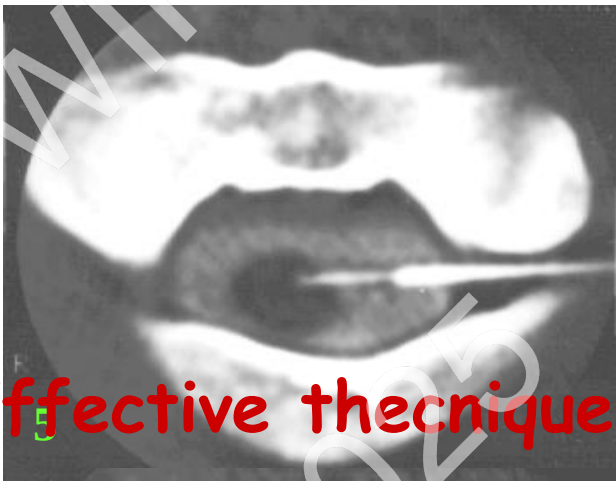
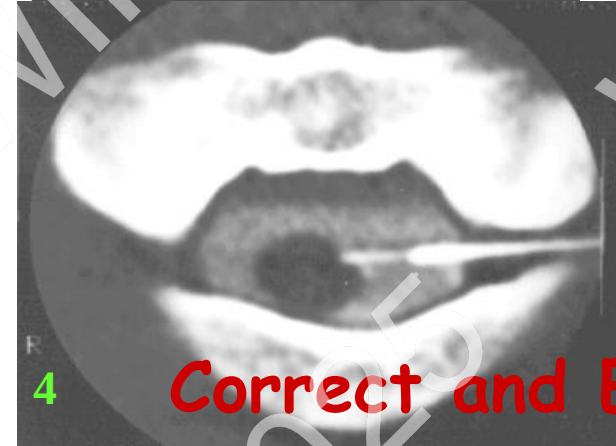
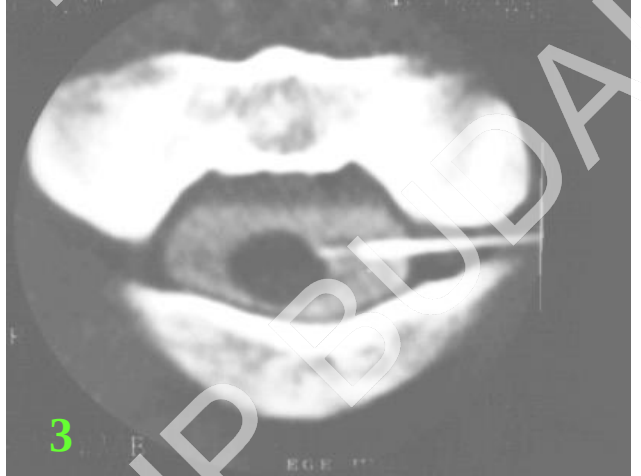
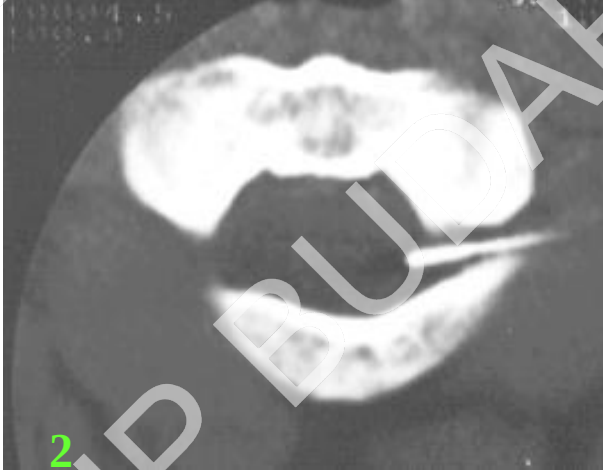
Surg Neurol 1995 May;43(5):478-82; discussion 482-3

Diametral measurements of the upper spinal cord for stereotactic pain procedures: experimental and clinical study.

Kanpolat Y, Akyar S, Caglar S

University of Ankara, School of Medicine, Department of Neurosurgery, Turkey.

BACKGROUND: Stereotactic percutaneous pain procedures, percutaneous cordotomy, trigeminal tractotomy, and extralemniscal myelotomy are routinely performed with computed tomography (CT) guidance. This new imaging technique enables one to measure the spinal cord diameters for each patient uniquely. Significant differences have been recognized between the measurements obtained with CT and the reference values given for such procedures. **METHODS:** To confirm the reliability of CT measurements, two experimental models were used. In the first stage, an artificial neck and spinal cord model was set up and diameters of the spinal cord were remeasured with CT. In the second stage, spinal cord diameters of the upper cervical region on 10 mongrel dogs were initially taken with CT, then standard laminectomy was performed and diameters of the same region were measured under the operating microscope. **RESULTS:** The experimental studies confirmed that CT measurements of the upper cervical cord are reliable. In clinical application, diametral measurements of the spinal cord at occiput C-1 level were carried out in 30 patients who underwent percutaneous trigeminal tractotomy and extralemniscal myelotomy. The anteroposterior diameter at this level was measured at 7.0-12.8 mm and the transverse diameter ranges between 9.3-14 mm. At the level of C-1-C-2, these measurements were performed over 63 patients who experienced percutaneous cordotomy. In this group the anteroposterior (A-P) diameter was measured as 7.0-11.4 mm, and the transverse diameter as 9.0-14.0 mm. **CONCLUSIONS:** Our clinical experiences and the results of the experimental measurements demonstrate that CT imaging gives accurate diametral values that would favorably influence the surgical procedures, and thus, with CT imaging it is possible to perform main stereotactic destructive pain procedures safely, effectively and selectively.



**Correct and Effective technique is CT Guided
Percutaneous Cordotomy**



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History in past (!)



**Flouroscopy ? Consider it carefully!!!
Safety comes with CT guidance...**



CT-Guided Percutaneous Cordotomy for Intractable Pain in What is More than a Disease: Lung Malignancies

*Akciğer Malignitelerinde İnatçı Ağrılar İçin BT - Rehberliğinde Perkütan
Kordotomi*

Yucel KANPOLAT¹, Mevci OZDEMIR², Eyyub S. M. AL-BEYATI³

224 patients with intractable pain were treated

- Among the 224 patients in the series
- 210 had intractable pain due to malignancies. The majority of the cases were diagnosed as pulmonary malignancies (108 patients).
- Of the 108 admitted for treatment of intractable pain, 67 were pulmonary carcinoma, 26 mesothelioma and 15 Pancoast tumors.

CT-Guided Percutaneous Cordotomy for Intractable Pain in What is More than a Disease: Lung Malignancies

Akciğer Malignitelerinde İnatçı Ağrılar İçin BT - Rehberliğinde Perkütan Kordotomi

Yucel KANPOLAT¹, Mevci OZDEMIR², Eyyub S. M. AL-BEYATI³

Table II: Median (Minimum - Maximum) Karnofsky Performance Scale (KPS) and Visual Analog Scale Scores (VAS)

	Pulmonary Ca			Mesothelioma			Pancoast		
	Preop.	Postop.	p	Preop.	Postop.	p	Preop.	Postop.	p
VAS	8 (6-9)	0 (0-5)	<0.001	8 (7-9)	0 (0-8)	<0.001	8 (7-9)	1 (0-3)	0.001
KPS	50 (20-70)	70 (20-70)	<0.001	40 (20-60)	70 (50-90)	<0.001	40 (20-70)	70 (50-80)	0.001

CT-Guided Percutaneous Cordotomy for Intractable Pain in What is More than a Disease: Lung Malignancies

*Akciğer Malignitelerinde İnatçı Ağrılar İçin BT - Rehberliğinde Perkütan
Kordotomi*

Yucel KANPOLAT¹, Mevci OZDEMIR², Eyyub S. M. AL-BEYATI³

MATERIAL and METHODS: Between 1987 and 2012, 224 patients with intractable pain were treated with computerized tomography (CT)-guided cordotomy. Among them, 210 had intractable pain due to malignancies. The majority of the cases were diagnosed as pulmonary malignancies (108 patients). Sixty-seven were pulmonary carcinoma, 26 mesothelioma and 15 Pancoast tumors.

RESULTS: After cordotomy, 98.13% of cancer patients reported initial pain relief. Minimum and maximum preoperative scores of the Karnofsky Performance Scale were 20 and 70, versus postoperative scores of 40 and 90 ($p<0.001$). The median preoperative VAS score was 8 (6-9). On the first postoperative day, the score dropped sharply to 0 (0-8) ($p<0.001$). In this selected series of 108 percutaneous cordotomy procedures, as well as in the total series of 224 patients, there was no mortality or major morbidity.

CONCLUSION: CT-guided percutaneous cordotomy is an effective procedure that should be used in the treatment of cancer-related pain problems. We suggest that cordotomy should be preferred as soon as possible in patients who fail to respond to the classic analgesic therapy

Clinical Article

CT-Guided Percutaneous Selective Cordotomy for Treatment of Intractable Pain in Patients with Malignant Pleural Mesothelioma

Y. Kanpolat¹, A. Savas¹, T. Ucar², and F. Torun¹

Summary

Malignant mesotheliomas are neoplasms that arise from mesothelial cells and cause intractable pain in the chest wall, usually located unilaterally. This local pain can be well controlled by computerized tomography (CT)-guided percutaneous cordotomy (PC). One hundred and fifty-three patients suffering from intractable pain due to malignancy were treated with CT-guided cordotomy between 1988 and 2001. Seventy of the 153 patients had pulmonary malignancy. Among these, 40 had bronchogenic carcinoma, 11 had Pancoast tumors and the remaining 19 had mesothelioma. The latter 19 cases with malignant mesothelioma suffering from unilateral pain were treated with CT-guided PC. In 18 cases, pain was controlled totally and, in one, partial pain control was obtained. Selective pain control was obtained in 15 cases, in whom narcotic drugs were discontinued postoperatively. Post-cordotomy dysesthesia was noted in only one case, and no complication or mortality was observed. In the treatment of intractable pain, CT-guided cordotomy is a perfect method in selected cases with malignancy. This is the most effective and suitable treatment modality for local pain due to malignant mesothelioma.

Acta Neurochir (2002) 144: 595–599
DOI 10.1007/s00701-002-0945-2



Technical Report

Bilateral CT-guided Percutaneous Cordotomy for Cancer Pain Relief

I. YEGUL, E. ERHAN

Faculty of Medicine, Ege University, Bornova, Izmir, Turkey

Received: 22 August 2002 Revised: 28 May 2003 Accepted: 3 June 2003

AIM: CT-guided percutaneous cordotomy is a useful procedure for treating unilateral cancer pain, however, bilateral cordotomy can be required on some occasions. We evaluated the effectiveness and complications of bilateral cordotomy.

MATERIALS AND METHODS: Two hundred and thirty-four patients who suffered from unilateral cancer pain underwent CT-guided percutaneous cordotomy. The procedure was repeated in 22 patients, and nine patients had bilateral cordotomy. Effectiveness and complications were recorded after each procedure.

RESULTS: Of nine patents (three women and six men) having bilateral percutaneous cordotomy in our study, four patients had mirror pain after the first procedure. In the remaining five patients the

Percutaneous Cordotomy can be repeated for the other side at least 1 week later.



JOURNAL OF NEUROSURGERY:
Case Lessons

J Neurosurg Case Lessons 8(10): CASE2427, 2024
DOI: 10.3171/CASE2427

Cordotomy under general anesthesia for a pediatric palliative patient: illustrative case

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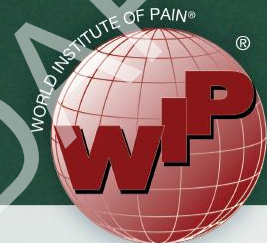
BACKGROUND Computed tomography (CT)-guided cordotomy has been shown to be a safe and effective method for treating cancer pain in adults in a palliative care setting. Its effectiveness has been rarely reported in children. During cordotomy, patient feedback is considered essential. Unfortunately, in this report, the featured patient's age and demeanor precluded an awake cordotomy. The authors report the first case, to their knowledge, of percutaneous cordotomy with the patient under general anesthesia.

OBSERVATIONS An 11-year-old boy with osteosarcoma of the right pelvis presented with medically refractory unilateral nociceptive pain. The pain prevented ambulation, interfered with sleep, was the focus of his concern, and could not be relieved without sedation. A left percutaneous CT-guided cervical cordotomy while he was under general anesthesia was performed without complication and provided sufficient pain relief to allow ambulation and restorative sleep. Pain was no longer an issue for the patient and his family.

LESSONS CT-guided percutaneous cervical cordotomy can be accomplished in a pediatric patient under general anesthesia. The risks of cordotomy under general anesthesia without patient feedback must be weighed against the opportunity to improve palliative care.

<https://thejns.org/doi/abs/10.3171/CASE2427>

KEYWORDS cordotomy; CT guided; palliative care; pediatric; general anesthesia; cancer pain



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Cordotomy for pain control and opioid reduction in cancer patients: A cancer center 11-year experience

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ABSTRACT

Background: Percutaneous lateral cervical cordotomy (PLCC) is a treatment option for predominantly nociceptive pain of oncological origin that is refractory to conservative methods, with unilateral distribution, particularly in the lower trunk or lower limbs of patients with a life expectancy of less than one year.

Objective: The aim of this study was to assess the analgesic efficacy and opioid utilization alteration in patients undergoing PLCC.

Methods: We retrospectively collected data from patients undergoing PLCC between 2011 and 2021 at the AC Camargo Cancer Center in São Paulo, Brazil.

Results: Sixty-three patients and their respective surgical outcomes were analyzed. The mean preoperative pain intensity, as assessed by the mean numerical rating scale (NRS), was 8.4 (range: 4–10), while postoperatively, it decreased to 0.78 (range: 0–8). Lower postoperative NRS scores were observed for pain in the lower limbs and abdomen compared to the lower thorax. The mean preoperative oral morphine equivalent (OME) consumption was 231.0 mg (range: 30.0–1015.2). At 30 days postoperative, the mean consumption of OME was 120.2 mg (range: 0.0–705.0). Twelve months after surgery, the average consumption of OME was 98.3 mg (range 0.0–396.0).

Conclusion: PLCC is a valuable therapeutic intervention for patients experiencing cancer pain that is unresponsive to conservative treatments. The anticipated analgesic outcomes are generally favorable, particularly in cases where the pain is localized unilaterally in the abdomen or lower body segments.

Table 3

Postoperative Adverse Events. Some patients experienced more than one adverse event.

Adverse events	Frequency (%)
<i>Patients with adverse events</i>	31 (49.2)
Mirror pain	12 (19.0)
New, non-mirror pain, including delayed neuropathic pain	6 (9.5)
Lack of improvement or recrudescence of pain	6 (9.5)
Motor deficits	4 (6.3)
Headache	3 (4.8)
Sensory deficits	1 (1.6)
Bladder dysfunction	1 (1.6)
Eyelid ptosis	1 (1.6)
<i>No events</i>	32 (50.8)
<i>Total adverse events</i>	34

RESEARCH ARTICLE

Effectiveness of CT-guided percutaneous cordotomy in intractable cancer pain: Experience in 14 patients

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Abstract

Background: Severe and treatment-resistant pain is a major issue for patients with cancer. Cordotomy is an effective approach for addressing severe cancer-related pain. It is based on blocking the transmission of pain by damaging the lateral spinothalamic tract.

Methods: Computed tomography guided cordotomy was performed on 14 patients who did not respond to medical and interventional pain management methods.

Results: Fourteen patients with cancer pain underwent CT-guided percutaneous cordotomy. Pain relief was reported in 86% of the patients. The visual analog scale values before and after cordotomy were compared and a significant difference was found ($p=0.0001$). The improvement in the Karnofsky Performance Scale score of the patients was found to be statistically significant ($p=0.0001$).

Conclusion: We believe that CT-guided cordotomy, performed by experienced hands in a team of experienced individuals and applied to the right patients, is an effective treatment. However, it is crucial to exercise extreme caution regarding potential side effects and serious complications during the cordotomy procedure.



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CASE REPORT

Bilateral percutaneous cervical cordotomy for cancer pain: A case report

Kanser ağrısında bilateral perkütan servikal kordotomi: Olgu sunumu

 Mert AKBAŞ,¹  Ferhat EGE,²  Gözde DAĞISTAN¹

Summary

Cancer is a systemic and progressive disease, and pain is a serious problem for patients. Cordotomy is one of the most effective treatments for refractory cancer pain. Bilateral percutaneous cervical cordotomy can be performed in patients with bilateral extremity pain. Accordingly, this case report discusses the use of bilateral cervical percutaneous cordotomy in the treatment of refractory cancer pain based on a 69-year-old woman with soft tissue sarcoma.

Keywords: Bilateral; cancer; cervical; cordotomy; pain; percutaneous; resistant; secondary.

Özet

Kanser, sistemik ve ilerleyici bir hastalıktır. Ağrı, hastalar için ciddi bir problemdir. Kordotomi, dirençli kanser ağrısı için en etkili tedavi yöntemlerinden biridir. Bilateral perkütan servikal kordotomi, bilateral ekstremitte ağrısı olan hastalarda yapılabilir. Buna göre, bu olgu sunumunda, yumuşak doku sarkomlu 69 yaşında bir kadın olgu temelinde dirençli kanser ağrısının tedavisinde bilateral servikal perkütan kordotomi kullanımı tartışılmıştır.

Anahtar sözcükler: Ağrı; bilateral; dirençli; kanser; kordotomi; perkütan; servikal.



Our Case Series

- 24 patients
- 11 patients Lung ca
- 3 bilateral cases
- 10 Neck pain, 3 Urinary retentaion
- 1 re-performed (no csf drop)
- VAS 10 1 ± 0.67
- Karnofsky Performance Scala

37.85 ± 12.51	$69.28 \pm$
13.28	



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No	Tarih	Adı Soyadı	Yaş	Cinsiyet	Tanı	Ağrı Yeri	İşlem süresi	Komplikasyon	VAS
1		Faruk Yücel Çelik	62	E	Akciğer CA	R-Kalça Ağrısı	45 dk	Mirror Pain/ Dengesizlik (Geçti)	10'dan 2'ye
2	20/09/2019	Erdiç Bingül	37	E	Rektum CA/ Alt eks. Met	R- Kalça Ağrısı	45 dk	Mirror Pain/ Dengesizlik/ Yoksunluk	10'dan 0'a
3	18/10/2019	Yaşar Tunç	52	E	Renal Cell CA/ Kemik Met	R/L üst eks. R daha çok	1 saat		10'dan 0'a
4	25/12/2019	Emine Sarılar	60	K	Myeloid Sarkoma	R Kalça Ağrısı (Ampute)	45 dk	Komplikasyon yok	8'den 0'a
5	17/01/2020	Emine Sarılar (2.)	60	K	Myeloid sarkoma	L Kalça Ağrısı	45 dk	Komplikasyon yok	7'den 0'a
6	03/10/2020	Hüseyin Uluksar	71	E	Prostat CA/ L Humerus Met		45 dk	Komplikasyon yok	10'dan 0'a
7	13/03/2020	Şükrü Namı	66	E	Servikal Travma-praplezi	Üst Eks.- paraparejik / Non-malign Ağrı	35 dk	Komplikasyon yok	10'dan 0'a
8	17/03/2020	Madinat Malachilev	49	K	Serviks CA (invazif squaraz hücre) / Kemik met	R bacak ağrısı	40 dk	Komplikasyon yok	10'dan 0'a
9	26/01/2021	Mehmet Dünder	63	E	R T5 Dematom ZONA		30 dk	Baş ağrısı/ R kol geçici parestezi	10'dan 0'a
10	18/11/2020	Tolga Şahin	22	E	R Brakial plexopati	R Kol ağrısı	30 dk		10'dan 2'ye
11	18/03/2021	Pakize Tok	49	K	Meme CA evre III	L Omuz kol ağrısı	25 dk	Ense ve baş ağrısı (geçti)	10'dan 0'a
12	09/04/2021	Haydar Kabaçelik	65	E	Akciğer CA / R kostal met	Sırt ağrısı	30 dk	Komplikasyon yok	10'dan 1'e
13	26/05/2021	Haydar Kabaçelik (2.)	65	E	Akciğer CA/ R kostal met	Kostal ağrı	20 dk	Komplikasyon yok	10'dan 0'a
14	24/10/2021	Mehmet Zerman	68	E	Böbrek CA/ Met	R Skapular Ağrı	25 dk	Komplikasyon yok	8'den 2'ye
15	12/11/2021	Yüksel Baykal	71	K	Akciğer CA Bronş	Sağ Hemitorax	20 dk	T4 komp. Fark. (işlem sonrası farkedildi) / İdrar ret.	8'den 2'ye
16	10/12/2021	Kemal Vural	55	E	Akciğer CA	Sağ Hemitorax Kostal	15 dk	Yoksunluk/ Ense Baş ağrısı	10'dan 0'a
17	29/07/2022	Burcu Yıldız	41	K	Akciğer CA	R Omuz-kol Ağrısı	15 dk	Yoksunluk/Ense -Baş Ağrısı	10'dan 0'a
18	05/08/2022	Erkan Belli	50	E	Akciğer CA	R Omuz-Kol Ağrısı	15 dk	Ense-Baş Ağrısı	10'dan 0'a
19	25/11/2022	Renginar Danyıldız	53	K	Akciğer CA	R Omuz- Sırt Ağrısı	20 dk	Komplikasyon yok	10'dan 2'ye
20	01/05/2023	Bülent Albayrak	37	E	Sakral Kordoma	Sağ Kalça	20 dk	Baş ağrısı	10'dan 1'e
21	05/07/2023	Bülent Albayrak	37	E	Sakral Kordoma	Sol Kalça	15 dk	Komplikasyon yok	10'dan 0'a
22	29/02/2024	Yılmaz Durmuşoğlu	68	E	Akciğer CA	Sol Omuz Kol	30 dk	Dengesizlik/Yoksunluk	10'dan 3'e
23	30/03/2024	Yılmaz Durmuşoğlu	68	E	Akciğer CA	Sol Omuz Kol	15 dk	Komplikasyon yok	0'dan 0'a
24	30/12/2024		67	K	Akciğer sukaomoz CA	Sağ kol	15 dk	Komplikasyon yok	10'dan 0'a



What is the Success rate for P.Cordotomy

- In the literature; success rates are changing from 60% to 94%
- In our 24 cases experience, we don't have a failure (1 re-perform case) or permanent complications.



- Some of our patients, with their primary disease under control, were able to **return to their normal active life immediately** after the cordotomy procedure.
- Nevertheless, the current results and outcomes of the procedure indicate that **cordotomy is an effective procedure** for intractable cancer pain.



- Authors suggests that the selected patients for the classic cordotomy procedure should be assumed to have **at least 2-5 months of survival.**



- Unless the patient is in agony, we believe that p.cordotomy is an effective procedure and should be preferred as soon as possible in patients who fail to respond to the classic analgesic therapy
- Also has to be chosen in all cancer patients even if they have only a few weeks of survival left



- Most of the patients in our series insisted on having the procedure applied, whatever the risks. It is important to ask "why?".
- *Cancer patients suffering from pain; who have a dream of being able to sleep more than one hour in a day, eat whatever they want, return to an active life, and socialize with their friends, etc*



- CT-guided percutaneous cordotomy is an effective procedure that should be used in the treatment of cancer-related pain problems.
- The safety of the procedure depends on correct patient selection and the experience of the physician.



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Special Thanks !





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