



SELECTIVE PERCUTANEOUS CORDOTOMY IN THE TREATMENT OF MALIGN PAIN - CASE REPORT

Băncilă Ana Teodora¹, Ianovici N.², Băncilă S. C.³

¹ *Oncology Radiotherapy „Coltea” Clinic Hospital of Bucharest*

² *Faculty of Medicine, “Gr. T. Popa” University of Iasi, Discipline NeuroSurgery*

³ *M.D. General Medicine*

Abstract. At least 10% of patients with cancer experience pain that is refractory to systemic analgesics. For most of these patients, interventional techniques may be of benefit but they are often not considered or are difficult to access. Of these techniques, spinal analgesia is most commonly used while neurosurgical procedures, such as percutaneous cordotomy with sectioning of the spinothalamic tract are rarely used. We describe a case illustrating the successful use of percutaneous cordotomy in a patient with refractory mixed nociceptive and neuropathic pain secondary to a lung cancer.

Keywords: Refractory cancer pain, percutaneous cordotomy, spinothalamic tract

Introduction

Percutaneous cordotomy also known as cordotomy or closed spinothalamic tractotomy is an efficient and simple method, performed with local anaesthesia, which does not require tegumentary incision and allows the drawing of a functional map, prior to the actual lesion. [1,2,5,6,7-10]

The ideal candidates are neoplastic patients with a life expectancy below 18 months or less, following failure in the conservative treatment (including high doses of orally administered opioids) and unilateral somatic pains: thoracic wall, upper limb, brachial plexus, pulmonary tumours (mesothelioma) for whom cordotomy can impede drug addiction and ensure life quality, as long as there are no brain metastases. Cordotomy can be applied in the absence of intracranial hypertension, at patients who present no afferent pain in that area, no skin infections at the electrode insertion spot and when contralateral lung doesn't have a severe pulmonary dysfunction. In bilateral neoplastic pain, bilateral cordotomy is recommended for patients with bilateral abdominal pain, pelvic and central discomfort. For pain in the upper body, in the superior limb, cervical cordotomy will be repeated at 4-6 weeks after the first lesion, due to possible respiratory difficulties.

Although cordotomy is not the selected treatment for benign affections, its use is preferable to the morphine pump. [10]

Technique

Contrast agent is administered in the lumbar subarachnoid space: 7 ml of 240mg/l loxehol; patient is placed in Trendelenburg position for 5 minutes, than in dorsal decubitus for CT exam, with a slight flexion of the cephalic extremity but with the spines' cervical axis in straight position [16].

An anaesthesia needle is introduced at the level of C1-C2, visualised on the pilot incidence, in inferior position related to the mastoid tip (axial plane view- perfectly perpendicular to spine's axis), the ideal incision being 1 mm anterior to the dented ligament for lumbosacral fibres, namely 2-3 mm anterior for thoracic and cervical fibres. Measurements for the spinal diameter help establish the length of the active electrode and they are: 7-11,4 mm antero-posterior, 9-14 mm transversal; as well as for the measurement of distance between skin and dura. Devices used for the procedure are 20 gauge needles, 0,4mm straight or curved tip electrodes for unilateral cordotomies, respectively 0,3mm electrodes for bilateral ones. The electrode's position is set based on the targeted spot. The electrode is connected to a radiofrequency generator, determining the impedance of tissues in the vicinity of skin: 400ohms in LCR, an increase in the impedance with 200ohms at the contact between skin and electrode, respectively above 1000 ohms after bone marrow

Băncilă Ana Teodora

1-3 I. C. Bratianu Bvd., Bucharest, Romania

e-mail: bancilasorin@yahoo.com

penetration. Its position is constantly verified by visualising its tip at CT, whereas neurophysiologic confirmation of the selected target is achieved by electro stimulation: low frequency stimulation 5 Hz, 0,2-1 V, may cause small contractions in the neck muscles and trapeze. Should there be any muscular contraction in extremities the electrode will be moved in an anterior position. If this position is correct cotralateral dysesthesias are obtained- heat or cold sensation by high frequency stimulation 100 Hz at 0,2-1 V. Ideally, these sensations should overlap around the painful area.

Lesion is carried out: initially at a reduced temperature of 45-50 degrees for 20-30 seconds. In the absence of a neurological affection a permanent lesion is accomplished at 70-80 degrees, for 60 seconds. Normally, there are maximum 3 lesions in the unilateral surgical approaches, each for 60 seconds, with a 0,4mm diameter electrode, respectively 1-2 lesions in the bilateral approaches with a 0,3 mm diameter electrode, procedures that will be executed in time- minimum within one week. Lahuerta 1994 [16] reveals that the best analgesia is obtained when lesions are made at 5mm interiorly from the spinal area, taking over a large space in the ventral quadrant.

Results

On a number of 3742 patients exposed in several series, Lorenz discloses satisfactory results in the control of pain for 75%-96% of cases; for 5570 patients, Sindou [16] uncovers favourable results for 70,9% cases. Recurrence of method: at 6 months, post cordotomy pain re-emerges at 25% of patients, and at 12 months in 60%.

Postoperative complications: transient motor deficits in 4-17% (paresis, ipsilateral plegia to cordotomy); in bilateral cordotomies uni or bilateral motor deficits may occur at 8-18% of cases, permanent deficits in 0-3% cases by damaging the crossed corticospinal tract or the anterior spinal artery; respiratory disorders may happen, transitory, in high bilateral cervical precocious cordotomies by ascendant edema and the affection of C3-C5 phrenic nerves; rarely, respiratory arrest may occur; 0-28% ataxia by damaging the spinocerebellar tract; circulatory disorders; transitory arterial hypotension, sometimes severe after bilateral cordotomies; sphincter disorders: transitory urinary retention-probably by the intertwining between afferent sphincter fibres with sacral origin algogenic fibres in the spinocerebellar tract; sexual disorders: low libido, with preservation of erection and ejaculation in unilateral tractotomy, global and persistent disorders in bilateral tractotomies; post cordotomy dysesthesia by altering the spinothalamic/spinoreticular thalamic tract (6-20%), ipsilateral to

cordotomy paired pain; Horner syndrome (respiratory dysfunctions, sleep apnea); mortality- Lorenz 1988 described it for 2616 patients: in the case of high cordotomies the average mortality rate is 3%, with variations between 0-4,6%; if the approach is anterior to the inferior cervical, mortality rate is very low. [2,3,6,8-10]

Efficacy of cordotomy implies complete, total (no sensitivity pain sensation) and durable analgesia within the selected area (both analgesic and thermoanesthesia areas will have a somatotopic level corresponding to the marrow incision), in the absence of secondary, motor, sensitive, cardio-respiratory, sphincter or sexual disorders. Generally, after a correct cordotomy procedure analgesia develops immediately, in 90% of cases [2,11,14-16]. Sometimes after cordotomy, pain is determined by: *somatotopic variations*- they are rare and can affect the sacral fibres contingent, which can have a deeper medial positioning; exceptionally, spinothalamic tract does not cross itself in totality; a small contingent of fibres disposed ipsilateral in relation to pain manifestations will remain imperceptible within a unilateral cordotomy, causing residual postoperative pain, as well as non-anaesthetic areas within the analgesia place; *level variations of fiber decussation*- explains the cordotomy with at least 4 rostral segments away from the insertion spot of radicular fibres in the painful area.

Pain can occur postoperatively in the same region:

- precocious - within the first 7-10 days, implies partial interconnection between fibres that mediate algic sensitivity within the desired area, the procedure requiring a deeper incision, more cranial; or if the pain is identified by the patient;
- tardy - after 1-2 months, reveals that some fibres have only been submitted to contusion and not sectioned;
- very late - more than 6 months, demonstrable by an extension of algogenic lesion.

Postoperative pain can have the same pattern or can be modified qualitatively: parasthesia or dysesthesia are localised within the same area or different areas:

- allesthesia - pain, parasthesia or dysesthesia outside the analgesic area, sometimes activated by stimulants applied within the pain zone; possible cause: incision in the marrow intersected the posterior spinal horn;
- pain occurring ipsilaterally to cordotomy, "paired" within symmetrical areas with those initially touched by pain= controversial explanations: the pain was, in fact, bilateral, predominantly on one side, the suppression of those contralateral to cordotomy emphasising

the others; commissural or supraspinal direct connexions; tumour infiltration or metastasis in the contralateral dorsal spinal horn that is detectable throughout a different type of pain only when the original pain has been eliminated by cordotomy; hiperexcitability of cells in the posterior spinal horn to nociceptive stimuli appears by interrupting the descendant inhibition systems.

At 50% of patients this “paired” pain appears immediately or within the first 24 hours after cordotomy at 80% of patients. The intensity is progressive, more reduced than the initial pain, easier to control through opioid treatment, especially in patients whose initial neoplasia did not expand towards the other side of the body.

Painful anaesthesia- re-emergence of pain on the anaesthetised with analgesia area (unlike frequent situations, where weeks or months after cordotomy, analgesia level decreases or its quality significantly reduces, algescic sensitivity spots appear, preceding initial pain).

Case report

54 years old, male patient diagnosed with stage III neoplasm of right pulmonary apex in 2009, chemotreated, continuous evolution at distance, (M1oss RT, M1pul, M1gg1), is admitted at “Bagdasar Arseni” Clinical Emergency Hospital. He accuses pain at the level of the right shoulder and hemithorax, resistant to treatment. He is investigated and evaluated for specialty treatment.

Personal antecedents are insignificant.

Clinical exam is normal, except for an altered general state, pale and dry teguments and mucous, cachexia

Neurological exam highlighted impossible walking/upright position; complete paraplegia (Frankel A. full neurological lesion); R.C. bilateral extension; R.O.T functional at inferior limbs; sensitivity: chronic malign pain at the level of the right shoulder and hemithorax (VAS-9); full sensitive deficit with an approximate T1 level. Sphincter: urinary retention; vesical catheter; psychic/speech: Gsc= 15, patient is oriented temporally and spatially and towards himself.

Investigations: thoracic CT - right pulmonary apex tumour, 6,5/5 cm, invasion of C6-T1 paravertebral region and vertebral canal. High paravertebral adenopathies, right pulmonary hillums and in abdominal aorta window.

Functional respiratory tests - restrictive ventilatory disorder with 37% VEMS reduction. **EKG** normal. **Cardiological** - Chronic respiratory failure. BPOC. Arrhythmia. **Laboratory tests** normal, except for ESR (110mm/h), anaemia (Hb= 7,9g/dl), neutrophilia, hyponatremia.

Thoracic surgical consult: stage IV, right bronchopulmonary neoplasm (Pancoast-Tobias-tumour), with C6-T1 vertebral invasion. The patient is not eligible for surgery. **Spinal surgical consult:** full paraplegia. Pulmonary apex tumour with vertebral invasion. At this moment patient is not eligible for neurosurgery. Throughout hospitalisation the patient has presented functional ileus with severe abdominal meteorism, thus in need of nasogastric catheter, with progressive improvement.

Selective percutaneous cordotomy is opted for and performed with radiofrequency of the left spinothalamic fascicle, at C1-C2 level, under control of computed tomography. Topographic and imagistic identification (CT observance) of the cervical spine and electrophysiological identification of the left spinothalamic fascicle at C1-C2 level. After compression through electronic stimulation of the lateral spinothalamic fascia, a selective lesion through radiofrequency is carried out at 70 C degrees, for 60 seconds.



Figure 1, 2. Selective percutaneous cordotomy under CT control

Evolution was favourable with significant improvement in the chronic malign pain (VAS-3). No side effects were determined, post operatively. At discharge, patient's neurological state is ameliorated.

Recommendations: patient is transferred at “Sf. Luca” Oncology Hospital in order to continue with the specific treatment; neurological reassessment if

needed; surgical thoracic reassessment.

The patient died due to the oncologic diagnosis, four weeks after the neurosurgical intervention.

Conclusions

This article develops the case of a patient with a particular, severe malign pain treated by percutaneous cordotomy and emphasises the importance of a multidisciplinary collaboration in the treatment procedure of refractory malign pain.

The malign pain was unilateral.

Contralateral lung presented no severe dysfunction.

No cranial hypertension, also visible through computed tomography (CT).

No immediate complications following the procedure were detected; short hospitalization period.

Percutaneous cordotomy is a simple and efficient method, based on local anaesthesia, under CT control, which requires no tegument incision.

On a short term, this procedure leads to a significant improvement in malign pain.

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