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ARTIGO ORIGINAL

Incidence of Persistent Postoperative Pain After Thoracotomy in a Cancer Hospital: A Prospective, Observational Study

Incidência de Dor Persistente Pós-Operatória Após Toracotomia num Hospital Oncológico: Um Estudo Observacional Prospetivo

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Keywords
Pain Measurement; Pain, Postoperative; Thoracotomy/adverse effects
Palavras-chave
Avaliação da Dor; Dor Pós-Operatória; Toracotomia/efeitos adversos

ABSTRACT

Introduction: Persistent postoperative pain after thoracotomy, can affect 35%-57% of patients at 3 months and acute postoperative pain appears to be one of the strongest predictors of chronic pain after thoracic surgery. The aim of this study was to determine the incidence of post-thoracotomy pain at 3 months with a standardized outpatient analgesic regimen and regular pain assessment.

Material and Methods: This prospective and observational study included adult patients submitted to thoracotomy between January 2018 and March 2020. Nociceptive and neuropathic pain were assessed pre-operatively, at discharge, and at 1, 2 and 3 months after surgery. Nociceptive pain included static and dynamic pain assessed using the numerical rating scale (0 to 10). The DN4 and DN2 questionnaires were used to evaluate neuropathic pain. All patients received paracetamol 1 g q8h, tramadol 50 mg q8h, ibuprofen 400 mg q8h, and orodispersible tramadol 50 mg as needed. Ibuprofen was maintained for 7 to 10 days and, if contraindicated, metamizole magnesium 575 mg q8h was prescribed. For neuropathic pain, pregabalin 50 mg q12h was added. Readjustments were made at 1, 2 and 3 months, according to analgesic needs.

Results: Sixty-nine patients were included and 55 finished the study. At 3 months, 14.5% (95% CI, 6.9%-27.2%) had dynamic numerical pain score > 3 and 12.7% (95% CI, 5.7%-25.1%) had neuropathic pain. 61.8%, 27.3% and 18.2% required pain medication at 1, 2 and 3 months, respectively. Only 7.2% had an analgesic regimen with tramadol at 3 months.

Conclusion: We report an incidence of persistent post thoracotomy pain at 3 months of 14.5% (95% CI, 6.9%-27.2%), when a thorough in-hospital acute pain service and outpatient follow up with a standardized analgesic protocol is used at 1, 2 and 3 months.

RESUMO

Introdução: A dor persistente pós-operatória afeta 35%-57% dos doentes aos 3 meses após toracotomia e a dor aguda pós-operatória parece ser um dos seus maiores preditores. O objetivo do estudo foi determinar a incidência de dor aos 3 meses pós-toracotomia com um regime analgésico em ambulatório padronizado.

Material e Métodos: Este estudo observacional prospetivo incluiu doentes adultos submetidos a toracotomia entre janeiro 2018 e março de 2020. Foi avaliada a dor nociceptiva e neuropática no pré-operatório, na alta hospitalar e aos 1, 2 e 3 meses de pós-operatório. A dor nociceptiva, estática e dinâmica, foi avaliada utilizando a escala numérica de dor (0 a 10). Os questionários DN4 e DN2 foram usados para avaliar a dor neuropática. Todos os doentes receberam paracetamol 1 g q8h, tramadol 50 mg q8h, ibuprofeno 400 mg q8h, e tramadol orodispersível 50 mg SOS. O ibuprofeno foi mantido entre 7-10 dias e, se contraindicado, era prescrito metamizol magnésico 575 mg q8h. Para dor neuropática, era adicionada pregabalina 50 mg q12h. A medicação foi reajustada aos 1, 2 e 3 meses, de acordo com as necessidades analgésicas.

Resultados: Foram incluídos 69 pacientes e 55 completaram o

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estudo. Aos 3 meses, 14,5% (95% CI, 6,9%-27,2%) tinham um score de dor dinâmica > 3% e 12,7% (95% CI, 5,7%-25,1%) tinham dor neuropática. 61,8%, 27,3% e 18,2% necessitaram de medicação analgésica aos 1, 2 e 3 meses, respetivamente. Aos 3 meses, apenas 7,2% tinham analgesia com tramadol.

Conclusão: Reportamos uma incidência de dor persistente pós-toracotomia aos 3 meses de 14,5% (95% CI, 6,9%-27,2%), após um seguimento durante o internamento em contexto de unidade de dor aguda e em ambulatório aos 1, 2 e 3 meses com um protocolo analgésico padronizado.

INTRODUCTION

Since its earliest references,[1] persistent postoperative pain was described in 1999 as lasting at least 2 months after surgery[2,3] and since then its definition has been widely discussed.[4,5] The International Classification of Diseases (ICD-11) defines chronic postsurgical pain as chronic pain developing or increasing in intensity after a surgical procedure and persisting beyond the healing process, i.e. at least 3 months after surgery.[6]

Persistent postoperative pain has been recognized as an increasingly significant clinical problem,[7] commonly associated with numerous risk factors, such as preoperative pain lasting more than 1 month, genetic predisposition, catastrophizing, depression and anxiety, chemo or radiation therapy to the surgical area, and acute uncontrolled postoperative pain.[7-10] In fact, a study reports that every 10% increase in the time spent in severe acute postoperative pain is associated with a 30% increase in chronic pain at 12 months,[11] highlighting the importance of effective and timely acute pain control.

A variety of surgical procedures, including lower limb amputation, abdominal, thoracic, vascular, cerebral or breast surgeries also predispose to persistent postoperative pain, especially when associated with nerve injury and long surgical time.[7,8,12]

Thoracotomy is particularly associated with severe pain, due to both surgical manipulation and postoperative thoracostomy tube, and further exacerbated by the patients' breathing.[13] Damage to the intercostal nerves has been postulated as the main responsible for the development of this type of pain.[14] After thoracotomy, persistent postoperative pain can affect 35%-57% of patients at 3 months[15-17] and acute postoperative pain appears to be one of the strongest predictors of chronic pain after thoracic surgery.[18]

To effectively control acute post-thoracotomy pain, various multimodal analgesic regimens have been proposed,[19-21] including nonsteroidal anti-inflammatory drugs (NSAIDs), ketamine, intravenous patient-controlled analgesia (i.v. PCA) with an opioid, as well as various regional techniques, such as epidural, paravertebral or intercostal block and fascial plane blocks (e.g. erector spinae block and serratus anterior plane block), often with local anesthetics and opioids combined. Subarachnoid injection of an opioid (morphine or sufentanil) has been advocated as more effective than systemic opioid analgesia.[22]

Persistent post-thoracotomy pain commonly has a neuropathic component.[23] Anticonvulsants, such as pregabalin, are recommended as first-line treatment for chronic neuropathic pain[24] although they have no preventive role in chronic postsurgical pain.[25,26]

Chronic postsurgical pain is a cause of chronic opioid consumption and a transitional pain service has been described as a method of postoperative opioid weaning.[17,27] It involves assessing the patients preoperatively, postoperatively in the hospital setting, and postoperatively in the outpatient setting with the aim of improving pain management and reducing the risk of developing chronic postsurgical pain.[28]

We aim to study the incidence of persistent post-thoracotomy pain with a standardized outpatient analgesic regimen with regular pain assessment in the first 3 months after surgery.

MATERIAL AND METHODS

Study Design

This was a questionnaire based single-center, prospective, observational study. Approval was obtained from the local ethical committee. The study included all patients, aged > 18 years, submitted to thoracic surgery via thoracotomy between January 2018 and March 2020.

Exclusion criteria were: inability to answer the questionnaires (≥3 unanswered questions), allergy or contraindication to the drugs included in the standardized postoperative analgesic regimen, chronic pain patients on regular strong opioids, procedures not performed under thoracotomy, and patients requiring surgical reintervention during the follow-up period.

The primary endpoint of this study is to identify the incidence of persistent post-thoracotomy pain with a standardized outpatient analgesic regimen with regular pain assessment in the first 3 months after surgery.

The secondary outcomes are to evaluate numerical pain scores, analgesic needs at 1, 2 and 3 months after thoracotomy, and describe the persistent postsurgical pain in the study population (intensity, neuropathic component and impact on quality of life).

Relevant clinical data was collected including: patient demographics; ASA physical status; radiotherapy/chemotherapy in the previous 6 weeks; regular preoperative medication (including analgesics, antidepressants, anxiolytics, gabapentin/pregabalin); type of surgery; postoperative analgesic regimen prescribed; postsurgical static and dynamic pain follow-up until analgesic discharge;

patient satisfaction regarding pain treatment; pain intensity and neuropathic pain at the day of discharge, at 1, 2 and 3 months after surgery; impact of pain in daily activities; and quality of life at 3 months after surgery. A set of questionnaires were designed based on validated scores: numerical rating scale (NRS, 0 to 10) to assess the intensity of static and dynamic pain, DN4 and DN2 questionnaires to evaluated the presence of neuropathic pain, and elements of the Brief Pain Inventory to assess quality of life.

To determine the incidence of nociceptive pain at the surgery location, dichotomous yes or no questions were asked. Static pain was assessed by asking the patient to rate their current pain at rest using the NRS.

Dynamic pain was evaluated by asking the patient to cough strongly two times and rate the pain with coughing using the NRS. NRS scores of 1 to 3 were considered light pain, scores of 4 to 6 as moderate pain, scores of 7 to 9 as severe pain and a score of 10 as maximal pain.

The DN4 questionnaire focused on the presence of burning, painful cold, electric shock, tingling, pins and needles, numbness, itching, touch hypoesthesia, pricking hypoesthesia and pain caused or increased by brushing.

The DN2 questionnaire consists of the first seven items of DN4 and was used during the telephonic interviews after discharge. A DN4 score ≥4 or DN2 score ≥3 was considered positive for neuropathic pain.

Questions from the Brief Pain Inventory about pain interference with general activity, enjoyment of life, sleep and relations with other people were used to assess quality of life.

Preoperatively, informed consent was obtained from all patients and questionnaire 1 (Appendix 1) was applied, assessing preoperative NRS of static and dynamic pain, and the presence of neuropathic pain assessed by the DN4 questionnaire.

Intraoperatively, all patients underwent total intravenous anesthesia alone or in combination with thoracic epidural or intrathecal morphine, according to the anesthesiologist's assessment and preference.

In our institution, lung resection via thoracotomy is performed on a weekly basis in about 8 patients per month by two teams of thoracic surgeons. The thoracotomy is either via anterolateral or posterolateral incision, depending on the specific surgical procedure.

Immediate postoperative analgesia was mainly maintained with paracetamol 1 g q6h combined with i.v. morphine PCA with basal infusion (up to 0.5 mg/h, bolus 1 mg, lock out 8 minutes) or i.v. morphine PCA without basal infusion for patients who had an intraoperative bolus of intrathecal morphine or epidural infusion of ropivacaine 0.1% and morphine 0.05 mg/mL at 4-8 mL/h.

On the day of hospital discharge, questionnaire 2 (Appendix 2) was performed evaluating postoperative pain at discharge using NRS of static and dynamic pain, and the DN4 questionnaire. At discharge, patients were prescribed one of the following outpatient analgesic regimens: a standard combination of paracetamol 1g q8h, tramadol 50 mg q8h, ibuprofen 400 mg q8h, and orodispersible tramadol 50 mg as needed (maximum q8h). Ibuprofen was maintained for a maximum of 7 to 10 days and, if there was any contraindication for NSAIDs, such as previous myocardial infarction, ischemic cardiomyopathy, glomerular filtration rate < 60 mL/min or history of peptic ulcer, metamizole magnesium 575 mg q8h was prescribed instead of ibuprofen. For patients with neuropathic pain according to DN4 questionnaire, pregabalin 50 mg q12h was added to the previous regimens.

During the follow-up period, there was a first in-hospital appointment at 7-10 days post-discharge, in which the analgesic regimen was reassessed and adjusted according to the patients' needs and ibuprofen/metamizole was stopped. At 1-, 2- and 3-months post-surgery, questionnaires 3 (Appendix 3) and 4 (Appendix 4) were applied via telephone and analgesic adjustments were made as required.

In these telephonic interviews, pain evaluation was accomplished through NRS of static and dynamic pain and DN2 questionnaire. In questionnaire 4 at 3 months post-surgery, pain trajectory and pain interference in daily life was also evaluated. Whenever the numerical pain score was < 3, tramadol was stopped and paracetamol maintained until the next telephonic reassessment. If there were no signs of neuropathic pain, after at least 1 month, pregabalin was also stopped.

After the final telephonic assessment, at 3 months post-surgery, patients who were under medication with dynamic numerical pain score > 3 or neuropathic pain were considered to have persistent post-thoracotomy pain and were referred to our institution's chronic pain clinic.

Statistical Analysis

A sample size calculation was initially performed, assuming a 35% incidence of persistent postsurgical pain.

It was calculated that a total of 110 participants would provide a 10% margin of error at a significance level of 0.05% and 20% drop-out. Unfortunately, we were forced to stop recruitment prematurely due to COVID-19 pandemic in March 2020 with 69 patients enrolled, which increases the margin of error to 12.6%.

A database was made using *Microsoft Excel* and statistical analysis was performed using *RStudio* (version 1.3.1093, PBC). A 95% confidence interval was calculated for the proportion of patients with persistent and neuropathic post-thoracotomy pain at 3 months after surgery.

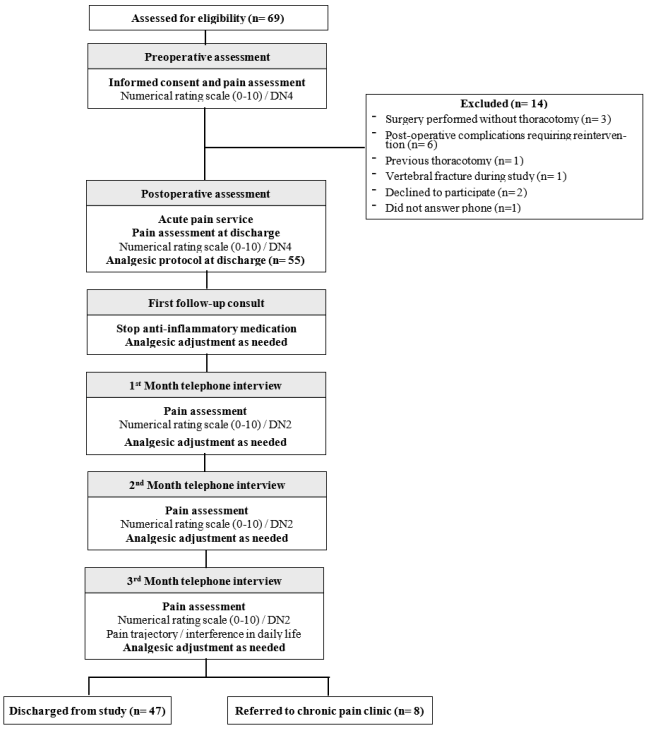

Figure 1. Flow diagram

Results

Sixty-nine patients who were scheduled to undergo thoracotomy were assessed for eligibility. A total of 14 patients were excluded throughout the course of the study: 11 did not meet the inclusion criteria, 2 refused to participate and 1 was lost to follow-up after the 1st month interview.

Fig. 1 shows the flow chart regarding analgesic assessment at discharge, first follow-up visit and telephone interviews at 1, 2 and 3 months.

Patient characteristics in terms of demographics, type of surgery, previous medication and treatments and satisfaction at discharge are presented in Table 1.

In our sample, the patients were 52.7% male and 47.3% female with a median age of 63 years old. The ASA physical status classification ranged from I-III, with 69.1% classified as ASA II. A majority of 80% of patients had not had neoadjuvant treatment and the most common surgical procedures were lung lobectomy (49.1%) and atypical lung resection (34.6%). Regarding pre-operative medication, 72.7% denied previous pain or psychiatric medication, 3.6% patients reporting frequent use of pain medication and 23.7% the use of psychiatric and/or neuropathic medication.

The most common postoperative analgesic regimen was i.v. PCA (47.3%), followed by epidural analgesia (43.6%) and 9.1% patients had combined subarachnoid analgesia with iv PCA. Regarding the analgesic regimen, most patients were satisfied or very satisfied with the analgesic control (47.3%).

Table 2 presents pain scores of static and dynamic pain and neuropathic characteristics as well as analgesic requirements throughout the evaluated time points and pain interference in daily life at 3 months.

The study group had a median hospital length of stay of 3 days. Patients had an IQR of 0 – 2 for static pain and 2 – 5.75 for dynamic pain until discharge. During the follow up

Table 1. Patient characteristics

Patient characteristics	
Gender, n (%)	
Male	29 (52.7%)
Female	26 (47.3%)
Age, median (10th percentil-90th percentile)	63 (45.4-74.6)
ASA physical status, n (%)	
I	1 (1.8%)
II	38 (69.1%)
III	16 (29.1%)
Previous treatment, n (%)	
None	44 (80%)
Radiotherapy	1 (1.8%)
Chemotherapy	10 (18.2%)
Type of surgery, n (%)	
Lung lobectomy	27 (49.1%)
Atypical lung resection	19 (34.6%)
Pneumonectomy	1 (1.8%)
Other	8 (14.5%)
Lung lobectomy + atypical lung resection	1 (1.8%)
Lung segmentectomy	3 (5.5%)
Pulmonary nodule enucleation	1 (1.8%)
Lymph node resection	1 (1.8%)
Pleural mass resection	1 (1.8%)
Thymoma	1 (1.8%)
Medication prior to surgery, n (%)	
None	40 (72.7%)
Use of pain medication	2 (3.6%)
Anti-inflammatory and/or paracetamol	1 (1.8%)
Minor opioid + Anti-inflammatory + paracetamol	1 (1.8%)
Use of psychiatric and/or neuropathic medication	13 (23.7%)
Antidepressants	2 (3.6%)
Antidepressants + gabapentinoids	1 (1.8%)
Anxiolytics	6 (11%)
Anxiolytics + antidepressants	3 (5.5%)
Anxiolytics + antidepressants + gabapentinoids	1 (1.8%)
Postoperative analgesia, n (%)	
i.v. PCA	26 (47.3%)
Intrathecal analgesia + i.v. PCA	5 (9.1%)
Epidural analgesia	24 (43.6%)
Satisfaction at discharge, n (%)	
Very satisfied	21 (38.2%)
Satisfied	26 (47.3%)
Not asked	8 (14.5%)

Table 2. Intensity and characteristics of postoperative pain

Postoperative pain		
Days of follow-up until discharge, median (IQR)	3 (2 - 4)	
	Static pain	**Dynamic pain**
Pain intensity, median (IQR)		
Day 1	0 (0 - 2)	3 (2 - 5)
Day 2	0 (0 - 2)	4 (2 - 5.75)
At discharge	0 (0 - 1.5)	3 (2 - 4.5)
1st month	0 (0 - 0)	2 (0 - 4)
2nd month	0 (0 - 0)	0 (0 - 2)
3rd month	0 (0 - 0)	0 (0 - 1.5)
DN4 at discharge, median (IQR)	1 (0 - 1)	
DN2, median (IQR)		
1st month	1 (0 - 1)	
2nd month	0 (0 - 1)	
3rd month	1 (0 - 1)	
Patients using pain medication, n (%)		
At discharge	55 (100%)	
1st month	34 (61.8%)	
2nd month	15 (27.3%)	
3rd month	8 (14.5%)	
Patients with neuropathic pain, n (%)		
At discharge	5 (9.1%)	
1st month	10 (18.2%)	
2nd month	7 (12.7%)	
3rd month	7 (12.7%)	
Pain interference at 3rd month > 3, n (%)		
General activity	1 (1.82%)	
Sleep	0 (0%)	
Relations with other people	0 (0%)	
Enjoyment of life	0 (0%)	

period, NRS were gradually lower with a IQR of 0 – 0 for static pain and 0 – 1.5 for dynamic pain at 3 months. The DN4 and DN2 scores had an IQR of 0 – 1 throughout the study period. Even though 61.8% of patients required pain medication at 1 month post-surgery, this percentage declines to 27.3% and 14.5% at 2- and 3-months post-surgery, respectively.

At the end of the study, 14.5% (95% CI, 6.9%-27.2%) of patients had dynamic numerical pain score > 3, had pain medication prescribed, were considered to have persistent post-thoracotomy pain and were referred to chronic pain clinic. Of note, half of these patients had chemotherapy in the 6 weeks prior to surgery and half of them were submitted to lobectomy.

The incidence of neuropathic pain at 3 months post-thoracotomy was 12.7% (95% CI, 5.7%-25.1%) in this group of patients. Of note, only one patient reported pain interference in general activity at 3 months.

DISCUSSION

In this study, 14.5% (95% CI, 6.9%-27.2%) of patients continued to have pain 3 months after thoracotomy. This study focused on outpatient follow-up pain management with a specific *per oral* analgesic regimen including paracetamol, anti-inflammatory drug and a weak opioid, with pregabalin when clinically required. A similar protocol has been researched by Tiippana E *et al* who studied the use of an extended pain management protocol including ibuprofen or paracetamol and tramadol, with a phone interview one week after discharge, and found this extended protocol to be likely more important than any particular analgesic technique in preventing acute and persistent post-thoracotomy pain.[29]

The apparently lower incidence of persistent post thoracotomy pain at 3 months in our study sample further supports that a prolonged patient follow-up regarding pain management might be beneficial in this population. In fact, the implementation of a transitional pain service has shown promising results in the management of patients at risk of chronic postsurgical pain or chronic opioid consumption.[27,28,30] Even though the incidence in our sample may seem lower than the incidence reported in the literature, a comparative analysis is limited by discrepancies in population, definition of persistent post-thoracotomy pain and in the methods used to evaluate pain. %here are other limitations to this study. The intraoperative management as well as the immediate acute pain management relied on the anesthesiologist's assessment and preference. Two surgical teams perform open thoracic surgery in our institution, which may confer additional technical heterogeneity. The major limitation is the lack of a control group, preventing a comparative analysis. Due to sample size limitations, we were unable to study possible associations between persistent post-thoracotomy pain and potential risk factors, such as chemotherapy prior to surgery and depressive or anxiety disorders. When compared to the literature, even though the results of this study are promising in terms of incidence of persistent post thoracotomy pain at 3 months, the lack of a control group makes it impossible to assume an association with the analgesic and follow up protocol.

It would be interesting to study the same protocol using the usual care as a control group and eventually extend the follow up period to 6 and 12 months.

CONCLUSION

We report an incidence of persistent post thoracotomy pain at 3 months of 14.5% (95% CI, 6.9%-27.2%), when a thorough in-hospital acute pain service and outpatient follow up with a standardized analgesic protocol is used at 1, 2 and 3 months. Further research is necessary to evaluate the importance of strict pain control in the first months after thoracotomy in preventing persistent postsurgical pain.

APPENDIX 1

QUESTIONNAIRE OF PREOPERATIVE PAIN

1. Currently, at rest, do you have any pain in the area where you will have surgery?
• Yes ___ No ___

1.1 If you have pain, how do you rate your pain right now, on a scale of 0 to 10, where 0 means no pain and 10 means the worst imaginable pain?
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

2. Currently, after coughing twice, do you have any pain in the area where you will have surgery?
• Yes ___ No ___

2.1 If you have pain, how do you rate your pain right now, on a scale of 0 to 10, where 0 means no pain and 10 means the worst imaginable pain?
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

3. Pain characterization:
3.1 Does your pain have one or more of the following characteristics?
• Burning Yes ___ No ___
• Painful cold Yes ___ No ___
• Electric shock Yes ___ No ___

3.2 Is the pain associated with one or more of the following symptoms in the same area?
• Tingling Yes ___ No ___
• Pins and needles Yes ___ No ___
• Numbness Yes ___ No ___
• Itching Yes ___ No ___

3.3 Is the pain located in an area where the physical examination has one or more of the following characteristics?
• Hypoesthesia to touch Yes ___ No ___
• Hypoesthesia to pinprick Yes ___ No ___

3.4 In the painful area, can the pain be caused or increased by:
• Brushing Yes ___ No ___
Total DN4 ___/10

APPENDIX 2

QUESTIONNAIRE OF POSTOPERATIVE PAIN AT DISCHARGE

1. Currently, at rest, do you have any pain in the area where you had surgery?
• Yes ___ No ___

1.1 If you have pain, how do you rate your pain right now, on a scale of 0 to 10, where 0 means no pain and 10 means the worst imaginable pain?
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

2. Currently, after coughing twice, do you have any pain in the area where you had surgery?
• Yes ___ No ___

2.1 If you have pain, how do you rate your pain right now, on a scale of 0 to 10, where 0 means no pain and 10 means the worst imaginable pain?
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

3. Pain characterization:
3.1 Does your pain have one or more of the following characteristics?
• Burning Yes ___ No ___
• Painful cold Yes ___ No ___
• Electric shock Yes ___ No ___

3.2 Is the pain associated with one or more of the following symptoms in the same area?
• Tingling Yes ___ No ___
• Pins and needles Yes ___ No ___
• Numbness Yes ___ No ___
• Itching Yes ___ No ___

3.3 Is the pain located in an area where the physical examination has one or more of the following characteristics?
• Hypoesthesia to touch Yes ___ No ___
• Hypoesthesia to pinprick Yes ___ No ___

3.4 In the painful area, can the pain be caused or increased by:
• Brushing Yes ___ No ___
Total DN4 ___/10

APPENDIX 3

TELEPHONE QUESTIONNAIRE OF POSTOPERATIVE PAIN AT 1 AND 2 MONTHS POST-SURGERY

1. Currently, at rest, do you have any pain in the area where you had surgery?
• Yes ___ No ___

1.1 If you have pain, how do you rate your pain right now, on a scale of 0 to 10, where 0 means no pain and 10 means the worst imaginable pain?
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

2. Currently, after coughing twice, do you have any pain in the area where you had surgery?
• Yes ___ No ___

2.1 If you have pain, how do you rate your pain right now, on a scale of 0 to 10, where 0 means no pain and 10 means the worst imaginable pain?
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

3. Pain characterization:
3.1 Does your pain have one or more of the following

characteristics?
• Burning Yes ___ No ___
• Painful cold Yes ___ No ___
• Electric shock Yes ___ No ___

3.2 Is the pain associated with one or more of the following symptoms in the same area?
• Tingling Yes ___ No ___
• Pins and needles Yes ___ No ___
• Numbness Yes ___ No ___
• Itching Yes ___ No ___

Total DN2 ___/7

APPENDIX 4

TELEPHONE QUESTIONNAIRE OF POSTOPERATIVE PAIN AT 3 MONTHS POST-SURGERY

1. Currently, at rest, do you have any pain in the area where you had surgery?
• Yes ___ No ___

1.1 If you have pain, how do you rate your pain right now, on a scale of 0 to 10, where 0 means no pain and 10 means the worst imaginable pain?
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

2. Currently, after coughing twice, do you have any pain in the area where you had surgery?
• Yes ___ No ___

2.1 If you have pain, how do you rate your pain right now, on a scale of 0 to 10, where 0 means no pain and 10 means the worst imaginable pain?
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

3. Pain trajectory:
3.1 Since hospital discharge until today, has your pain:
• Got worse Yes ___ No ___
• Got better Yes ___ No ___
• Stayed the same Yes ___ No ___

4. Pain characterization:
4.1 Does your pain have one or more of the following characteristics?
• Burning Yes ___ No ___
• Painful cold Yes ___ No ___
• Electric shock Yes ___ No ___

4.2 Is the pain associated with one or more of the following symptoms in the same area?
• Tingling Yes ___ No ___
• Pins and needles Yes ___ No ___
• Numbness Yes ___ No ___
• Itching Yes ___ No ___

Total DN2 ___/7

5. In the past week, on a scale of 0 to 10, where 0 means "does not interfere" and 10 means "completely interferes", how has pain interfered with:
5.1 General activity
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

5.1.1 Which activity is most affected?
• Work __ Housework __ Leisure __

5.2 Enjoyment of life
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

5.3 Sleep
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

5.4 Relations with other people
• 0 __ Mild (1-3) __ Moderate (4-6) __ Severe (7-9) __ Maximal (10) __

CONTRIBUTORSHIP STATEMENT / DECLARAÇÃO DE CONTRIBUIÇÃO

MRP, SC, SS, MM, CA, SC, AS: Contributed to the study design, data collection and writing.
All authors approved the final version to be published.
MRP, SC, SS, MM, CA, SC, AS: Contribuíram no desenho de estudo, colheita e tratamento dos dados e redação.
Todos aprovaram a versão final a ser publicada.

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Protection of Human and Animal Subjects: The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki as revised in 2013).
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Responsabilidades Éticas
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Proteção de Pessoas e Animais: Os autores declaram que os procedimentos seguidos estavam de acordo com os regulamentos estabelecidos pelos responsáveis da Comissão de Investigação Clínica e Ética e de acordo com a Declaração de Helsínquia revista em 2013 e da Associação Médica Mundial.
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