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Chronic post-surgical pain after colon surgery in patients included in an enhanced recovery program

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Background: Enhanced recovery after surgery (ERAS) program improves immediate recovery. Beyond immediate benefits, long-term impact of ERAS implementation is not yet evident. This retrospective single-center cohort study investigates prevalence and characteristics of chronic post-surgical pain (CPSP) in patients who underwent colon surgery.

Methods: Two hundred and ninety-seven patients enrolled prospectively in our ERAS database were contacted by mail to question the presence of CPSP. In case of CPSP, intensity, location, and type of pain, impact of pain on quality of life and treatment taken were assessed. Post-operative pain experience during hospital stay, recall of pain, and discomfort duration when back home were assessed in all patients. Comparison between patients with and without CPSP was made to approach the risk factors of CPSP in this population.

Results: At 27 months after colon surgery, 25/198 patients reported CPSP (12.6%) and pain was severe in 5 patients (2.5%). CPSP had a deep abdominal component in 56% of patients and a parietal component in 20% of patients. Patients with CPSP+ differed from patients CPSP− for pre-operative pain presence (56% vs 24.8%, $P = 0.004$), recalled post-operative pain intensity (4 vs 3, $P = 0.045$), duration of discomfort after discharge (2 vs 1 weeks, $P = 0.035$). Pre-operative pain was found as a significant CPSP risk factor (odds ratio 1.34; 95% CI: 1.05-1.70).

Conclusion: CPSP prevalence after laparoscopic colon surgery seems not much affected by ERAS context. Pre-operative presence of pain emerged as an important risk factor. These findings should be confirmed in a prospective multicenter study.

1 | INTRODUCTION

Enhanced recovery after surgery (ERAS) program, also called fast-track (FT) surgery is defined as a multimodal pathway aimed to reduce surgical stress by using well-designed specific measures causing less organ dysfunction, less morbidity and faster recovery.[1] In the field of colorectal surgery, FT is considered as the most important innovation after the advent of laparoscopy.[2] Most common applied measures of the pathway are early post-operative feeding and mobilization, no post-operative nasogastric tube, no pre-operative bowel preparation, epidural analgesia, and no pre-operative fasting.[3] ERAS program is centered on the patient, certainly contributing to improved recovery. A reduction of the length of hospital stay with a similar 30-day complication rate is observed.[4] Beyond these immediate benefits, long-term benefits in relation with the implementation of ERAS program is not yet evident.[5] Among patient's reported outcome measures, chronic post-surgical pain (CPSP) defined as pain that persists past normal healing time has received more and more attention and has become a global health priority.[5,6] CPSP is frequent after surgery

with an average incidence of 10% including 2% of patients suffering severe pain, which strongly affects their daily quality of life.[7] CPSP represents a significant medical and socioeconomic problem because it delays recovery, reduces satisfaction, affects the quality of life of patients, and increases healthcare utilization.[2] As a consequence, CPSP prevention stands as an indicator of health care quality.[8] Reports about CPSP after abdominal procedures and specifically colon surgery are scarce in the literature by comparison with other procedures like thoracotomy, mastectomy, inguinal hernia repair, or arthroplasties.[9] The prevalence of CPSP after open and laparoscopic colon surgery ranges between 17% and 34%.[7,10,11] In large cohorts of patients, retrospective analysis shows a 17%-26% CPSP incidence between 1 and 3 years after surgery.[12,13] While there appears to be no difference between open and laparoscopic techniques,[7] to our knowledge, there are currently no data regarding the impact of ERAS program on CPSP incidence after colon surgery. The primary aim of the present study was to investigate the prevalence of CPSP after colon surgery in patients included in a complete ERAS program and CPSP characteristics. The secondary aim of the study was to characterize patients with or without CPSP and to explore risks factors of CPSP after colon surgery in an ERAS program.

Editorial comment

Persistent post-surgical pain is now recognized as a potentially preventable cause of chronic pain. Apart from perioperative pharmacological interventions, the choice of surgical technique probably can be involved in its development. Here, the prevalence and characteristics of pain after fast track colorectal surgery was retrospectively studied. The prevalence of chronic post-surgical pain was no different from surgery without a fast-track procedure. As in earlier studies, pre-operative pain was also found to be an important risk factor.

2 | MATERIALS AND METHODS

After approval by the Institution Ethical Committee (Commission d'Ethique Biomédicale Hospitalo-Facultaire n°2012/05MAR/092, Belgian n°B403201213674; Président: Pr J-M. Maloteaux) a survey questionnaire was mailed to all the patients included in the ERAS program after colon surgery register of the Cliniques universitaires Saint-Luc, Brussels, Belgium, between April 2007 and February 2014. The inclusion criteria in the ERAS program were colonic disease, patient consent, propitious social context, ASA score < 4, and absence of severe neuropsychiatric disease.

2.1 | Mailing

A first mailing was made in May 2012 for patients who underwent surgery between April 2007 and December 2011 (results were presented at the annual meeting of the American Society of Anesthesiologists; 13-17 October 2012; Washington, DC. Abstract 886). A second mailing was achieved in June 2015 for patients who underwent surgery between January 2012 and February 2014 (Figure 1, Flow chart). The sending of a second mailing was decided following the introduction in 2011 of a new surgical technique, namely the single-incision laparoscopic surgery (SILS) approach. In order to improve the response rate, the questionnaire was mailed

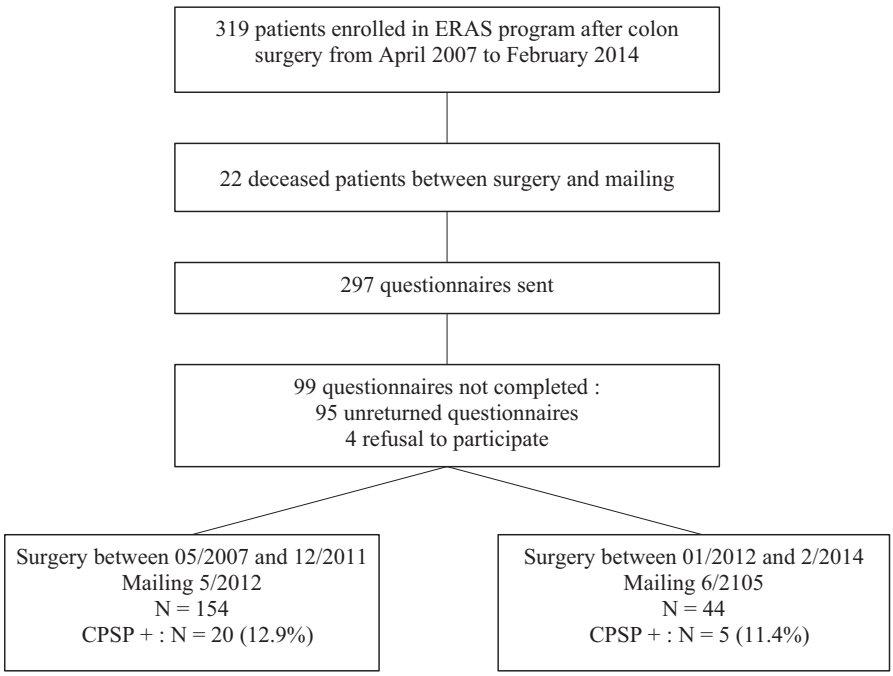

FIGURE 1 Flow chart of patients' inclusion in the survey

with a pre-stamped envelope for reply. In case of no response at 8 weeks, a second mailing was sent.

2.2 | Questionnaire

For the survey, we used an easy-to-use non-validated questionnaire adapted from the validated Brief Pain Inventory and from the validated French version of the McGill Pain Questionnaire, ie, the "Questionnaire Douleur de Saint Antoine (QDSA)." The questionnaire was sent at least 3 months after the surgery. The persistence of pain that patients considered directly related to their colorectal surgery was assessed in a dichotomous manner ("do you have actual pain that you consider being directly related to your colonic surgery?"). In case of positive response, the intensity of the average and maximal pain during the previous week and present pain were questioned on an numeric rating scale (NRS) from 0 to 10 (0, no pain, and 10, the worst pain possible). The location(s) (scars, upper or lower deep abdominal, lower back, perineal, anal or genital area, lower limbs, shoulder or else to specify) of present pain were specified by the patient including the possibility to mention pain related to epidural placement (thoracic back pain, lower limbs pain, etc.). Characteristics of pain and intensity of the different pain modalities were assessed to better approach the type of pain and specifically the neuropathic component of the pain (from Short-form Mc Gill Pain Questionnaire). Patients had to evaluate the following adjectives using a 4-point Likert scale (absent, mild, moderate, or severe): throbbing, cramping, gnawing, aching, heavy, and tender as continuous pain descriptors, shooting, stabbing, sharp, splitting, electric shock, and piercing as intermittent pain descriptors, hot burning, cold freezing, light touch, tingling, and numbness as predominantly neuropathic pain descriptors and finally exhausting, sickening, fearful, and punishing as affective descriptors.[14] Pain impact on the quality of life including daily activities, leisure, sleep, and mood (dichotomic response, eg, does pain affect your sleep? Your mood? …) was also questioned. Finally, the medications taken to relieve chronic pain (yes or no) and the name of the painkillers taken as well as treatment efficacy (none, partly effective, effective) were assessed.

As we sought to explore the emotional context of the pain experience in ERAS, the questionnaire also assessed the global satisfaction concerning adherence to ERAS protocol on a 5-point Likert-scale (very unsatisfactory to extremely satisfactory) or the recall about acute post-operative pain that was associated to a NRS between 0 and 10 (0, no pain, and 10, the worst pain possible) for average and maximal pain during hospitalization. Efficacy of analgesia provided when in the hospital, quality of pre-operative information about ERAS program and satisfaction about length of hospital stay were assessed in a dichotomous manner (yes or no). Further, the patients were also asked to recall with a scale the duration of post-operative pain and discomfort they experienced when back home (never, less than 2 weeks, 2 to 4 weeks, more than 4 weeks). They were also asked to specify the location of the post-operative pain they had on a body scheme.

2.3 | Data retrieved from ERAS register

Date of surgery (to calculate time interval between surgery and questionnaire mailing), site of surgery (right colectomy, left colectomy, total colectomy, sigmoidectomy, transverse colectomy), indication for surgery (cancer, chronic Inflammatory Bowel Disease (IBD) or diverticulitis), surgical technique (laparoscopy or laparotomy), patient's demographic data like sex, age, ASA score, Association Française de Chirurgie (AFC) score, Body Mass Index (BMI), post-operative complications (acute and late), readmission, reoperation, Dindo-Clavien score, and use of adjuvant chemotherapy were retrieved from the ERAS register to assess possible risks factors.

2.4 | Data retrieved from patient's medical record

Other possible risks factors such as smoking, diabetes, presence of pre-operative pain (from pre-operative systematic Kalkman score calculation), use of pre-operative opioids, type of post-operative analgesia (epidural vs intravenous Patient-Controlled Analgesia), intensity of pain on an NRS from 0 to 10 at rest or at movement at day 1 and day 2 assessed by the Acute Postoperative Pain Service were completed from patient's medical records.

2.5 | Perioperative analgesic protocol as part of ERAS program

All patients included in our ERAS program underwent pre-operative anesthetic consultation and «FT dedicated» nurse consultation at 2 weeks before the procedure or earlier. The anesthetic protocol was standardized as following. Patients were pre-medicated with oral clonidine 150 mcg. At the induction of anesthesia, a thoracic epidural catheter was placed for intra- and post-operative administration of local anesthetic (levobupivacaine) and sufentanil. In case of hemostatic disorders, patient refusal, or epidural placement failure, an intravenous lidocaine infusion was administered (bolus of 1.5mg/Kg followed by an infusion of 2mg/Kg/h during surgery and 1mg/Kg/h for the following 24 h). Multimodal intraoperative analgesic regimen also included intravenous magnesium 2 gr, ketorolac 30 mg (contraindications: active gastrointestinal ulcer, glomerular filtration < 60 ml/min and allergy) and ketamine (bolus dose of 0.5 mg/kg followed by continuous infusion 0.25 mg/kg/h stopped at the end of the surgical procedure). The post-operative analgesic protocol included a continuous epidural infusion of levobupivacaine 0.125% with sufentanil 0.1 µg/ml as well as systematic administration of paracetamol 3 g per day and ibuprofen 800 mg per day for 48 h. Tramadol was used as rescue analgesic. All patients left the hospital with a standardized analgesic prescription and an explanatory leaflet for post-operative follow-up. They were examined on post-operative Day10 by the surgeon.

2.6 | Statistical analysis

Statistical analysis was performed with SigmaStat 3.5 (Systat Software GmbH, Erkrath Germany). Results were expressed

as proportions, mean ± standard deviation, or median value (interquartile range) as specified. According to a Kolmogorov-Smirnov normality test, parametric data between the groups were compared by unpaired Student *t* test and nonparametric data by Mann-Whitney Rank Sum test. Categorical data were compared using chi-squared test and Fisher exact test using a 2-tailed probability. A *P*-value less than 0.05 was considered to be significant.

Univariate regression model was used to assess the association between CPSP related to surgery (dependent variable) and potential risk factors (independent variables). For the univariate regression, variables found in the analysis between CPSP and no CPSP groups with a *P*-value < 0.1 were included: age, pre-operative pain, intensity of recalled median post-operative pain, efficacy of post-operative pain treatment, and length of post-operative discomfort after discharge. The same variables have been found to well-known risks factors for CPSP in the literature (Althaus' model[15]) and in other studies.[10,11,16] The indication of surgery (cancer versus inflammatory disease) was also taken into account as it was found very relevant in a previous study.[11] Finally, a multivariate logistic regression model (backward stepwise model; *P* < 0.05) was used to determine independent risk factors for CPSP, keeping in the equation the variables which were found relevant in the univariate analysis: pre-operative pain, efficacy of post-operative pain treatment, indication of surgery, and length of post-operative discomfort after discharge.

3 | RESULTS

From April 2007 to February 2014, 319 patients met our inclusion criteria and were enrolled in the ERAS program for colon surgery. Two hundred and ninety-seven questionnaires were sent to the surviving patients and 198 questionnaires were returned, ie, response rate of 66.7% (Flow chart, Figure 1). Characteristics of the patients, responders vs non-responders, are reported in Table 1. One hundred and ninety-eight patients were included in the final analysis, 107 men and 91 women, average age 59 ± 12 years, who comment on their experience of acute pain and the persistence or not of pain after colon surgery at a median of 27 months (IQR: 16-38 months) after the surgical procedure.

Out of 198 patients who completed the questionnaire, 25 patients reported CPSP *directly* related to the surgery (prevalence: 12.6%) and pain was severe (ie, NRS ≥ 6 on a scale from 0 to 10) in 5 patients (prevalence: 2.5%). Average and maximal daily pain intensities in CPSP patients were respectively 3 (1-4.5) and 5 (3-8) on an NRS from 0 to 10. CPSP had a deep abdominal origin in 56% (n = 14/25) of the cases whose characteristics argued for a high probability of visceral pain (deep abdominal or pelvis location) and a parietal location with a high probability of neuropathic component in 20% (n = 5/25) of the patients (neuropathic characteristics mentioned in the QDSA questionnaire). Remaining patients reported combinations of abdominal, low back and shoulder pain. Fifty percent of patients (13/25) with CPSP visited a physician for pain and 36% (9/25) needed analgesics intake. Analgesics were considered effective by 47.8% of the patients and partially effective by 52.2% of patients. No patient mentioned regular intake of strong opioid analgesic. CPSP had a negative impact on the quality of life of 62% of the patients as following: 44% reported sleep disturbances, walking ability was affected in 25%, and driving ability in 28%, social life was reduced in 20% of patients. Inability to concentrate was found in 12.5% of patients. Finally, the presence of chronic pain had a negative effect on the mood in 56% of the patients.

The demographic characteristics of patients with CPSP (CPSP+) and without CPSP (CPSP–) are reported in Table 2. Presence of pre-operative pain was more frequent in CPSP+ patients (56% vs 24.8%, *P* = 0.004). The surgical technique either laparoscopic with mini-Pfannenstiel or conversion to median laparotomy did not affect the presence of CPSP (Table 2). Similarly, SILS approach, demonstrated

TABLE 1 Characteristics of responders and non-responders to the survey

	Responders n = 198	Non-responders n = 141*	*P* value
Age (years)	60 ± 12	59 ± 14	0.558
ASA status	2 [2-2]	2 [2-2]	0.555
Sex ratio (M/F)	107/91	80/61	0.890
AFC score (0-4)	0 [0-0]	0 [0-1]	0.554
BMI (Kg/m2)	22 [23-28]	25 [23-27]	0.901
Intraoperative complications (n) (%)	3 [1.5]	7 [4.9]	0.100
Post-operative complications < 30 days (n) (%)	37 [18.7]	42 [29.8]	0.802
Dindo-Clavien score	0 [0-1]	0 [0-2]	0.095
Readmission (n) (%)	8 [4.0]	15 [10.6]	0.027
Reoperation (n) (%)	8 [4.0]	11 [7.8]	0.301

*Non-responders including deceased patients (n = 22).

TABLE 2 Demographic characteristics of patients with and without chronic post-surgical pain (CPSP)

	CPSP− n = 173	CPSP+ n = 25	*P* value
Time interval between surgery and questionnaire (months)	34 ± 12	28 ± 15	0.092
Age (years)	61 ± 13	56 ± 12	0.065
ASA status	2 [2-2]	2 [2-2]	0.884
Sex ratio (M/F)	93/77	14/11	0.890
BMI (Kg/m^2)	25 [23-28]	24 [22-27]	0.216
Pre-operative pain (n) [%]	43 [25]	14 [56]	0.004
Pre-operative opioids (n) [%]	0 [0]	1 [4]	0.131
History of abdominal surgery (n) [%]	86 [57]	16 [63]	0.810
Diabetes (n) [%]	7 [4]	0 [0]	0.599
Smoking (n) [%]	32 [18.5]	8 [32]	0.179
Cancer/Chronic inflammatory disease (n) [%]	112/61 [65/35]	12/13 [48/52]	0.124
Intraoperative complication/conversion to laparotomy (n) [%]	16 [9]	3 [12]	0.710
Post-operative complications < 30 days (n) [%]	50 [29]	5 [20]	0.336
Dindo-Clavien score	0 [0-1]	0 [0-1]	0.920
Length of hospital stay (days)	3 [3-3]	3 [3-3]	0.999
Consultation to emergency room < 30 days (n) [%]	8 [4.6]	3 [12]	0.148
Reoperation (n) [%]	9 [5.2]	1 [4]	0.855
Adjuvant chemotherapy (n) [%]	6 [3.5]	2 [8]	0.265

no different prevalence between CPSP− and CPSP+ patients (n = 20, 12, 9% vs. n = 5, 11, 4%). It is also interesting to note that presence of painful complaints not directly related to colon surgery was mentioned by 40% (n = 10) of patients with CPSP vs 20.4% (n = 37) of patients without CPSP ($P = 0.041$).

The post-operative experience of the patients is detailed in Table 3. From medical records, 92% and 96% of the patients benefited from perioperative epidural analgesia in CPSP− and CPSP+ groups, respectively. No difference was found between the two groups for NRS pain scores assessed by the Acute Pain Service at rest and movement at day1 and day2 (Table 3). The global experience with FT protocol was very positive in almost all the patients as underlined by various items in Table 3. The difference between patients without and with CPSP concerned the intensity of recalled average (median) post-operative pain and the duration of post-discharge discomfort that were higher in CPSP+ patients (Table 3).

Univariate regression analysis found the following variables associated with the development of CPSP: the presence of pre-operative pain ($P = 0.021$) and the efficacy of post-operative pain treatment ($P = 0.003$). Age ($P = 0.102$), indication of surgery, ie, cancer or chronic inflammatory bowel disease ($P = 0.073$), recall about mean intensity of post-operative pain ($P = 0.206$) and the duration of discomfort after discharge ($P = 0.059$) were not significant. In the final multivariate logistic regression model, presence of pre-operative pain predicted the development of CPSP with an odds ratio of 1.34 (95% CI: 1.05-1.70). The efficacy of perioperative pain treatment in contrast was associated with a reduction of the risk of CPSP with an odds ratio of 0.25 (95% CI: 0.07-0.83).

4 | DISCUSSION

Our results demonstrate a 12.6% prevalence of CPSP, with 2.5% severe pain, directly related to the procedure at 27 months after FT colon surgery. Neuropathic characteristics of CPSP were reported by 20% of the patients. The presence of some pre-operative pain was the most relevant predictive factor of the development of CPSP in our population.

Although abdominal surgery is common, specifically in the context of colon cancer, CPSP after colon surgery has so far received little attention. However, our prevalence of CPSP is in the range of the one actually reported after surgery, all procedures taken together,[5,7] but is slightly lower than previously reported for colon resection under open surgery (18%)[10] and also laparoscopic surgery without ERAS program implementation (17%). In this later retrospective study[11] dedicated to chronic pain after laparoscopic colorectal surgery, the authors using our questionnaire mentioned severe disabling CPSP (NRS > 7/10) in 37% of the patients[11] compared to less than 20% of CPSP patients in our study while average CPSP intensity was similar.

In addition, compared to the aforementioned studies,[10,11] characteristics of pain seem somewhat different. Neuropathic

TABLE 3 Post-operative pain experience in patients with and without chronic post-surgical pain

	CPSP− n = 173	CPSP+ n = 25	*P* value
Assessed by Acute Pain Service during hospital stay			
NRS (0-10) at rest D1	2 [0-3]	1 [0-3]	0.368
NRS (0-10) at movement D1	4 [2-5]	4 [3-5]	0.914
NRS (0-10) at rest D2	2 [0-3]	1.5 [0-2]	0.617
NRS (0-10) at movement D2	4 [3-5]	3 [3-4]	0.305
Recall of fast-track experience and acute post-operative pain during hospital stay			
Global experience of enhanced recovery protocol	4 [4-5]	4 [3.5-5]	0.693
1: very unsatisfactory			
2: unsatisfactory			
3: satisfactory			
4: very satisfactory			
5: extremely satisfactory			
Recall of post-operative pain	2 [1-2]	2 [1-3]	0.436
0: No recollection			
1: No pain			
2: Mild to moderate pain			
3: Severe pain			
Intensity of recalled median post-operative pain on NRS (0-10)	3 [1-5]	4 [2-7]	0.045
Intensity of recalled maximum post-operative pain on NRS (0-10)	3 [1-6]	5 [2-7]	0.200
Efficacy of post-operative pain treatment (n) (%)	150 [87]	18 [73]	0.071
Efficacy of analgesic relay (n) (%)	157 [91]	23 [92]	0.920
Need of more painkillers (n) (%)	20 [12]	3 [12]	0.986
Need of more explanations (n) (%)	17 [10]	4 [16]	0.313
Satisfaction about length in hospital stay (n) (%)	141 [82]	22 [88]	0.649
Recall of acute post-operative pain and discomfort at home			
Length of acute post-operative pain after discharge	1 [0-2]	1 [0.5-2]	0.320
1: Never			
2: <2 weeks			
3: 2 to 4 weeks			
4: > 4 weeks			
Length of post-operative discomfort after discharge	1 [0-2]	2 [1-3]	0.035
1: Never			
2: <2 weeks			
3: 2 to 4 weeks			
4: >4 weeks			

characteristics of CPSP were reported by 47% of CPSP patients after open midline laparotomy[10] and by at least 40% of the patients after laparoscopic approach,[11] while in our study, 20% of the patients might have a neuropathic component in their CPSP. The presence of a neuropathic component in CPSP is generally associated to increased pain severity and poorer quality of life.[7] Among our patients, 56% reported visceral CPSP, a prevalence similar to that found after laparoscopic approach (55%) in the study of Joris.[11] The aforementioned findings regarding the nature of CPSP in this study should be considered with caution because no direct physical examination of patients was made, and diagnosis was exclusion diagnosis based on pain characters reported in CPSP questionnaire. Thereby, it appears that the multimodal patient-centered approach used in ERAS program compared to conventional care only slightly helps to reduce CPSP incidence but might contribute to decrease the severity of CPSP after colon surgery. Such observations certainly deserve attention and some discussion regarding both protective and risk factors associated to the development of CPSP after colon surgery in the context of ERAS program.

In our patients, the presence of some pre-operative pain was the most relevant predictive factor of the development of CPSP. "Pain predicts pain"[17] and pre-operative pain at the surgical site or elsewhere is a serious risk factor for chronic pain after surgery as stated in the risk index developed by Althaus[15] and in several large studies.[7,12] At 6 months after gastrointestinal surgery, 29% of patients with pre-operative remote pain and 35% of patients with pre-operative pain at the surgical site reported CPSP.[16] In the context of laparoscopic colorectal surgery, pre-operative pain was an independent risk factor of CPSP (odds ratio: 4.22).[11] More than a half of our patients with CPSP presented with pre-operative pain and pre-operative pain increased the risk of CPSP by average 30% (odds ratio 1.34; 95% CI: 1.05-1.70). Here, it is worth mentioning that patients with CPSP at the surgery site also report other pain conditions as it was the case in 40% of our patients.[16]

The severity of acute post-operative pain usually stands as a major predictor of CPSP,[7,15] particularly the amount of time spent in unrelieved pain rather a single peak pain intensity rating.[7] In our study, punctual objective measurements of post-operative pain by the Acute Pain Service did not show difference between patients with and without CPSP. Although the presence of epidural analgesia might by a possible explanation, a similar observation was made by other authors.[16] Also, recall of post-operative pain and discomfort only slightly differed between patients with and without CPSP. The relationship between acute post-operative pain and CPSP remains difficult to understand and today no causality link has been formally established.[18] In summary, all these observations seem to point to individuals more prone to develop pain whatever its origin[8] and the fact that CPSP is probably more often "individual-related" than correlated to the degree of tissue injury caused by surgery.

Finally, our findings in agreement with the literature support the negative impact of CPSP on the patient's daily quality of life.[6,7] Indeed, 62% of our patients with CPSP reported a negative impact of pain on their quality of life at 2 years and later after laparoscopic colorectal surgery.

4.1 | Strengths and limitations of the present study

Our study is potentially limited by its nature, namely questionnaire based.

First, the rate of non-responders (30%) could have introduced a selection bias. We cannot exclude that the responding population was not representative of the general population and, that the observed prevalence of CPSP is misestimated. Indeed, the non-responding population had a higher rate of re-admissions for complications. However, complications did not appear to be associated with CPSP development in the present study. Probably, the use of phone calls to administer questionnaire could increase the response rate. Second, the retrospective nature and the variable interval between surgery and completion of questionnaire could have produced a recall bias. Nevertheless, we used several prospectively collected data from our databases inter alia for the presence of pre-operative pain. Sending the mail at a specific interval after surgery probably reduces the recall bias. Third, although easy-to-use, the questionnaires were self-administered. Patients have not been examined physically and we did not use specific questionnaires to assess anxiety, catastrophizing or pain characteristics. For example, the visceral nature of pain was an exclusion diagnosis from the data reported in the questionnaire by the patient, eg, deep abdominal and/or pelvic pain, diffuse location and no characteristic of neuropathic component in the descriptive pain items. The neuropathic features of CPSP also were assessed by the French version of the validated short-form of McGill questionnaire and the QDSA but not by well-known questionnaire like the DN4. In summary, the present study suffers the possible bias related to its design, ie, retrospective nature and based on questionnaire.

In contrast, the strength of this study relies on the fact that all patients were included in a specific and complete FT protocol after colonic surgery and, all the peri-operative data were prospectively reported in hospital ERAS database.

In conclusion, although being a retrospective analysis of a single center cohort of patients, the present study is the first one to examine the incidence of CPSP in a population of patients undergoing laparoscopic colon surgery with a complete ERAS program (ie, multimodal patient-centered approach). We report a quite similar prevalence of CPSP to that previously reported for the same procedure performed under laparoscopic approach but without ERAS context. Further, our data underline the presence of pre-operative pain as an important risk factor, increasing by 30% the risk to develop CPSP in this context. Consequently, future studies should target those patients from either/both pre-operative psychologic (eg, anxiety, catastrophizing) and pathophysiologic (eg, assessment of endogenous pain processing) management. Also, in the present study, all the patients received perioperative epidural analgesia although the technique is not anymore recommended for laparoscopic approaches in ERAS protocols.[19] It is not excluded that some high-risk patients benefited of epidural analgesia as CPSP preventive strategy. Finally, the present findings, including predictors of CPSP such as pre-operative pain or efficacy of post-operative analgesia regimen, deserve to be prospectively studied in ERAS patients and certainly should be encoded in a systematic manner in existing ERAS databases.

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CONFLICT OF INTEREST

The authors have no conflict of interest.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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