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ORIGINAL

Observational study to evaluate the impact of the presence of preoperative chronic pain on postoperative outcomes after abdominal hernia surgery

Estudio observacional para evaluar el impacto de la presencia de dolor crónico preoperatorio en los resultados postoperatorios tras la cirugía de hernia abdominal

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ABSTRACT:

Introduction: Most recent studies indicate that acute postoperative pain remains an unsolved problem. The most consistently associated predictive factor in abdominal hernia surgery is the existence of chronic preoperative pain. The main objective of the study is to evaluate the impact that the presence of chronic preoperative pain may have on the postoperative pain of these patients after hernia surgery. The secondary objective is to assess the quality of postoperative care of patients by filling in the multidimensional IPO questionnaire ("International Pain Outcome").

Patients and methods: Prospective observational case-control study, comparing the postoperative results obtained in the surgical hospitalization ward 24 hours after the surgical procedure by filling in the multidimensional IPO ("International Pain Outcome") questionnaire within the international quality project Pain- Out for the improvement of postoperative results. The primary variable of the study was the assessment of acute postoperative pain 24 hours after surgery, which included: worst pain, least pain, percentage of time with severe pain, and percentage of pain relief with treatment. The comparison of the postoperative results obtained is based on the responses obtained from the questionnaire, the responses being of three types, numerical (0-10), dichotomous (yes/no) or percentage (0-100 %).

Results: 76 patients who underwent abdominal hernia surgery were included, divided into two groups: 27 patients with preoperative chronic pain (PCP) and 46 patients without preoperative pain (WCP). Regarding the minimum perceived pain, pain relief and time

with severe pain, there were significant differences between both groups (WCP of 0.8 ± 0.8 vs. PCP 2.0 ± 1.9, $p = 0.004$ for minimum pain), 0.8 ± 0.2 vs. 0.6 ± 0.3, $p = 0.001$, for pain relief) and 0.2 ± 0.2 vs. 0.3 ± 0.2, $p = 0.039$, for severe pain time). There were also differences in interference with coughing and/or breathing and with sleep, with no differences in side effects.
Conclusions: Patients with preoperative chronic pain had more acute postoperative pain when sleeping, breathing, coughing, or moving around in bed and, in addition, they remained in severe pain longer compared to patients who did not have chronic pain before abdominal hernia surgery. These results highlight the importance of preoperative identification of these patients and the design of individualized analgesic strategies to obtain better postoperative results.

RESUMEN:

Introducción: Los estudios más recientes indican que el dolor agudo postoperatorio sigue siendo un problema sin resolver. El factor predictivo más consistentemente asociado en la cirugía de la hernia abdominal es la existencia de dolor crónico preoperatorio. El objetivo principal del estudio es evaluar el impacto que puede tener la presencia de dolor crónico preoperatorio en el dolor postoperatorio de estos pacientes tras cirugía de hernia. El objetivo secundario es evaluar la calidad de los cuidados postoperatorios de los pacientes mediante la cumplimentación del cuestionario multidimensional IPO ("International Pain Outcome").
Pacientes y métodos: Estudio observacional prospectivo tipo caso-control, comparando los resultados postoperatorios obtenidos en la planta de hospitalización quirúrgica 24 horas después del procedimiento quirúrgico mediante la cumplimentación por el paciente del cuestionario multidimensional IPO ("International Pain Outcome") dentro del proyecto de calidad internacional Pain-Out para la mejora de los resultados postoperatorios. La variable primaria del estudio era la valoración del dolor agudo postoperatorio a las 24 horas de la cirugía y que incluía: el peor dolor, el menor dolor, el porcentaje de tiempo con dolor intenso y el porcentaje de alivio del dolor con tratamiento. La comparación de los resultados postoperatorios obtenidos es en base a las respuestas obtenidas del cuestionario, siendo de tres tipos las respuestas, numéricas (0-10), dicotómicas (sí/no) o porcentuales (0-100 %).
Resultados: Se incluyeron 76 pacientes intervenidos de cirugía de hernia abdominal divididos en dos grupos: 27 pacientes con dolor crónico preoperatorio (DCP) y 46 pacientes sin dolor preoperatorio (SCP). Sobre el mínimo dolor percibido, alivio de dolor y tiempo con dolor severo, hubo diferencias significativas entre ambos grupos (SCP de 0,8 ± 0,8 frente 2,0 ± 1,9, $p = 0{,}004$ para mínimo dolor; 0,8 ± 0,2 frente 0,6 ± 0,3, $p = 0{,}001$, para alivio dolor; y 0,2 ± 0,2 frente 0,3 ± 0,2, $p = 0{,}039$, para tiempo de dolor severo). Tambien hubo diferencias en la interferencia con toser y/o respirar y con el sueño, sin encontrar diferencias en los efectos secundarios.
Conclusiones: Los pacientes con dolor crónico preoperatorio tuvieron más dolor agudo postoperatorio al dormir, respirar, toser o al movilizarse en la cama y, además, permanecieron más tiempo con dolor severo comparado con los pacientes que no tenían dolor crónico antes de la cirugía de hernia abdominal. Estos resultados ponen de relieve la importancia de la identificación preoperatoria de estos pacientes y el diseño de estrategias analgésicas individualizadas para la obtención de mejores resultados postoperatorios.

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Key words: *Inguinal hernia surgery; acute postoperative pain; chronic preoperative pain; numerical verbal scale.*

Palabras clave: *Cirugía de hernia inguinal, dolor agudo postoperatorio, dolor crónico preoperatorio, escala verbal numérica.*

Introduction

Most recent studies indicate that acute postoperative pain continues to be an unsolved problem: between 30-80 % of operated patients report pain of moderate or severe intensity on the first postoperative day (1-3). One of the factors that can explain this situation is the lack of identification of certain predictive factors that can lead to inadequate postoperative pain management if anticipatory individualized analgesic treatments are not used through multimodal analgesia and a strategy that covers the entire preoperative period (4,5).

In abdominal hernia surgery, the following predictive factors have been associated with the presence of greater acute postoperative pain: young age, recurrent hernias, number of previous repairs, large hernia defect, obesity, hypothyroidism, rheumatic diseases, constipation, pulmonary pathology, active smoker, prostatic hypertrophy or sleep apnea. However, the most consistently documented factor in abdominal hernia surgery is the existence of chronic preoperative pain (6). On the other hand, the preoperative pain of inguinal hernia has recently been associated with histological abnormalities of the hypertrophied ilioinguinal nerve and fibrosis of the external oblique fascia in the external ring (7). Pubmed database was searched (MESH terms: chronic pain AND period, preoperative AND postoperative pain AND abdominal hernia) and only one study (8) was found that related preoperative chronic pain with worse postoperative acute pain results.

The main objective of this study is to determine whether preoperative chronic pain influences postoperative pain after abdominal hernia repair surgery. The secondary objective is to evaluate the quality of postoperative care for patients by filling in the multidimensional IPO questionnaire ("International Pain Outcome").

Materials and methods

Patient selection

This is a prospective observational case/control study of the postoperative results obtained in the surgical hospital ward of our hospital 24 hours after the surgical procedure in the period between January 2018 and June 2019. The study protocol was approved by the Research Ethics Committee of our Autonomous Community (CEI-Illes Balears).

Inclusion criteria were the following: patients undergoing abdominal hernia surgery (inguinal herniorrhaphy / hernioplasty, umbilical herniorrhaphy / hernioplasty mainly), older than 18 years with verbal and written informed consent, in the first 24 hours after surgery and having a minimum of 6 hours in the ward from the arrival of the operating room. *Exclusion criteria* were: refusing to participate, being sedated or asleep at the time of the visit, not being in the room at the time of data collection, or being impossible to communicate due to cognitive impairment or poor handling of the Spanish Language.

Postoperative analgesic regimen for this surgery was the same for all patients and followed the acute postoperative pain protocols of our hospital: infiltration of the surgical wound by the surgeon with L-bupivacaine 0.25 %, paracetamol 1 g every eight hours, dexketoprofen 50 mg every eight hours (alternate) and rescue analgesia with morphine 0.05-0.1 mg/kg every four hours intravenously.

During the first postoperative day, the medical research team visited the patients operated on for abdominal hernia in the surgical ward and, after verbal explanations of the study, they were asked to participate in the study. After their approval and signing of the informed consent approved by the CEIC-IB, they were instructed to fill in the questions of the multidimensional IPO ("International Pain Outcome") questionnaire of the Pain-Out project.

The primary variable of the study was the assessment of acute postoperative pain 24 hours after surgery, which included: worst pain, least pain, percentage of time with severe pain, and percentage of pain relief with treatment. The secondary variables were: 1) the interference of pain with sleep, activities in and out of bed, breathing and emotional state; 2) side effects of analgesic treatment, including nausea, drowsiness, dizziness and itching; 3) the ability to participate in decisions about pain treatment, perception of quality of care and satisfaction; 4) the use of non-pharmacological strategies for pain relief and 5) the existence or not of pain three months before surgery and its intensity. The responses to the questionnaire were of three types:

The main objective of this study is to determine whether preoperative chronic pain influences postoperative pain after abdominal hernia repair surgery

numerical (0-10), dichotomous (yes/no) or percentage (0-100 %). Data obtained from the questionnaires was entered into the PAIN OUT database with access to a secure and multi-institutional web page maintained by the University of Leipzig in Germany through the Institute for Medical Informatics, Statistics and Epidemiology and which periodically monitors the quality of the data received.

The Pain-Out methodology is a project funded by the European Commission and supported by the International Association for the Study of Pain (8). It is a tool designed to improve the management of acute postoperative pain in Europe and has already been used as a working model in other countries such as China or Mexico. Its objective is to implement a project to improve the quality of care by evaluating postoperative results, analyzing the deficits detected in each hospital, establishing a change plan to improve results and, finally, evaluating these interventions continuously and cyclically following the "Plan-Do-Check-Act" management model. The working hypothesis is that the quality of perioperative pain care can improve if the results of the care providers are audited by obtaining their own results (*"feedback"*) and compared with those of other hospitals (*"benchmark"*).

Statistical analysis

Since we did not find other studies similar to ours in the reviewed literature, the objective was to obtain a sufficient sample to be able to assume normality in the statistical analysis.

To analyze the postoperative results obtained, a descriptive analysis was carried out, with frequencies and percentages, of the affirmative responses to each of the qualitative variables. Chi-square and Fisher's exact test were used to compare the results between the two groups, applicable in contrasting dichotomous variables for independent samples. Student's t-test was used for quantitative variables and a value of $p < 0.05$ was considered as an indicator of a significant difference. The statistical software used to analyze the data was SPSS v.26.

Results

Demographic characteristics of the patients studied were similar between the group without preoperative chronic pain three months before surgery (WCP group) and with preoperative chronic pain (PCP group) are shown in Table I.

Regarding the primary variables of the study (Table II and Figure 1), to the question of the IPO questionnaire about the maximum pain perceived in the first 24 hours (numerical scale 0-10), the responses of the patients were evaluated in the group WCP of 3.6 ± 2.1 (mean ± standard deviation) and in the PCP group 4.6 ± 3.5 ($p = 0.194$). As to the minimum pain perceived, the WCP group reported ratings of 0.8 ± 0.8 compared to the PCP group 2.0 ± 1.9 with statistically significant differences between both groups (p = 0.004).

Regarding pain relief, it is represented on a percentage scale from 0 to 1 based on the relief experienced with all the treatments combined; the WCP group obtained a mean score of 0.8 ± 0.2 compared to the PCP group 0.6 ± 0.3 with statistical significance ($p = 0.001$).

As to the time with severe pain expressed on a percentage scale from 0 to 1 as a function of time elapsed with severe pain,

Table I. Demographic data

	WCP group	PCP group	Statistical difference
N.º of patients	46	27	
Age (years ± SD)	57.63 ± 12	55.33 ± 12	$p < 0.05$
Sex (% women/% men)	29 / 71	19 / 11	$p < 0.05$
Weight (kg ± SD)	80.06 ± 23	81.38 ± 16	$p < 0.05$

SD: standard deviation.

Table II. Primary variable results for both groups

	TOTAL		WCP group		PCP group		
	N	Mean ± SD	N	Mean ± SD	N	Mean ± SD	p
Maximum pain	74	3.9 ± 2.7	45	3.6 ± 2.1	27	4.6 ± 3.5	0.194
Minimum pain	73	1.3 ± 1.4	44	0.8 ± 0.8	27	2.0 ± 1.9	0.004*
Pain relief	73	0.7 ± 0.3	45	0.8 ± 0.2	26	0.6 ± 0.3	0.001*
Time with severe pain	72	0.2 ± 0.2	45	0.2 ± 0.2	26	0.3 ± 0.2	0.039*

Data shown as mean ± standard deviation. *p < 0.05 = statistically significant differences.

the WCP group reported 0.2 ± 0.2 compared to the PCP group with 0.3 ± 0.2 with statistically significant differences ($p = 0.039$).

Postoperative pain interference was also evaluated (numerical scale 0-10) and statistically significant differences were obtained between both groups in all activities ($p < 0.05$): a) interference with bed activities: 2.3 ± 2.4 vs 4.9 ± 3.1 ($p < 0.001$), b) interference with coughing and/or breathing 2.5 ± 2.6 vs. 4.0 ± 3.3 ($p = 0.035$), c) interference with sleep 1.0 ± 1.5 versus 2.3 ± 2.7 ($p = 0.025$) and d) interference with getting out of bed 1.9 ± 1.6 versus 4.0 ± 2.6 ($p = 0.004$) (Figure 1).

In the assessment of the interference of pain with emotions, statistically differences were observed between both groups (numerical scale 0-10): for anxiety 0.4 ± 1.0 versus 3.4 ± 3.4 ($p <0.000$) and for feeling helpless 0.5 ± 1.5 versus 2.0 ± 3.0 ($p = 0.024$). Regarding the adverse effects of postoperative analgesic treatments, only somnolence showed significant differences (1.0 ± 2.0 vs. 2.5 ± 3.2, $p = 0.037$) between both groups. In the rest, nausea, dizziness or itching there were no differences.

Finally, the mean degree of satisfaction obtained in the two groups was 8.1 ± 2.4 (numerical scale 0-10) with statistically significant differences between the two: WCP group 8.5 ± 2.3 vs. group PCP 7.2 ± 2.4 ($p = 0.032$).

As to the qualitative variables (Table III, Figure 2), 27 patients (37 %) reported having suffered preoperative pain three months before surgery. Regarding the question of "if they had gotten out of bed since the operation", the WCP group answered affirmatively in 93.3 % compared to 70.4 % of the PCP group ($Chi^2 = 0.015$), "if they would like more treatment" , the WCP group answered affirmatively in 0 % compared to 24% of the PCP group ($Chi^2 = 0.002$) and "if they would like more information about the treatment", the WCP group answered affirmatively in 40.9% compared to 48 % of the PCP group ($Chi^2 = 0.568$) (Figure 2).

Discussion

In our study, the presence of preoperative chronic pain was associated with obtaining greater pain intensities (sleeping, breathing, coughing, or moving in bed), higher ratings of minimal perceived pain, less pain relief with mainly pharmacological analgesic measures and longer time with severe pain. Furthermore, we found in these patients the existence of greater anxiety, a feeling of helplessness and that they would have liked to receive more analgesic treatment than that received.

Over the last years, numerous predictive factors have been identified: a large meta-analysis that included 53,362 patients from 33 publications studied the impact of preoperative factors on postoperative outcomes (9). Nine variables reached statistical significance: young age, female sex, smoking habit, high body mass index, presence of preoperative pain and the use of preoperative analgesia. The most negative prognostic factor was having a history of difficulty falling asleep and depression. In a recent study in more than 22,963 patients undergoing 30 different surgical procedures, the analysis of the surgical groups indicated that the intensity of postoperative pain increased 0.14 points for each increase in the numerical scale in preoperative chronic pain (10).

In our study, patients without preoperative chronic pain presented lower ratings on the acute postoperative pain scales in most of the items included in the IPO questionnaire. Patients with chronic preoperative pain are characterized from a pathophysiological point of view by having activated the sensitization mechanisms involved in the chronification and amplification of the pain signal. Therefore, an increase in excitability and efficiency in the synapse of neurons in the pain transmission pathways at the level of the central nervous system, caused by increased nociceptive efferences (11), may explain the difference in the results obtained in this study. On the other hand, we do not know the impact that opioid-induced hyperalgesia (12) can cause in patients with chronic pain receiving opioid treatment and that it may be a reason for suffering more postoperative pain (13).

The prevalence of chronic pain in the European population is estimated to be 19 % of the adult population (14) and, on the other hand, there are many publications that indicate that preoperative pain is an independent predictor of the severity of acute postoperative pain (6,7,15,16). Furthermore, severe postoperative pain has been associated as a predictor for the appearance of chronic postoperative pain (17). Therefore, the

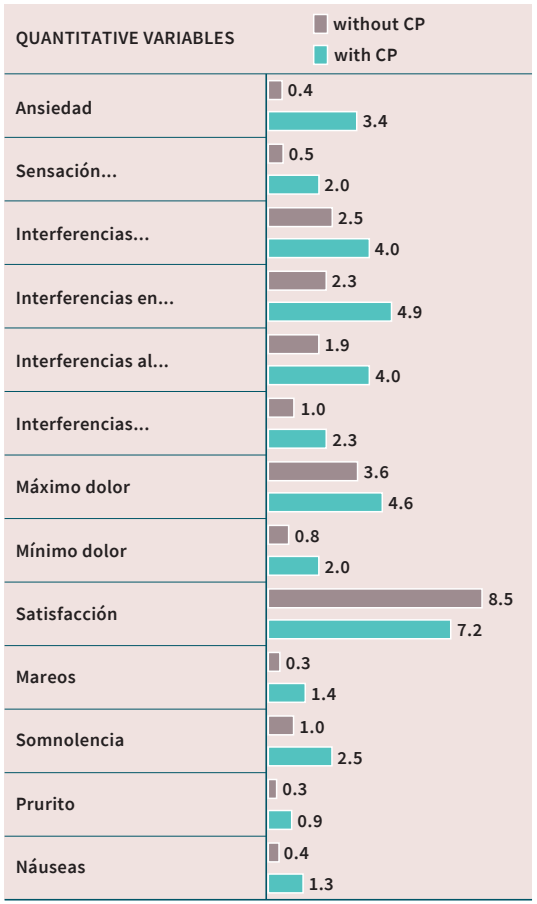

Figure 1. Comparative graph between both groups of the primary and secondary variables.

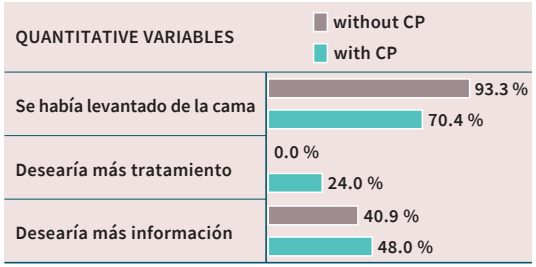

Figure 2. Comparative graph between both groups of the secondary qualitative variables.

identification of the patient with preoperative chronic pain who is going to undergo a surgical procedure for abdominal hernia repair can be a strategy for improving postoperative results.

In this way, an individualized, multimodal analgesic strategy could be designed during the preoperative period such as readjustment of opioid doses (opioid tapering), intraoperatively with loco-regional techniques, and postoperatively for the first days in the domicile for the new models of Acute Pain Units (APU) through Transitional Chronic Pain Units (11).

The work presented is a prospective observational study that is part of a sample of patients within the Pain-Out project for the study of acute postoperative pain. To eliminate possible confounding factors, only surgical repair of abdominal hernias was selected. The main limitation of our study is not having differentiated the surgical techniques for abdominal hernia repair or intraoperative anesthetic technique and that, on the other hand, our study is extrapolated from the data collection of the Pain-Out healthcare quality project for improving the postoperative results of other surgical procedures. Furthermore, in the sample obtained, the patients were not stratified by important variables such as sex, age, or BMI, among others, and that may have an impact on the perception of postoperative pain.

Conclusion

As a conclusion, in our study, patients with preoperative chronic pain had more acute postoperative pain when sleeping, breathing, coughing or when moving in bed and, in addition, they remained with severe pain for longer compared to patients who did not have chronic pain before abdominal hernia surgery. However, the degree of satisfaction was high in both groups, although they would have liked to have more information about analgesic treatments.

In any case, our study confirms and evidences the importance of identifying patients with preoperative chronic pain for the individualization of multimodal analgesic treatments throughout the perioperative period to obtain the best postoperative results.

Table III. Comparative values of secondary qualitative variables between both groups

		TOTAL		WCP GROUP		PCP GROUP		
		N	% (n)	N	% (n)	N	% (n)	p
Preoperative pain	0	73	63.0 (46)					
	1		37.0 (27)					
Get out of bed since intervention	0	74	14.9 (11)	45	6.7 (3)	27	29.6 (8)	0.015*
	1		85.1 (63)		93.3 (42)		70.4 (19)	
Wished more treatment	0	70	91.4 (64)	43	100.0 (43)	25	76.0 (19)	0.002*
	1		8.6 (6)		0.0 (0)		24.0 (6)	
Wished more information	0	71	54.9 (39)	44	59,1 (26)	25	52.0 (13)	0.568
	1		45.1 (32)		40.9 (18)		48.0 (12)	

Dichotomic variable: 0 = no, 1 = yes. *p < 0.05 statistically significant differences.

REFERENCES

1. Gramke HF, De Rijke JM, Van Kleef M, Raps F, Kessels AGH, Peters ML, et al. The prevalence of postoperative pain in a cross-sectional group of patients after day-case surgery in a university hospital. Clin J Pain. 2007;23(6):543-8. DOI: 10.1097/AJP.0b013e318074c970.
2. Sommer M, De Rijke JM, Van Kleef M, Kessels AGH, Peters ML, Geurts JWJM, et al. The prevalence of postoperative pain in a sample of 1490 surgical inpatients. Eur J Anaesthesiol. 2008;25(4):267-74. DOI: 10.1017/S0265021507003031.
3. Radinovic K, Milan Z, Markovic-Denic L, Dubljanin-Raspopovic E, Jovanovic B, Bumbasirevic V. Predictors of severe pain in the immediate postoperative period in elderly patients following hip fracture surgery. Injury. 2014;45(8):1246-50. DOI: 10.1016/j.injury.2014.05.024.
4. Zheng H, Schnabel A, Yahiaoui-Doktor M, Meissner W, Van Aken H, Zahn P, et al. Age and preoperative pain are major confounders for sex differences in postoperative pain outcome: A prospective database analysis. PLoS One. 2017;12(6):1-14. DOI: 10.1371/journal.pone.0178659.
5. Rehberg B, Mathivon S, Combescure C, Mercier Y, Savoldelli GL. Prediction of acute postoperative pain following breast

cancer surgery using the pain sensitivity questionnaire a cohort study. Clin J Pain. 2017;33(1):57-66. DOI: 10.1097/AJP.0000000000000380.
6. Yang MMH, Hartley RL, Leung AA, Ronksley PE, Jetté N, Casha S, et al. Preoperative predictors of poor acute postoperative pain control: A systematic review and meta-analysis. BMJ Open. 2019;9(4):1-11. DOI: 10.1136/bmjopen-2018-025091.
7. Gerbershagen HJ, Pogatzki-Zahn E, Aduckathil S, Peelen LM, Kappen TH, Van Wijck AJM, et al. Procedure-specific risk factor analysis for the development of severe postoperative pain. Anesthesiology. 2014;120(5):1237-45. DOI: 10.1097/ALN.0000000000000108.
8. Tsirline VB, Colavita PD, Belyansky I, Zemlyak AY, Lincourt AE, Todd Heniford B. Preoperative pain is the strongest predictor of postoperative pain and diminished quality of life after ventral hernia repair. Am Surg. 2013;79(8):829-36. DOI: 10.1177/000313481307900828.
9. Wright R, Salisbury T, Landes J. Groin anatomy, preoperative pain, and compression neuropathy in primary inguinal hernia: What really matters. Am J Surg. 2019;217(5):873-7. DOI: 10.1016/j.amjsurg.2019.02.017.
10. Zaslansky R, Rothaug J, Chapman CR, Bäckström R, Brill S, Fletcher D, et al. PAIN OUT: The making of an international acute pain registry. Eur J Pain. 2015;19(4):490-502. DOI: 10.1002/ejp.571.
11. Katz J, Weinrib A, Fashler SR, Katznelzon R, Shah BR, Ladak SS, et al. The Toronto General Hospital transitional pain service: Development and implementation of a multidisciplinary program to prevent chronic postsurgical pain. J Pain Res. 2015;8:695-702. DOI: 10.2147/JPR.S91924.
12. Peters ML, Sommer M, De Rijke JM, Kessels F, Heineman E, Patijn J, et al. Somatic and psychologic predictors of long-term unfavorable outcome after surgical intervention. Ann Surg. 2007;245(3):487-94. DOI: 10.1097/01.sla.0000245495.79781.65.
13. Dasinger EA, Graham LA, Wahl TS, Richman JS, Baker SJ, Hawn MT, et al. Preoperative opioid use and postoperative pain associated with surgical readmissions. Am J Surg. 2019;218(5):828-35. DOI: 10.1016/j.amjsurg.2019.02.033.
14. Woolf CJ. Central sensitization: Implications for the diagnosis and treatment of pain. Pain. 2011;152(3 suppl):S2-S15. DOI: 10.1016/j.pain.2010.09.030.
15. Breivik H, Collett B, Ventafridda V, Cohen R, Gallacher D. Survey of chronic pain in Europe: Prevalence, impact on daily life, and treatment. Eur J Pain. 2006;10(4):287-333. DOI: 10.1016/j.ejpain.2005.06.009.
16. Bisgaard T, Klarskov B, Rosenberg J, Kehlet H. Characteristics and prediction of early pain after laparoscopic cholecystectomy. Pain. 2001;90(3):261-9. DOI: 10.1016/S0304-3959(00)00406-1.
17. Werner MU, Mjöbo HN, Nielsen PR, Rudin Å. Prediction of postoperative pain: A systematic review of predictive experimental pain studies. Anesthesiology. 2010;112(6):1494-502. DOI: 10.1097/ALN.0b013e3181dcd5a0.