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Incidence of chronic post-surgical pain and its associated factors in patients taken to inguinal hernia repair☆

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ABSTRACT

Introduction: In up to 50% of cases, inguinal hernia repair is associated with chronic post-surgical pain, which can be a cause of disability in a proportion of patients.
Objective: To estimate the incidence of chronic post-surgical pain and its associated factors in patients taken to inguinal hernia repair.
Materials and methods: Observational follow-up study in a cohort of patients. Social, demographic and personal background information was obtained; the incidence and intensity of acute and chronic post-operative pain was determined; and the factors associated with the development of chronic pain were evaluated. Associations were determined in accordance with the nature of the variables. A linear regression was used to assess the role of confounding factors.
Results: Overall, 108 patients were analysed, and of them, 27.8% ($n=30$) had chronic post-surgical pain. The multivariate analysis showed that the use of general anaesthesia and uncontrolled pain 15 days after surgery were associated with a higher risk of developing this condition. In contrast, diclofenac administration was protective.
Discussion: Chronic post-surgical pain is frequent in this type of surgery. According to this study, the use of peri-operative analgesia together with pain prevention and management within the first post-operative weeks help prevent the development of chronic post-surgical pain. General anaesthesia may increase the risk. Similar studies conducted at a larger scale could help identify other associated factors.

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Incidencia y factores asociados al dolor crónico posoperatorio en pacientes llevados a herniorrafia inguinal

Palabras clave:
Dolor crónico
Herniorrafia
Hernia, inguinal
Factores de riesgo
Factores protectores

RESUMEN

Introducción: La herniorrafia inguinal se asocia hasta en un 50% de los casos a dolor crónico posoperatorio, y en algunas personas puede ser incapacitante.
Objetivo: Estimar la incidencia e identificar los factores asociados al dolor crónico postoperatorio en pacientes llevados a herniorrafia inguinal.
Matriales y métodos: Se realizó un estudio observacional en una cohorte de seguimiento. Se obtuvo información sociodemográfica y de antecedentes personales, se determinó la incidencia e intensidad de dolor agudo posoperatorio y de dolor crónico posoperatorio, y se evaluaron los factores asociados al desarrollo de este último. Se establecieron asociaciones según la naturaleza de las variables. Mediante una regresión lineal se evaluó el papel de los factores de confusión.
Resultados: Se analizaron 108 pacientes, de los cuales 27.8% (n=30) presentaron dolor crónico posoperatorio. El análisis multivariado mostró que el uso de anestesia general y el dolor no controlado a los 15 días del postoperatorio se relacionaron con mayor riesgo de desarrollar esta entidad. La administración de diclofenaco fue en cambio un factor protector.
Discusión: El dolor crónico postoperatorio es frecuente luego de una herniorrafia inguinal. Según este estudio, el uso de analgesia perioperatoria y la prevención y manejo del dolor en las primeras semanas del posoperatorio, ayudan a prevenir esta entidad. La anestesia general podría aumentar el riesgo. Estudios similares realizados a una escala más grande, permitirán identificar otros factores relacionados.

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Introduction

Based on the criteria by Macrae and Akkaya, the International Association for the Study of Pain (IASP) defined chronic post-surgical pain (CPSP) as pain lasting at least 2 months following the insult, after having ruled out other causes for pain and the possibility of it being the continuation of a pre-existing problem.[1,2] Other authors have suggested increasing this time period to 3–6 months following surgery, which is more consistent with the most widely accepted definition of chronic pain (3 months), and allows for longer follow-up of the patient's functional status.[3] In view of the above, the two-month cutoff point might correspond to a continuum between acute post-operative pain and CPSP.

Inguinal hernia repair is associated with the presence of CPSP in up to 50% of cases,[2,4] with a mean of 11.5%[5] reports of persistent pain even up to a year after surgery.[4] However, prevalence varies according to the surgical technique, being higher in open inguinal herniorrhaphy (7.3%), as compared with laparoscopic repair (5%).[6] CPSP requires early multi-disciplinary treatment, given the fact that up to 20% of patients are affected in their ability to perform their daily activities.[7]

Predisposing factors for CPSP are described in the literature.[8–13] However, results are still contradictory, which means that the search for these associations needs to continue in order to identify those patients who are at risk of suffering from this disorder. Moreover, a search of the literature revealed that, in Colombia, there are no data available to help determine the size of the problem of persistent post-operative pain (PPP) and CPSP following inguinal hernia repair and, consequently, there is no culture among healthcare practitioners of systematically working to prevent this disorder.

The objective of this study is to estimate the incidence of CPSP and its associated factors in patients taken to inguinal herniorrhaphy at Hospital Universitario Mayor (HUM) and Hospital Universitario Barrios Unidos (HUBU) – Mederi. This will provide data to help assess the size of the problem in our setting and implement actions that may have an impact on the quality of life of our patients.

Methodology

Observational follow-up cohort study. The study was first approved by the Ethics Committees of Universidad del Rosario and Méderi. It included patients over 18 years of age, ASA I, II and III, scheduled for unilateral or bilateral inguinal herniorrhaphy at HUM and HUBU – Mederi, during the time period between February and August 2014. The patients agreed to participate in the study and signed the relevant informed consent. Excluded were patients with a history of sensory-motor disability that prevented them from responding a sociodemographic questionnaire, rating pain intensity and/or answering the post-operative telephone survey; patients with chronic pelvic pain of gynaecological origin; and pregnant women. Patients were recruited sequentially during the study period. Before the surgical procedure, they were given a questionnaire consisting of sociodemographic and personal variables. After

the surgery, the intensity of acute post-operative pain was assessed in the recovery room using the visual analogue scale (VAS). Additional relevant data were taken from the electronic clinical record in order to assess the presence of factors associated with the development of CPSP. All patients were given a telephone survey two months later in order to determine the presence or absence of pain 15 days after surgery, the development of complications, and the presence of CPSP. Additionally, pain intensity in cases of CPSP was measured during the same telephone call using the verbal pain scale. CPSP was diagnosed in cases of pain or persistent dysesthesia in the surgical area, whether it irradiated or not to the inguinal and pubic area or to the thigh two months after the surgery, only if the pain or dysesthesia had different characteristics when compared with the pre-operative finding, if applicable. A distinction was made between the presence of CPSP and PPP according to the pain characteristics reported by the patients at the time of the post-operative call.

Statistical analysis

A descriptive analysis of the data collected was performed using the SPSS software package, version 19. Normality tests were performed for the quantitative variables. The incidence of APSP and CPSP was estimated. The chi square was used for estimating associations, the Fisher exact test was used for qualitative variables, the Student's *t* test was used for variables with parametric distribution, and the Mann–Whitney *U* test was used for non-parametric distribution, with their respective statistical significance. Finally,

Table 1 – Sociodemographic characteristics.

Variable	Characteristics	*n*	%
Age by categories	Less than 40 years	8	7.4
	Between 40 and 65 years	51	47.2
	65 or older	49	45.3
Sex	Female	16	14.8
	Male	92	85.1
BMI (kg/m^2)	<18.5	1	0.9
	18.5–24.9	55	50.9
	25–29.9	44	40.7
	30–34.9	8	7.4
	35 or more	0	0
Marital status	Single	18	16.7
	Married	53	49.0
	Free union	20	18.5
	Widowed	9	8.3
	Separated	8	7.4
Schooling	None	3	2.8
	Primary	45	41.6
	Secondary	31	28.7
	Technical	8	7.4
	University	20	18.5
	Graduate	1	0.9
Socioeconomic bracket	1	7	6.48
	2	41	37.9
	3	48	44.4
	4	9	8.3
	5	1	0.9
	6	2	1.8
Work status	Employee	35	32.4
	Unemployed	11	10.1
	Retired	39	36.1
	Self-employed	21	19.4
	Others	2	1.8
History of anxiety disorder	Yes	1	0.9
History of depressive disorder	Yes	1	0.9
Chronic use of analgesics	Yes	4	3.7
	No	104	96.2

Source: Authors.

Table 2 – Anaesthetic and surgical variables.

Variable	Characteristics	*n*	%
Anaesthesia technique	General	47	43.5
	Spinal	58	53.7
	Spinal converted to general	3	2.7
Use of intra-thecal opioids in spinal anaesthesia	Yes	14	22.9*
	No	47	77.0*
Name of intra-thecal opioid (*n* = 14)	Fentanyl	13	92.8†
	Morphine	1	7.1†
Dose of intra-thecal opioid	10 mcg	1	7.1†
	12 mcg	1	7.1†
	20 mcg	3	21.4†
	25 mcg	8	57.2†
	100 mcg (morfina)	1	7.1†
Number of analgesics used intraoperatively	None	2	1.8
	One analgesic	46	42.6
	Two analgesics	41	38.0
	Three analgesics	11	10.2
	Four analgesics	8	7.4
Surgical time	Less than 3 h	108	99.9
Surgical wound infiltration in open technique	Yes	63	58.2
	No	45	41.7
Nerve visualisation in surgery	Yes	43	39.8
	No	27	25.0
	Not reported	38	35.1
Nerve sparing in surgery	Yes	48	44.4
	No	8	7.4
	Not reported	52	48.1
Use of mesh	Yes	108	99.9
History of recurrent hernia	Yes	24	22.2
	No	84	77.7
Surgical technique	Laparoscopic	31	28.7
	Open Lichtenstein technique	34	31.5
	Open preperitoneal technique	42	38.8
	Laparoscopic, converted	1	0.9
Laterality of the surgery	Left	31	28.7
	Right	54	50.0
	Bilateral	23	21.3
Post-operative complications	None	89	82.4
	Seroma	4	3.7
	Infection	2	1.8
	Haematoma	6	5.6
	Granuloma	1	0.9
	Recurrence	4	3.7
	Bladder injury	2	1.8
Experience of the surgeon	Less than 3 years	28	25.9
	Between 3 and 5 years	17	15.7
	Between 6 and10 years	33	30.5
	More than 10 years	30	27.7

* Percentage in relation to the total number of patients taken to surgery under spinal anaesthesia (*n* = 61).
† Percentage in relation to the total number of patients in whom intra-thecal opioid was used.
Source: Authors.

Table 3 – Transition analgesia.

Variable	Characteristics	n	%*
One analgesic	Dipyrone	19	41.3
	Tramadol	17	36.9
	NSAIDs	5	10.8
	Morphine	3	6.5
	Hyoscine butylbromide	1	2.2
	Meperidine	1	2.2
Two analgesics	Dipyrone + Diclofenac	16	39.0
	Dipyrone + Tramadol	5	12.2
	Dipyrone + Morphine	7	17.1
	Diclofenac + Tramadol	7	17.1
	Diclofenac + Block	1	2.4
	Tramadol + Block II-IH	1	2.4
	Tramadol + Dexamethasone	3	7.3
	Tramadol + Meperidine	1	2.4
Three analgesics	Dipyrone + Morphine + Tramadol	2	18.0
	Dipyrone + Morphine + Fentanyl	1	9.1
	Dipyrone + Tramadol + Block	1	9.1
	Dipyrone + Diclofenac + Dexamethasone	3	27.2
	Dipyrone + Diclofenac + Tramadol	2	18.0
	Dipyrone + Diclofenac + Morphine	1	9.1
	Diclofenaco + Tramadol + Ketamine	1	9.1
Four analgesics	Dipyrone + Diclofenac + Tramadol + Block	1	12.4
	Dipyrone + Diclofenaco + Tramadol + Dexamethasone	3	37.5
	Diclofenac + Tramadol + Ketamine + Bloqueo	4	50.0

* Percentage in relation to the total number of patients according to the number of analgesics used. One analgesic: $n = 46$, two analgesics: $n = 41$, three analgesics: $n = 11$, four analgesics: $n = 8$.
Source: Authors.

a multivariate analysis was conducted including candidate variables in accordance with the Hosmer–Lemershow criterion ($p < 0.2$), and those considered clinically relevant, in order to estimate relative risks adjusted for potential confounding variables.

Results

An initial sample of 114 patients was obtained. Of these, 6 were lost to follow-up (due to change in domicile or wrong telephone number), resulting in the analysis of results for 108 patients, of which 76 (70.3%) were taken to open surgery and 32 (29.6%) to laparoscopic surgery. No mortality was reported. Mean age was 61 years ± 14.6, with a range between 26 and 92 years of age. The majority of patients were males ($n = 92$, 85.1%), with normal BMI (24.8 kg/m^2 ± 3.1, minimum 17.26, maximum 31.79). Only one patient in the sample had a history of depression and anxiety at the time of inclusion in the study. Table 1 summarises the sociodemographic characteristics of the sample analysed.

It was found that 59.2% of the patients had pre-operative groin pain ($n = 64$), mild in 48.4% ($n = 31$), moderate in 42.2% ($n = 27$), and severe in 9.3% ($n = 6$). There were no cases of unbearable pre-operative pain. Groin pain was right-sided in 54.7% of cases (35/64), left-side in 34.3% (22/64) and bilateral in 10.9% (7/64).

Regarding the anaesthesia technique, the majority of patients received spinal anaesthesia ($n = 61$, 56.4%). Of those taken to open surgery, 75% received spinal anaesthesia ($n = 57$), while all patients taken to laparoscopic hernia repair received general anaesthesia. Intra-thecal opioid was used in 22.9% of patients intervened under spinal anaesthesia ($n = 14$); of them, 13 received fentanyl in a dose range of 10–25 mcg, and one patient received a dose of 100 mcg of intra-thecal morphine. One or two intra-operative analgesics were used in the majority of patients (42.6% and 38%, respectively). Regarding the details of the surgical technique, the open technique was used in 70.3% of cases ($n = 76$), while laparoscopic herniorrhaphy was performed in 28.7% of patients ($n = 31$). One case required conversion of the surgical technique (from laparoscopic to open). Two types of open techniques were performed: pre-peritoneal in 38.8% of cases ($n = 42$), and Lichtenstein in 31.5% ($n = 34$); the transabdominal pre-peritoneal technique (TAPP) was used in all cases of laparoscopic surgery. The most frequent post-operative complication was haematoma development ($n = 6$, 5.6%). No complications were found in 82.4% of cases ($n = 89$). Table 2 shows the anatomical and surgical variables included in the assessment.

Transitional analgesia used intra-operatively was analysed in detail and it was found that when single analgesia was used, the drugs used most frequently were dipyrone and tramadol; when two analgesics were used, the most frequent combination was dipyrone + diclofenac; when

three analgesics were used, the most frequent combination was dipyrone + diclofenac + tramadol. Finally, when four analgesics were used the most frequent combination used was diclofenac + tramadol + ketamine + ilioinguinal and iliohypogastric blocks (Table 3).

Acute post-operative pain was present in 57.4% of the patients included in the analysis ($n = 62$). The majority described that acute pain was mild (50%, 31/62), while 50% reported uncontrolled acute post-operative pain ($n = 31$), defined as a score of 40–100 mm on the VAS. Among patients taken to open surgery, the majority experienced mild pain (30.2%), and in the laparoscopic herniorrhaphy group, the majority had acute post-operative pain of moderate intensity (28.1%). Overall, 61.1% reported pain at 15 days ($n = 66$), of mild intensity in the majority of cases ($n = 40$, 60.6%). When the presence of pain was assessed two months after surgery, 57.4% ($n = 62$) reported pain in the operated area, the majority of mild intensity ($n = 45$, 72.5%); however, 30 of the 62 cases met the diagnostic criteria for CPSP (27.8% of the total sample). Localised, intermittent pain, and pain on exertion (walking) were found not to meet the criteria of CPSP. Table 4 shows post-operative pain and its characteristics.

The incidence of acute post-operative pain in the sample assessed was 57 for every 100 patients taken to inguinal hernia repair, while the incidence of CPSP was 27 for every 100.

The bivariate analysis (Table 5) showed the following statistically significant associations: being a working employee was associated with a higher risk of developing CPSP (RR 2.08; 95% CI 1.15–3.76), as was also the case with the presence of post-operative complications (RR 1.3; 95% CI 1.05–1.60), a less experienced surgeon (RR 1.9; 95% CI 1.05–3.43), and uncontrolled pain after 15 days (RR 1.82, 95% CI 1.01–3.32). In contrast, the use of non-steroidal anti-inflammatory agents (NSAIDs) such as diclofenac IV was found to be associated with a lower risk (RR 0.36, 95% CI 0.16–0.81). Although age was different in the comparison groups (mean of 58.3 years vs. 63.2 years in patients with and without CPSP, respectively), it was not significantly associated with the development of chronic pain ($p = 0.127$).

Finally, the multivariate analysis showed that general anaesthesia (aRR 23.8; 95% CI 1.36–418.22) and uncontrolled post-operative pain on day 15 (aRR 18.69; 95% CI 1.2–291.8) were risk factors with a statistically significant association. It was also found, like in the bivariate analysis, that the use of NSAID-type transitional analgesia was a protective factor against the development of CPSP (0.11, 95% CI 0.01–0.89) (Table 6).

Discussion

Inguinal herniorrhaphy is a frequent surgical procedure that has been associated with CPSP, affecting quality of life and creating disability in the patient and costs for the health system. This study found that 27.8% of the patients reported post-operative pain consistent with the criteria for CPSP. Of them, 30% reported moderate pain and 3.3% reported severe pain. These values are consistent with other reports.[2,4] The reason why some patients develop chronic pain is unknown, and a significant part of the pathophysiology of this condition is based on theoretical assumptions. In 2013, Ronal Deumens described cellular, molecular and clinical factors in an attempt at finding the best treatment based on the etiological mechanism(s).[2]

Although a cutoff point of 2 months was used in this study for defining CPSP, the characteristics of the pain in the intervened inguinal area was analysed in other to distinguish between PPP and CPSP. The analysis showed that 30 out of 62 patients met the criteria for neuropathic-type pain, which points more towards chronic pain. These results support statements by other authors who suggest extending follow-up 3–6 months after surgery. This is more consistent with the most widely accepted definition of chronic pain at the present time (3 months), considering that it allows for longer follow-up of the patient's functional status.[3] If this were applied to the subjects included in this study, the incidence of CPSP might increase, given that close to half of the patients who experienced post-operative pain two months after surgery had pain of somatic characteristics. The persistence of this symptom could lead to central sensitisation, triggering CPSP per se.

This article describes factors associated with chronic post-surgical pain in 108 patients taken to open or laparoscopic inguinal hernia repair in two teaching hospitals in the city of Bogotá. The multivariate analysis showed that general anaesthesia is a risk factor for the development of CPSP. A study by Callesen in 2003 showed no superiority of any anaesthetic technique regarding the development of chronic pain following open inguinal hernia repair.[14] The evidence suggests that more than the general or spinal anaesthesia as a factor associated with the development of CPSP, the concomitant use of local anaesthetics (for infiltration in the surgical wound or the performance of an ilioinguinal-iliohypogastric block) is a protective factor against the development of chronic pain following inguinal herniorrhaphy.[15] Spinal anaesthesia has been found to be protective against the development of chronic pain in patients taken to other surgical procedures such as hysterectomy or caesarean section. One possible explanation is that central impulse blockade is powerful in spinal anaesthesia, something that does not happen under general anaesthesia.[16,17] However, the finding in this study that general anaesthesia is a risk factor for the development of CPSP must be interpreted with caution. This finding about general anaesthesia may correlate with preferences of the attending anaesthetist for cases of larger size hernias, or with patients who do not cooperate and might be at a higher risk of developing CPSP, but not with the type of anaesthesia per se.

There was a statistically significant association between pain severity after 15 days and the presence of CPSP, the frequency being higher in patients with uncontrolled pain (moderate or severe), finding that is consistent with the literature. Franneby et al. found that the persistence of pain in the operated inguinal area between the first and the fourth week after the procedure is a predictive factor of persistent pain one year after inguinal hernia repair (9% vs. 3%,

Table 4 – Post-operative pain.

Variable	Characteristics	*n*	%
Presence of acute post-operative pain	Yes	62	57.4
	No	46	42.5
Intensity of acute post-operative pain	Mild (VAS 1–39 mm)	31	50*
	Moderate (VAS 40–69 mm)	17	27.4*
	Severe (VAS 70–100 mm)	14	22.5*
	Uncontrolled (VAS 40–100 mm)	31	50*
Presence of pain at 15 days	Yes	66	61.1
	No	42	38.8
Intensity of pain between post-operative weeks 1 and 3	Mild	40	60.6†
	Moderate	20	30.3†
	Severe	6	9.0†
Presence of PPP	Yes	62	57.4
	No	46	42.5
Intensity of PPP	Mild	45	72.5‡
	Moderate	16	25.8‡
	Severe	1	1.6‡
Type of PPP	Shooting	6	9.7‡
	Stinging	13	20.9‡
	Numbness	6	9.7‡
	Burning	2	3.2‡
	Paresthesia	3	4.8‡
	Localised	14	22.6‡
	Intermittent	17	27.4‡
	When walking	1	1.6‡
Presence of CPSP	Yes	30	27.8
	No	78	72.2
Intensity of CPSP	Mild	20	66.6§
	Moderate	9	30.0§
	Severe	1	3.3§
Irradiation	No	17	56.6
	Yes	13	43.3
	To testis	7	53.8¶
	To pubis	2	15.4¶
	To thigh	3	23.0¶
	To hip	1	7.7¶

* Percentage in relation to the total number of patients with acute post-operative pain ($n = 62$).
† Percentage in relation to the total number of patients with pain at 15 days.
‡ Percentage in relation to the total number of patients with PPP.
§ Percentage in relation to the total number of patients with CPSP.
¶ Percentage in relation to the total number of patients who reported irradiated pain ($n = 13$).
VAS: Visual Analogue Scale; CPSP: Chronic post-surgical pain; PPP: persistent post-operative pain.
Source: Authors.

$p < 0.05$, and 24% vs. 3%, $p < 0.001$, respectively).[10] The above is supported by the pathophysiology of CPSP, where the persistence of pain eventually leads to the development of peripheral neuroplasticity mechanisms that perpetuate the painful picture.[18]

Finally, the use of NSAIDs like diclofenac was protective against the development of CPSP in this study. The use of perioperative analgesia is based on the assumption that there is a disruption in the peripheral transmission of painful signals and, consequently, central sensitisation, reducing the risk of developing CPSP.[19] However, the use of NSAIDs has not been shown to have a significant impact on the incidence or severity of persistent post-operative pain.[20] The findings in the study could be explained to the extent that diclofenac was the drug most frequently used in combination with other agents as part of peri-operative multi-modal analgesia, and more than the use of specific drugs, their combination is the current recommendation for the prevention and management of acute post-operative pain[21] and, consequently, CPSP.

This is the first local and national study on this topic, with stringent follow-up of patients two months after surgery. The study is highly relevant because it provides a perspective

Table 5 – Factors associated with the development of CPSP in inguinal hernia repair.

Factor studied	RR	95% CI	*p* Value
Age 40 years or less	0.89	0.25–3.08	0.609
Age 65 or more	0.87	0.69–1.10	0.260
Male sex	2.43	0.64–9.23	0.117
BMI equal to or greater than 30	0.43	0.06–2.76	0.292
Marital status (without partner)	1.04	0.54–1.98	0.899
Upper socioeconomic bracket (4–6)	1.26	0.77–2.07	0.255
Schooling (the lower the schooling, the higher the risk)	2.50	1.05–5.91	0.186
Schooling (professional vs. high-school)	1.06	0.80–1.40	0.647
Work status (employee)	2.08	1.15–3.76	0.015
Chronic use of analgesics	0.89	0.16–5.03	0.692
Pre-operative inguinal pain	1.18	0.62–2.24	0.593
Uncontrolled pre-operative pain	1.51	0.82–2.77	0.186
Severe pre-operative inguinal pain	1.21	0.37–3.93	0.535
General anaesthesia technique	1.17	0.93–1.47	0.185
Use of intra-thecal opioids	0.90	0.67–1.22	0.416
Surgical wound infiltration	0.83	0.64–1.06	0.127
Nerve visualisation in surgery	0.77	0.54–1.09	0.120
Nerve sparing in surgery	0.92	0.25–3.34	0.637
History of recurrent hernia	1.50	0.79–2.83	0.228
Open surgical technique	2.01	0.85–4.78	0.086
Pre-peritoneal open technique (vs. anterior)	1.09	0.80–1.50	0.561
Use of intra-operative analgesia	0.68	0.17–2.76	0.488
Use of one analgesic	0.92	0.72–1.17	0.513
Two analgesics	0.97	0.76–1.25	0.842
Three analgesics	0.87	0.54–1.38	0.362
Ilioinguinal–iliohypogastric block	0.89	0.25–3.08	0.609
Use of NSAIDs	0.36	0.16–0.81	0.007
Acute post-operative pain	1.48	0.77–2.86	0.227
Uncontrolled acute post-operative pain (VAS $\geq$ 40)	1.24	0.65–2.34	0.510
Severe acute post-operative pain (VAS $\geq$ 70)	1.34	0.61–2.92	0.477
Post-operative complications	1.30	1.05–1.60	0.052
Experience of the surgeon (less than 3 years)	1.90	1.05–3.43	0.038
Post-operative pain at 15 days	1.27	0.66–2.44	0.463
Uncontrolled post-operative pain at 15 days (moderate–severe)	1.82	1.01–3.32	0.058

BMI: Body mass index, NSAIDs: non-steroidal anti-inflammatory agents, VAS: Visual Analogue Scale.
Source: Authors.

Table 6 – Multivariate analysis of factors associated with the development of chronic post-surgical pain.

Factor studied	aRR	95% CI	*p* Value
Under age	0.96	0.89–1.02	0.234
Male sex	1.03	0.00–1.01	0.999
Work status (employee)	3.55	0.37–34.40	0.274
General anaesthesia technique	23.83	1.36–418.22	0.030
Surgical wound infiltration	7.66	0.73–79.65	0.088
Open surgical technique	8.38	0.43–160.08	0.086
Use of NSAIDs (diclofenac)	0.11	0.01–0.899	0.050
Absence of post-operative complications	0.69	0.06–8.16	0.767
Experience of the surgeon (more than 3 years)	0.78	0.13–4.76	0.790
Uncontrolled post-operative pain at 15 days (moderate–severe)	18.69	1.20–291.83	0.037

NSAIDs: non-steroidal anti-inflammatory agents.
Source: Authors.

on the behaviour of CPSP following inguinal hernia repair in our setting. It has the inherent weaknesses of observational studies which require caution when it comes to making causal associations and extrapolations of the results to other populations. Perhaps due to the sample size, the study lacked sufficient power to find associations with other factors described in the literature. Larger studies with greater scope are required in order to identify other factors related to the development of chronic pain following inguinal hernia repair.

Conclusions

CPSP associated with inguinal herniorrhaphy is a frequent problem in our setting and, consequently, it requires actions designed to mitigate it. According to this study, the use of general anaesthesia may increase the risk of developing CPSP following inguinal hernia repair. Moreover, the use of intra-operative analgesia could lower the incidence of CPSP. It is recommended to implement specific evidence-based management protocols for this surgery at an institutional level in order to allow efficient management of acute post-operative pain and persistent pain during the first few weeks after the surgery and lead to a lower incidence of CPSP. Such protocols should include a programme designed to create awareness among surgeons and anaesthetists together with an education programme addressed to patients and families. Larger studies of this type may allow to identify additional factors and lead to actions designed to impact the prevention and management of CPSP.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

Conflicts of interest

The authors have no conflicts of interest to declare.

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