



Chronic postsurgical pain: still a neglected topic?

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Background: Surgical injury can frequently lead to chronic pain. Despite the obvious importance of this problem, the first publications on chronic pain after surgery as a general topic appeared only a decade ago. This study tests the hypothesis that chronic postsurgical pain was, and still is, represented insufficiently.

Methods: We analyzed the presentation of this topic in journal articles covered by PubMed and in surgical textbooks. The following signs of insufficient representation in journal articles were used: (1) the lack of journal editorials on chronic pain after surgery, (2) the lack of journal articles with titles clearly indicating that they are devoted to chronic postsurgical pain, and (3) the insufficient representation of chronic postsurgical pain in the top surgical journals.

Results: It was demonstrated that insufficient representation of this topic existed in 1981–2000, especially in surgical journals and textbooks. Interest in this topic began to increase, however, mostly regarding one specific surgery: herniorrhaphy. It is important that the change in the attitude toward chronic postsurgical pain spreads to other groups of surgeries.

Conclusion: Chronic postsurgical pain is still a neglected topic, except for pain after herniorrhaphy. The change in the attitude toward chronic postsurgical pain is the important first step in the approach to this problem.

Keywords: neuropathic pain, persistent pain, chronic pain, postoperative pain

Introduction

The recent report of the Institute of Medicine's committee on pain relief in the US indicated that “more than 116 million Americans have pain that persists for weeks to years.”¹ The important part of this problem is chronic postsurgical pain. Aasvang and Kehlet² estimated the incidence of chronic pain after some surgical procedures: thoracotomy (approximately 50%), breast surgery (30%), cholecystectomy (10%–20%), and inguinal herniorrhaphy (10%). When the total number of patients who undergo these surgeries each year is taken into account, those figures are stunning. Macrae³ tried to present some figures that reflect the magnitude of the chronic postsurgical pain problem. His calculations yielded at least 400,000 new cases of chronic pain each year (in the US). He also indicated⁴ that about 20% of patients attending chronic pain clinics name surgery as one of the causes of their chronic pain, and for about half of these patients it was the sole cause.

Despite the obvious importance of this problem, publications on chronic pain after surgery as a general topic began to appear only a decade ago.^{4–6} These authors analyzed more than 100 references related to chronic postsurgical pain, noting that several features were common to all publications: (1) they were strictly limited to specific

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operations, (2) they failed to give a detailed description of the operative approaches, and (3) they usually provided only superficial assessments of chronic pain.^{4,6} Their conclusion was that “chronic pain after surgery has been a neglected topic.”⁴

The word “postsurgical” in the term “chronic postsurgical pain” already indicates the role of surgery in its genesis. The combination of two factors related to coping with this problem gives surgery an additional importance: (1) ineffective existing treatments of neuropathic pain and (2) the importance of surgical techniques avoiding nerve injuries in the prevention of this type of chronic pain. Unfortunately, treatments for neuropathic pain, including the majority of chronic postsurgical pain cases, are not very effective. No more than 40%–60% of patients obtain pain relief; in addition, the relief is only partial.⁷ Existing evidence indicates that intraoperative nerve injury is the most important contributor to the development of chronic postsurgical pain.^{8,9} The analysis of all possible approaches for the prevention of postsurgical pain points to one reliable solution: surgical techniques that avoid nerve damage should be used wherever possible.⁸ As a result, although chronic postsurgical pain is a topic relevant to many specialties (surgery, anesthesiology, neurology, pain medicine, rehabilitation medicine, and psychology), currently, the most promising approach to reducing the incidence and intensity of chronic postsurgical pain is almost completely in the hands of surgeons, who can select techniques that minimize the risk of nerve damage. Therefore, the adequate presentation of chronic postoperative pain in surgical journals and textbooks is especially important.

Our study tested the hypothesis that chronic pain after surgery was, and still is, represented insufficiently. We analyzed the presentation of this topic in journal articles covered by PubMed, especially in surgical journals, and also in surgery textbooks.

Methods

To test the study hypothesis with journal articles, we used the following three signs of insufficient representation: (1) the lack of journal editorials on chronic pain after surgery, (2) the lack of journal articles with titles clearly indicating that they are devoted to chronic postsurgical pain, and (3) the insufficient representation of chronic postsurgical pain in the top surgical journals. Concerning the analysis of textbooks, we followed the general approach used by Rabow et al.¹⁰ The representation of chronic postsurgical pain in textbooks was assessed on the basis of the presence of this topic in general chapters and in the chapters on specific surgeries, as well

as on the total content volume related to chronic pain after surgery. Journal articles were collected using the National Library of Medicine’s PubMed website (<http://www.ncbi.nlm.nih.gov/PubMed>). All types of articles published in English during 30 years (1981–2010) were included. Keywords related to the names of surgical interventions were added to the terms related to the chronic pain (“chronic pain” OR “neuropathy” OR “neuralgia”). Boolean operations were used in which the following variables were selected: keywords, years of publications, and type of publications. In addition to the electronic search of articles, related publications were also collected manually from the literature on chronic postsurgical pain (Figure 1).

Editorials

The editorials (articles solicited by an editorial board to provide an editorial perspective on the article published in a journal) on chronic postsurgical pain were grouped into 5-year periods, starting with 1981–1985, separately for (1) all journals covered by PubMed and (2) only surgical journals.

Topic-in-title articles

To select journal articles with titles clearly indicating that they are devoted to chronic postsurgical pain (topic-in-title articles), the indication “[Title]” was added to all terms placed into PubMed search boxes. The topic-in-title type of articles were searched as representing chronic pain after surgery in general (when terms “surgery” [Title] OR “post-operative” [Title] were added to pain terms “chronic pain” [Title] OR “neuropathy” [Title]) or as representing chronic pain after specific surgeries (see Table 1). The specific surgeries were selected on the basis of preliminary PubMed searches conducted with inclusion of various specific terms of surgical interventions and specific pain-related terms (indicated in Table 1). In the preliminary searches, the indication “[Title]” in the PubMed search box was not used. The preliminary searches resulted in a total of 1043 references. The topic-in-title articles for a specific group of surgeries were counted only when a preliminary search for this group gave ten or more general (non-topic-in-title) references. Eight groups of surgeries were selected: herniorrhaphy, limb amputation, thoracic surgery, arthroplasty, breast surgery, cardiac surgery, gallbladder surgery, and prostatectomy. For inclusion as the topic-in-title publication, articles found in various searches were reviewed to make sure that they fit the definition of chronic pain after surgery. Articles with titles without certain indication of pain duration, such as

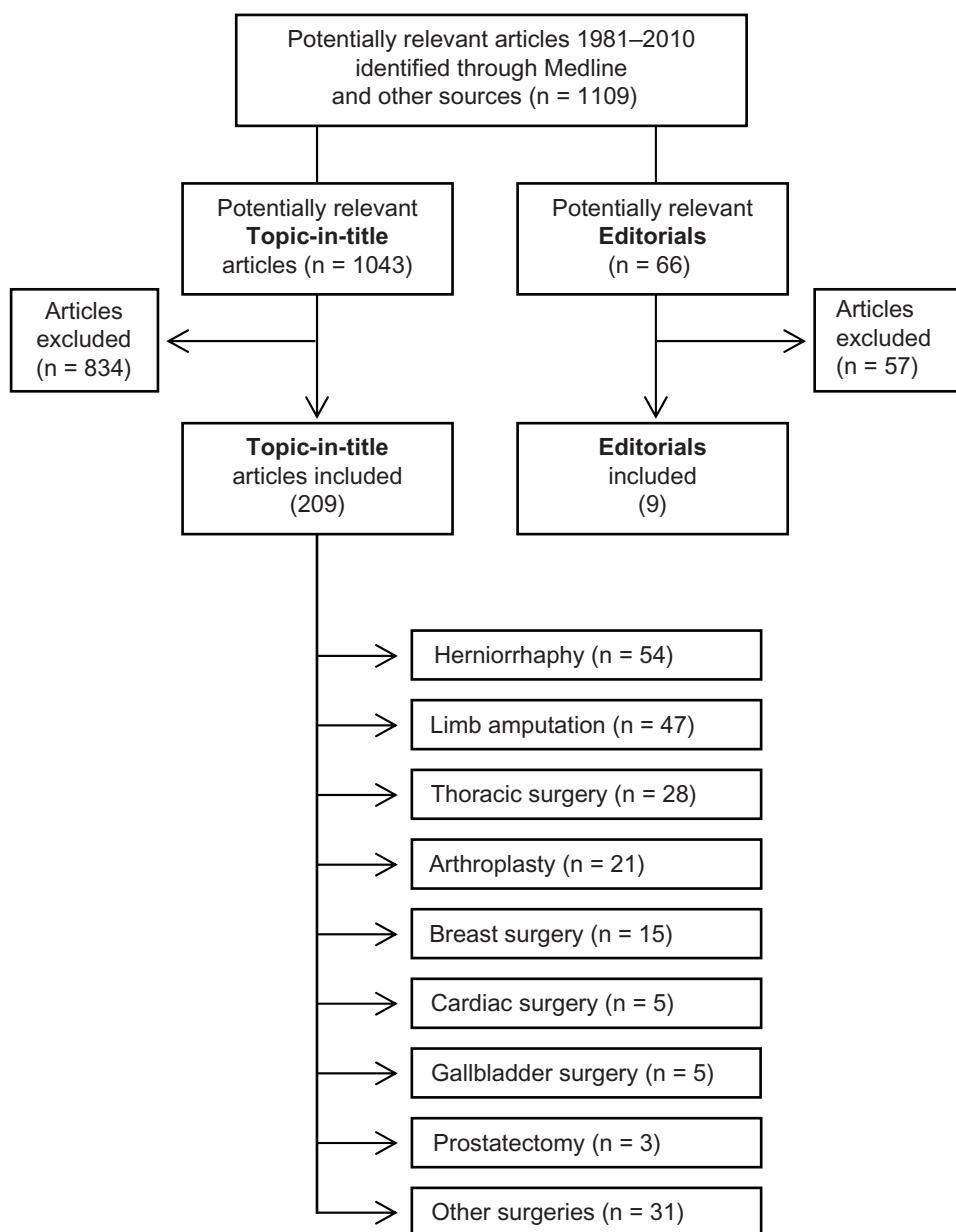


Figure 1 Flow chart of screened, excluded, and included articles on chronic postsurgical pain (1981–2010).

“persistent,” “persisting,” “long-term,” “residual pain,” or “pain syndrome” were checked and included only if the duration of pain was 6 months or longer. If the duration of pain was indicated in the title of an article as 6 months or longer, it was also included in the database.

To quantitatively evaluate the response of surgical journals to the problem of chronic postsurgical pain, we analyzed the publications of topic-in-title articles in the top 20 surgical journals. It has been observed that the number of journal articles on a new and important topic rises much faster in the top specialty journals than it does in all other journals covered by PubMed.¹¹ We also calculated the Top Journal Selectivity

Index (TJSI). This index represents the ratio of the number of articles in the top 20 surgical journals to the number of articles in all journals covered by PubMed^{11,12} (see Discussion). We counted only articles with titles clearly announcing that they are devoted to chronic pain after surgery (topic-in-title articles). The selection of the top 20 surgical journals was based on the rank of a journal sorted by the impact factor, as indicated by Journal Citation Reports for year 2010 (<http://science.thomsonreuters.com>). The following surgical journals were included: the *American Journal of Surgery*, *American Journal of Surgical Pathology*, *American Journal of Transplantation*, *Annals of Surgery*, *Annals of Surgical*

Table 1 Numerical representation of topic-in-title articles on chronic pain after specific surgeries, 1981–2010^a

No	Terms of surgical interventions ^b	Number of topic-in-title articles
1	Herniorrhaphy OR "hernia repair"	54
2	Amputation ^c	47
3	"Thoracic surgery" OR thoracotomy	28
4	Arthroplasty OR "knee replacement" OR "hip replacement"	21
5	"Breast surgery" OR "breast reconstruction" OR mastectomy	15
6	"Cardiac surgery" OR "CABG surgery" OR sternotomy	13
7	"Gallbladder surgery" OR cholecystectomy	5
8	Prostatectomy	3
Total		186

Notes: ^aElectronic (via PubMed) and manual search of the literature on chronic postsurgical pain. ^bAND the following pain-related terms: "chronic pain" OR "neuropathy" OR "neuralgia" were added. ^cthe following terms: "phantom pain" OR "residual limb pain" were added to the pain-related terms.

Abbreviation: CABG, coronary artery bypass grafting.

Oncology, Archives of Surgery, British Journal of Surgery, Dermatologic Surgery, Endoscopy, Journal of the American Academy of Orthopaedic Surgeons, American Journal of Bone and Joint Surgery, Journal of Gastrointestinal Surgery, Journal of Shoulder and Elbow Surgery, Journal of Surgical Oncology, Journal of Vascular Surgery, Journal of Thoracic and Cardiovascular Surgery, Surgical Endoscopy, Surgery, Transplantation, and World Journal of Surgery.

Textbooks

The assessment of representation of chronic postsurgical pain in the surgical textbooks was based on the analysis of three texts selected on the basis of two factors: the text should be eponymously titled (named texts) and also should be sorted as one of the top three surgical texts held in libraries as listed in the meta-catalog WorldCat (worldcat.org). The following textbooks were selected: *Sabiston Textbook of Surgery*, 18th ed, 2008;¹³ *Schwartz's Principles of Surgery*, 9th ed, 2009;¹⁴ and *Greenfield's Surgery*, 5th ed, 2010.¹⁵ For comparison, an anesthesiology textbook was also analyzed: *Miller's Anesthesia*, 7th ed, 2010.¹⁶ All textbooks were inspected on the presence of materials related to chronic postsurgical pain (number of lines of text, tables, figures, references). The data were collected in three steps: (1) review of chapters on basic principles (examination of the table of contents, identification of chapters devoted to general topics, inspection of all pages of identified chapters), (2) review of specific surgeries (examination of text index for keywords concerning specific surgeries: limb amputation, thoracotomy, coronary artery

bypass grafting, mastectomy, cholecystectomy, herniorrhaphy, and arthroplasty; inspection of all pages of identified chapters), and (3) examination of the text index (keywords concerning specific chronic pain syndromes: causalgia, complex regional pain syndrome, neuralgia, neuropathy, pain chronic, pain neuropathic, phantom pain; inspection of all pages indicated for these terms.) Each textbook was assessed by two reviewers (SG and IK). Discrepancies in the count were resolved by consensus.

Results Editorials

The results on the representation of chronic postsurgical pain in journal editorials are presented in Table 2. Since 1981 only nine editorials were published (two in 2001–2005 and seven in 2006–2010). Seven of them appeared in anesthesiological journals (four in *Anesthesiology*) and none in surgical journals.

Topic-in-title articles

Topic-in-title articles (clearly announcing the problem of chronic postsurgical pain) are presented in Table 3. This table reflects only the number of articles that represent chronic pain after surgery in general. It indicates that the topic-in-title articles began to appear in significant numbers only relatively late, especially in surgical journals (2001–2010). Table 4 compares the numbers of topic-in-title articles on chronic and acute postsurgical pain represented as a percentage of all articles on chronic or acute pain (without the indication "surgery" and "postoperative"). The percentage of the topic-in-title type of articles on chronic postsurgical pain was 0% in 1981–1990 and rose to 0.8% in 2001–2010. Nevertheless, even in 2001–2010 it was one-seventh the number on acute postsurgical pain.

The summary of the results with the topic-in-title articles for eight specific groups of surgeries is presented in Table 1. The most publications were on herniorrhaphy (54 articles), then, in decreasing order, amputation (47),

Table 2 Editorials on chronic postsurgical pain

Years	Number of editorials		References
	All journals	Surgical journals	
81–85	0	0	
86–90	0	0	
91–95	0	0	
96–00	0	0	
01–05	2	0	22,23
06–10	7	0	24–30

Table 3 Topic-in-title articles on chronic postsurgical pain, 1981–2010

Years	Numbers of articles ^a	
	All journals ^b	Surgical journals
81–85	0	0
86–90	0	0
91–95	2	2
96–00	9	2
01–05	15	6
06–10	31	10

Notes: ^aArticles with titles clearly indicating that they are devoted to postsurgical chronic pain. Searched as articles on chronic pain after surgery in general: “chronic pain” OR “neuropathic” AND “surgery” OR “postoperative;” ^bincluding surgical journals.

thoracic surgery (28), arthroplasty (21), breast surgery (15), and cardiac surgery (13). There were only five topic-in-title articles on gallbladder surgery and three on prostatectomy. The distribution of articles among journals of different specialties depended on the type of specific surgeries. With herniorrhaphy it was mostly surgical journals, with limb amputation mostly pain journals and disability/rehabilitation journals, and with all other surgeries mostly anesthesiology and pain journals. Table 5 presents the time-related progress in numerical representation of topic-in-title articles on chronic pain after specific surgeries in all journals and separately in all surgical journals. In surgical journals the only impressive rise was for herniorrhaphy, from five articles in 1991–2000 to 41 in 2001–2010.

The publication of topic-in-title articles on chronic pain after surgery in the top 20 surgical journals is represented in Table 6. In 1991–2000 only two articles were published in the top surgical journals, but that dramatically increased (to 18) in 2001–2010. The TJSI calculated for herniorrhaphy (only for topic-in-title articles) was 36.7% in 2001–2010. That means that these articles published in the top 20 surgical journals constitute almost one-third of all articles published

in journals covered by PubMed (>5000). However, the same index for the other seven surgeries was only 2.9%.

Textbooks

The textbook analysis is presented in Table 7. Only chronic pain after inguinal herniorrhaphy was present in all three surgical texts (but not in *Miller’s Anesthesia*). *Greenfield’s Surgery* mentioned chronic pain after three specific surgeries (more than the other texts in this regard); however, it did not include anything on chronic postsurgical pain in the chapters on basic principles. Orthopedic surgeries in general were included only in one of the three surgical texts; therefore, chronic pain after arthroplasty is not in the table. The number of chronic pain-related references varied from two to five in the surgical texts, and there were 12 references in *Miller’s Anesthesia*. The chronic pain-related figures or tables were absent in *Sabiston Textbook of Surgery* and *Greenfield’s Surgery*. There were two chronic pain-related tables in *Schwartz’s Principles of Surgery*. *Miller’s Anesthesia* included two figures and two tables related to chronic postsurgical pain. The total number of lines on chronic postsurgical pain was more or less similar: from 85 to 64 lines in the surgical texts and 100 lines in *Miller’s Anesthesia*. Taking into account that one page of the texts has approximately 120 lines and the total volume of the texts varies from 2000 to 3000 pages, the presentation of chronic pain after surgeries is almost negligible.

Discussion

The indices that were used in this study indicated that the topic of chronic postsurgical pain is represented insufficiently, especially in surgical journals. Only nine editorials on chronic postsurgical pain were published in 1981–2010, all in nonsurgical journals. The articles clearly announcing the problem of chronic postsurgical pain (topic-in-title articles) began to appear in significant numbers only relatively late, in 2001–2010; however, even during the last decade they were sevenfold fewer than articles on acute postsurgical pain. In 1991–2000 only two topic-in-title articles on chronic pain after surgery were published in the top 20 surgical journals. There was a clear sign that the interest in chronic postsurgical pain began to increase in 2001–2010, but only in one group of surgeries: herniorrhaphy. The topic-in-title articles in all journals with this type of surgery increased from five (1991–2000) to 49 (2001–2010). The increase in postherniorrhaphy pain reporting is in stark contrast to publications regarding other types of postsurgical pain, especially in surgical journals (Figure 2).

Table 4 Comparisons of topic-in-title articles on chronic and acute postsurgical pain

Years	“Chronic pain” ^a AND “surgery” ^b IN TITLE		“Pain” NOT “chronic” AND “surgery” ^b IN TITLE	
	Number of articles	As a percentage of “chronic pain” ^a only ^c	Number of articles	As a percentage of “pain” only ^c
81–90	0	0%	626	6.8%
91–00	11	0.6%	1137	6.5%
01–10	46	0.8%	2117	5.8%

Notes: ^aOR “neuropathic;” ^bOR “postoperative;” ^cwithout “surgery” or “postoperative.”

Table 5 Time-related progress in numerical representation of topic-in-title articles on chronic pain after specific surgeries

No	Specific surgeries	All journals			Surgical journals ^a		
		81–90	91–00	01–10	81–90	91–00	01–10
1	Herniorrhaphy	0	5	49	0	5	41
2	Limb amputation	7	18	22	0	4	2
3	Thoracic surgery	2	10	16	0	4	6
4	Arthroplasty	6	4	11	2	2	6
5	Breast surgery	1	5	9	0	0	0
6	Cardiac surgery	1	4	8	0	1	0
7	Gallbladder surgery	0	4	1	0	1	0
8	Prostatectomy	0	0	3	0	0	1

Note: ^aNumber of articles in all surgical journals covered by PubMed.

The most significant sign of insufficient representation of chronic postsurgical pain is found in the presentation of this topic in surgical textbooks (2008–2010 editions). The presentation of chronic postsurgical pain in less than a page for various groups of surgeries per 2000–3000 pages of a textbook is clearly inadequate. However, chronic pain after herniorrhaphy is reflected in all three surgical texts analyzed (mostly very briefly).

Over the 10 years since the publication of seminal papers presenting postsurgical chronic pain,^{4–6} an important change has occurred but only in one area: chronic pain after herniorrhaphy. TJSI for herniorrhaphy has reached 36.7% (Table 6). It means that approximately one-third of all articles on herniorrhaphy in all journals covered by PubMed were published in the top 20 surgical journals. TJSI represents the ratio of the number of articles in the top 20 journals of the specialty to the number of articles in all journals covered by PubMed (>5000). A surge of this index is the sign of rising interest in a publication topic. For some reason, the top journals respond more rapidly to new and important developments in a specialty.^{11,12,17} At a time when TJSI for chronic pain after herniorrhaphy was so high, it was ten times lower for seven other surgeries (2.9%), reflecting insignificant attention to chronic pain after these types of surgeries. Hopefully, the increased TJSI for herniorrhaphy indicates the initial change in the attitude toward chronic postsurgical pain in general and that it will soon spread to other groups of surgeries.

Such a change in attitude is necessary because of the vast number of patients with chronic postsurgical pain. Macrae³ gave some insight into the magnitude of the problem by taking the number of operations performed in the US in 1994 (only for seven groups of surgeries) and multiplying it by the lowest figures for the incidence of chronic pain for these surgeries. His calculations yielded a possible 394,000 cases

of chronic postsurgical pain each year. The complete absence of editorials related to this problem in the 1990–2000 period clearly indicates that the attention of the medical community was not focused on this type of pain.

The main reason for the neglect of chronic postsurgical pain in surgical journals and textbooks was well described by Macrae in 2001: “It is hard for any doctor to accept that the treatments they offer may cause morbidity, especially if they feel that they may be to blame.”¹⁴ An additional reason might be that surgeons are less exposed to patients with developed chronic postsurgical pain than physicians in other specialties (eg, family medicine, pain medicine, neurology). At the same time, surgeons do have good reasons to feel that they are not to be blamed for chronic postsurgical pain. Although iatrogenic neuropathic pain caused by intraoperative nerve injury is the most common type of chronic postsurgical pain, this type of pain may also happen without any damage to a nerve trunk.^{8,9} In addition, nerve damage alone is usually not sufficient to cause chronic pain, because most of the cases of intraoperative nerve damage result in motor and

Table 6 Top Journal Selectivity Index (TJSI) for representation of chronic pain as an adverse effect of surgery

Topic of publications	Years	Number of articles ^a		TJSI (ratio of top to all)
		All journals ^b (>5000)	Top specialty journals ^c (20)	
Chronic postsurgical pain: herniorrhaphy	91–00	5	2	
Chronic postsurgical pain: herniorrhaphy	01–10	49	18	36.7%
Chronic postsurgical pain: seven specific surgeries ^d	91–00	45	1	
Chronic postsurgical pain: seven specific surgeries ^d	01–10	70	2	2.9%

Notes: TJSI represents the number of articles published in the top 20 journals to the number of articles in all journals covered by PubMed;^{11,12} ^aTopic-in-title articles;

^bJournals covered by PubMed; ^ctop 20 surgical journals sorted by impact factor (journal citation report, 2010); ^dlimb amputation, thoracic surgery, arthroplasty, breast surgery, cardiac surgery, gallbladder surgery, prostatectomy.

Table 7 Presentation of chronic postsurgical pain in surgical textbooks

	<i>Sabiston Textbook of Surgery, 2008</i>	<i>Schwartz's Principles of Surgery, 2009</i>	<i>Greenfield's Surgery, 2010</i>	<i>Miller's Anesthesia, 2010</i>
Total number of pages	2286	1776	2074	3084
Total number of lines ^a on the topic	85	70	64	100
Total number of references on the topic	4	2	5	12
Presence of the topic in chapters				
Basic principles	+	+	-	+
Limb amputation	-	-	+	-
Thoracotomy	-	-	-	+
Coronary artery bypass grafting	-	-	-	+
Mastectomy	-	-	+	-
Inguinal herniorrhaphy	+	+	+	-

Note: ^aApproximately 120 lines per page.

sensory changes without the development of chronic pain. Chronic postsurgical pain is complex and poorly understood; there are many possible factors in its development (see reviews^{3,8,9}).

It is accepted that chronic postsurgical pain is an inevitable consequence of surgery in a certain proportion of cases, like wound infection.³ Chronic postsurgical pain should be discussed openly, and correct information on risk should be given to prospective patients. The incidence of chronic postsurgical pain varies very widely, up to 80% with limb amputations.¹⁸ The *Sabiston Textbook of Surgery*¹³ indicates that chronic pain after open inguinal hernia repair has incidence ranging from 29% to 75%. A systematic review by Aasvang and Kehlet² reported that the overall incidence of chronic pain after open inguinal herniorrhaphy is 18%. In a recent large prospective study, Aasvang et al¹⁹ found that the incidence of substantial pain 6 months after groin hernia repair was 12%. If patients had accurate information on their risk of chronic pain, they at least would be in the position to decide against an operation.

According to Kehlet et al,⁸ the analysis of all possible approaches for the prevention of chronic postsurgical pain yields only one reliable solution: to use surgical techniques that avoid nerve damage. In a subsequent study,¹⁹ these authors provided a rationale for selecting surgical techniques with a lower risk of chronic pain after groin hernia repair. They demonstrated that the incidence of "substantial pain" was significantly lower with laparoscopic than with open surgery (8.1% vs 16.0%, $P < 0.02$). A similar conclusion regarding chronic pain after laparoscopic versus open surgery was reached regarding cholecystectomy. Stiff et al²⁰ indicated that right upper quadrant chronic pain was less common after laparoscopic surgery (3.4% vs 9.7%, $P < 0.05$).

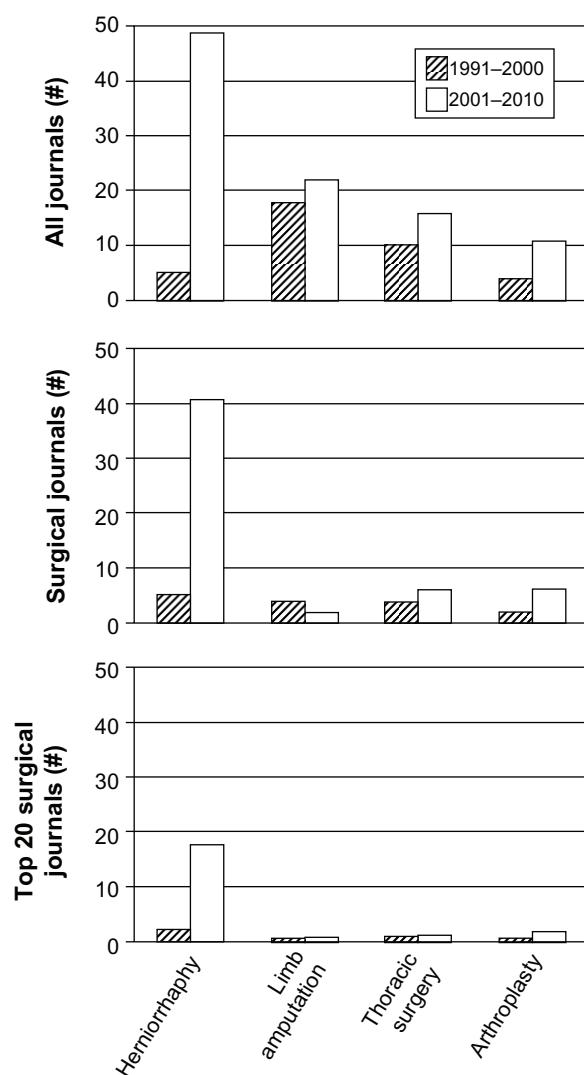


Figure 2 Number of topic-in-title articles published in 1991–2000 and 2001–2010 periods on chronic pain after the four types of specific surgeries.^a
Notes: ^aAlong the vertical axis, the number (#) of articles published in all journals (including surgical journals), the number of articles published in surgical journals (including top 20 surgical journals), and the number of articles published in top 20 surgical journals (listed in the method section). Along the horizontal axis, the four types of specific surgeries with the highest number of published articles.

Although chronic postsurgical pain is relevant to many specialties (eg, surgery, anesthesiology, neurology, pain medicine, and rehabilitation medicine), risk can be decreased only by surgeons, because only they can choose to use techniques with lower risk of nerve damage. Chronic postoperative pain can also include anesthesia-related nerve injuries. Cheney et al²¹ analyzed claims against anesthesiologists and found that 670 (16% of 4183) claims were for anesthesia-related nerve injury, including nerve injuries due to positioning of the patient after anesthesia induction. The most frequent sites of injury were the ulnar nerve (28%) and brachial plexus (20%).

Conclusion

In conclusion, chronic postsurgical pain is still insufficiently represented, especially in surgical journals and textbooks. However, there is an indication (rise in TJSI) that the interest in this topic began to increase. At present, the increase is mostly related to one specific group of surgeries: herniorrhaphy. However, it is likely that the change in the attitude toward chronic postsurgical pain will spread to other specific groups of surgeries.

Disclosure

The authors report no conflicts of interest in this work.

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Supplementary material

List of “topic-in-title” articles on chronic postsurgical pain (1981–2010)

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