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The Incidence of Chronic Postsurgical Pain After Inguinal Hernia Surgery: Association with the Acute Postsurgical Pain: A Preliminary Study Based on Questionnaires

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Purpose: Chronic postsurgical pain（CPSP）is a major issue associated with surgery. The primary aim of this study was to define the incidence of CPSP after inguinal hernia surgery. The secondary goals were to define risk factors for the development of CPSP. Methods: We performed a retrospective study analyzing inguinal hernia patients after surgery. We investigated the presence or absence of pain, the site of pain, and its intensity. Factors such as sex, age, time of surgery, days of hospital stay and the presence or absence of acute postsurgical pain on the first postoperative day were compared between patients with and without CPSP. Results: CPSP occurred in 15 out of 49 patients. The median numerical rating scale（NRS）(0-10), pain score for CPSP was 3（1-8）. CPSP was significantly less in older patients. NRS score for the acute postsurgical pain of patients with CPSP was 3（0-10）, but NRS score of patients who did not produce CPSP was 1（0-7）. Conclusions: These results indicated that CPSP develops following approximately 30% of inguinal hernia surgery cases. It may be predicted by the intensity of acute postsurgical pain on the first postoperative day.

Key words: chronic postsurgical pain, acute postsurgical pain, inguinal hernia

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INTRODUCTION

Chronic postsurgical pain（CPSP）, such as post-thoracotomy pain syndrome and phantom limb pain, poses a significant problem for long-term perioperative care. Furthermore, surgeries such as breast cancer surgery, coronary artery bypass surgery, and cesarean section are reported to substantially provoke CPSP［1］. The International Association for the Study of Pain（IASP）defines CPSP as the pain that develops after a surgical procedure and lasts for at least 2 months following the procedure. Other causes for the pain must be excluded（e.g., continuing malignancy or chronic infection）, in particular, pain from a condition preceding the surgery must be disregarded［2］. Genetic susceptibility, preceding pain, psychosocial factors, age, and sex are known risk factors for the development of CPSP［1］.

Recently, it was shown that the incidence of CPSP after breast cancer surgery in Japan is similar to that in America and Europe［3-6］. It has been revealed that CPSP following inguinal hernia surgery is not rare, but the reported frequency of CPSP varies by 0.7-43.3% depending on the study［1, 7, 8］. Callesen *et al*. reported that the extent of acute postoperative pain at 1 and 4 weeks after inguinal hernia surgery is a predictive factor for CPSP at 1 year［9］. However, there is little information regarding the incidence of CPSP after inguinal hernia surgery in Japan. In addition, the relationship between the incidence of CPSP and acute postsurgical pain on the first postoperative day following inguinal hernia surgery is unclear; therefore, we investigated the incidence of and risk factors for CPSP associated with inguinal hernia surgery.

METHODS

This study was undertaken with the approval of the Ethical Review Board of the National Hospital Organization Hamada Medical Center.

We retrospectively examined the clinical records of patients aged over 20 years old who underwent open inguinal hernia surgery and passed more than 3 months after surgery between January 2011 and September 2012.

First a questionnaire was mailed to all of the target patients followed by a telephone survey made to patients who consented to further questioning. The survey assessed the presence or absence of current pain［evaluated on the Numerical Rating Scale（NRS）(0-10)］, site of pain, triggers of pain, characteristics of pain, and frequency of pain.

We retrospectively studied these patients' clinical records to identify their age, height, and weight as well as the time of surgery, method of surgery, method of anesthesia, days of hospital stay and NRS pain scores on the first postoperative day. We

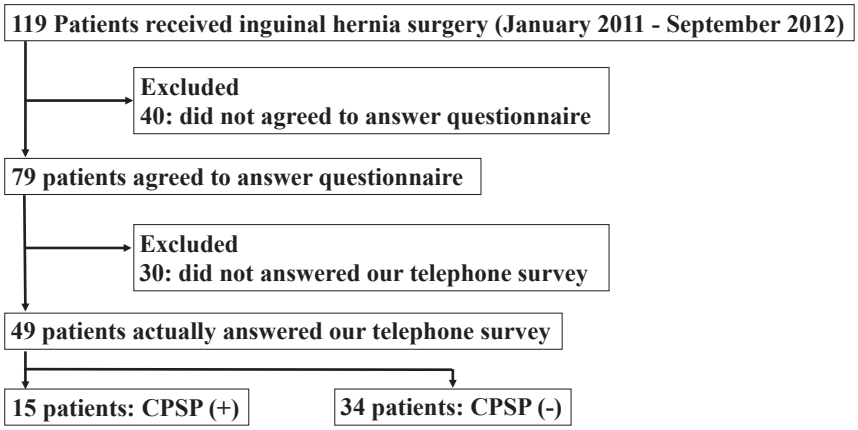

Fig. 1. Flow diagram
CPSP after open inguinal hernia surgery occurred in 15 out of 49 patients (30.6%). 34 patients did not develop CPSP. CPSP: chronic postsurgical pain.

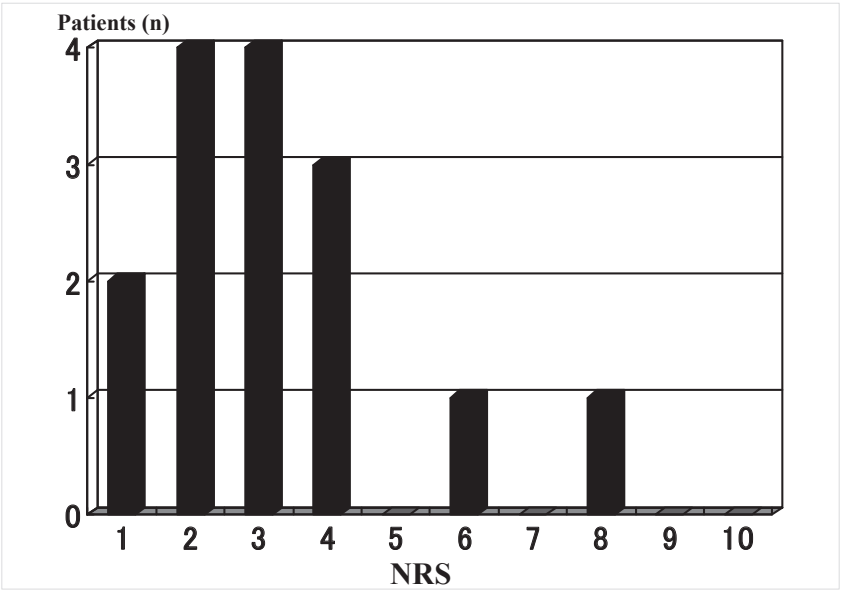

Fig. 2. Intensity and the number of patients of CPSP
The numerical rating scale（NRS）pain score ranges from 0 to 10. Data presented at number of patients. The median with range of NRS pain score for CPSP was 3（1-8）. Two of 49 patients（4%）suffered from pain with an NRS pain score of 5 or more 4.

first divided the results into two groups: those who had not experienced CPSP and those who had (with and without CPSP). We examined these for trends in age, sex, height, weight, time of surgery, and NRS pain scores in the acute phase after surgery. Chi-squared (χ^2) and Mann-Whitney U tests were used for statistical analyses (Stat-View 5.0; Abacus Concepts, Inc. Berkley, CA, USA). Statistical significance was set at $P < 0.05$.

RESULTS

There were 119 patients who underwent open inguinal hernia surgery and passed more than 3 months after the surgery between January 2011 and September 2012. Seventy-nine patients (66.4%) responded to the questionnaire, of which 49 patients (41.1%) agreed to further questioning by taking part in a telephone survey (Fig. 1). Of 49 patients, 45 patients were male and 4 were female. Their ages raged between 33 and 85, with their average age being 71. Spinal anesthesia with isobaric 0.5% bupivacaine and non-endoscopic surgery using surgical mesh were used in all cases. CPSP after open inguinal hernia surgery occurred in 15 out of 49 patients (30.6%) (Fig. 1). The median average of NRS pain score for CPSP was 3 (range: 1-8). Severe CPSP with NRS ≥5 occurred in two patients (4%) (Fig. 2). Thirteen patients had pain around the wound area, and two patients reported experiencing pain in the scrotal region. Twelve patients experienced pain during movement, and five patients in cold weather. Six patients felt pain every day, and six patients once every several days. Six patients had dull pain, five patients pressing pain, four patients stabbing pain, two patients tingling pain, and two patients described their pain as a throbbing pain (multiple replies were allowed). Comparison on the basis of the presence or absence of CPSP showed no significant differences in factors such as sex, height, weight, time of surgery and days of hospital stay. CPSP was significantly less in older patients ($P = 0.0107$). The median NRS pain scores for the acute postsurgical pain of patients with CPSP was 3 (0-10), but NRS pain scores of patients who did not produce CPSP was 1 (0-7) ($P = 0.0199$) (Table).

DISCUSSION

We found that younger patients were more likely to suffer CPSP than older patients, and that those who developed CPSP were more likely to have a higher NRS pain score for acute postsurgical pain on the first day following inguinal hernia surgery.

The international guidelines for inguinal hernia surgery characterize its associated CPSP as pain present at sites different to those of any preoperative

Table. Comparison of the presence or absence of CPSP

	CPSP (+) (n = 15)	CPSP (−) (n = 34)
Gender (M: F)	**14:01**	**31:03:00**
Age (years)	**67 (33-83)**	**75 (61-85) *1**
Weight (kg)	**59.8 (46.8-70.0)**	**59.2 (48.5-70.0)**
Height (cm)	**162.8 (152.7-168.0)**	**160.2 (139.0-166.0)**
Time of surgery (min)	**80 (42-102)**	**104 (48-118)**
NRS pain scores for the acute postsurgical pain	**3 (0-10)**	**1 (0-7) *2**
Days of hospital stay (days)	**6 (4-18)**	**7 (4-49)**

Data presented as median score with range. Patients without CPSP were significantly older and had a higher NRS pain score for the acute postsurgical pain as compared with the patients who did not have CPSP. *$^1P = 0.0107$, *$^2P = 0.0199$. CPSP: chronic postsurgical pain. M: male. F: female. NRS: numerical rating scale.

pain, still present 3 months following surgery, which persists beyond 6 months [7]. Many articles adopt the time frame of CPSP resolution as 1 year from 3 months postsurgery [1, 8-13]. In our study, pain that persisted for more than 3 months following a surgical procedure was considered CPSP.

Consistent with our data, nationwide questionnaire surveys taken in Denmark showed that CPSP occurred in 28.7% of inguinal hernia surgeries postoperatively and that 11.0% of survey respondents develop functional disorders [8]. According to the European Hernia Society, CPSP severe enough to cause difficulties in everyday life occurs at a 0.5-6.0% frequency [7], which is again close to our results. Considering its high occurrence and severe intensity, CPSP after an inguinal hernia surgery is one of the most serious complications and cannot be ignored in the hospital setting.

Kehlet *et al*. indicated the association between acute postoperative pain and CPSP [1]. Van den Kerkhof *et al*. reported that one of the most consistent predictors of CPSP is the presence of severe acute pain in the first week after surgery [12]. Callesen *et al*. also predicted CPSP based on a sum of daily pain scores for the first 7 days after inguinal hernia surgery [9]. Our data indicated that CPSP may be predicted by the intensity of acute postsurgical pain on the first postoperative day. We therefore suggested that the management of acute postoperative pain in the early period is important for preventing CPSP. In fact, CPSP can be suppressed by the use of thoracic paravertebral block, postoperative epidural analgesia, opioids, and NSAIDs that inhibit the pain in the acute phase [4, 13, 14].

The general mechanisms of CPSP include surgical nerve injury, excitement of neuromas at the lesion site, peripheral sensitization, central sensitization, descending inhibitory system, limbic cortex, change of mood, behavior and autonomic response in the hypothalamus, perception of pain in the cortex, and genetic contribution [1]. As for the major risk factors, the development of CPSP are generally associated with genetic problems, psychologic problems, younger age, female sex, severity of preoperative pain, perioperative neuropathy, smoking, and strong postoperative pain [1, 10, 12, 15, 16]. In our study, CPSP was associated with age and acute postoperative pain.

Our study has several limitations. First, our retrospective study was performed without randomization of patient selection. The divided groups in our study were those who had not experienced CPSP and those who had, termed with and without CPSP, respectively. The preoperative patient background characteristics had no significant differences in terms of gender, height and body weight, and all patients underwent the same operation method under the same spinal anesthesia procedure. However, because of the lack of randomization this could distort results. In future, a prospective study will be needed. Second, it is reported that worst NRS scores of inguinal hernia surgery on the first postoperative day was about 5 [17]. However, we did not evaluate worst NRS scores on the first postoperative day. We only checked the NRS scores from clinical records on the first postoperative day. It is possible that we underestimated NRS scores. Third, we do not do the follow-up of patients after the discharge. Therefore, we do not know whether patients receive the same treatment for postoperative pain. It may be important that we inform patients how to manage the pain in this therapeutic window.

In conclusion, it was shown that inguinal hernia surgery frequently develops CPSP, despite it being a minor surgery. It may be predicted by the intensity of acute postsurgical pain on the first postoperative day. Therefore, it is suggested that the management of acute postsurgical pain is important to prevent CPSP after inguinal hernia surgery.

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