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Pain and Functional Impairment 1 Year After Inguinal Herniorrhaphy: A Nationwide Questionnaire Study

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Objective
To determine the incidence of groin pain 1 year after inguinal herniorrhaphy and to assess the influence of chronic groin pain on function.

Summary Background Data
The reported incidence of chronic pain after inguinal herniorrhaphy varies from 0% to 37%. No cross-sectional cohort studies with high follow-up rates have addressed this problem, and there is a lack of assessment of the functional consequences of chronic groin pain after herniorrhaphy.

Methods
Two sets of self-administered questionnaires were mailed 1 year after surgery. The first established the incidence of chronic groin pain. The second characterized the pain and the effect of the pain on the function of those reporting pain. The study population comprised patients older than age 18 years registered in the Danish Hernia Database who underwent surgery between February 1, 1998, and March 31, 1998.

Results
The response rate to the first questionnaire was 80.8%. Pain in the groin area was reported by 28.7%, and 11.0% reported that pain was interfering with work or leisure activity. Older patients had a lower incidence of pain. There were no differences in the incidence of pain with regard to the different types of hernia, the different types of surgical repairs, or the different types of anesthesia. The second questionnaire was returned by 83%. Of these, 46 (4%) reported constant pain. The intensity of pain while at rest was moderate or severe in 40 (3%); with physical activity, pain was moderate or severe in 91 (8%). Impairment of specific daily activities as a result of pain was reported by 194 (16.6%). Pain characteristics were predominantly sensory, with a low use of affective terms.

Conclusion
One year after inguinal hernia repair, pain is common (28.7%) and is associated with functional impairment in more than half of those with pain. These factors should be addressed when discussing the need for surgical intervention for an inguinal hernia.

Chronic pain after inguinal herniorrhaphy is not rare, but the reported frequency of pain varies from 0% to 37%.[1–7] However, the extent to which chronic pain impairs function has not been well described. The development of chronic pain after inguinal herniorrhaphy has been attributed to several mechanisms, including damage to well-defined sensory nerves (ilioinguinal, iliohypogastric, and genitofemoral)[8] and "mesh inguinodynia."[9] Several factors have been proposed as predictors of chronic pain, including surgery for a recurrent hernia,[10] intensity of early postoperative pain,[3,10] insurance status of the patient,[11] degree of specialization and experience of the surgeon,[12] and the type of surgical procedure used. Liem et al[2] found a lower incidence of pain after a laparoscopic hernia repair (2%) than an open nonmesh repair (14%). Dirksen et al[4] found no difference in the development of chronic pain after a Bassini repair (12%) versus a laparoscopic repair (15%). Hay et al,[6] in a large multicenter trial including 1,578 patients, found an overall pain incidence of 7%, with no significant differences among the different types of nonmesh, open hernia repairs. Rutkow and Robbins,[13] in contrast, found a chronic pain incidence of 0% in their case series of recurrent her-

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Table 1. QUESTIONNAIRE 1

Modality	Question	Allowed answers/comments
Recurrence	Have you noticed recurrence of your inguinal hernia, after the operation?	Yes No In doubt
Pain	Have you had any pain, within the last month, in the area where the inguinal hernia was situated before the operation	Yes No If the answer to this question was yes, a more detailed questionnaire was sent
Consequence of pain	If you have had any pain in the groin area within the last month, have you been examined or treated for this pain	Yes No
	If you have had any pain in the groin area within the last month, has this pain been the cause of limitations in work or leisure activities	Yes No

nias, using a tension-free mesh repair. None of these studies of surgical technique had chronic pain as a primary outcome parameter, and the definitions of chronic pain were inconsistent. A large-scale multicenter study addressing postherniorrhaphy pain found moderate to severe pain in 12% of patients.[3] However, this study is difficult to interpret because approximately 62% of the participating patients were excluded or lost to follow-up. Because patient selection and participation in clinical trials may influence the long-term outcome, the frequency of chronic pain after inguinal herniorrhaphy in the general population is unknown. The low recurrence rates associated with the use of mesh repair may shift focus from recurrence to other outcome parameters. Further, all frequent and negative consequences of surgery should be considered when discussing the indication for surgery with the patient. We have therefore attempted to establish the frequency and significance of pain after inguinal herniorrhaphy in a nationwide population.

PATIENTS AND METHODS

After receiving approval from the appropriate ethics committees and the oversight board of the Danish Hernia Database, a questionnaire study was carried out. Because of the rules regulating the use of the database, contact with patients was required to be on the basis of a registration in the Danish National Hospital Administrative System. Information in the two registers was linked by the use of unique Social Security numbers. Inclusion criteria included concurrent registration in the database and the hospital administration system, age older than 18, and surgical repair of an inguinal or femoral hernia between February 1, 1998, and March 31, 1998. Patients who underwent surgery for simultaneous bilateral hernias were excluded, as were patients who in the observation period had a subsequent hernia repair. A screening questionnaire (Table 1) was sent by mail to all patients precisely 1 year after surgery. Patients were asked whether they believed they had a recurrence of their hernia or had experienced pain during the past month. Patients who said they had groin pain received a second, more detailed questionnaire (Table 2) asking about the pain and its effect on the person's function.

The setup and organization of the database has been reported elsewhere.[14] In brief, a one-page form is filled out by the operating surgeon immediately after surgery and sent to a central database secretariat, where the subsequent data processing is carried out. Currently, more than 95% of inguinal herniorrhaphies performed in Denmark (approximately 10,000/year) are reported to the database. The following information was abstracted from the database: whether the repair was for a primary or a recurrent hernia, the type of repair, the type of anesthesia used, the type of hernia found, and the age and sex of the patient. Data from the returned questionnaires, together with data from the database, were analyzed using SAS version 6.12 software (SAS Institute, Inc., Cary, NC). Data are presented, where appropriate, with 95% confidence intervals, considering the study cohort as a sample from a conceptual population of all herniorrhaphy patients in Denmark. Overlapping confidence intervals are seen as no significant difference between the groups compared.

RESULTS

In the 2-month period between February 1, 1998, and March 31, 1998, 1,652 patients were registered in the database as having undergone surgery for an inguinal or femoral hernia, and 1,443 questionnaires were mailed. Reasons for not receiving questionnaire 1 are detailed in Table 3.

Questionnaire 1 was returned by 1,166 patients for a response rate of 80.8%. Three hundred thirty-five patients (28.7%) reported having pain in the area of the hernia within the past month and 128 (11.0%) reported that the pain impaired their work or leisure activities, but only 53 (4.5%) had sought or received medical treatment for this pain. A suspicion of recurrence of the hernia was reported by 79 patients (6.8%); another 148 (12.7%) were unsure of a recurrence. Approximately half the patients reporting recurrence also reported pain; less than one third of patients without self-reported recurrence reported pain. The inci-

Table 2. QUESTIONNAIRE 2

Modality	Question	Allowed answers/comments
Localization of pain	On the drawing below, please mark the area, where the pain typically is situated	Drawing of groin area
Impairment, as a consequence of pain	Please state whether the pain in the groin is a problem carrying out the following activities: Raising from low chair Sitting down >30 min. Standing up >30 min. Walking on stairs Shopping Driving a car Traveling by bus or train Exercising usual sports activity Don't know	Yes No Don't Know Not applicable
Description of pain	Please mark any of the following words, that best describes the pain in the groin: Tender (oem); Shooting (jagende); Pricking (prikkende) Constricting (snaerende); Sharp/cutting (skaerende/skarpe); Cleaving (kloevende); Pulling (hivende); Drilling (borende); Hot/burning (varm/braendende); Dull/aching (tung/dump); Radiating (udstraelende); Pounding/hammering (dunkende/hamrende); Irritating (irriterende); Tiring/exhausting (traettende/udmattende); Sickening (kvalmende); Frightful (frygtelig); Punishing (straffende)	
Frequency of pain	How often is the pain present	Seldom Occasionally Always or nearly always
Level of pain	How strong is the pain typically –at rest –during physical activity	No pain: Slight pain: Moderate pain Severe pain

dences of pain and impairment, stratified by gender, primary versus recurrent hernia repair, type of repair, type of anesthesia, and surgical findings, are shown in Table 4. There was no relation between the risk of chronic pain and the choice of anesthetic method or type of surgical repair.

Questionnaire 2 was mailed to the 335 respondents of the first questionnaire who reported having pain where the hernia was situated, and 278 responses were received (83.0% response rate). Temporal and activity-related aspects of the pain are summarized in Table 5. Pain was more commonly reported with activity than at rest (85.6% vs. 50.7%). Moderate to severe pain was also much more commonly reported with activity (32.7% vs. 14.4%). Impairment of one or more daily life activities as a result of pain was reported by 194 (69.8%) patients responding to questionnaire 2 (corresponding to 16.6% of the 1,166 patients), when they were questioned about eight specific activities. The activities most frequently associated with pain were "standing for more than half an hour" (32.0%) and "climbing stairs" (27.7%). The location or locations of the pain were determined from the pain diagram completed by the patient. Pain in the groin (defined as pain above the inguinal ligament, lateral to a small area over the pubic tubercle and not related to the genital area) was the most frequent single location (n = 122; 43.9%) and was present in 245 patients (88.1%) when combined with other locations. Isolated pain over the pubic tubercle, in the leg, or in the genitalia was present in only nine patients. The pain descriptors used by the patients are listed in Table 6. The most frequent pain descriptor used was "tender" (42.1%); "shooting" was used by 28.8% of the patients and "pricking" by 25.2%. One or more neuropathic pain descriptors (sharp, shooting, pricking, or burning)[15] were used by 59.4% of the patients. Affective pain descriptors were used

Table 3. DANISH NATIONAL HERNIA DATABASE STATISTICS AND REASONS FOR EXCLUSION OF PATIENTS

Inguinal hernia operations recorded in database between Feb. 1 and March 31, 1998	1,652
Excluded	
Deceased	50
Address unobtainable	59
Emigrated	3
Access denied by department	1
Simultaneous bilateral surgery or subsequent surgery in observation period	96
Patients receiving questionnaire 1	1,443

less frequently than sensory descriptors; "irritating" (*irriterende* in Danish, which connotes "annoying" to a greater extent than "inflamed") was the most frequently used affective term.

DISCUSSION

All surgeons know that chronic pain may occur after inguinal herniorrhaphy, but the exact prevalence, cause, duration, and social consequences have not been well described. To our knowledge, this is the first nationwide survey that describes the frequency of the problem and the consequences to individual function. The literature shows a highly variable incidence of chronic pain, ranging from 0% to 37% in individual or multicenter studies.[1–7] These reports are predominantly from public hospitals and university institutions and are in contrast with results from dedicated hernia centers, where the incidence of chronic postherniorrhaphy pain is 0% to 2%.[13,16,17] However, assessing chronic pain was not the primary aim of most of the available studies. Detailed descriptions of the pain pattern and social consequences from large studies are rare, except for two multicenter studies.[3,5] In these studies, where the follow-up rate was approximately 32%[3] and approximately 70%,[5] an incidence of moderate to severe pain was found in approximately 10%. In Gillion and Fagniez's study,[5] 5% of the patients assessed their discomfort as more troublesome than the hernia they had before. Based on these and other outcome data,[18] it has been suggested that data other than recurrence rate should be considered in the overall assessment of the outcome after inguinal herniorrhaphy.

Predictive factors of chronic postherniorrhaphy pain are not well established, although it may be related to the intensity of pain in the early postoperative period[3,10] and late sensory disturbances.[3,5] In accordance with the lower pain intensity in elderly patients in the early postoperative period,[10] the results of the present study also found less chronic pain in elderly patients. The existing literature is inconsistent in explaining the relation between a specific

Table 4. DEMOGRAPHICS AND SURGICAL FACTORS

		Surgical procedures	Pain (%)	Functional impairment (%)
Demographics				
Age group	18–40	179	39.7 (32.4–47.2)	11.2 (7.0–16.8)
	41–65	579	33.2 (29.36–37.2)	15.2 (12.4–18.4)
	65+	408	17.6 (14.1–21.7)	6.1 (4.0–8.9)
Operation for recurrence	No	969	27.7 (24.9–30.6)	10.9 (9.0–13.1)
	Yes	197	34.1 (27.4–41.1)	13.7 (9.2–19.3)
Gender	Male	1,073	28.0 (25.3–30.8)	11.0 (9.2–13.0)
	Female	93	37.6 (27.8–48.3)	16.1 (9.3–25.3)
Surgical Factors				
Findings	Indirect	555	26.7 (23.0–30.6)	9.7 (7.4–12.5)
	Direct	454	31.7 (27.5–36.2)	13.0 (10.0–16.5)
	Pantaloon	79	27.9 (18.3–39.1)	12.7 (6.2–22.1)
	Femoral hernia	38	34.2 (19.5–51.5)	18.4 (7.6–34.5)
	Other	40	2.5 (0–13.2)	5.0 (0.5–17.2)
Procedure	Lichtenstein	523	29.0 (25.2–33.2)	12.2 (9.6–15.4)
	Conventional open	275	25.8 (20.8–31.4)	10.6 (7.2–14.8)
	mesh procedure (not Lichtenstein)	257	30.4 (24.8–36.4)	12.1 (8.3–16.7)
	Other open procedure	85	31.8 (22.1–42.8)	8.2 (3.3–16.3)
	Laparoscopic	26	26.9 (11.4–48.0)	7.7 (0.7–25.5)
Anesthesia	GA	705	28.2 (24.9–31.7)	11.8 (9.5–14.4)
	RA	331	28.7 (23.9–33.9)	9.7 (6.7–13.4)
	LA	130	31.5 (23.7–40.3)	13.9 (8.4–21.0)
Total		1,166	28.7 (26.2–31.4)	11.4 (9.6–13.4)

GA, general anesthesia; RA, epidural or spinal anesthesia; LA, local infiltration/inguinal field block anesthesia.
Percentages are given with 95% confidence interval in parentheses.

Table 5. FREQUENCY AND INTENSITY OF PAIN AND THE RELATION TO PHYSICAL ACTIVITY

		n	% of Responders to questionnaire 2 (n = 278)	% of Responders to Questionnaire 1 (n = 1,166)
Frequency of pain	Seldom	35	12.6	3.0
	Occasionally	183	65.8	15.7
	Always or nearly always	46	16.5	3.9
	Unknown	14	5.0	1.2
Intensity of pain	At rest:			
	No pain	103	37.0	8.8
	Light pain	101	36.3	8.7
	Moderate pain	39	14.0	3.3
	Severe pain	1	0.4	0.1
	Unknown	34	12.2	2.9
	At physical activity:			
	No pain	18	6.5	1.5
	Light pain	147	52.9	12.6
	Moderate pain	77	27.7	6.6
	Severe pain	14	5.0	1.2
	Unknown	22	7.9	1.9
Pain at specified activity	Any of activities mentioned below	194	69.8	16.6
	Standing more than ½ hr	89	32.0	7.6
	Climbing stairs	77	27.7	6.6
	Sitting more than ½ hr	74	26.6	6.3
	Exercising usual sport	70	25.2	6.0
	Getting up from chair	55	19.8	4.7
	Shopping	51	18.3	4.3
	Driving a car	49	17.6	4.2
	Traveling by bus or train	19	6.8	1.6

surgical procedure and the risk of chronic postherniorrhaphy pain,[1–6,13] although in some studies there may be a tendency toward less chronic pain after laparoscopic herniorrhaphy.[2,7] In our large-scale study, we found no relation between chronic pain and the type of hernia repair, however, the relatively small number of laparoscopic procedures performed precludes final conclusions as to the potential benefits of this type of herniorrhaphy.

Table 6. PAIN DESCRIPTORS

	n	%
Sensory Descriptors		
Tender	117	42.1
Shooting	80	28.8
Pricking	70	25.2
Constricting	50	18.0
Sharp/cutting	47	16.9
Cleaving	37	13.3
Pulling	33	11.9
Drilling	27	9.7
Hot/burning	25	9.0
Dull/aching	23	8.3
Radiating	22	7.9
Pounding/hammering	19	6.8
Affective Descriptors		
Irritating	74	26.6
Tiring/exhausting	24	8.6
Sickening	6	2.2
Frightful	4	1.4
Punishing	2	0.7

The cause of chronic postherniorrhaphy pain is probably associated with nerve damage to one or more of the three nerves passing through the surgical field. This is supported by the association between sensory disturbances and chronic pain.[3,5] The correlation between the intensity of early postherniorrhaphy pain and the risk of chronic pain[10] leads us to hypothesize that nerve compression or injury may be a pathogenic risk factor for both acute and chronic pain. However, hernia surgeons have recommended that nerve ends should be ligated[19] or intentionally severed[20] to reduce the risk of chronic pain, but with no documentation regarding the outcome of these recommendations. Nevertheless, the pain characteristics found in our study, combined with the relation between early pain intensity and sensory disturbances, suggest that pain from nerve damage is a concern.

Our findings of a relatively low use of affective words ("tiring/exhausting," 8.6%; "sickening," 2.2%) in patients with chronic postherniorrhaphy pain differs from what is usually reported in patients with chronic pain but is similar to what is reported for acute pain.[21] Of patients with low back pain or musculoskeletal pain seen in pain clinics, 30% to 50% use the terms "tiring/exhausting" or "sickening" as

descriptors.[22] This may represent selection bias in studies based in pain clinics or, less likely, a difference between patients with chronic postherniorrhaphy pain versus patients with other chronic pain problems.

The present study represents the largest study to date of chronic postherniorrhaphy pain, with a high follow-up rate (> 80%), and it is the only large-scale epidemiologic study from a nationwide population. Eleven percent to 17% of the patients reported that pain interfered with their work or leisure activity, underscoring the importance of this problem. This is emphasized by the data for participation in usual sports activities, where 25% of respondents with pain reported impairment and another 25% reported no impairment. However, the remaining 50% responded that they no longer participated in this activity or did not answer the question. The finding that more than 5% of all patients undergoing inguinal herniorrhaphy report difficulty with standing for 30 minutes or more (or inability to do so) because of pain at the site of hernia to us indicates significant functional impairment.

Our reported incidences of chronic pain may have been slightly overestimated if the nonresponders had less pain than responders. However, pain limiting social activities would still be in the range of 9% to 11%, even assuming that all nonresponders did not have any pain.

In summary, our nationwide, large-scale study in unselected patients undergoing inguinal herniorrhaphy documents a high incidence of chronic pain leading to various types of social disability in 11% to 17% of patients. We believe that potential pain and impairment need to be considered and discussed before deciding to proceed with herniorrhaphy. The results of our study and those of others[3,5] suggest that a significant proportion of the pain is of neuropathic origin. Future studies should focus on a detailed description of the surgical technique (e.g., nerve identification, transsection, repair technique) and a detailed postoperative follow-up with characterization of the pain (stimulus-independent vs. -dependent pain). Only by such careful studies and assessment of the causes of pain can rational prevention and management techniques be developed.[23]

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