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Are the outcomes of emergency Lichtenstein hernioplasty similar to the outcomes of elective Lichtenstein hernioplasty?

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KEYWORDS
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Abstract *Background:* The safe use of polypropylene prosthesis for the repair of complicated inguinal hernias has been established even when small bowel resection was required. Few reports have completely addressed this subject; none have compared the outcomes of emergency and elective Lichtenstein hernioplasty.
Methods: From January 2001 to December 2003, 343 patients were electively operated for inguinal hernia and 62 for complicated inguinal hernia. A follow-up period of 17–57 months using the Quantitative and Qualitative Measurement Instrument for evaluation of Lichtenstein hernioplasty outcomes (QQMI) was completed for 48 emergency patients and 326 elective patients.
Results: The mean QQMI score showed that most patients felt that the outcomes of their surgery were very good or excellent. Mean QQMI score for elective surgery was 10.1 and 9.5 for emergency surgery.
Conclusions: The outcomes of emergency Lichtenstein hernioplasty were inferior to the outcomes of elective Lichtenstein hernioplasty.

Introduction

Tension-free Lichtenstein hernioplasty is currently considered the gold standard for elective inguinal hernia repair in male patients.[1–8] The use of a polypropylene mesh for the repair of complicated inguinal hernias, incarcerated and strangulated, has been well studied and its safety has been established, even when intestinal resection was required.[9–14] Some criteria have been suggested for the safe repair of complicated inguinal hernias: easy reduction of the hernia sac and its contents without causing any damage, good exposure, easy access for possible resection, and safe hernia repair through the same access.[10–14] The use of prosthesis is not recommended in the presence of

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intestinal necrosis or peritonitis.[9–14] Complicated inguinal hernia is a serious surgical emergency associated with high morbidity and mortality, and occurs more often in elderly patients.[11–19] The outcomes of emergency Lichtenstein hernioplasty versus the outcomes of elective Lichtenstein hernioplasty have not been compared before.[8–19] Applying the recently developed Quantitative and Qualitative Measurement Instrument (QQMI) for evaluation of Lichtenstein hernioplasty outcomes[8] should be possible to compare the outcomes of Lichtenstein hernioplasty between different groups of patients. Our aim was to respond to the following question: are the outcomes of emergency Lichtenstein hernioplasty similar to the outcomes of elective Lichtenstein hernioplasty? In order to achieve this aim we compared the outcomes of emergency Lichtenstein hernioplasty versus the outcomes of elective Lichtenstein hernioplasty measured by the QQMI.

Patients and methods

The records of all adult male patients who underwent emergency and elective Lichtenstein hernioplasty for inguinal hernia at our institution from January 2001 to December 2003 were reviewed. During that period, 405 male patients were operated; of them, 343 (85%) were elective and 62 (15%) were submitted to emergency surgery for complicated inguinal hernia. The follow-up consisted of an interview and physical examination and was performed from May to July 2005. During the interview the QQMI was measured. From the total population of 405 patients, 374 (92%) responded to citation and were included in the study. Thirty-one patients (7%) were excluded: there were three deaths (1%), none related to hernioplasty; 17 patients (4%) were lost to follow-up; and within the patients operated on for complicated inguinal hernia, 11 (3%) had other procedures performed instead of Lichtenstein hernioplasty because they required intestinal resection or presented with peritonitis. Therefore, we studied 48 patients with emergency Lichtenstein hernioplasty and 326 patients with elective Lichtenstein hernioplasty, with a follow-up period ranging from 17 to 57 months, mean 39 ± 6.4 months for elective patients and 38 ± 3.5 for emergency patients.

Design of the study

This study corresponds to a qualitative and quantitative research comparing surgical outcomes in a consecutive non-randomized controlled sample with a prospective longitudinal phase. The study applies a disease-specific instrument designed for the purpose of measuring the Lichtenstein hernioplasty outcomes.[8] For all included patients, a protocol, previously approved by the ethics committee of our institution, which included categorical and continuous variables, was completed together with a pre-printed QQMI sheet. Information about complications, preoperative, and postoperative symptoms gathered from patients during the interview, was compared and completed with data obtained from the clinical record.

Definitions and classification

Incarceration was defined as irreducibility of an external inguinal hernia and strangulation as an irreducible hernia with objective signs of ischemia and necrosis.[13–20] Chronic postherniorrhaphy pain was defined as the spectrum of pain developed at the surgical site that persisted for more than one year after a surgical procedure aimed to repair an inguinal hernia was performed.[8,21] We used the suggested questionnaire and objective assessment described by Kehlet et al.[21] to evaluate chronic inguinodynia, however the outcomes of the study were reported after the QQMI.[8] In our institution we use the classification of Gilbert,[22] Rutkow and Robbins[23] for inguinal hernias.

QQMI

This instrument has seven items designed to measure the domains of health-related quality of life: physical, psychological and social. Additionally it permits the structured evaluation and report of the surgical outcomes of Lichtenstein hernioplasty. Item 1 measures the psychological domain and introduces the patient and the interviewer to the interview. Item 2 measures the patient' social domain and evaluates preoperative symptoms. Item 3 measures the physical domain and evaluates late complications of the procedure. Item 4 addresses early postoperative complications and most of the surgical outcomes traditionally reported. Item 5 measures the physical and social domains. Items 6 and 7 measure the psychological, physical and social domains; they evaluate the satisfaction of the patient with the surgery and explore the reasons why the patient is satisfied or not with the surgery, and explore the reasons whether or not he would undergo another hernia surgery. The final score obtained with this instrument allows for stratification of the results in five levels of final outcomes.[8]

Perioperative management

All patients underwent surgery under spinal anesthesia. We used single doses of a second-generation cephalosporin at induction. During the postoperative period in 40 (83.3%) emergency surgery patients therapeutic antibiotics were used (cloxacillin, ciprofloxacin, and metronidazole associated with gentamicin). No elective surgery patient required postoperative antibiotics. The surgical technique was the one described by Lichtenstein et al.[1,7]

Statistical analysis

Continuous variables were expressed as the mean ± standard deviation; categorical variables were reported as a percentage. The statistical comparative analysis was performed by Student's *t* test for categorical variables and Pearson χ^2 test for continuous variables. Fisher's exact test was used if any expected value in a 2×2 table was less than 5. Statistical significance level was defined at $p < 0.05$. Data were analyzed with the software SPSS version 11.0 (Chicago, Illinois, USA).

Results

Mean age was similar for both groups. Emergency surgery patients had a longer length of stay than elective patients. Most hernias in elective surgery were primary, indirect type 1. In emergency surgery, most hernias were also primary, indirect types 1 and 3; combined type 6 hernias were also frequent (Table 1). Both groups were comparable in terms of associated morbidities and surgical risk (Table 2). In emergency surgery the hernia sac contained an ischemic small bowel loop in 23 patients; in 17 patients the hernia sac contained only omentum. Other hernia sac contents were appendix, cecum and sigmoid colon. None of these abdominal organs was resected (Table 3).

Most patients in both groups stated that they were feeling very good or excellent regarding their surgery (item 1, Table 4). Five patients with elective Lichtenstein hernioplasty stated that their inguinodynia remained similar to the pain that they were feeling before their surgery, none with emergency Lichtenstein hernioplasty declared this symptom or any other symptom (item 2, Table 5). During the postoperative period, 33 elective surgery patients (10%) and 5 emergency surgery patients (10.4%) developed inguinodynia; in 6 elective patients and 1 emergency patient the symptom currently persists (Fig. 1). The complication rate after surgery in elective Lichtenstein hernioplasty was 20% and in emergency Lichtenstein

Table 1 Demography and classification

	Elective	Emergency	*p*
Age	52.2 ± 18.5	54.2 ± 17.7	NS
Length of stay	1.6 ± 1.32	2.81 ± 1.29	<0.05
Hernia, *N* (%)	326	48	
Primary	291 (89)	39 (81)	NS
Recurrent	35 (11)	9 (19)	NS
Type			
1	167 (51)	13 (27)	<0.05
2	41 (13)	2 (2)	<0.05
3	45 (14)	19 (39)	<0.05
4	55 (17)	6 (12)	NS
5	15 (5)	—	NS
6	3 (1)	9 (19)	<0.05

NS, not significant.

Table 2 Associated pathological conditions and surgical risk

	Elective ($N = 326$) (%)[a]	Emergency ($N = 48$) (%)[b]	*p*
High blood pressure	137 (42)	19 (39.6)	NS
Ischemic heart disease	54 (16.5)	5 (10.4)	NS
Diabetes	61 (19)	9 (18.7)	NS
Chronic lung disease	29 (9)	3 (6.2)	NS
Others	34 (10.4)	7 (14.5)	NS
Patients older than 71 years of age	78 (24)	11 (23)	NS
Body mass index >30	75 (23)	7 (14.5)	NS
ASA I and II	290 (89)	38 (79)	NS
ASA III and IV	36 (11)	10 (21)	NS

NS, not significant; ASA, American Society of Anesthesiology surgical risk score.
[a] One or more associated conditions in 135 patients (56.7%).
[b] One or more associated conditions in 32 patients (67%).

Table 3 Hernia sac contents

Contents in complicated hernias ($N = 48$)	*N* (%)
Ischemic small bowel	23 (48)
Greater omentum	17 (35)
Appendix	3 (6)
Sigmoid colon	3 (6)
Appendix and cecum	1 (2)

Table 4 Item 1: how do you feel about your hernia repair surgery?

	Elective ($N = 326$) (%)	Emergency ($N = 48$) (%)	p
−1: Worse	—	—	—
0: Bad	3 (1)	—	NS
1: Same as before	2 (1)	—	NS
2: Better than before	—	4 (8)	NS
3: Good	9 (3)	4 (8)	NS
4: Very good	15 (5)	2 (4)	NS
5: Excellent	296 (91)	38 (79)	<0.05

NS, not significant.

hernioplasty 27%, most complications developed during the immediate postoperative period and most of them were resolved during the same hospitalization. Surgery was required for 10 patients, all of them within the elective surgery group: in four patients a surgical site expanding hematoma was explored; in two patients a hydrocele developed and was resolved 4—6 months after the hernioplasty. There were four cases of hernia recurrence in elective Lichtenstein hernioplasty patients; they occurred 5—8 months after the original surgery; all of them were repaired with another Lichtenstein hernioplasty 4—6 months after recurrence (Table 6).

Physical activity and working performance improved significantly in 81% of elective Lichtenstein hernioplasty patients and 71% of emergency Lichtenstein hernioplasty patients (item 5, Table 5). Most elective patients and all emergency patients, declared their satisfaction with the surgery. Five elective patients declared being unsatisfied with their surgery because they had

Table 5 Final outcomes

QQMI items	Elective	Emergency	p
2. Preoperative inguinodynia	5 (1)	—	NS
3. Postoperative inguinodynia	33 (10)	5 (10)	NS
4. Postoperative complications	67 (20)	13 (27)	NS
5. Improvement of physical performance	265 (81)	34 (71)	<0.05
6. Satisfaction with LH	321 (98)	48 (100)	NS
7. Would undergo another LH	274 (84)	30 (62)	<0.05

NS, not significant; QQMI, Qualitative and Quantitative Measurement Instrument; LH, Lichtenstein hernioplasty.

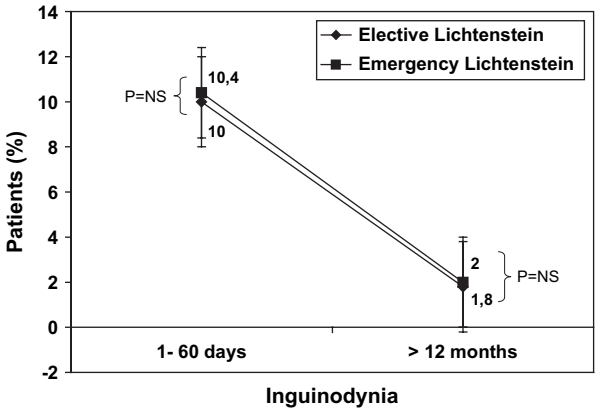

Figure 1 Inguinodynia. There was a non-significant difference in postoperative and chronic inguinodynia between both groups.

chronic inguinodynia. The reasons why most patients declared satisfaction with their surgery were different in both groups. Emergency Lichtenstein hernioplasty patients were satisfied because they felt that the surgery saved their lives (71%). Elective Lichtenstein patients were satisfied because of the fact of returning to work without any nuisance in 46%, and absence of inguinodynia in 35% (item 6, Table 5). Most patients in both groups declared that they would undergo another hernioplasty; the most frequent reason was because they felt that their problem was resolved with the surgery. Fifty-two (16%) elective patients and 18 (37%) emergency patients declared that they would not undergo another inguinal hernia surgery for reasons like fear of complications suffered in the postoperative period,

Table 6 Item 4: did you have any complication after your surgery?

	Elective ($N = 326$) (%)	Emergency ($N = 48$) (%)	p
Yes	67 (20)	13 (27)	NS
No	259 (79)	35 (73)	NS
Complications			
Seroma	2 (0.6)	2 (4)	NS
Hydrocele[a]	2 (0.6)	—	NS
Hernia recurrence[b]	4 (1.2)	—	NS
Testicular swelling	9 (2.7)	2 (4)	NS
Local echymoses	10 (3)	1 (2)	NS
Hematoma	15 (4.6)[c]	2 (4)	NS
Urinary retention	25 (7.6)	5 (10.4)	NS
Pneumonia	—	1 (2)	NS

NS, not significant.
[a] Surgical resolution 4—6 months after LH.
[b] Surgical resolution 4—6 months after recurrence.
[c] Surgical exploration in 4 of 15 hematomas.

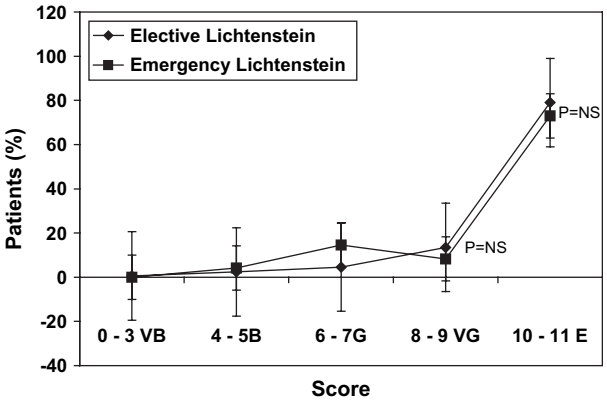

Figure 2 QQMI final outcomes. QQMI levels: VB, very bad; B, bad; G, good; VG, very good; E, excellent. Both groups reached similar QQMI levels.

old age, chronic inguinodynia or a recently diagnosed cancer (item 7, Table 5).

According to the final QQMI score, most patients in both groups felt that the outcome of their surgery was excellent or very good (Fig. 2). The mean score for elective patients was 10.1 ± 1.7 and for emergency patients was 9.5 ± 1.7 (Table 7). All studied parameters showed similar values. A tendency, significant in some parameters, was observed towards better outcomes favoring elective patients.

Discussion

Despite the fact that Lichtenstein hernioplasty constitutes the current gold standard for the elective repair of inguinal hernia in men,[1–8] the application of this technique for emergency surgery has not been widely accepted due to many factors influencing the decision to use or not prosthesis in this setting or regarding the technique previously used to repair the defect. The safe use of prosthesis for the repair of complicated hernias has been validated,[9–14] however surgical health-related quality of life outcomes have not been previously addressed or reported. Herein we report our experience with the Lichtenstein hernioplasty in the emergency setting for selected patients and compare their outcomes with the outcomes of the elective patients operated during the same period with the same technique. Of 62 patients operated on for complicated inguinal hernias, we included 48 in this study; most of the excluded patients had hernias complicated with intestinal necrosis or peritonitis therefore we did not use prosthesis in these patients. Habitually a complicated hernia with less than 24 or even 48 h of incarceration or strangulation will not be septic or the intestine necrotic or perforated, consequently the patients that we operated with Lichtenstein hernioplasty had recently complicated hernias (less than 48 h) without septic complications and were suitable for the use of prosthesis.

Table 7 Final QQMI outcomes

Outcome level	Points	Elective ($N = 326$) (%)	Emergency ($N = 48$) (%)	p
Very bad	0	—	—	—
	1	—	—	—
	2	2 (1)	—	NS
	3	—	—	—
Bad	4	2 (1)	—	NS
	5	6 (2)	2 (4)	NS
Good	6	2 (1)	1 (2)	NS
	7	13 (4)	6 (12)	NS
Very good	8	12 (4)	3 (6)	NS
	9	32 (10)	1 (2)	NS
Excellent	10	46 (14)	20 (42)	<0.05
	11	211 (65)	15 (31)	<0.05
Mean $\pm$ SD		10.1 ± 1.7	9.5 ± 1.7	NS

QQMI. Qualitative and Quantitative Measurement Instrument; NS, not significant; SD, standard deviation.

Mean age, type of hernia, associated pathological conditions and surgical risks were comparable for both groups. For emergency patients, the period of hospitalization was longer than for elective patients because they suffered proportionally more postoperative complications but not more severe than the complications suffered for elective patients. The feeling of well being predominated in emergency and elective patients, the score reached in item 1 ranged from 3 to 5 points for 92% of elective and 98% of emergency patients. Preoperative inguinodynia persisted only in five elective Lichtenstein hernioplasty patients; persistence of this symptom was within the expected incidence for Lichtenstein hernioplasty.[8] The most frequently reported symptom or complication after mesh hernioplasty was inguinodynia.[21–30] A similar proportion of patients in both groups developed inguinodynia; in 6 elective patients and 1 emergency patient this symptom did not resolve during the follow-up period; that was because chronic inguinodynia requires a prolonged period of time for spontaneous resolution and some patients even required surgery for resolution.[21,24,26,28–30]

Postoperative complications in emergency patients were similar in number, type and severity to postoperative complications in elective patients. Sixty-seven elective patients (20%) and 13

emergency patients (27%) developed postoperative complications, these rates were similar to the published (1—25%) postoperative complication rate for emergency and elective Lichtenstein hernioplasty.[1—9,11,12,18,19] There were no postoperative deaths within 6 months after surgery. The most frequent postoperative complication developed in elective and emergency Lichtenstein hernioplasty was urinary retention; this complication was related to the spinal anesthesia that we routinely used for elective or emergency surgery. Other frequent complications were surgical site echymoses and hematoma. Four of 15 surgical site hematomas in the elective group required surgical exploration; the rest of them were conservatively treated. Hemorrhagic complications are relatively frequent in open inguinal hernia surgery, curiously this complications were more severe in our elective patients than in our emergency patients, the reason for this probably was the extra attention paid to hemostasis in the emergency setting. The recurrence rate for emergency surgery was 0%; for emergency Lichtenstein hernioplasty the reported recurrence rate ranges from 0% to 2.8%.[9,11,12] In elective patients the recurrence rate was 1.2%, this frequency was within the expected recurrence rate for elective Lichtenstein hernioplasty,[1—8] the positive difference favoring emergency surgery was not statistically significant.

Most elective patients (98%) and all emergency patients were satisfied with their surgery; the reasons for this satisfaction were different in both groups. Thirty-four (71%) emergency patients were satisfied because they considered that the surgery saved their lives; this is a very good reason to express satisfaction for any surgery; however some patients who expressed satisfaction for this fact also stated their fears concerning the postoperative complications suffered. The other 14 patients (29%) were satisfied because the surgery allowed them to continue with their daily activities and work; the return to activities of daily living is an important health-related quality of life outcome evaluated by patients.[8,27] Forty-six percent of elective patients were satisfied because they could return to work, and 34% because the preoperative inguinodynia and inguinal bulge was resolved. Five elective patients were not satisfied with the procedure because they developed inguinodynia; this symptom has been reported as a common cause of patient dissatisfaction with inguinal hernioplasty.[8,21,24] Most elective and emergency Lichtenstein hernioplasty patients would undergo another inguinal hernioplasty; the willingness to undergo another surgery similar to the first one is another outcome demonstrating the quality of the surgical care and technique employed. Sixteen percent of elective patients and 37.5% of emergency patients would not undergo another hernioplasty due to a variety of reasons: advanced age, recently diagnosed cancer, chronic inguinodynia, and fear of postoperative complications. The individual score levels for patients in both groups were similar; the significant differences were in the 10 points level favoring emergency patients and in the 11 points level favoring elective patients. The mean score for elective Lichtenstein hernioplasty was 10.1 ± 1.7 versus a mean score for emergency Lichtenstein hernioplasty of 9.5 ± 1.7; the difference was not significant. According to the QQMI, outcomes were classified as very good (8—9 points) and excellent (10—11 points) in 93% of elective patients and 81% of emergency patients.

Conclusions

The use of polypropylene prosthesis in the emergency setting is safe and the outcomes have been satisfactory.[9—19] We demonstrated through the application of the QQMI that the outcomes of emergency Lichtenstein hernioplasty were similar but not as excellent as the outcomes of elective Lichtenstein hernioplasty. The outcomes of Lichtenstein hernioplasty were very good or excellent in 93% of elective patients and in 81% of emergency patients.

References

1. Lichtenstein IL, Shulman AG, Amid PK, Montflor MM. The tension-free hernioplasty. *Am J Surg* 1989;**157**:188—93.
2. Friis E, Lindahl F. The tension-free hernioplasty in a randomized trial. *Am J Surg* 1996;**172**:315—9.
3. Wantz GE. Experience with the tension-free hernioplasty for primary inguinal hernias in men. *J Am Coll Surg* 1996; **183**:351—6.
4. McGillicuddy JE. Prospective randomized comparison of the Shouldice and Lichtenstein hernia repair procedures. *Arch Surg* 1998;**133**:974—8.
5. Hernandez-Granados P, Ontañon M, Lasala M, Garcia C, Arguello M, Medina I. Tension-free hernioplasty in primary inguinal hernia: a series of 2054 cases. *Hernia* 2000;**4**: 141—3.
6. Nordin P, Bartelmess P, Jansson C, Svensson C, Edlund G. Randomized trial of Lichtenstein versus Shouldice hernia repair in general surgical practice. *Br J Surg* 2002;**89**: 45—9.
7. Amid PK. Lichtenstein tension-free hernioplasty: its inception, evolution, and principles. *Hernia* 2004;**8**:1—7.
8. Beltrán MA, Burgos CC, Almonacid JF, Larenas R, Tapia T, Vicencio A, et al. Long-term follow-up of tension-free Lichtenstein hernioplasty: application of a qualitative-and-quantitative measurement instrument. *Hernia* 2005;**9**: 368—74.

9. Pans A, Desaive C, Jacquet N. Use of a preperitoneal prosthesis for strangulated groin hernia. *Br J Surg* 1997;**84**:310—2.
10. Mauch J, Helbling C, Schlumpf R. Incarcerated and strangulated hernias: surgical approach and management. *Swiss Surg* 2000;**6**:28—31.
11. Wysocki A, Pozniczek M, Krzywon J, Bolt L. Use of polypropylene prostheses for strangulated inguinal and incisional hernias. *Hernia* 2001;**5**:105—6.
12. Wysocki A, Pozniczek M, Krzywon J, Strzalka M. Lichtenstein repair for incarcerated groin hernias. *Eur J Surg* 2002;**168**: 452—4.
13. Kurt N, Oncel M, Ozkan Z, Bingul S. Risk and outcome of bowel resection in patients with incarcerated groin hernias: retrospective study. *World J Surg* 2003;**27**:741—3.
14. Papaziogas B, Lazaridis Ch, Makris J, Koutelidakis J, Patsas A, Grigoriou M, et al. Tension-free repair versus modified Bassini technique (Andrews technique) for strangulated inguinal hernia: a comparative study. *Hernia* 2005;**9**:156—9.
15. Malek S, Torella F, Edwards PR. Emergency repair of groin hernia: outcome and implications for elective surgery waiting times. *Int J Clin Pract* 2004;**58**:207—9.
16. Alvarez JA, Baldonedo RF, García I, Suarez JA, Alvarez P, Jorge JI. Hernias externas incarceradas en pacientes octogenarios. *Cir Esp* 2004;**75**:129—34.
17. Alvarez JA, Baldonedo RF, Bear IG, Solis JAS, Alvarez P, Jorge JI. Incarcerated groin hernias in adults: Presentation and outcome. *Hernia* 2004;**8**:121—6.
18. Kulah B, Kulacoglu IH, Oruc MT, Duzgun AP, Moran M, Ozmen MM, et al. Presentation and outcome of incarcerated external hernias in adults. *Am J Surg* 2001;**181**:101—4.
19. Kulah B, Duzgun AP, Moran M, Kulacoglu IH, Ozmen MM, Coskun F. Emergency hernia repairs in elderly patients. *Am J Surg* 2001;**182**:455—9.
20. Perrott CA. Inguinal hernias: room for a better understanding. *Am J Emerg Med* 2004;**22**:48—50.
21. Kehlet H, Bay-Nielsen M, Kingsnorth A. Chronic postherniorrhaphy pain — a call for uniform assessment. *Hernia* 2002;**6**: 178—81.
22. Gilbert AI. An anatomic and functional classification for the diagnosis and treatment of inguinal hernia. *Am J Surg* 1989; **157**:331—4.
23. Rutkow IM, Robbins AW. ''Tension-free'' inguinal herniorrhaphy: a preliminary report on the ''Mesh-Plug'' technique. *Surgery* 1993;**114**:3—7.
24. Heise CP, Starling JR. Mesh inguinodynia: a new clinical syndrome after inguinal herniorrhaphy? *J Am Coll Surg* 1998; **187**:514—8.
25. Riley KD, Lilly MC, Arregui ME. Management of complications following inguinal hernia repair. *Prob Gen Surg* 2002; **19**:97—108.
26. Ducic I, Dellon L. Testicular pain after inguinal hernia repair: an approach to resection of the genital branch of genitofemoral nerve. *J Am Coll Surg* 2004;**198**: 181—4.
27. Bowley DMG, Butler M, Shaw S, Kingsnorth AN. Dispositional pessimism predicts delayed return to normal activities after inguinal hernia operation. *Surgery* 2003;**133**:141—6.
28. Lee CH, Dellon L. Surgical management of groin pain of neural origin. *J Am Coll Surg* 2000;**191**:137—42.
29. Amid PK. A 1-stage surgical treatment for postherniorrhaphy neuropathic pain: triple neurectomy and proximal end implantation without mobilization of the cord. *Arch Surg* 2002;**137**:100—4.
30. Bay-Nielsen M, Perkins FM, Kehlet H. Pain and functional impairment 1 year after inguinal herniorrhaphy: a nationwide questionnaire study. *Ann Surg* 2001;**233**:1—7.