Maarten J.A. Loos werd geboren op 27 december 1981 in Roosendaal (Noord-Brabant). In 2000 haalde hij zijn Gymnasium Bèta diploma (cum laude) aan het Norbertus College in Roosendaal. In hetzelfde jaar werd gestart met de studie geneeskunde aan de Universiteit van Maastricht en behaalde hij zijn doctoraalexamen in 2004. Reeds aanwezige interesse in de Heelkunde werd na het desbetreffende co-schap in het Máxima Medisch Centrum te Veldhoven versterkt. Zodoende begon hij tijdens zijn coschappen onder leiding van dr. R.M.H. Roumen en dr. M.R.M. Scheltinga met onderzoek naar 'chronische pijn na liesbreukchirurgie'. Andere vormen van 'lieschirurgie' zoals de Pfannenstiel-incisie werden hier snel bij betrokken. In juli 2006 behaalde hij zijn artsexamen, waarna hij aan de slag ging als AGNIO Heelkunde/ Intensive Care in het Máxima Medisch Centrum. Ondertussen ging het onderzoek gestaag door wat uiteindelijk geresulteerd heeft in dit proefschrift. Sinds 1 januari 2008 is hij via opleidingsregio Nijmegen in opleiding tot algemeen chirurg in het Máxima Medisch Centrum (Veldhoven/ Eindhoven), opleider dr. R.M.H. Roumen/ dr. W.F. Prakken.

Indien u vanwege dit supplement graag de rest van het proefschrift zou willen inzien, ben ik uiteraard bereid u een exemplaar toe te sturen. U kunt mij contacteren via loosmaarten@hotmail.com. Het volledige proefschrift zal ook online beschikbaar zijn op www.liespijn.nl.

# Surgical management of chronic inguinal pain syndromes

*Supplement*

Maarten Loos

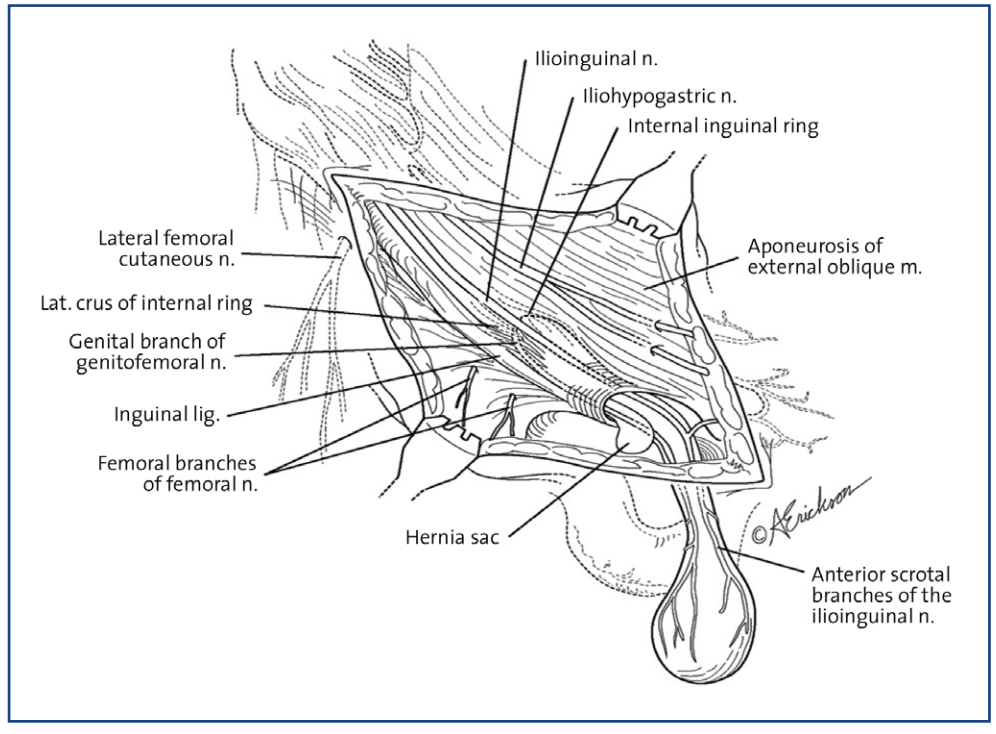
## INTRODUCTION

This supplement is part of the thesis of Maarten Loos on 'the surgical management of chronic inguinal pain syndromes' (University of Maastricht, september 29th 2011).

'Routine' operations such as inguinal herniorrhaphy and Pfannenstiel incisions for caesarean deliveries may inflict patients with chronic pain that is likely related to the interference with nerve structures located in the lower abdominal and inguinal area[1,2]. Knowledge on the diagnostic and therapeutic options is limited. The aim of this thesis was to study the management of chronic pain syndromes after inguinal hernia repair and Pfannenstiel incisions in general patient populations.

**Prevalence and risk factors**

An initial questionnaire study investigated the incidence of chronic pain among more than 2000 inguinal hernia repair patients[3]. Over 40% of the patients reported some degree of pain (moderate pain 9%, severe 2%). One fifth felt functionally impaired in their work or leisure activities and almost one-fourth of the pain patients reported inguinal numbness. Other pain associated variables were age and recurrent hernia




*Inguinal neuro-anatomy*[11]

repair. This first study clearly indicated that patients scheduled for routine inguinal hernia repair should be counselled preoperatively on the risk of chronic post-operative pain.

A second study described a modified questionnaire interviewing a MMC cohort of women (n=866) with a history of Pfannenstiel incision for caesarean delivery or abdominal hysterectomy[4]. After a 2 year follow-up, one third experienced some form of chronic pain at the incision site. Moderate or severe pain was reported by 7%, and 9% of the women was impaired in daily activities. Nerve entrapment was present in over half of the examined patients reporting moderate to severe pain. This study demonstrated that chronic pain due to nerve entrapment is common following a routine Pfannenstiel incision.

**Diagnostic approach**

Various pain tools are available in pain research. A third study compared two commonly used tests (Visual Analogue Scale (VAS, 1-100mm) and 4-point Verbal Rating Scale (VRS) for scale failure, sensitivity and interpretability[5]. A questionnaire identified the pain intensity level in a cohort of patients that previously underwent inguinal herniorrhaphy. Scale failure (one or both tests not completed correctly) was observed five times more frequently in VAS tests compared to VRS. Advanced age was a significant risk factor for scale failure. VAS categories which concurred the most with VRS scores were: 0-8 mm = no pain, 9-32 mm = mild, 33-71 mm = moderate, >71 mm = severe pain. VAS scores grouped per VRS category showed considerable overlap. The VRS was superior in sensitivity and interpretability. It was concluded that the VRS should be favoured over the VAS in postherniorrhaphy pain assessment.

**A novel classification**

A universally accepted classification for postherniorrhaphy pain is lacking. A fourth study studied 148 patients with moderate to severe postherniorrhaphy pain complaints using an interview and a physical examination[6]. Three separate groups of diagnoses were identified. Group I was suffering from neuropathic pain (50%) indicating inguinal nerve damage. Group II harboured non-neuropathic pain (25%) due to various diagnoses such as periostitis and recurrent hernia. Group III was characterized by a tender spermatic cord and/or a tight feeling in the lower abdomen ('funiculodynia', 25%). Chronic pain following elective hernia repair apparently is diverse in etiology, but our classification may contribute to the development of tailored treatment regimens.

**Surgical management**

Our treatment approach of neuropathic pain after inguinal hernia repair and Pfannenstiel incisions offers nerve blocks and operative neurectomy. First, treatment results of 54 postherniorrhaphy neuropathic pain patients who underwent a neurectomy (dissection and removal of affected nerve) in our hospital were analyzed[7]. About half claimed to be pain-free or almost pain-free, a quarter experienced some pain reduction but still experienced pain at a regular basis, whereas the remaining quarter did not benefit from the neurectomy. Sexual intercourse-related pain and dysejaculation disorders responded favourably to neurectomy in two-thirds of the involved patients. This retrospective cohort study demonstrated that a surgical neurectomy provides reasonably good long-term pain relief for postherniorrhaphy groin neuralgia in the majority of patients.

A randomized controlled trial ('GroinPain Trial') was constructed to identify the optimal treatment modality in patients with postherniorrhaphy pain[8]. Adult patients with chronic postherniorrhaphy inguinal pain (> 3 months) caused by inguinal nerve entrapment with a temporary, but significant pain reduction after a lidocain nerve block are eligible for randomization. They either receive repetitive local nerve blocks with lidocain, corticosteroids and hyaluronic acid, or a 'tailored' surgical neurectomy. Patient enrollment started in February 2006 and is expected to end in June 2011. Results of this prospective randomized controlled trial are expected shortly.

Patients treated for neuropathic pain after a Pfannenstiel incision were retrospectively investigated[9]. Twenty-seven women had either received a neurectomy and/ or only local nerve blocks. A single diagnostic nerve block provided long-term pain relief in five patients. Satisfaction in the remaining 22 women undergoing neurectomy was good to excellent in 73%, moderate in 14%, and poor in 13%. Successful treatment improved sexual intercourse-related pain in most females. Co-morbidities (endometriosis, lumbosacral radicular syndrome) and earlier pain treatment were identified as risk factors for surgical failure. This study demonstrated that peripheral nerve blocking provides long-term pain reduction in some individuals with post-Pfannenstiel neuralgia. An iliohypogastric or ilioinguinal nerve neurectomy is a safe and effective procedure in most remaining patients.

**Occupational disability**

Routine inguinal hernia repair results in occupational disability in 1-2% of the patients[10]. However, only 4 of 23 studies on neurectomy for inguinal neuralgia reported on occupational disability as a secondary outcome measure. In our patient registry[7] some 56 to 100% of the patients could resume their occupational obligations after pain treatment. Moreover, effective pain treatment, such as our 'tailored neurectomy' is calculated to save a minimum of €1.8 million of workers' compensational costs in The Netherlands yearly. Tailored neurectomy apparently is an effective treatment for occupational disability due to postherniorrhaphy inguinal neuralgia in patients. A successful neurectomy greatly reduces workers' compensational costs and may have substantial financial consequences worldwide.

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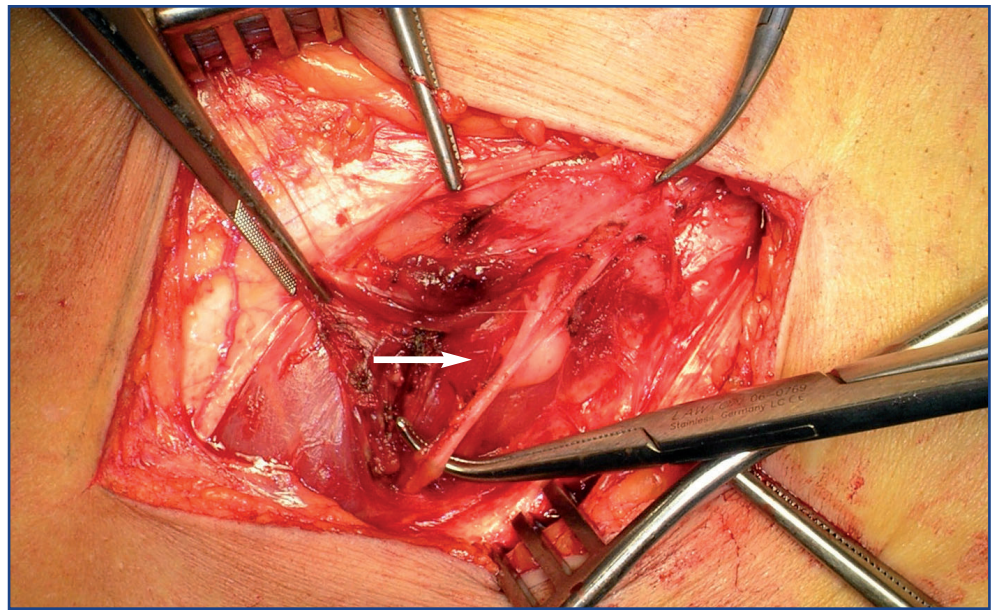
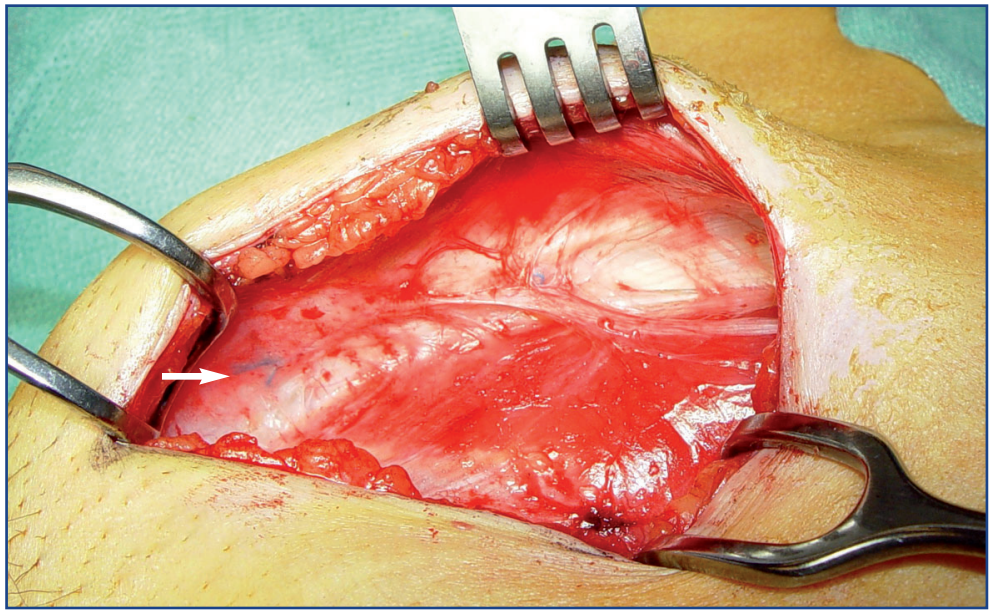
## CASE 1

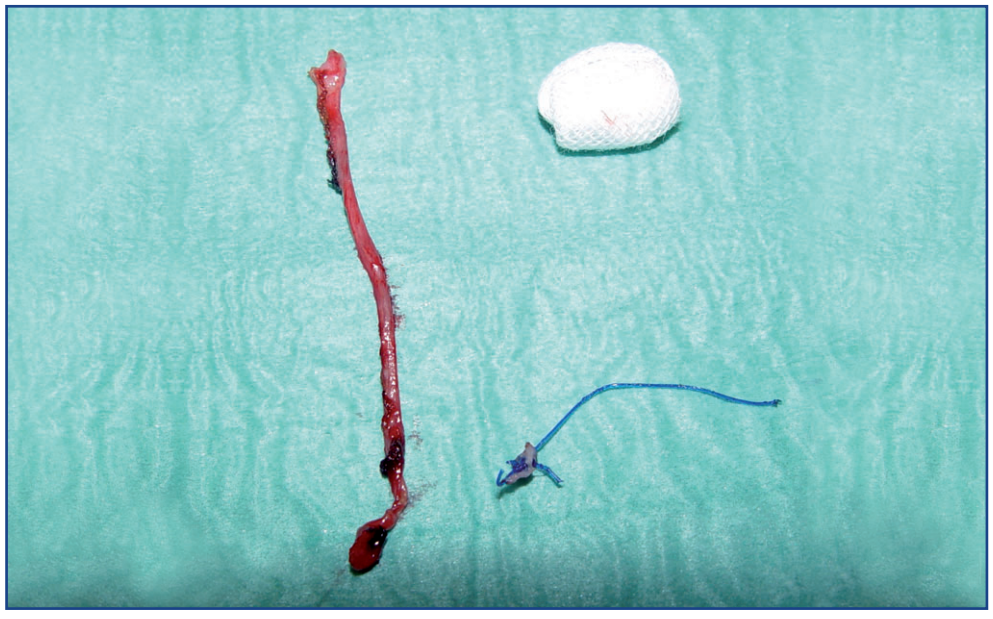
A 42-year old man developed neuropathic pain symptoms (hypoesthesia, hyperalgesia and allodynia) in the groin region after a Lichtenstein hernioplasty resulting in occupational disability. After a two years doctor's delay, a surgical exploration was performed revealing a neuroma (→) of the ilioinguinal nerve that was entrapped at the lateral corner of the mesh. After a neurectomy and excision of the neuroma of the affected nerve, total pain relief was obtained. He was able to perform his original work again.



## CASE 2

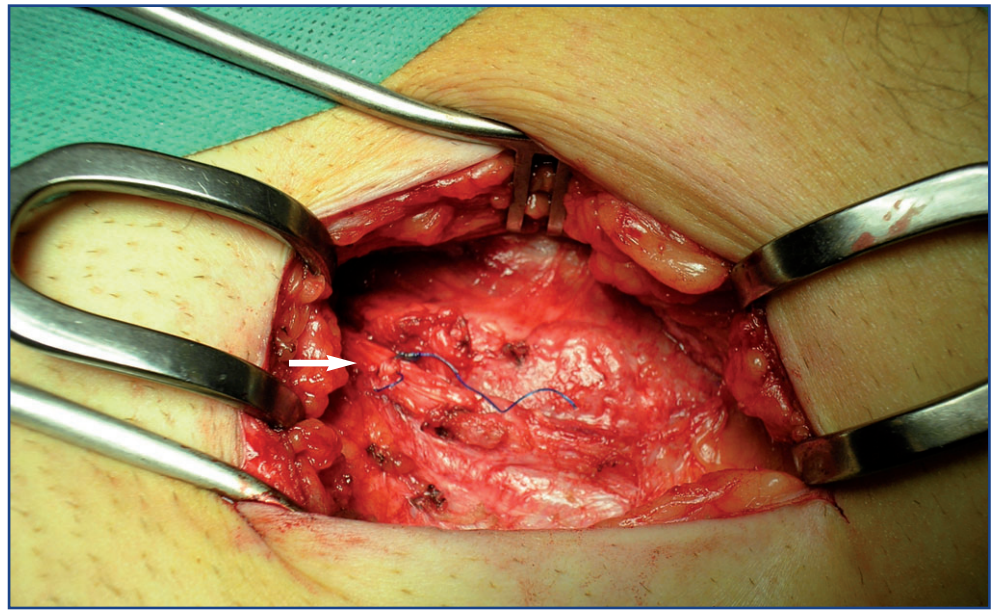
A 44-year old woman presented with persisting stabbing pain in the right groin after multiple inguinal operations. Inguinal exploration revealed an entrapment by suture material (→) around the ilioinguinal nerve. Neurectomy relieved her pain substantially.





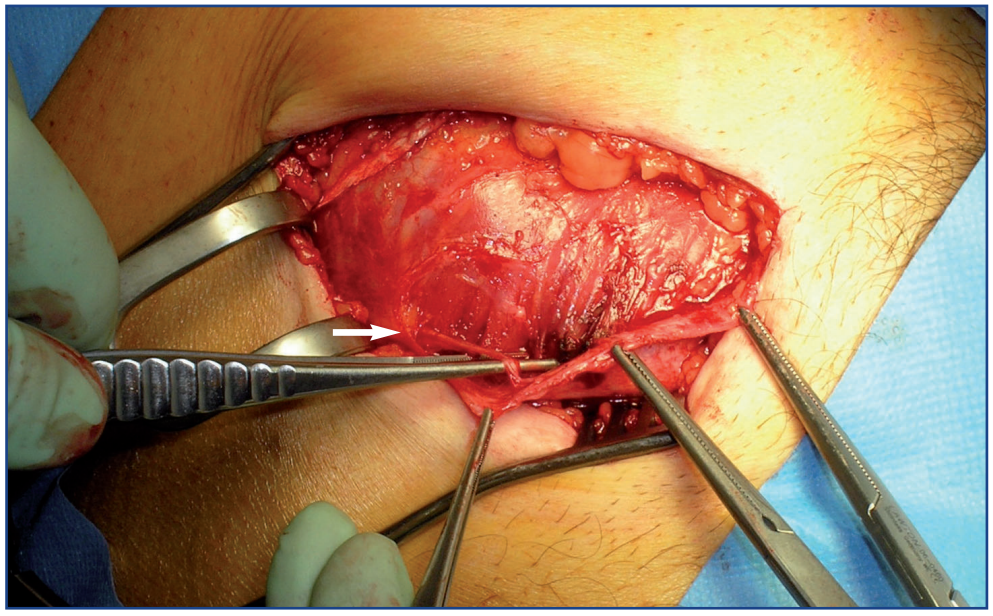
## CASE 3

A 50-year old patient reported persistent pain for at least 3 years that had started immediately after a hernioplasty including mesh. This picture illustrates an entrapped nerve by an unfortunate placement of suture material (→).



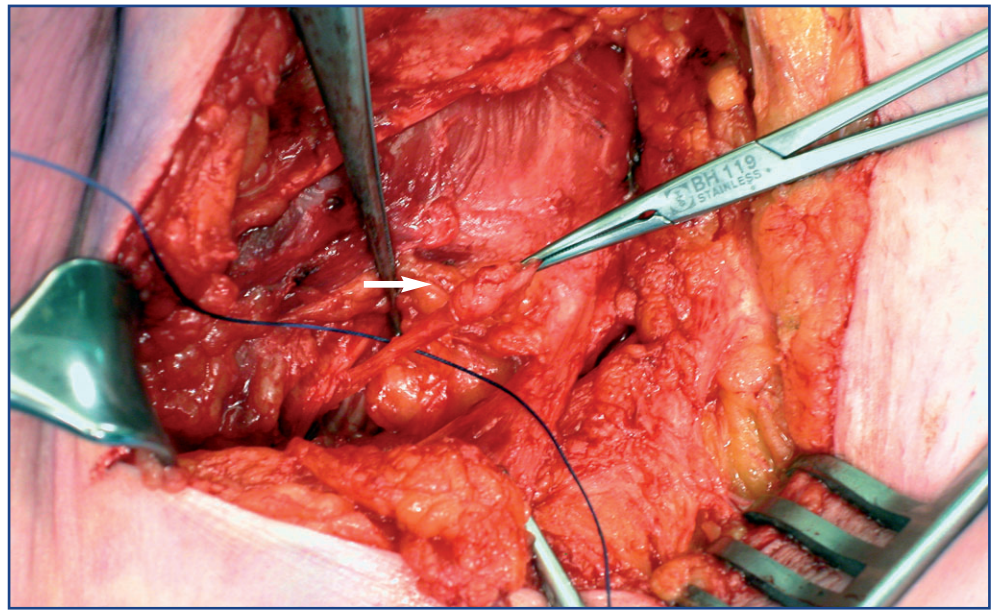
## CASE 4

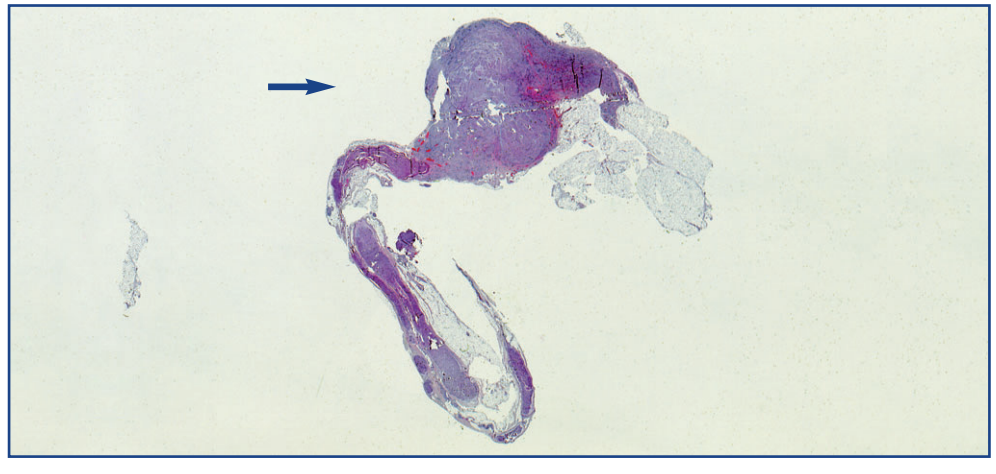
One and a half year after a Lichtenstein repair a 54-year old man presented with intermittent but progressive stabbing pain in the right groin. The first year after the hernia repair he had been without complaints. He also reported pain after ejaculation that negatively influenced his sexual activities. At inguinal exploration both the iliohypogastric (→) and genitofemoral nerves were trapped in the mesh. Neurectomy of both nerves provided considerate long-term pain relief. The dysejaculation complaints completely resolved.



## CASE 5

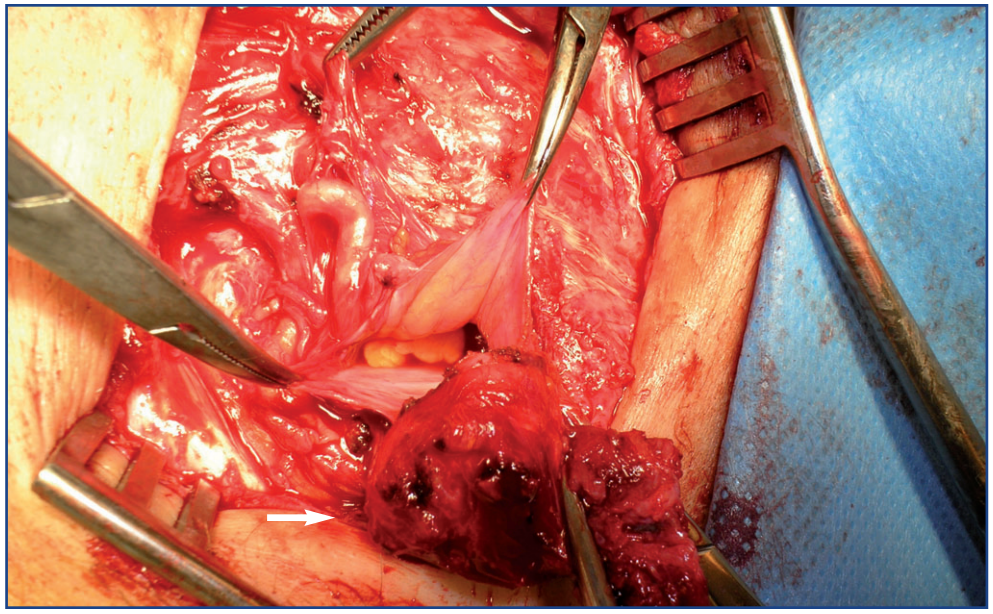
A 57-year old man presented with right inguinal pain after numerous hernia repairs. He had become occupationally disabled due to the severity of the pain. Exploration revealed a neuroma of the ilioinguinal nerve (→) which was confirmed by histopathology. After neurectomy the pain intensity decreased to an acceptable level and he could resume his previous work.



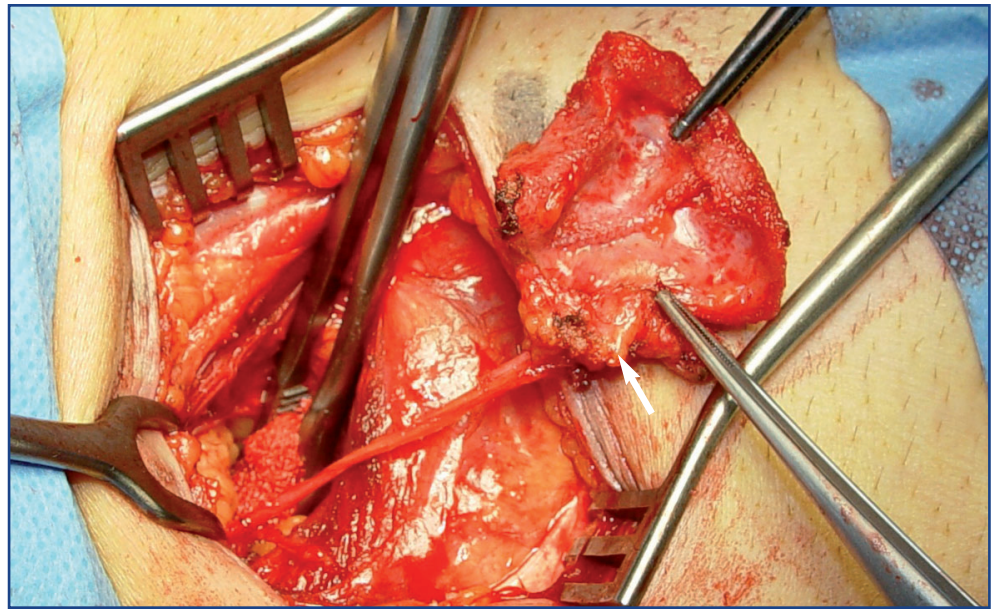
## CASE 6

We saw a 32-year old man with severe left chronic inguinal pain which was position dependent. There were no specific sensory disturbances. Therefore, we concluded that the pain was most probably nociceptive of origin. His hernia had previously been repaired using the so called mesh plug technique. After plug removal (→) pain intensity decreased significantly. About one year later, he developed new inguinal pain symptoms due to a recurrent hernia. A laparoscopic hernia repair (TEP procedure) resulted in moderate pain relief.



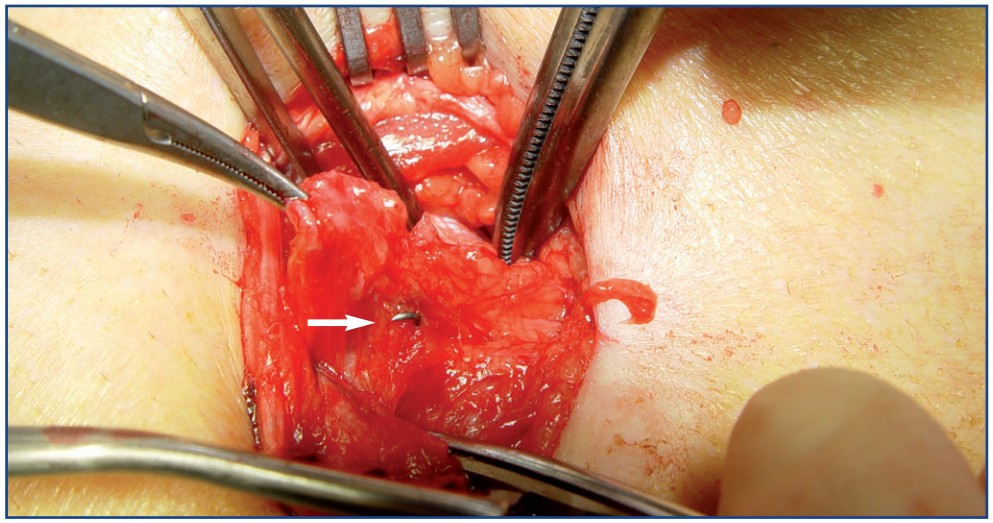
## CASE 7

A 50-year old female patient presented with neuropathic pain after a laparoscopic herniorrhaphy (TAPP) resulting in major impairment of her daily activities. At groin exploration the preperitoneal space was opened by dividing the internal oblique and transverse abdominal muscles. The genitofemoral nerve appeared to be encapsulated by the wrinkled mesh (meshoma →). Neurectomy of this nerve with partial mesh excision decreased her pain substantially.



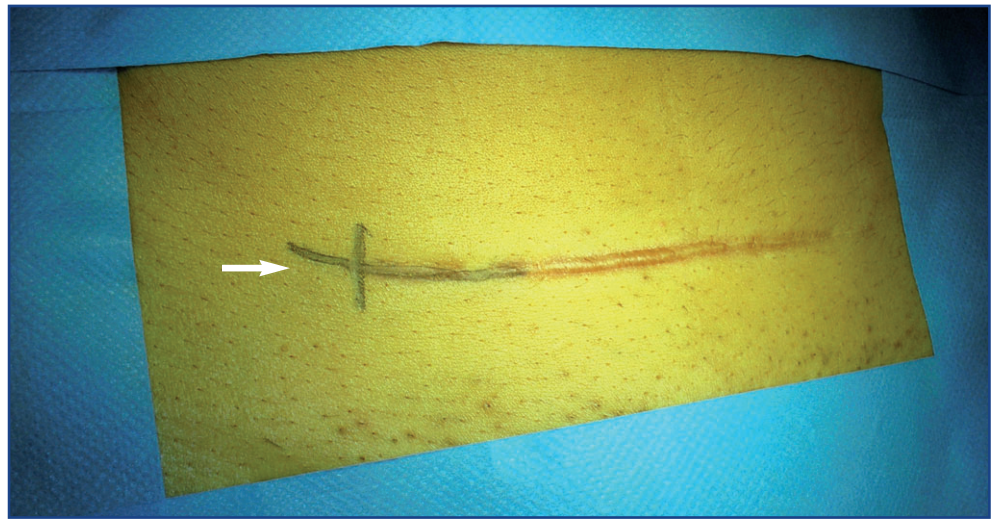
## CASE 8

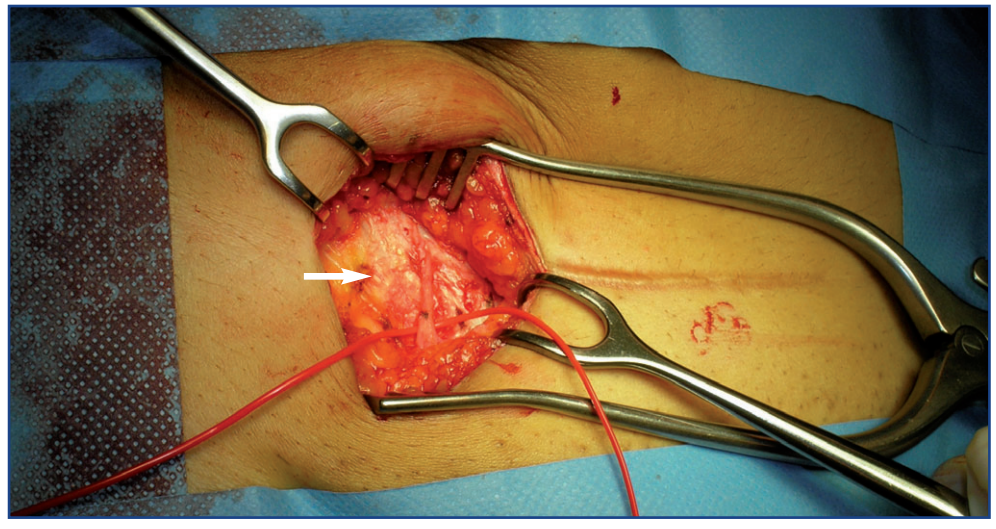
This 28-year old woman presented with inguinal pain after laparoscopic femoral hernia repair. At physical examination she had a trigger point at the lateral border of the pubic bone, suggesting periostitis pubis. She also reported a position dependent pain in the inguinal and femoral region with some numbness of the skin. Local injections did not result in pain relief. We explored the inguinal region and discovered several tackers (→) that had penetrated the pubic bone at exactly the pain trigger point. These were removed. No neurectomy was performed. Her pubic pain was resolved, but she still had disabling groin discomfort.



## CASE 9

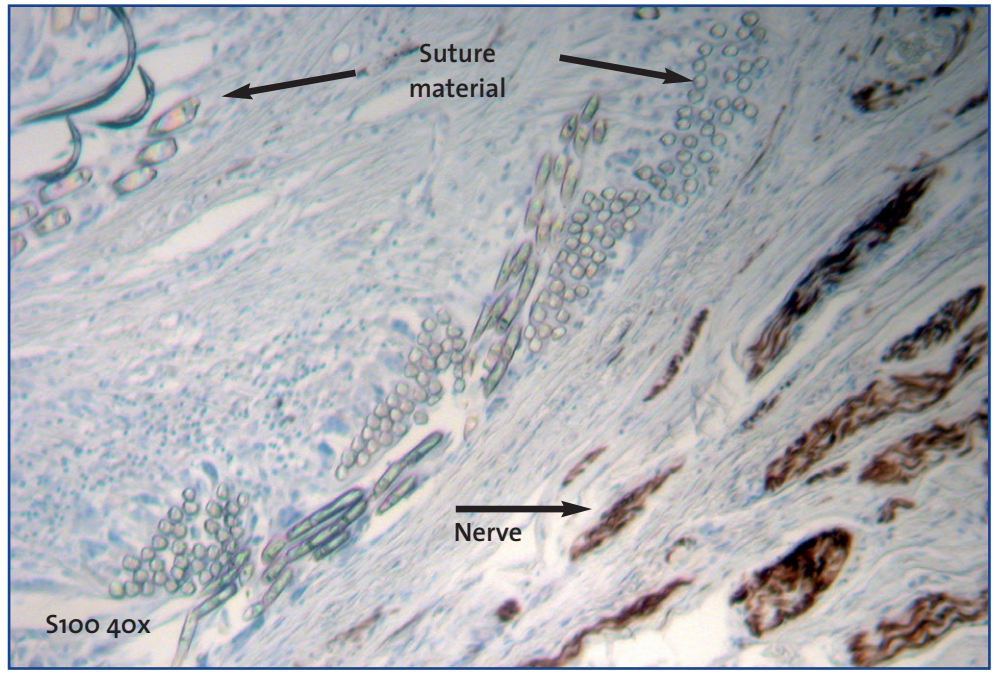
A 44-year old woman developed neuropathic pain after a caesarean delivery 4 years previously. Her Visual Analogue Scale (VAS) was 8/10. At physical examination she had hypoesthesia and hyperalgia in the groin. Palpation of the lateral border of right Pfannenstiel area triggered her pain, which irradiated to the pubic and inner thigh region. During exploration, a penetrating branch of the ilioinguinal nerve was discovered which was entrapped in fibrosis and subsequently neurectomized. She became nearly pain-free, with a VAS of 2/10.





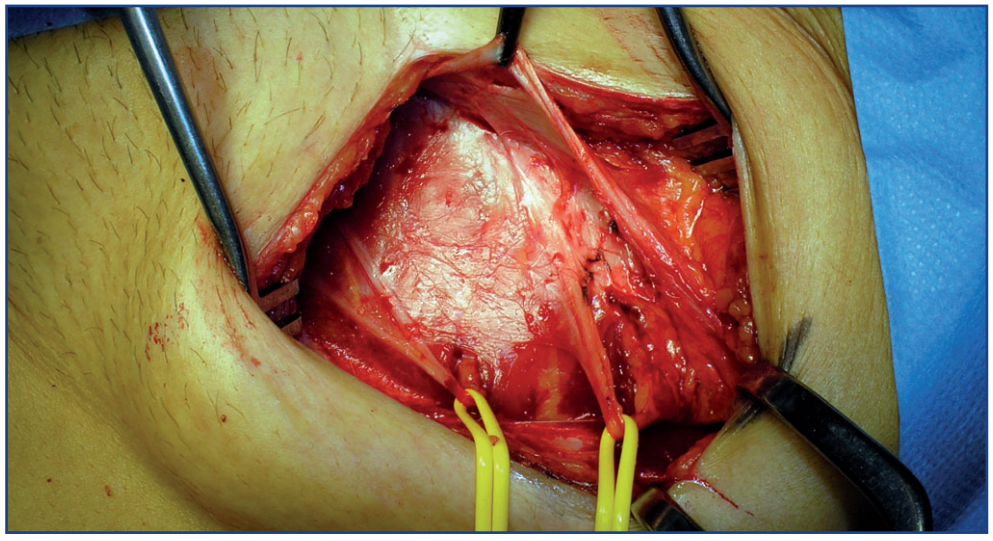
## CASE 10

During the last couple of years a 67-year old woman had frequently been admitted for chronic abdominal pain located in the left lower quadrant. Although she never had shown any infectious signs (fever, elevated C-reactive protein or leucocytosis), she was still diagnosed with diverticulitis. However, a detailed pain history clarified that her pain had started after her caesarean section in 1969 at the age of 28. Since then, no one had been able to elucidate the origin of her pain. She stopped visiting doctors and tried to cope with this discomfort during her active life as a housewife. At our physical examination a Pfannenstiel scar was noticed and therefore a nerve entrapment was suspected. Local infiltration with lidocain shortly relieved her pain. Surgical exploration revealed a huge neuroma of 1,5 cm and the ilioinguinal nerve was strangled by a still visible non absorbable suture. The neuroma and nerve were resected and her pain disappeared. The impact on her daily life was dramatic.

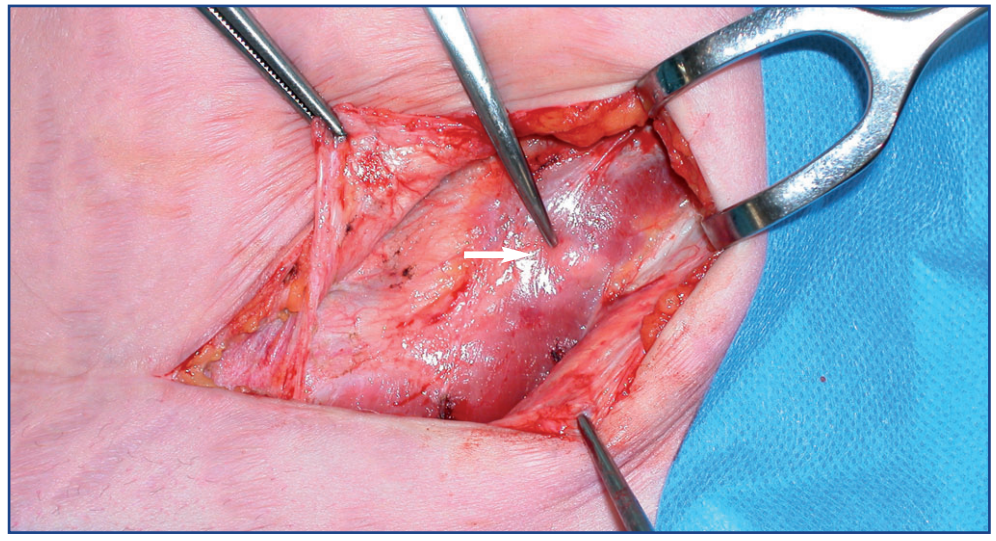
## CASE 11

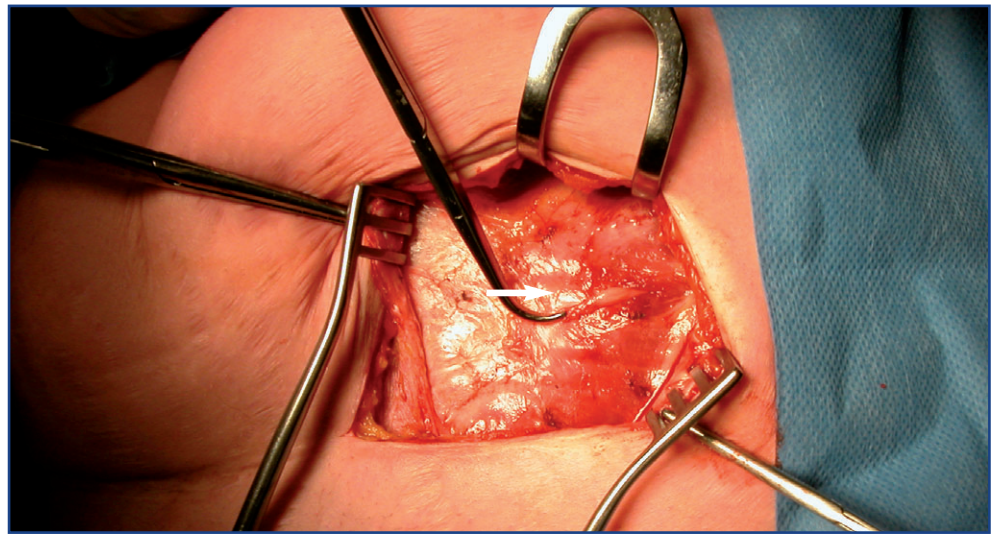
This case concerned a 43-year old woman with a more than 15 year lasting previously unrecognised pain syndrome, caused by postoperative fibrosis at the lateral border of a Pfannenstiel incision. During that period the pain had negatively influenced her sex-life. She was advised to consult a psychiatrist for her pain syndrome. Physical examination however was typical for nerve entrapment and the ilioinguinal and iliohypogastric nerve were both resected as distal and proximal as possible. Afterwards she was pain free, with a dramatic improvement of her quality of life including joyful sexual activity.



## CASE 12

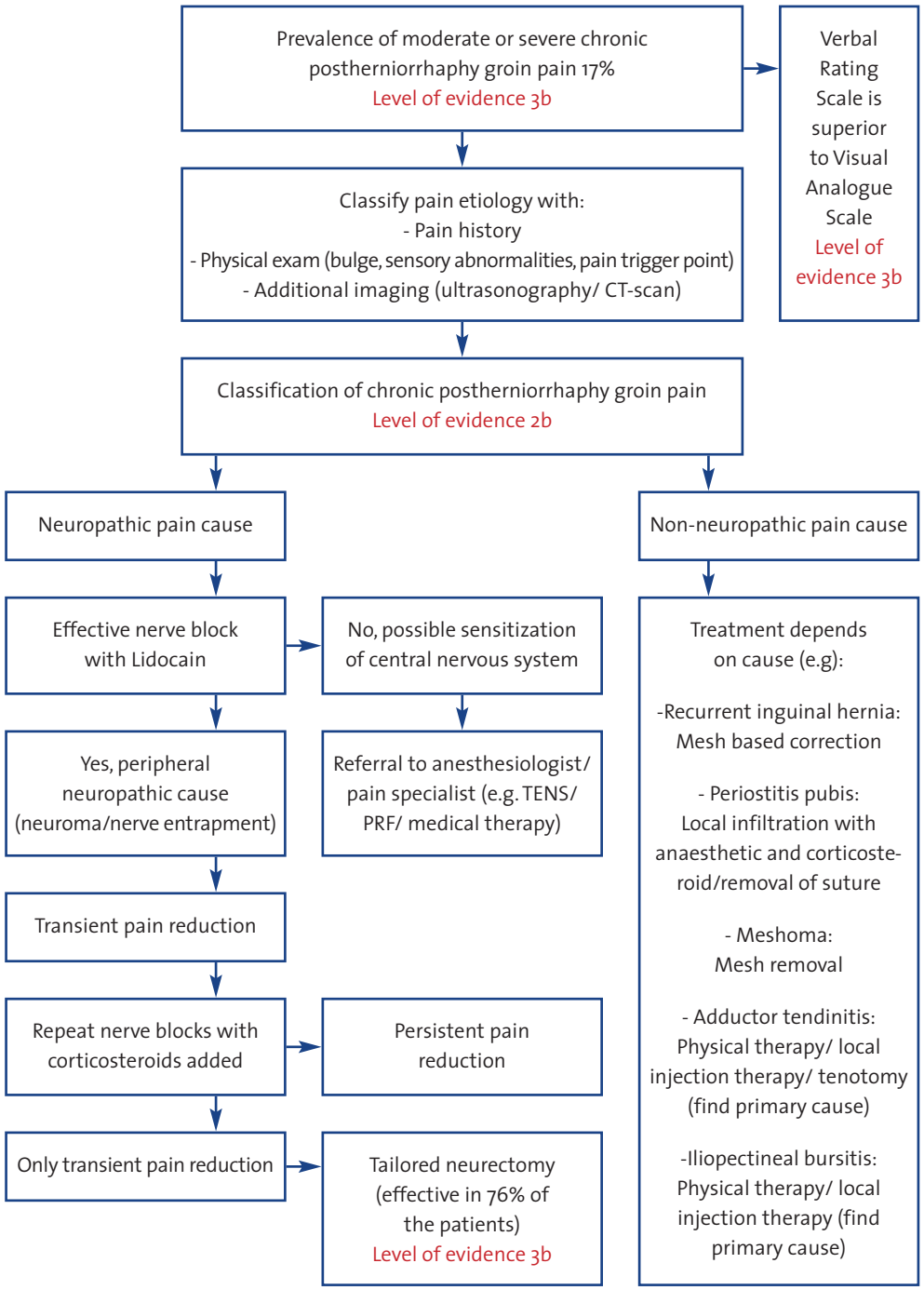
This case concerns a 37-year old woman who was successfully treated in our institute for a post-Pfannenstiel pain syndrome on the left side. She had received a neurectomy of the iliohypogastric nerve. Unfortunately, her pain complaints recurred after some 6 months and after a temporary successful local block a re-exploration was performed. We came across a stump-neuroma of the iliohypogastric nerve (→) at the level of the internal oblique muscle. It was resected as far laterally as possible. Evaluation at 3 months after this second neurectomy showed that she was very satisfied with the result.





## TREATMENT ALGORITHM

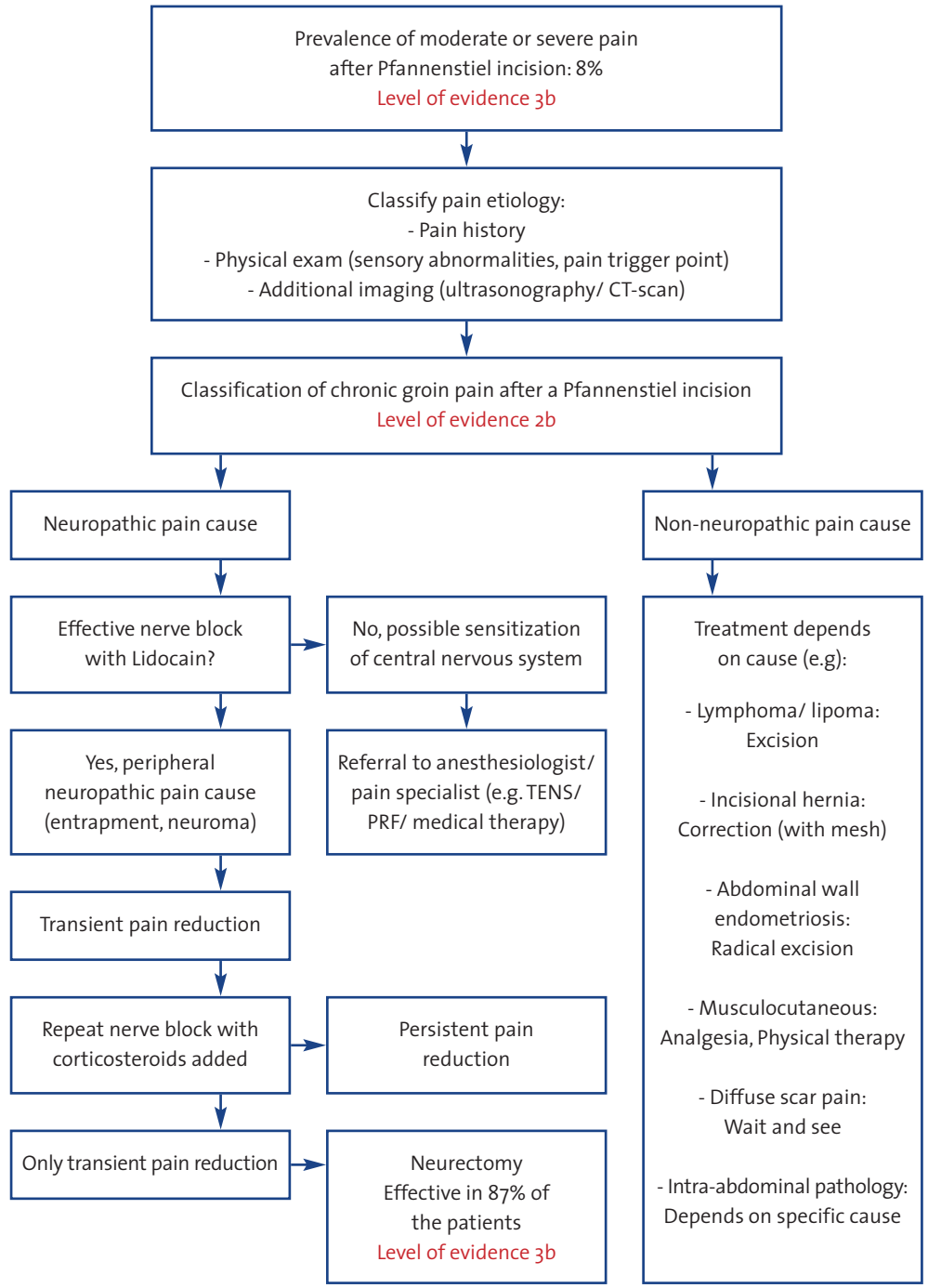
I Diagnostic and therapeutic pathway for postherniorrhaphy inguinal pain






## TREATMENT ALGORITHM

II Diagnostic and therapeutic pathway for chronic post-Pfannenstiel pain



## DIFFERENTIAL DIAGNOSIS OF CHRONIC GROIN PAIN*

**Surgery**
- Primary hernia
  - Inguinal
  - Femoral
  - Obturator
- Recurrent hernia
- Posthernia
  Initial open repair:
  - Neuropathic (nerve entrapment/ neuroma)
    - Iliohypogastric
    - Ilioinguinal
    - Genitofemoral
    - Lateral Femoral Cutaneous
  - Non-neuropathic
    - Rolled-up mesh
    - Tack
    - Periostitis pubis

  Initial laparoscopic repair
  - Neuropathic (nerve entrapment/ neuroma, often genital branch)
  - Non-neuropathic
- Abdominal Cutaneous Nerve Entrapment Syndrome

**Gynecology**
- Pfannenstiel incision
  - Neuropathic
    - Iliohypogastric
    - Ilioinguinal
- Cervical cancer
- Endometriosis
  - Round ligament
  - Pfannenstiel incision
  - Intra-abdominal
- Tubal/ ovarian disorders
- Uterus myomatosis

**Orthopedics**
- Acetabular labral tears
- Avascular necrosis
- Chondritis dissecans
- Legge-Calve Perthes disease
- Osteoarthritis
- Pelvic stress fractures
- Slipped femoral capsule epiphysis
- Snapping hip syndrome (ant/ lat)
- Synovitis
- Iliopectineal bursitis
- Spondylolisthesis
- Spondylolysis

**Sports medicine**
- Rectus strain
- Adductor tendinitis
- Iliopsoas tendinitis
- Symphysiolysis/ symphysitis
- 'Sportsman hernia' (tear in inguinal ring)

**Urology**
- Postvasectomy pain syndrome (entrapment genital branch)
- Vas granuloma/ fibrosis
- Cystitis
- Epididymitis
- Urinary tract infection
- Prostatitis
- Nephrolithiasis
- Torsion of testis

**Gastroenterology**
- Appendicitis
- Adhesions
- Diverticulitis



## DIFFERENTIAL DIAGNOSIS OF CHRONIC GROIN PAIN*

- Inflammatory retroperitoneal phlegmon (pancreatitis)
- Meckel diverticulitis
- Granulomatous colitis

**Vascular**
- Hematoma
- Varices (during pregnancy!)
- Pelvic congestion syndrome
- Postvein stripping
- Pseudoaneurysm
- Iliac/ femoral artery aneurysm/ stenosis
- Thrombosis
- Vascular graft
- Abdominal aortic aneurysm (with compression of genitofemoral nerve)

**Oncology**
- Retroperitoneal neoplasm
- Osseous metastases pelvis/ hip joint

**Dermatology**
- Lymphadenitis
- Psoriasis/burn
- Sebaceous cyst/ hydradenitis supp
- Thrombophlebitis/ cellulitis

**Infectious disease**
- Herpes zoster
- HIV/tuberculosis
- Lyme disease
- Psoas abscess

**Neurology**
- Lumbosacral disorders
- Neurofibromatosis
- Disc disease
- Spinal injuries, inflammation, tumors

**Rheumatology**
- Connective tissue disease
- Systemic lupus eritematous

**Modified from: Ferzli G et al. Postherniorrhaphy groin pain and how to avoid it. Surg Clin N Am 2008; 88: 203-216 and Roumen RMH, Scheltinga MRM. Liespijn en geen liesbreuk, maar wat dan wel? Ned Tijdschr Geneesk 2004; 148: 2421-2426.*

# Inguinal Pain Assessment Form

**Patient id:**

**Date:…...../……../…….. …..**

**Doctor:……..**

**Pain history:**

……..
……..
…….....

1. Symptomatic groin: □ right □ left □ both
   Since:…....months/years
2. Onset of pain symptoms: □ immediately □ ……months postoperatively
3. Difference with preoperative situation: □ better □ same □ worse
4. Initial operation: Date: ...../...../.....
   □ Inguinal hernia repair: □ Lichtenstein □ Shouldice □ Hernia sac resection
   □ Plug & patch □ TEP □ TAPP □ Other:.....
   Mesh type: .....
   □ Pfannenstiel □ Vasectomy □ Appendectomy □ Laparoscopy
   □ Other …….....
5. Frequency: □ rare( <1x/ week) □ occasional(1-7x/week) □ regular (once daily) □ always
   ……..x/ month
6. Localisation: □ inguinal area □ upper leg (□ medial □ lateral)
   □ scrotum, labia □ other:…….....
7. Irradiation: .....
8. Pain character: □ burning □ prickling □ nagging
   □ stabbing □ gnauwing □ pulling
   □ sharp □ pounding □ other:…….....
   □ electric □ pinching

*Loos MJA. Dissertation 'Surgical management of chronic inguinal pain syndromes', sept 2011*



9. Pain-inducing activities:
   □ none □ standing > half hour □ sitting □ lifting □ standing up
   □ driving □ defecating □ sleeping □ playing sports □ walking
   □ sitting □ lying down
10. Sexual pain complaints: □ ejaculatory pain (□ during □ afterwards) □ erectile pain
    □ orgasmic pain
11. Course over time (after initial operation): □ decreasing □ constant
    □ intermittent □ progressive
12. Other chronic pain syndromes present: □ no □ yes
    Please specify:……

**Specific questions:**

13. Inguinal bulge: □ yes □ no
14. Pain at flexion, exo-, endorotation of the hip: □ yes □ no
15. Hip joint pain: □ yes □ no
16. Pain related to the menstrual cycle: □ yes □ no
    □ not applicable

**Relevant medical history:**

| | Year | Diagnosis | Operation |
|---|---|---|---|
| 1. | | | |
| 2. | | | |

**Risk factors:**

1. Smoking: □ yes □ no 2. COPD: □ yes □ no
3. Strenuous physical labour: □ yes □ no 4. Other:……

**Current work situation:** □ wage-earning □ self-employed □ unemployed
□ disabled □ retired

**Effect of pain on work status:** □ none □ changed jobs after last operation due to pain
□ stopped working due to pain
□ works part-time due to pain

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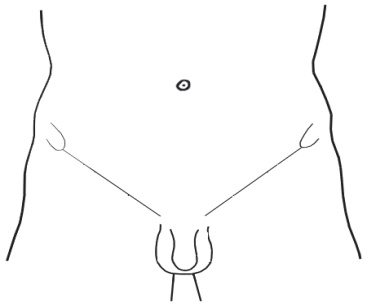
**Physical examination (indicate left/ right):**

*Inspection:*

- Bulges (□ inguinal □ femoral)
- Scars (draw)
- Inguinal varicose veins: □ yes □ no



*Sensation: (draw)*

- Test with monofilament wire:

  □ anesthesia □ hypoesthesia □ hyperalgesia □ allodynia

*Palpation:*

- Inguinal bulge □ yes □ no
- Femoral bulge □ yes □ no
- Painful lymph nodes □ yes □ no
- Pain pressing pubic tubercle □ yes □ no
- Pain pressing adductor tendons □ yes □ no
- Trigger point □ yes □ no

  Radiation to:……

*Specific tests:*

- Carnett's test: □ positive □ negative
- Laseque's test: □ positive □ negative
- Adductor test: □ positive □ negative
- Pain at flexion/ endo-exorotation hip*: □ positive □ negative

(*=suggestive for iliopectineal bursitis)

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**Pain level before nerve block**

***VAS***

No pain Very severe pain

***VRS*** □ No Pain □ Moderate pain

□ Very mild pain □ Severe pain

□ Mild pain □ Very severe pain

**After nerve Block (5-10 minutes:**

***VAS***

No pain Very severe pain

***VRS*** □ No Pain □ Moderate pain

□ Very mild pain □ Severe pain

□ Mild pain □ Very severe pain

**Additional diagnostics:**

□ Nerve block: (□ Lidocain.....cc □ Bupivacain …..cc □ Corticosteroids.……mg )

□ X-ray –pelvis/ hip □ Ultrasonography □ Herniography

□ CT-scan □ MRI □ Bone scan

□ Other:……..

**Differential diagnosis:**

……

**Treatment:**

□ None □ Additional nerve blocks:

□ Mesh removal □ Recurrent inguinal hernia repair

□ Neurectomy (□ Iliohypogastric □ Ilioinguinal □ Genitofemoral nerve)

□ Other: ……....

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