Risk factors for and prevention of chronic pain and sensory disorders following inguinal hernia repair

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BACKGROUND: *Inguinal hernia repair is one of the most common surgical procedures in man. Immediate postoperative pain is an important issue that can delay hospital discharge. Besides, the presence of chronic pain after herniorrhaphy, which can affect up to 50% of patients, is a growing concern. However information regarding the precise etiological factors of this chronic postoperative pain is lacking. One factor thought to contribute to post herniorrhaphy chronic pain is the surgical procedure for inguinal hernia repair used by the surgeon.*
MATERIALS AND METHOD: *The study was conducted over a period of 5 years and included 1000 consecutive patients operated with inguinal hernia. Each patients completed a questionnaire about the presence or absence of pain or sensory disorders. After completed only 365 of patients remains in the study. From this patients, a total of 38 had different intensity of pain. From those, 13% were operated through an tissular procedure, whereas the laparoscopic procedure was responsible only for 7% of the patients with chronic postoperative pain. Most of the patients had mild or moderate pain and only one patient experienced severe pain. According to the type of procedure performed, in 25 patients were used the tissular procedure and only 12 patients with laparoscopic hernia repair had chronic pain.*
CONCLUSION: *The etiology of chronic groin pain post hernia repair is related in part to nerve injury. This is supported by the high frequency of sensory symptoms and numbness in these patients. However other factors including the role of tissue injury and inflammatory postoperative changes need to be considered.*

KEY WORDS: Chronic postoperative pain, Inguinal hernia repair, Open surgery, Laparoscopic surgery

Introduction

Chronic pain and cutaneous sensory disorders are complications that may occur at different time intervals following inguinal hernia repair surgery. If not treated, postoperative pain leads to chronic pain and undesirable events ranging from patient discomfort and prolonged immobility [1,2]. Postoperative chronic pain has been the focus of several investigations in recent years, contributing to solve uncertain questions on the subject, such as the possible evolutionary mechanisms of acute pain to chronic pain[3]. Still there are few consistent data in the literature [4,5, 6]. Chronic pain is different from the postoperative pain that occurs immediately after surgery and which usually yields to antalgic and anti-inflammatory treatment and whose intensity gradually subsides [7]. It is usually located in the inguinal or testicular/labial area and its intensity varies from one individual to another. Sensory disorders, on the other hand, appear in the shape of paraesthesia in the operated area; these instances of paraesthesia can also be associated with impaired sexual dynamics (such as a low libido, or ejaculation pain) [8].

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Chronic pain after inguinal hernia repair has a wide range, estimated to be between 0 and 43% [9]. Although this estimation is the result of a systematic review, incidences varied widely between the studies included due to different definitions of pain. A widely accepted definition was provided by a Committee of the International Association for the Study of Pain: "Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" [10,11].

Postoperative pain has a variable duration. The one which persists postoperatively for months is estimated to represent 10-15% in the case of tissular procedures and 8% in the case of tension-free procedures [12].

In our study we tried to evaluate the incidence, intensity and risk factors of pain after inguinal hernia repair.

Material and Method

The study was conducted over a 5-year period, between 2012 and 2016 in a single University Surgical Department. Only patients who were operated on for uncomplicated inguinal hernia were included in our study. Of the 1000 consecutive patients operated on for hernia, 365 (36.5%) met the criteria that allowed them to be included in our study. As inclusion criteria the only one was the presence of pain or sensitive disorders.

The patients were operated on according to the preferences of each individual surgeon, so that in the case of half of these patients the laparoscopic TEP technique was used, whereas in the case of the other patients, one of the preferred tissular procedures was employed: Bassini, Kirschner, or McVay. The patients were then asked to undergo periodic checks (1 month, 3 - 6 - 12 - 24 months after operation). The patients underwent a clinical check as well as an ultrasound check. Each patient then filled out an anonymous assessment questionnaire which comprised questions such as whether pain was present or absent, and questions with regard to the localization of the pain, the way in which the pain occurred, its frequency, and the way in which it affected the patients' daily activities. Intensity of pain was assessed by using Visual Analog Scala (VAS) were 0 was noted for no pain and with 5 the maximum intensity. In the first month after surgery we considered that pain was due to the surgical trauma and we have taken into account only persistent pain after two month. The data collected referred only for the patients which shows for follow up at 3 months postoperatively. At 6 and 12 months the response rate was very low and not statistically significant, so we decided not include those patient in our study. Similar at 24 months the response was even lower. The data sheet is shown in Table I.

We have interpreted the results obtained, according to the data in Table II.

Table I - *Pain assessment questionnaire.*

Discomfort or pain in the operated inguinal area	Discomfort	1
	Mild pain	2
	Moderate pain	3
	Severe pain	4
Localization	Operated side	1
	Both sides	2
	Scrotum	3
Moment of occurrence	While walking	1
	During physical effort (exercise)	2
	While resting	3
Frequency of pain	Occasionally	1
	Several times	2
	Permanent	3
Impact upon daily living activities	Unaffected	1
	Limited activity	2
	Unable to do anything	3

Table II - *Interpretation of results.*

Pain score	Score
Low	3 - 5
Medium	6 - 9
High	10 - 12
Severe	13 - 16

Results

Of the patients operated for inguinal hernia (365 in all), the ones in whose case the tissular procedure was used showed a significantly higher percentage of chronic postoperative pain (13.9%) (N=25), as well as sensory disorders (7%), as compared to the patients who were operated using video endoscopy, in whose case only 7% (N=13) had chronic pain, while 10% had sensory disorders. A first estimate of our study shows that postoperative pain is significantly lower in the case of endoscopic surgery as compared to tissular surgery. Based on the applied questionnaire results, we drew up a hierarchy of pain according to the number of patients, as shown in Table III.

The patients with mild pain had a score of 3-5, which was calculated based on the questionnaires. Mild pain occurred in 16 patients who underwent tissular surgery

Table III - *Chronic postoperative pain intensity.*

Pain intensity	No.	%
Mild	25	65.8
Moderate	12	31.6
Severe	1	2.6

TABLE IV - *Pain intensity according to type of surgery.*

Type of operation	Mild pain		Moderate pain		Severe pain		Total	
	No.	%	No.	%	No.	%	No.	%
Tissular	16	8.9	8	4.4	1	0.6	25	16.8
TEP	9	4.9	4	2.2	-	-	13	3.6
Total	25		12				38	

TABLE V - *Incidence of sensory disorders.*

Type of intervention	Paraesthesia		Hypoaesthesia		Anaesthesia		Total	
	No.	%	No.	%	No.	%	No.	%
Tissular	19	10.6	25	13.9	4	2.2	48	26.7
TEP	8	4.3	9	4.9	3	1.6	20	10.8
Total	27	14.9	34	18.8	7	3.8	68	37.5

and in 9 patients who underwent endoscopic surgery. According to hernia type, 22 patients had primary hernia, while 3 patients had recurrent inguinal hernia.

Moderate pain was present in 6.6% of cases (N=12); in the case of 8 of these patients the tissular procedure was used, while in 4 cases, TEP was employed. The score obtained by the patients was between 6 and 10. Pain occurred during physical effort (exercise), during long walks, or in the case of sexual activity. Pain relief was achieved through rest, through the administration of nonsteroidal anti-inflammatory drugs, or by local infiltration of analgesics. Of the moderate pain patients, 11 had primary inguinal hernia while one had recurrent inguinal hernia.

Severe pain was recorded in only one case, in a patient with multi-recurrent inguinal hernia, in whose case tissular surgery was used. The pain in the case of this patient was very pronounced, almost permanent, and did not allow any normal physical activity. The intensity score calculated in the case of this patient was 15 points. This data was summarized in Table IV.

Sensory disorders were present in 18.6% of the studied cases (N=68). They were represented by instances of paraesthesia in 7.4% of cases (N=27), hypoaesthesia in 9.3% of cases (N=34), and anaesthesia in 1.9% of cases (N=7). The discomfort induced by these disorders was improved by conservative treatment. As in the case of pain, sensory disorders too were significantly less intense in the case of endoscopic surgery as compared to tissular surgery, the results being summarized in Table V

Discussion

Chronic pain and cutaneous sensory disorders following inguinal hernia repair surgery affect, at variable rates, the quality of the patients' lives and social-professional activity. The clinical manifestations are diverse and depend on the type of injury inflicted [13]. Chronic residual neuralgia may be caused by the surgical handling of the sensitive inguinal nerves during herniotomy or it could be due to the adjacent scar tissue or the adjacent inflammatory granulomas [14].

Chronic pain may be of neuropathic or nociceptive origin. Neuropathic pain is the result of an intraoperative injury to the nerve and can consist in the sectioning, stretching, contusion, or suturing thereof [15]. On the other hand, nociceptive pain is the result of injury to the tissue around the nerve [16]. The pain can be localized, diffuse, or projected via the nerve pathway into the surrounding areas. It can occur early or late, after several weeks or months following operation [17,18].

It is important to prevent any injury to the nerves, because the treatment of neuralgic complications is, in many cases, not efficacious. The nerve pathways in the inguinal area are, in most cases, variable and unpredictable [19,20]. The nerve structures that innervate the inguinal and genital areas are situated in the extraperitoneal space and are represented by the iliohypogastric nerve, the ilioinguinal nerve, and the genitofemoral nerve, and the lateral femoral cutaneous nerve. The incidence of pain in the inguinal area and in the lower limb studied in multicentre trials decreased to a great extent after the surgeons became familiar with the anatomy of the region, from an endoscopic perspective [13,21-24].

Chronic inguinal pain and sensory disorders are more frequently encountered following open surgery as compared to endoscopic surgery. This fact is demonstrated by numerous studies [21-24], but it is also follows from our study, which showed, in the case of conventional surgery, an incidence of painful phenomena which was even twice as high. This may be explained by the occurrence of instances of periprosthetic scar fibrosis or it may come as a result of prosthetic contraction. When dissecting the properitoneal space, the nerve elements need to be protected by their being handled in a gentle, non-traumat-

ic manner, and the prosthetic mesh must not come in direct contact with the nerve trunks [25,26]. Improvements in surgical technique and knowledge on stapling or non-stapling fixation of the meshes may lead to a smaller risk of chronic pain [27]. Most of the published studies on laparoscopic vs open repair have had a low quality of pain assessment and its social consequences, as pain has not been the primary outcome variable [28]. The most important indication for laparoscopic hernia repair, especially the TEP technique, should be the low risk for chronic postoperative pain and not the hernia recurrence, since the results between open Lichtenstein mesh repair and TEP are similar [30].

Postoperative inguinal pain may also be caused by the formation of exuberant scar tissue, such as a neuroma. Pain in this case is induced by shifting one's position and is accompanied by hyperaesthesia. In the case of a complete sectioning of the nerve or after the incorporation of the nerve into a suture, the pain is similar to that caused by a burn, with intermittent exacerbations, and is initially accompanied by hypoaesthesia, followed by hyperaesthesia [31].

Pain in the pubic tubercle can be a consequence of injury to, stretching, or inflammation, of the medial section of the pectineus muscle, or it may be the consequence of a secondary periosteal reaction of certain suture threads that were passed through the tubercle [32]. The pain is usually of medium intensity but sometimes it may grow, to the point where it becomes disabling [33]. A temporary improvement may be achieved by a local anaesthetic injection to the area where the intensity of the pain is highest [34].

The treatment of chronic pain following inguinal hernia repair surgery is usually difficult. Neurolysis of the affected nerve may cause the disappearance of pain. The affected nerve may be identified via nerve blocks achieved with local anaesthetics. The iliohypogastric and ilioinguinal nerves may be blocked or sectioned in the inguinal area [35]. The blocking of the genitofemoral nerve is achieved paravertebrally, at the L1-L2 level, and the sectioning thereof is done by flank incision or laparoscopically. Complementary treatments include the administration of anti-inflammatory drugs, analgesics, antidepressants, anxiolytics, or by transcutaneous electrical nerve stimulation [36].

The limitation of our study is that we could not carry out an extensive follow up of the patient because the low response rate following the treatment of inguinal hernia.

Conclusions

In summary, chronic postoperative pain after inguinal hernia repair emphasizes the clinical importance of chronic postoperative pain that only recently have been recognized and also demonstrates that we presently have an imperfect knowledge of the etiological factors involved. In the future, the primary focus should be to identify preoperative risk factors for high intensity chronic postoperative pain. It is necessary to define an operative technique where intraoperative nerve injury is avoided. Future studies should improve their methods of assessing chronic pain to allow interpretation of the potential risk factors. Finally, we emphasize that prophylactic methods to reduce chronic postoperative pain should have the highest priority.

Riassunto

Introduzione: Gli interventi chirurgici per la riparazione dell'ernia inguinale sono tra i più frequenti all'interno dei servizi chirurgici. Il dolore cronico post-operatorio è un'importante causa di morbilità che può portare ad una prolungata ospedalizzazione e maggiori costi nel sistema sanitario.

Il dolore cronico post-operatorio può verificarsi in quasi il 50% dei casi, ma la sua eziologia non è ancora del tutto chiara. Uno dei principali fattori eziologici riconosciuti è la tecnica chirurgica utilizzata.

Obiettivo: Lo scopo di questo studio è quello di valutare la frequenza con cui si manifesta il dolore cronico in seguito all'intervento chirurgico di riparazione dell'ernia inguinale e di valutarne la frequenza secondo la procedura dell'operatore.

Materiale e Metodo: Ho condotto uno studio retrospettivo che si estende per un periodo di cinque anni in un centro chirurgico universitario. In questo studio sono stati inclusi 1.000 pazienti che sono stati operati all'ernia inguinale. Ogni paziente ha compilato un questionario sulla presenza o assenza del dolore cronico o sui cambiamenti sensoriali postoperatori. Dopo la raccolta dei questionari sono rimasti solo 365 pazienti per lo studio. 38 di loro hanno avuto dolori cronici di varia intensità. Nel 13% dei casi con il dolore cronico è stata applicata una procedura tissutale, solo con la sutura senza protesi. Dopo la tecnica laparoscopica solo il 7% dei pazienti manifestavano dolore cronico. In termini di intensità del dolore, la maggior parte dei pazienti ha avuto dolori di intensità lieve o moderata, solo un paziente ha riscontrato dolore di forte intensità.

Discussione: Il dolore cronico post-operatorio dopo la cura chirurgica dell'ernia inguinale è più frequente, dopo la chirurgia a cielo aperto, rispetto alle tecniche endoscopiche. Nel nostro studio è stato due volte più frequente. Abbiamo dato una spiegazione a questo fatto con la produzione di un tessuto cicatriziale periprotesico e la modifica della posizione della protesi.

Conclusioni: Il dolore cronico post-operatorio è principalmente una conseguenza della lesione traumatica dei nervi nella regione inguinale. Tuttavia bisogna prendere in considerazione il processo infiammatorio post-operatorio e il trauma ai tessuti che ne consegue.

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