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Dermatome mapping: easy to do with formidable results: our experience

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ABSTRACT

Background: Although the recurrence rates after Hernia Surgeries have declined, a new complication, the chronic post-operative pain has crept up. The existing methods of assessment of post-operative disability and surgical limitations are non-consistent and unreliable. Álvarez et al suggested a novel way of mapping the affected dermatomes after hernia surgery and incorporating factors like side, source, type, distribution and intensity of pain into a classification system called Dermatome mapping classification (DMC). The DMC is an easy to do office based evaluation that uses just the surgeon's ballpoint pen, and a photograph for further reference.

Methods: We observed 100 patients' after Open Hernioplasty, conducted a Dermatome mapping and summarized our result.

Results: Most of our patients had some pain and discomfort within the first week of the surgery that gradually declined. The DMC successfully predicted an iatrogenic denervation and also provided on the incidence of post-operative pain ~ 8% in the 100 patients whom we evaluated. The Ilio-inguinal nerve was the most commonly affected nerve.

Conclusions: The DMC is an objective record of the subjective assessment of the post-operative patient and it provides the surgeon with an insight on the result and efficacy of the surgery being performed. The technique is equally productive for evaluating Open and Laparoscopic Hernia repairs or planning and evaluating Neurectomies for chronic pain.

Keywords: Chronic pain, Dermatome, Hernia, Hernioplasty, Mapping, Neurectomy

INTRODUCTION

In the past few years, recurrence rates for inguinal hernia after surgery have declined. The aftermath of a hernia surgery may be followed by a chronic pain. The incidence is quite frequent and patient's come to the treating surgeon anxiously with a common question. "Doctor, is this pain a complication of the surgery?" Treating surgeons face a challenge in diagnosing the source of pain because diagnostic modalities such as radiological and electro-myographic studies fail to

highlight and describe these clinical entities. The available resources only aim to quantify the disability and limitations of the surgery but they fail to highlight the forth-coming treatment options that may be planned for the patient.¹

Neuroanatomy of the inguinal canal

The Lumbar plexus arises from the anterior rami of the L1-L4 and traverse the psoas major and emanates from the lateral aspect of the muscle. The ilio-hypogastric

nerve [Figure 1] supplies the skin over the gluteal region and the provides motor supply to the Transversus abdominis and internal oblique. It originates from the superior branch of the anterior rami of the L1 spinal nerve, occasionally receiving a branch from the subcostal nerve (T12) or the Ilio-inguinal nerve (L1) below it. It divides to form Anterior and Lateral cutaneous branches. The Ilio-inguinal nerve [Figure 2] runs below the iliohypogastric nerve and pierces the transversus abdominis muscles (and not passing from the deep ring) and lies in the inguinal canal. It is intricately related to the cord structures and lies over it. It supplies the upper and medial part of the thigh and terminates as the anterior scrotal nerve (male) or anterior labia nerve (female). The genital branch (L1-12) also arises from the lumbar plexus, passed through the deep ring and is located under the cord and is protected by the cremasteric fascia. It supplies the cremaster, dartos and the skin of the scrotum and forms a pathway for the cremasteric reflex. The femoral nerve (L2-L4) is the direct branch of the lumbar plexus. Only the cutaneous branches (middle and intermediate cutaneous nerves) would be of importance to a surgeon worried about chronic pain after hernia. The Lateral cutaneous nerve of the thigh (L2-L3) passes deep to the inguinal ligament, occasionally piercing it and supplies the lateral aspect of the thigh.^{2,3}

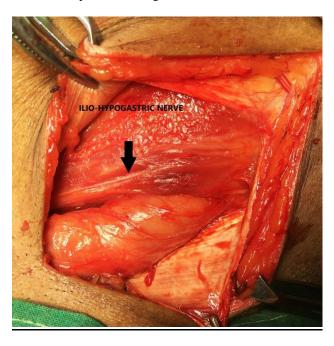


Figure 1: Intraoperative view of the ilio-hypogastric nerve.

Numerous articles have stated that there may be a considerable variation in the origin of the nerves from the lumbar plexus, however the dermatomes they supply are fairly constant. Hence, a novel technique of mapping the dermatomes supplied by the nerves in open hernia repair such as ilio-hypogastric, ilio-inguinal, genital branch of genitofemoral nerves may be mapped by the dermatome mapping technique. ^{4,6}

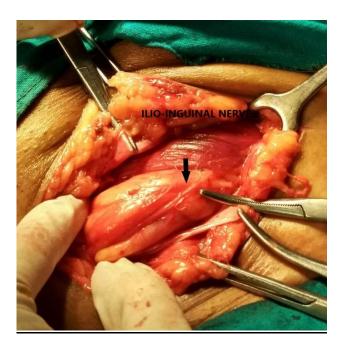


Figure 2: Intraoperative view of the ilio-inguinal nerve.

What is dermatome mapping test (DMT)?

Dermatomes involved in each nerve trunk is fairly constant and reliable even though variations in the neuro-anatomy may become hostile for the treating surgeon. Clinical evaluation of dermatomes has always been a routine part of a general medicine curriculum during their undergraduate course as a part of the neurological examination. The Dermatome mapping test has been a comprehensive evaluation of any patient with post-operative groin pain. Rigoberto Álvarez et al published his paper, in 1998 in Spanish with immense potential to overcome the limitations of the existing modalities of detecting disability after hernia surgery. The technique has a high sensitivity and provides some post-surgical outcomes. 1,7

The dermatome mapping classification provides a single, tabular format and incorporates a combination of quantitative and qualitative assessment of the pain perceived by the patient into one single tabular format. It includes the origin, source, intensity (Visual analogue Scale), location and type (Neuropathic, Non-neuropathic or Denervation). The classification system has been updated in 2015 and is globally accepted.^{1,7}.

METHODS

Our study is a meticulous longitudinal observation of 100 post-operative patients who underwent open hernioplasty. The evaluation was carried out purely on outdoor clinic basis. We evaluated the outcomes of surgery at frequent intervals starting from the first post-operative week during the removal of sutures followed by a monthly follow up ending by upto 6 months. Patients with

persistent pain after 3 months were considered to have chronic pain and were asked to follow up regularly and were managed accordingly. Data was collected by using a pre-printed and pre-tested dermatome mapping classification (DMC) performa sheet for each patient and the results were tabulated, in a Microsoft Excel spreadsheet and analysed our results with the same software for a graphical outcome. Our technique follows a simple test using permanent markers or a simple ball point pen with symbols such as +, - or O (Figure 3).

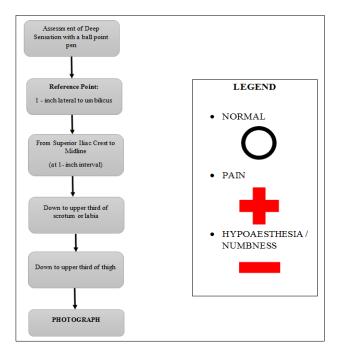


Figure 3: Flowchart depicting the sequence of steps in performing the Dermatome mapping test.

RESULTS

We observed 100 patients in their post-operative phase after hernioplasty. Mean age (years)±SD was 60.72±6.6. The patient's had symptomatic hernia for 18.2±7.6 months [mean duration of symptoms in years±SD]. Out of our 100 patients 92 had inguinal hernia of primary origin while 8 were recurrence. 82 cases were unilateral and 18 cases were bilateral. 62 were indirect and 38 cases were direct hernias (Table 1).

Table 1: Demographics and distribution of cases.

Characteristics	Number of patients (n= 100)
Age (years) Mean±SD	60.72±6.6
Duration of symptoms (Mean±SD)	18.2±7.6
Primary hernias	92
Recurrent hernias	8
Hernia side	
Unilateral	82
Bilateral	18
Type of hernia	
Direct	38
Indirect	62

Our evaluation with dermatome mapping revealed, pain in the post-operative period gradually decreases with time (Figure 4). A pictorial representation of the pain, 1 week after surgery analysed with the visual analogue scale (VAS) as a part of the dermatome mapping classification (DMC) has been depicted in the pie chart (Figure 5).

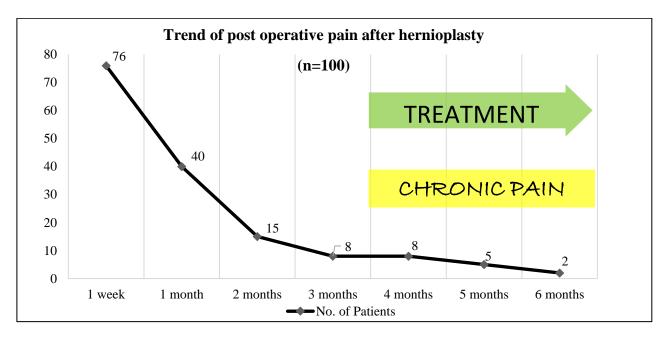


Figure 4: Graphical representation of trend of post-operative pain after hernioplasty.

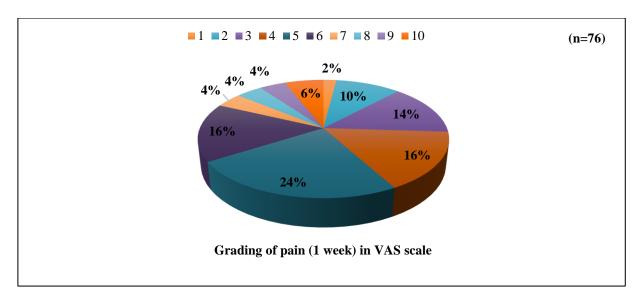


Figure 5: Quantitative assessment of pain using VAS scores after a week following surgery.

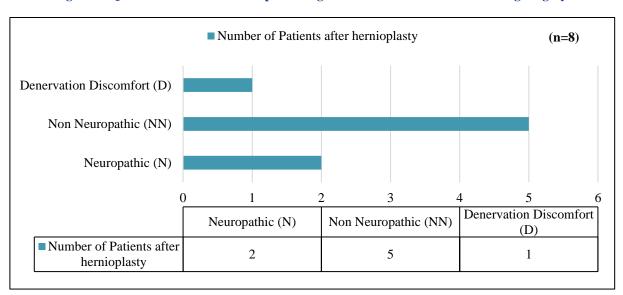


Figure 6a: Type of chronic postoperative pain after hernioplasty.

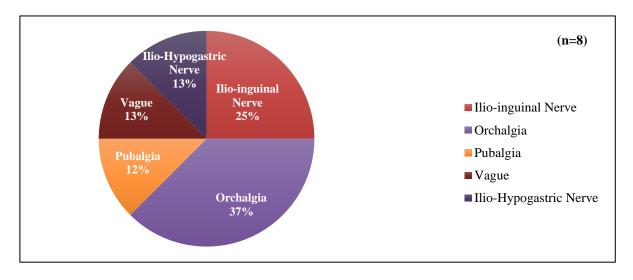


Figure 6b: Source of postoperative pain after hernioplasty.

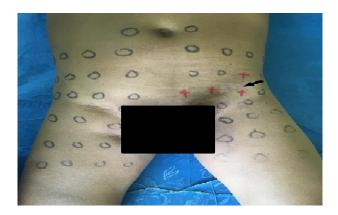


Figure 7: Photograph of our patient from the study who has pain along the ilio-inguinal dermatome indicated by + sign. O signifies the normal sensation and the Black arrow points to the incision line.

The incidence of chronic pain was 8% in our institution. Although denervation injuries were avoidable most of our patients present with post-operative orchialgia (37%), pubalgia (12%) or vague (13 %) symptoms and were classified as Non-neuropathic pain [Figures 6a, 6b]. We had one case of Iatrogenic Ilio-hypogastric nerve denervation, while postoperative pain in the Ilio-inguinal nerve territory [Figure 7] was predominant due to manhandling of the cord structures and an incorrect fixation of the mesh or due to iatrogenic suture bites on the nerve's trunk. Patients with chronic pain were first put on a course of non-steroidal anti-inflammatory drugs (NSAIDs). Most of the patients benefitted from these and rarely required a transition to drugs with higher analgesic action. None of our patients had pain with an increased intensity which required local infiltration of anaesthetic agents or a triple neurectomy.

DISCUSSION

Álvarez et al 's results of post-operative pain after hernia surgery for over 10 years revealed that the ilio-inguinal nerve was more prone to damage followed by the genital branch of genitofemoral nerve, in the open technique during the handling of the cord structures or during a plug-patch repairs over the internal ring. The femoral branch of genitofemoral nerve was affected more during laparoscopic procedures. This was primarily due to dissection near the iliac vessels. There was no incidence of any Lateral femoral cutaneous nerve involvement. His technique proved wise to address the outcomes of removal of mesh and neurectomies.^{1,7}

Today over 20 million hernia surgeries are done annually, starting from institutes specializing in Herniology to independent practitioners all around the world.^{8,9} Recurrence rates in the mesh era is approximately 1-5%. ^{10,11} Variation in the neuro-anatomy leads to difficult post-operative situations. The incidence of chronic pain

after hernia surgery ranges from 4%-20%. The International Association for the study of pain (IASP) has divided post-operative inguinodynia into a nociceptive pain and a neuropathic pain. Nociceptive pain is mainly due to inflammation and has a delayed manifestation. Nociceptive pain can be avoided by gentle handing of the cord structure and to avoid crude vigorous dissection methods. It is essential that the nerves are not dissected from their investing fascia as taught previously. Neuropathic pain is an immediate manifestation due to injury to the nerve trunk with sutures or tacs. Patients are symptomatic and a positive Tinel's sign may be found. Apart from these two broad divisions there seems to be an overlapping "gray zone" that is ill-understood and is affected by the patient's perception to pain and psychological factors that decrease the quality of life. The incidence can be decreased from 5-8% to 1% by carefully identifying the nerves during surgery. 12

The DMC combines both qualitative and quantitative assessment of post-operative pain and is superior to the existing quantitative methods of pain assessment such as visual analogue scale (VAS), pain disability index (PDI), short form Mc Gill pain questionnaire (SF-MPQ) and the Carolinas comfort score (CCS).

Our results showed the potential benefit of using a dermatome mapping after hernia repair and we consider it to be mandatory evaluation after the surgery that yields the outcome of the procedure.

CONCLUSION

Dermatome mapping is simple and cost effective technique that uses only a ballpoint pen and can be performed easily during scheduled follow up visits after Hernia surgery. The photograph taken acts as an objective record of subjective situations such as post-operative chronic pain. The classification system forms a universal language for surgeons to address the treatment plans in a logical fashion. It is an excellent tool to assess the post-operative outcomes and document the aftermath of the surgery to communicate the efficacy of the surgery. It helps us develop a tailored approach to address the situations involving chronic post-operative groin pain and plan further treatment options for the patients.

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Institutional Ethics Committee

REFERENCES

- 1. Álvarez R. Dermatome Mapping: Preoperative and Postoperative. The SAGES Manual of Groin Pain. Jacob BP, Chen DC, Ramshaw B, Towfigh S. Springer Verlag; 2016:277-292.
- Gray H. Anatomy of the Human Body. Neurology. The Lumbosacral plexus. 1918 [https://www.bartleby.com/107/212.html]
- 3. Last RJ, McMinn RMH. Last's anatomy, regional and applied. 6th Ed. Edinburgh: Churchill Livingstone; 1996.
- 4. Hollinshead WH. Anatomy for surgeons. In: The Back and the Limbs. 3rd edn. Harper and Row Publishers; 1982:583-588.
- Skandalakis JE. Retroperitoneum. Skandalakis, Surgical Anatomy. The Embryology and Anatomic Basis of Modern Surgery. International Student Edition. Paschalidis Medical Publication; 2004: 517–572.
- 6. Uzmansel D, Aktekin M. Multiple variations of the nerves arising from the lumbar plexus. Neuroanatomy. 2006;5:37-9.
- Álvarez Quintero R, Mayagoitia González JC. Dolor inguinal crónico posoperatorio o inguinodinia. In: Mayagoitia González JC, editor. Chapter 37. Hernias de la pared abdominal: tratamiento actual. 3rd ed. Editorial Alfi: México; 2015:293-299.

- 8. Aasvang E, Kehlet H. Surgical management of chronic pain after inguinal hernia repair. Br J Surg. 2005;92:795-801.
- 9. Alfi eri S, Amid PK, Campanelli G, Izard G, Kehlet H, Wijsmuller AR, et al. International guidelines for prevention and management of post-operative chronic pain following inguinal hernia surgery. Hernia. 2011;15:239-49.
- 10. Bittner R, Schwarz J. Inguinal hernia repair: current surgical techniques. Langenbeck's archives of surgery. Deutsche Gesellschaft für Chirurgie. 2012;397:271-82.
- 11. Bjurstrom MF, Amid PK, Chen DC. Evaluation and Treatment of -Postoperative Groin Pain. Hernia Surgery Current Principles. Springer Verlag; 481-490.
- Amid PK, Chen DC. Postherniorraphy Inguinodynia: Causes, Prevention, and Surgical Treatment: Triple Neurectomy. In: Fischer's Mastery of Surgery. In: Kluwer W, editor. Volume 1. Chapter 210. 2011:2240-2243.

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