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Is It the Mesh?

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It is well known that after inguinal herniorrhaphy, some patients develop inguinodynia. Pain has often been blamed on injury or entrapment of the ilioinguinal nerve. Since the advent of mesh, we have noticed a number of patients with persistent pain even after the ilioinguinal nerve has been transected or blocked. For that reason, a retrospective review was done to analyze whether the mesh could be a culprit for this chronic pain syndrome. A total of 12 cases were reviewed. All patients underwent exploration of the inguinal area, along with removal of the previous mesh and herniorraphy with a McVay technique. After exploration and removal of the mesh, the inguinal pain was greatly improved within 2 months of the time of surgery in all 12 patients. Despite changes in mesh manufacturing and hernia repair technique, we believe that there is a possible correlation between the mesh and inguinodynia in a certain subset of patients that seems to be unrelated to nerve pathology. This correlation may prompt revision in training surgical residents in primary tissue repair and may lead to further investigations regarding patient response to inguinal mesh placement.

Key words: Inguinodynia – Chronic groin pain – Mesh – Herniorrhaphy – Meshectomy

Inguinodynia is a well-known complication following hernia repair. Also known as chronic groin pain, the syndrome is described by the International Association for the Study of Pain as "groin pain reported by the patient at or beyond 3-mo following inguinal hernia repair."[1] This chronic syndrome is not uncommon, affecting as many as 62.9% of patients, with 2% to 4% of these having pain severe enough to affect their everyday activities. Furthermore, it is estimated that 5% to 7% of patients with postherniorrhaphy groin pain will sue their surgeon.[2]

In evaluation of a patient presenting with pain after hernia repair, the correct etiology of the pain needs to be ascertained. Chronic groin pain is often classified as either neuropathic[2] or nonneuropathic/nociceptive.[3] Neuropathic pain is typically associated with damage or impingement of 1 of the 3 major inguinal nerves (ilioinguinal nerve, iliohypogastric nerve, or the genital branch of the genitofemoral nerve) or is linked to pain due to inflammation from surgery. Nonneuropathic pain, in contrast, has been attributed to mesh-related fibrosis, inflammatory

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Table 1 Patient demographics

Variable	Group (n = 12)
Age, y, mean (range)	39.75 (18–77)
Male sex, No./total No.	11/12
Patient smoking, No./total No.	4/12
Time from initial herniorrhaphy to meshectomy, wk, mean (range)	49.08 (3–156)
Moderate to severe groin pain, No./total No.	12/12
Workers' compensation insurance, No/total No.	9/12
Patients who underwent rerepair attempt with mesh, No./total No.	3/12
Patients who underwent laparoscopic hernia repair, No./total No.	1/12

mass caused by the mesh, postoperative fibrosis, periosteal reaction from sutures/staples, or rolled-up bulky mesh leading to mechanical pressure.[1,2] Loos *et al*[4] offer an explanation known as "funiculodynia," in which the mesh leads to inflammation of the spermatic cord. Inguinodynia from the mesh falls into the category of nonneuropathic pain and has gained attention in recent years as a possible source of pain. This type of postherniorrhaphy pain is often noted to be more localized and chronic in nature. Some patients may present with a notable "mesh bulge" because the prosthetic has been displaced, some present with recurrent hernia, and some present with no physical abnormalities. In our practice, we noted a subgroup of patients complaining of chronic pain in the region of their previous synthetic mesh repair and hypothesized that the symptomatology from which they were suffering was caused by the mesh.

Materials and Methods

A retrospective chart review of 12 cases was performed for the period from 2008 to 2011. Patient inclusion criteria included previous inguinal hernia surgery (open or laparoscopic) with complaint of surgical site pain.

A single surgeon at an outpatient facility performed exploration of the inguinal area. Intraoperatively, mesh was excised as completely as possible. The surgeon, experienced in repair both with and without mesh, elected to perform a primary repair. Ilioinguinal neurectomy was performed if the nerve was noted upon exploration. Repair with the McVay technique was accomplished on all patients, using a generous relaxing incision along the internal oblique aponeurosis. There was no new placement of prosthetic or biologic material. Patients were followed for an average of 18 weeks. Patient resolution of symptomatology was noted on outpatient follow-up visits and quantified by the patients' return to work.

Results

Most of the patients were male, with a mean age of 39 years (Table 1). Several patients had undergone conservative treatments prior to surgical intervention, including oral analgesics, physical therapy, nerve injections, and chronic pain management. A total of 3 patients had undergone multiple previous repairs, and 1 patient had undergone ilioinguinal neurectomy with no alteration of the mesh. Upon exploration, 1 patient was noted to have an intact ilioinguinal nerve, and this was transected. There was no nerve noted intraoperatively in the other 11 patients, indicating possible previous transection or lack of identification.

Numerous types of mesh were noted upon exploration, three of which consisted of a plug repair. One patient was explored and noted to have the mesh with sutures in place but placement in the incorrect plane. Another patient was noted to have complete migration of the plug. Most of the patients were noted to have a "bulging" of the mesh upon exploration, with inadequate tension of the mesh. Several patients were noted to have extensive fibrosis surrounding the cord structures. One patient had appropriate placement of the mesh, with no bulging and no evidence of fibrosis or nerve damage.

The mesh was excised in all 12 patients. A minimal amount of prosthetic material was left only if it completely adhered to the vascular structures of the cord. Final pathology revealed elements of fibrosis in 7 of 12 patients and inflammation in 5 of the 12 patients.

After exploration, removal of the mesh, and rerepair of the hernia using the McVay/Cooper Ligament technique, the inguinal pain was improved within a mean of 18 weeks (range, 4–52 weeks) in all 12 patients (Table 2). All patients, including the 9 receiving workers' compensation, were able to return to work and resume previous activities within a period of several months to a year. There were no infections and no recurrence of the hernia noted in the 1 to 13 months of follow-up. Complications included one orchiectomy following meshectomy secondary to ischemic changes after dissection (history of 4 previous repairs).

Table 2 Postoperative outcomes

	Patients (n = 12)
Groin pain improvement, No./total No.	12/12
Pathology revealing fibrosis, No./total No.	7/12
Pathology revealing inflammation, No./ total No.	5/12
Hernia recurrence rate, No./total No.	0/12
Complications, No./total No.	1/12: orchiectomy
Return to work, No./total No.	12/12
Follow-up, wk, mean (range)	18 (4–52)

Discussion

Inguinodynia causes lifestyle-limiting pain in 2% to 4% of postoperative inguinal hernia patients.[1] In addressing patient complaints, the most common etiology blamed for the pain is often neuropathic.

If the pain is due to nerve irritation, can it be prevented? Compromise of nerve tissue may occur during dissection/placement of the mesh or by possible postoperative inflammation associated with wound healing. Studies have been done to determine whether postoperative pain could be attributed to the nerve and whether prophylactic severance would improve chronic groin pain. A systematic review by Wijsmuller *et al*[5] showed no significant difference in chronic groin pain after hernia repair following either ilioinguinal nerve preservation or division. Their recommendation was routine identification of all 3 nerves with no need to prophylactically sever the nerves. Another meta-analysis in 2012 of 6 randomized trials done in 1286 patients undergoing inguinal hernia repair revealed no difference at 6 and 12 months in chronic groin pain.[6] Although some controversy still exists, there continues to be a trend toward studies showing no evidence that prophylactic ilioinguinal neurectomy improves postoperative pain.

Other attempts at preventing nonneuropathic pain have included alternatives to suture/tacks. Multiple randomized controlled trials have as yet failed to show any difference in postoperative pain at or beyond 6 months with fibrin glue[7] or self-gripping meshes.[8]

As a prosthetic, the mesh used in inguinal hernia repairs has recently become a possible target for the pain. Industry has shifted from heavyweight to lightweight mesh. This material, typically defined as having a larger pore size and smaller surface area, is proposed to result in a decreased foreign body reaction,[9] in theory leading to decreased pain. A randomized trial in 2004 demonstrated a higher incidence of groin pain for heavyweight mesh at 6-month follow-up.[10] However, a larger, more recent randomized controlled trial of 590 patients by Bringman *et al*[11] showed no differences in chronic pain or hernia recurrence between the heavyweight and lightweight mesh groups.

Despite prophylactic nerve excision, suture substitutes, and decreased-weight mesh, there has been a persistence of pain in a subgroup of patients following hernia repair. Several small studies, similar to our own, have been done to evaluate whether mesh removal would improve patient outcome. A prospective study of 43 patients in 2009 demonstrated 95% complete resolution of chronic groin pain following radical neurectomy of the ilioinguinal and iliohypogastric nerve, with the removal of any prosthetic along the nerve tract.[3] A retrospective cohort study, with long-term follow-up at a tertiary referral center, studied 67 patients during 31.9 months. They noted that meshectomy for postherniorrhaphy pain led to significant symptom improvement and patient satisfaction, with acceptable morbidity and recurrence rates.[12] Furthermore, ilioinguinal neurectomy played no role in long-term pain outcome, suggesting again that the mesh may be the culprit for the pain. Another study of 20 patients, by Heise and Starling,[13] reported that removal improved symptoms in 57% of their patients who were experiencing postherniorrhaphy inguinodynia. Another small prospective study of 21 patients done by Aasvang and Kehlet,[14] showed significant improvement in pain and everyday activities after selective neurectomy and mesh removal.

In reoperation, some surgeons have attempted to replace the mesh, using a different prosthesis or different repair technique (plug versus patch, etc). As discussed previously, and as seen in 3 of our patients, this has not consistently been shown to improve outcome. Biologic meshes have been used to repair the defect, but studies have failed to show improvement over an anatomic repair in terms or pain or recurrence.[12] Furthermore, cost is a significant factor to consider when placing a new prosthetic or biologic product versus doing a primary repair. Reports of recurrence with a transversalis repair done with experience and adequate skill are noted to be between 4% and 6%,[15] although specialty centers, such as Shouldice, have recurrence rates as low as 1.5%.[16]

The pathology associated with chronic inguinodynia is poorly understood, and there still remains difficulty in diagnosing the source of nonneuro-

pathic pain prior to surgery. Regarding pathology, macrophages, T cells, and mast cells have all been noted to play a major role in the inflammatory response. One study on rats, by Rosch *et al*,[17] confirmed development of a biomaterial-dependent chronic inflammatory response to numerous types of common surgical mesh between 7 and 90 days. Few studies, however, have looked at the immune system's specific reaction to the mesh, and most research is still in animal testing.

We have noted a possible correlation between the mesh and inguinodynia in a subset of patients, and several small studies have shown similar results after meshectomy. Following prosthetic removal and primary repair, all of the patients in our study showed improvement. Of our 12 patients, 11 had improvement in their symptoms without any alteration of nerve anatomy, suggesting an alternative source of their pain. With complete resolution of patient symptoms after meshectomy, we ponder whether the mesh is the culprit. It is understood that the number of cases presented is limited and does not allow clear or absolute conclusion regarding the etiology of chronic nonneuropathic inguinal pain following prosthetic repair. It is hoped, however, that results from this study will motivate interest in a large-scale evaluation of this issue and possible reinterest in the education of surgical residents in performing a primary repair for indicated patients.

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