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# Assessment of the incidence of chronic pain and discomfort after primary inguinal hernia repair

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ABSTRACT

*Background:* Chronic pain and discomfort is a notable complication after inguinal hernia repair. This study assesses the incidence and degree of chronic pain and discomfort after primary inguinal hernia repair performed in our hospital and aims to clarify its relationship to the type of mesh placement.

*Materials and methods:* A retrospective analysis was conducted of 334 patients (378 lesions) who underwent primary inguinal hernia using the Lichtenstein (onlay mesh), Ultrapro Plug (UPP; onlay plus plug mesh), modified Kugel Patch (onlay and underlay mesh), or laparoscopic transabdominal preperitoneal (TAPP; underlay mesh) procedure. Postoperative pain was assessed using a numerical rating scale at postoperative 2-3 wk, 3 mo, and 6 mo. Postoperative discomfort was assessed 6 mo afterward.

*Results:* Questionnaire responses were received for 378 lesions (100%) after 2-3 wk, 229 (60.6%) after 3 mo, and 249 (65.9%) after 6 mo. The majority of chronic pain experienced was mild, and no patient suffered from severe pain. The level of pain tended to be less for the TAPP procedure than for other methods. Discomfort at rest was significantly less for TAPP *versus* Ultrapro Plug ($P < 0.01$), and discomfort with movement was significantly less for TAPP *versus* modified Kugel ($P < 0.05$).

*Conclusions:* Onlay mesh appears to be a risk factor in chronic pain and discomfort. The lower level of chronic pain and discomfort with underlay mesh placement is considered to result from the reduced risk of nerve damage in this procedure than in the onlay mesh placement procedure.



## Introduction

Procedures to repair inguinal hernias have evolved from traditional tissue suturing open repair methods (e.g., the Bassini, Shouldice, and McVay methods) to tension-free open repair methods (e.g., the Lichtenstein, Mesh-Plug, Prolene Hernia System, and modified Kugel [MK] procedures) and laparoscopic repair. Repair using synthetic mesh has become the standard technique worldwide and has contributed to the decreased incidence of recurrence and postoperative pain.[1-3] The low recurrence rates associated with mesh repair have turned the surgeon's attention from recurrence to postoperative chronic pain and discomfort. Although chronic pain and discomfort is still one of the greatest problems after inguinal hernia repair due to the fact that it interferes with patient's quality of life, there are very little data available from

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previous studies concerning presentation, diagnosis, and modes of treatment of this issue. In particular, the data in the literature concerning the cause of chronic pain are very limited.

The frequency of chronic pain after inguinal hernia repair is reported to range from 15% to 53%.[4] There are several mechanisms attributed to the development of chronic pain, including damage to the inguinal sensory nerves (ilioinguinal nerve, iliohypogastric nerve, and the genital branch of the genitofemoral nerve).[5] The beneficial effects of identification and preservation of the inguinal sensory nerves in reducing chronic pain have been described in several studies,[6-8] but the clinical usefulness has not yet been investigated in any large prospective trials. Previous studies reported a lower incidence of postoperative pain after laparoscopic hernia repair *versus* anterior open mesh repair.[9] The increasing number of reports describing a high incidence of chronic pain after the anterior procedure using mesh must be considered.[7] Onlay mesh, which is placed over the floor of the inguinal canal, causes increased chronic neurogenic pain due to contact with the inguinal sensory nerves running along the inguinal canal. The placement of underlay mesh in the preperitoneal space in the Kugel and laparoscopic repair methods avoids scarring in the region of the inguinal sensory nerves and the spermatic cord. Although damage to the inguinal sensory nerve appears to be a prerequisite for the development of chronic pain, the exact pathogenesis of chronic pain after inguinal hernia repair is still unclear.

The type of operative procedure and placement of the inserted mesh is probably one of the factors causing chronic pain and discomfort. Therefore, it is necessary to investigate the incidence of chronic pain and discomfort in each operative procedure. In this study, we conducted a retrospective, nonexperimental investigation into the incidence of postoperative chronic pain and discomfort after primary inguinal hernia repair using the Lichtenstein (onlay mesh placement), Ultrapro Plug (UPP; onlay and plug mesh placement), MK (onlay and underlay mesh placement), or laparoscopic transabdominal preperitoneal (TAPP; underlay mesh placement) procedures. We investigated whether the different methods of mesh placement would have any influence on the level of chronic pain and discomfort after a hernia repair.

## Materials and methods

### *Cases of primary inguinal hernia*

We conducted a retrospective investigation of patients with a primary inguinal hernia who underwent a mesh repair procedure between May 2011 and May 2014 in the Department of Gastrointestinal and Hepato-Biliary-Pancreatic Surgery in the Nippon Medical School. This study was carried out in accordance with the principles embodied in the Declaration of Helsinki, 2013, and informed consent was obtained from all patients.

All patients aged 40 y or older with a direct, indirect, or mixed hernia were included in the study. Although several patients had complained of inguinal pain or discomfort preoperatively, there were no patients suffered from severe pain or discomfort that interferes with daily life. The operative procedure was chosen according to either doctor preference or the patient's medical condition. Patients with irreducible, strangulated inguinal hernias, or a history of lower abdominal surgery were excluded from the MK and TAPP procedures.

### *Operations*

All patients underwent surgery under general anesthesia, and repairs were performed using the Lichtenstein, UPP, MK, or TAPP procedure. The Lichtenstein procedure was performed using PROLENE Soft Polypropylene Mesh (Ethicon, Inc). The trimming only mesh was placed over the floor of the inguinal canal and fixed to the inguinal ligament and internal abdominal oblique muscle with seven to eight interrupted 3-0 Vicryl sutures (Ethicon, Inc). The UPP procedure was performed using an Ultrapro Plug (Ethicon, Inc). This is a partially absorbable plug-and-onlay mesh device. The plug was inserted deep into the internal inguinal ring or medial defect, with the onlay mesh placed over the floor of the inguinal canal in a way similar to the method in the Lichtenstein procedure. The MK procedure was performed using a Modified Kugel Patch (C.R. Bard, Inc). In this method, an underlay mesh was placed in the preperitoneal space and fixed to the Cooper's ligament with two interrupted 2-0 Vicryl sutures to prevent the mesh from moving. In addition, we used optional onlay mesh in all cases. Although we did not conduct rigorous identification of the ilioinguinal nerve, the iliohypogastric nerve, or the genital branch of the genitofemoral nerve, we took great care not to involve any of these three inguinal nerves in all anterior procedures. The TAPP procedure was performed using a 3DMax Light Mesh (C.R. Bard, Inc). The mesh covered the whole of the myopectineal orifice and was attached with four to six tacks (AbsorbaTack fixation device; Covidien). The peritoneum was closed using running 3-0 Vicryl sutures.

The resident surgeons performed all hernia repairs under the supervision of specialist surgeons. The resident surgeons completed a form immediately after the operation, recording data about hernia type (direct, indirect, and combined) and the repair procedure used.

### *Evaluation of pain and discomfort after operation*

Patients were followed up in the outpatient unit at 2-3 wk, 3 mo, 6 mo, and 1 y after their surgery postoperatively. However, several patients did not participate in a routine follow-up because they were not in pain. In these types of cases, our policy is to recommend that patients come to hospital if any postoperative problems appear. Therefore, we believe that the reason some patients did not come to their follow-up was because they were experiencing no serious problems.

Discomfort was defined as an occasional abnormal feeling not affecting the quality of life. Pain was defined as the presence of constant or intermittent hurtfulness. Postoperative pain at rest and with movement was assessed at postoperative 2-3 wk, 3 mo, and 6 mo using a numerical rating scale (NRS) with pain scores ranging from 0 (no pain) to 10 (worst imaginable pain). The level of pain was classified as "mild" (NRS score, 1-3), "moderate" (NRS score, 4-6), and "severe" (NRS >6). The presence or absence of postoperative