

## **Acute Appendicitis Caused by the Migration of the Prosthetic Mesh Used for Open Indirect Inguinal Hernia Repair into the Peritoneal Cavity**

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This is an unusual case of a 55 year old male with appendicitis caused by the incarceration of the appendix in an area of tissue reaction from a prosthetic mesh used for open inguinal hernia repair which migrated transanatomically from the right inguinal area into the right lower peritoneal cavity. Isolated appendicitis caused by such phenomenon has never been reported in current literature.

**Key words:** Appendicitis, inguinal hernia, mesh herniorraphy, mesh migration, polypropylene mesh, prosthetic mesh

Appendectomy is the most common emergency procedure worldwide. Approximately seven percent of the total population worldwide will undergo appendectomy during their lifetime. The rate of appendectomy for appendicitis is estimated at 10 per 10,000 patients per year.<sup>1-3</sup>

Appendicitis is commonly caused by luminal obstruction. The most common etiology of obstruction is fecalith. Other causes include lymphoid hypertrophy, inspissated barium, parasites, small vegetable seeds and tumors. Rarely, appendicitis could be secondary to ingested nondietary foreign bodies<sup>4-10</sup>, procedures<sup>11</sup> and trauma.<sup>12-15</sup>

There has been no reported case of appendicitis caused by prosthetic mesh migration from the inguinal area into the peritoneal cavity. The authors searched MEDLINE using the following MeSH terms:

appendicitis, inguinal hernia, mesh herniorraphy and mesh migration.

### **The Case**

This is a case of a 55 year old male who complained of abdominal pain located in the right lower quadrant. The symptom of the patient started five days prior to consult, and it was associated with fever as well as nausea and vomiting. The patient did not have dysuria, constipation, decreased caliber of stools, diarrhea, hematochezia, increased abdominal girth, melena or obstipation.

The patient had two previous surgical operations. Eleven days prior to admission, mesh herniorraphy using polypropylene (Prolene) mesh was performed for an indirect inguinal hernia on the right. Twelve years prior to admission, the patient underwent exploratory laparotomy for strangulated inguinal hernia on the right. The patient had no known co-morbidities. He did not have allergies or adverse reactions to medications.

The initial vital signs of the patient at the emergency department were as follows: blood pressure of 110/70 mmHg, heart rate of 94 beats per minute, respiratory rate of 18 cycles per minute and temperature of 38.0°C. Upon inspection of the abdomen, scars obtained from the previous surgeries were noted at the midline and the right inguinal area. The bowel sounds were normoactive. Direct and rebound tenderness were elicited in the right lower quadrant upon palpation.

The initial laboratory as well as radiologic work-up included chest roentgenogram (trachea midline, no parahilar lymphadenopathies, no vessel prominence, clear lung fields, normal cardiac shadow and no bony abnormalities), complete blood count (hemoglobin 12.7 g/dL, hematocrit 0.38%, white blood count  $13.37 \times 10,000$  uL, neutrophil 0.73% and lymphocyte 0.18%), serum creatinine (70.3 umol/L), serum electrolytes (sodium 137.4 mmol/L and potassium 3.76 mmol/L), prothrombin time (international normalized ratio 1.16) and prothromboplastin time (31.7 seconds with 32.4 seconds as control), urinalysis (light yellow, clear, pH less than 5.5, specific gravity 1.023, no proteinuria, red blood cells zero to two per high power field, white blood cells one to three per high power field and no noted casts or crystals) and 12-lead electrocardiogram (normal sinus rhythm).

Whole abdominal ultrasound revealed an elongated and tubular structure which was immobile and noncompressible. It measured 1.7 cm by 1.5 cm in its anteroposterior and transverse dimensions, respectively. Incomplete concentric echoes were noted on its short axis. The aforementioned tubular structure was located in the right inguinal canal, and it was surrounded by an inhomogenous mass. A poorly defined and thickened area of mixed homogeneity was similarly noted in the right lower abdominal cavity.

The patient was initially diagnosed with periappendiceal abscess secondary to ruptured appendicitis. He underwent low midline laparotomy appendectomy on the second hospital day. Upon opening of the peritoneum, no purulent fluid was noted. The visualized portion of the appendix measured 9.5 cm in length and was noted to be in the suppurative stage. The distal part of the appendix was found incarcerated in a complex, heterogenous and reddish mass located in the right lower peritoneal cavity. After ligation of the mesoappendix, the appendix was ligated and divided 0.5 cm from the base. The distal portion of the appendix could not be extracted from the complex mass in the right lower abdomen (Figure 1). Debridement of the complex mass in the right lower abdomen was not performed after appendectomy. Upon further exploration, no other abdominal organs or areas of the peritoneal cavity were found to be involved. The patient had an uneventful post-

operative course. Histopathologic examination of the appendix revealed acute inflammatory changes consistent with acute appendicitis.



**Figure 1.** The distal end of the appendix (A) was incarcerated in an area of reactive inflammatory tissue (B) caused by the polypropylene mesh which migrated intraperitoneally. Other structures depicted are the appendiceal stump (C), cecum (D) and umbilicus (E).

## Discussion

In the case presented, the tip of the appendix was found attached to and inseparable from the complex, heterogenous and reddish mass in the right lower portion of the abdominal cavity. The complex mass was most probably composed of reactive tissues caused by the prosthetic mesh used for open hernia repair in the right inguinal area. The mesh may have migrated from the right inguinal area into the right lower peritoneal cavity.<sup>16</sup>

The reactive tissues surrounding the distal portion of the appendix may have caused configurational changes, extraluminal compression as well as reactive serosal inflammation<sup>16-17</sup> which led to luminal obstruction, bacterial overgrowth and appendicitis eventually.

There are two existing theories regarding the phenomenon of mesh migration. Primary, or mechanical, migration occurs when a mesh travels along adjoining paths of least resistance. This may be caused by external mechanical forces or inadequate fixation of the mesh.<sup>18</sup> The positioning, size and shape of the mesh may also play a significant role in primary mesh migration.<sup>19</sup>

In secondary migration, the prosthetic mesh traverses through trans-anatomical planes by eroding through the surrounding tissues. The localized inflammatory response induced by the mesh implant in hernia repair is a fundamental mechanism which strengthens and adds to the integrity of the repair.<sup>18,20</sup> This reactive inflammation may lead to erosion of adjacent tissues, which sometimes result in the migration of prosthetic meshes. More common complications that arise from such erosions include abscesses, adhesions, bowel obstruction, fistulous tracts and infections.<sup>17,19,21-22</sup> In laparoscopic abdominal wall hernia surgery, the biomaterial used for repair is considered to affect the degree and extent of interaction with the surrounding tissues. Monofilament polypropylene and multifilament polyester meshes have higher complication rates compared to double-filament or expanded polytetrafluoroethylene meshes.<sup>19</sup> Secondary migration is thought to be a gradual process which may take several years to occur.<sup>16</sup> Based on the history of the previous operation for inguinal hernia, ultrasonographic features and intraoperative findings, secondary migration is the more likely cause for the development of appendicitis in the case presented.

Appendectomy together with antibiotic coverage for appendiceal flora seemed adequate for the treatment of appendicitis secondary to incarceration in reactive tissues brought about by a prosthetic mesh which migrated into the abdominal cavity. Debridement of the reactive tissues in the right lower quadrant could also have been done. Most authors with experience on mesh migration recommend total removal the mesh if feasible<sup>23-26</sup> due to the risk of complications that might arise involving the adjacent structures.

Mesh migration is a known cause of morbidity in laparoscopic hernia repair.<sup>18,27-28</sup> It is estimated that three percent of patients who underwent laparoscopic inguinal hernia repair which utilized polypropylene mesh will develop this complication.<sup>29</sup> On the other hand, there have been no reported cases of prosthetic meshes used for open inguinal hernia repair which migrated through trans-anatomical planes from the inguinal area into the peritoneal cavity, and of appendicitis which have resulted from such phenomena, upon the time of writing of this case report.

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