Incidence of Inguinal Hernia Post Open Appendectomy
- An Observational Study

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ABSTRACT

BACKGROUND
Acute appendicitis is the most common surgical emergency faced in today's world. Inguinal hernia is the most common type of hernia seen in surgical practice. It can be of a direct and an indirect type. While the indirect type has a congenital cause, direct hernias are attributable to weakness of abdominal musculature. In this study, we aim to calculate the incidence of inguinal hernia following open appendectomy from a tertiary care prospective.

METHODS
This was a prospective observational study that was carried out over a period of three years. All patients who visited our OPD and had a history of Open Appendectomy were included in the study. After a thorough history, a comprehensive physical examination was carried out in these patients to rule out any evidence of inguinal hernia. The data was tabulated in the form of tables and graphs.

RESULTS
There were 918 patients in the study out of which 488 were male- and 430 were female-patients. There were 64 cases of inguinal hernia in this study which amounts to an incidence rate of 6.97%. However, it is the relation of direct right inguinal hernia to open appendectomy which catches attention. It alone has an incidence of 4.90% which can largely be attributed to damage to nerves during the procedure.

CONCLUSIONS
There is a high incidence of inguinal hernia associated with open appendectomy which could be avoided to a large extent if the surgical principles are followed.

KEYWORDS
Appendectomy, Inguinal Hernia, Appendicitis
Appendix is a worm-like tubular structure present in the Right Iliac Fossa originating from the Caecum. Although considered a vestigial organ in past, it has assumed importance of an organ with functions of immunity in today's era.\textsuperscript{1,2,3,4} Acute appendicitis is the most common surgical emergency faced in today's world.\textsuperscript{5} Although a lot many cases are managed conservatively these days, appendectomy remains the procedure of choice to treat acute appendicitis. Although laparoscopy has gained importance in the western world, open appendectomy still remains the most widely carried out operation as far as appendicitis is concerned.\textsuperscript{6} Hernia is defined as the protrusion of an organ or the part of an organ through the body wall containing it. Inguinal Hernia is the most common type of hernia seen in surgical practice. It consists mainly of a direct and an indirect type. While indirect type has a congenital cause, direct hernias are attributable to weakness of abdominal musculature.\textsuperscript{7} It was Hoguet, who in 1911 first demonstrated the association of drained appendectomy with inguinal Hernia. He attributed damage to ilioinguinal and iliohypogastric nerves during open appendectomy as the cause of weakness of anterior abdominal wall musculature and hence inguinal hernia.\textsuperscript{8}

In this study we aim to calculate the incidence of inguinal hernia following open appendectomy from a tertiary care prospective.

METHODS

This was an observational prospective observational study that was carried out over a period of three years with effect from 01st May 2016 to 30th April 2019 at Government Medical College, Jammu. All those patients who visited our OPD and had a history of Open Appendectomy were included in the study. After a thorough history, a comprehensive physical examination was carried out in these patients to rule out any evidence of Inguinal Hernia. Baseline investigations like complete blood count, kidney function test, liver profile, chest and abdominal x-ray, ultrasonography were done, some of the patients in whom there was any suspicion of underlying pathology contrast enhanced CT abdomen and pelvis and colonoscopy was performed. The examination consisted of inspection, palpation, percussion and auscultation and included various tests such as Cough impulse, three finger test, etc. These findings were later confirmed with an ultrasound examination. The data was tabulated in form of tables and graphs. Patients above the age of 60 years, patients with known history of any connective tissue disease, patients with history of any other abdominal surgical intervention in the past and patients with midline Incision were excluded from the study.

RESULTS

This study was conducted in the Department of Surgery, Government Medical College, Jammu w.e.f. 01st May 2016 to 30th April 2019 and included patients with a history of Open Appendectomy.

There were 918 patients in the study which comprised of 488 male and 430 female patients (Figure 1) which corresponds to 53% and 47% respectively.

All the patients were grouped according to their age as shown in table 1. Majority of patients were in the age group of 11-20 years which also corresponds to the highest number of cases of appendicitis in this group while the least number of patients were in age group of 31 - 40 years. Mean age- 8.143, standard deviation-9.0

<table>
<thead>
<tr>
<th>Age Group (In Years)</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10</td>
<td>97</td>
<td>83</td>
<td>180</td>
</tr>
<tr>
<td>11 - 20</td>
<td>131</td>
<td>103</td>
<td>234</td>
</tr>
<tr>
<td>21 - 30</td>
<td>49</td>
<td>70</td>
<td>119</td>
</tr>
<tr>
<td>31 - 40</td>
<td>58</td>
<td>39</td>
<td>97</td>
</tr>
<tr>
<td>41 - 50</td>
<td>67</td>
<td>78</td>
<td>145</td>
</tr>
<tr>
<td>51 - 60</td>
<td>86</td>
<td>57</td>
<td>143</td>
</tr>
<tr>
<td>Total</td>
<td>488</td>
<td>430</td>
<td>918</td>
</tr>
</tbody>
</table>

Table 1. Age Distribution

In our study of 918 patients we found patients who developed hernia post Appendicectomy were predisposed by underlying complicated pathology like abscess adhesions as shown in table and figure 2 with coef of variation-0.326

<table>
<thead>
<tr>
<th>Appendicitis Types</th>
<th>With Hernia</th>
<th>Without Hernia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complicated</td>
<td>42</td>
<td>243</td>
</tr>
<tr>
<td>uncomplicated</td>
<td>22</td>
<td>611</td>
</tr>
</tbody>
</table>

Table 2. Appendicitis Types

Figure 1. Sex Distribution

Figure 2. Appendicitis Types
Out of the total 918 patients who were examined via physical examination and ultrasonography, 64 were found to have inguinal hernia with 48 having Right sided and 16 having left sided inguinal hernia. 56 had direct while 08 had indirect inguinal hernia (Table 2). All these 64 were male patients.

<table>
<thead>
<tr>
<th>Types</th>
<th>Direct Inguinal Hernia</th>
<th>Indirect Inguinal Hernia</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Inguinal Hernia</td>
<td>45</td>
<td>03</td>
<td>48</td>
</tr>
<tr>
<td>Left Inguinal Hernia</td>
<td>11</td>
<td>05</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>56</td>
<td>08</td>
<td>64</td>
</tr>
</tbody>
</table>

**Table 3. Types of Hernia Post Appendectomy**

It's seen that there were 64 cases of inguinal hernia in this study which amounts to an incidence rate of 6.97%. However, it is the relation of Direct right inguinal hernia to open appendectomy which catches attention. It alone has an incidence of 4.90%. p-value of <0.005 which is statistically significant.

**DISCUSSION**

This was an observational prospective observational study that was carried out over a period of three years with effect from 01st May 2016 to 30th April 2019 at Government Medical College, Jammu. This study was aimed to demonstrate the importance of meticulous surgery and preserving nerves during appendectomy. The ilioinguinal nerve is out of reach of surgeon during conventional open appendectomy, however it is the damage to iliohypogastric branch that can lead to weakness of posterior wall of Hesselbach's triangle leading to Direct Inguinal Hernia. It runs downwards and inwards between internal oblique muscle and transversalis muscle. The conventional Mc Burney incision runs roughly parallel to the nerve and hence any attempt to cut the muscle in place of separating its fibres along its direction may result in damage to this nerve leading to more chance of Inguinal hernia. Incisions much below the anterior superior iliac spine can lead to denervation of segmental nerves which course downwards. Other reasons for inguinal hernia post appendectomy include use of drains and wound infections. Also tying sutures too tightly in internal oblique and transversalis muscle can lead to damage to iliohypogastric nerve.

Our study reported an incidence rate of 4.90% (table and figure 2) for Right Direct Inguinal Hernia post appendectomy which can largely be attributed to damage to nerves during the procedure. Similar results have also been published in literature earlier in various studies done at different times. In our study of 918 patients males were slightly predominant with 53% of males and 47% females. Majority of patients were in the age group of 11- 20 years (table and figure-1 & 3) which also corresponds to the highest number of cases of appendicitis in this group similar observations were encountered by Hormoz Mahmoudvand et al in their study of 264 patients. The occurrence of this disease is seen mostly in the second and third decades of life, with slightly more common among men. In our study of 918 patients we found patients who developed hernia post-Appendicectomy were predisposed by underlying complicated pathology like abscess adhesions as shown in table and figure-2 similar observations were encountered by Hormoz Mahmoudvand they found that the predisposition of hernia in patients with a history of infection is 2.5 times patients with no history of hernia, they also emphasised that chances of hernia in patients with Phlegmon appendix is almost 3.2 times the patients with purulent appendix and also chances are also 32% higher in perforated appendix than purulent appendix. With the advancement in surgery especially minimal access access surgery the incidence of post appendectomy inguinal hernia has been reduced to very much as compared to previous literature reason being small port site entry points leading to lesser nerve damage and this is also supported in literature by many authors. Hormoz Mahmoudvand et al concluded in their study that chance of development of inguinal hernia in patients who were operated using the open method was 3.32 times patients operated using the laparoscopic method.

**CONCLUSIONS**

Open appendectomy is perhaps the most extensively studied and performed surgical intervention, more so in developing countries. As such it is of great importance to respect surgical planes while performing such a procedure. Disregard to follow surgical principles can cause havoc to patient’s life both immediate and late. As open appendectomy is usually one of the first procedures a resident is taught, it becomes quite important that the resident learns the complexity of every step that seems to be performed with so much ease by the seasoned operator. There is a high incidence of inguinal hernia associated with open appendectomy which could be avoided to a large extent if the surgical principles are followed.

**REFERENCES**


