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INCIDENCE AND MANAGEMENT OF POST-APPENDECTOMY SMALL BOWEL OBSTRUCTION: A RETROSPECTIVE STUDY

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ABSTRACT
Appendectomy is the most performed emergency abdominal surgery across the globe, however, it has several complications, which make all its activities prone and subject to hemorrhic postoperative small bowel obstruction (SBO) as a result of the adhesions. The retrospective hospital-based research done between June 2005 and June 2010 in S.S. Institute of medical Sciences & Research Centre contained 782 patients who had gone through open appendectomy. Of these, 47 patients (6%) got small bowel obstruction whose average age was 29 years. It reviewed Clinical, radiological and laboratory results, and the nature of surgical intervention that was needed in the case of SBO. Small bowel obstruction developed within a few days after operations in 2 patients (0.2%), and within 2 years in 13 patients (1.6%) and thereafter in the remaining (4%). The most frequent kind of obstructive band adhesions was identified and some patients needed reception of bowel resection because of strangulation. The results were that the application of the linen in ligating the base of the appendix had shown a greater incidence of SBO. This paper has highlighted the need of early diagnosis and immediate treatment as delay might result in serious complication such as gastrointestinal resections. Minimally invasive surgery can potentially lower the risk of SBO, and more studies are required in order to gauge the efficacy of different preventative measures against postoperative adhesions.

Keywords: Appendectomy, Small Bowel Obstruction, Postoperative Adhesions, Retrospective Study, Adhesiolysis.

INTRODUCTION
Appendectomy has turned out to be one of the most generic and ordinary abdominal surgery emergency procedures conducted all around the globe [1]. The Post-appendectomy small bowel obstruction is associated with small bowels obstruction adhesion, and it occurs in 1.0 to 1.5 percent of all patients after 14 years of going under the operation [2,3]. The most common emergency procedure that has been linked with some short term and long-run health related complications is appendectomy. Appendectomy is believed to have another significant long-term complication, which is the blockage of the small bowel following the procedure. It is not known exactly how frequently this complication takes place and the quoted risk is between 0.2 per cent and 10.7 per cent [4-7]. The post-surgical adhesions are among the major challenges following the colorectal surgical operations, although the epidemiology and clinical complication are unclear [8,9]. It is believed that the

occurrence of small bowel obstruction of adhesive nature after surgery operation is regarded as among the major complications following any surgery operation that is carried out in the abdominal area or the pelvis. It leads to approximately 32 percent of the total acute small bowel obstructions [10-15]. It has also been stated that prior appendectomy is one of the other important factors leading to adhesions leading to mechanical bowel obstruction. These kinds of patients tend to experience obstruction as a result of adhesive bands. Postoperative adhesions have been given contentiously but one researcher is propagating the idea of conservative administration of care, whereas some propagate early surgical attention [16-19]. The fact that adhesive small bowel obstruction is a serious clinical concern and mortality occurs at high degrees in case the bowel becomes necrotic or perforated is essential.

METHODOLOGY

The patients in whom their appendices were surgically removed and histopathological examined were taken into consideration. The cases of re-admission due to adhesive bowel obstruction were identified and data on their clinical conditions was addressed. The researches excluded obstruction due to other causes. The information retrieved was a period between appendectomy and bowel obstruction, the nature of the intervention, its clinical presentation, the radiological and laboratory tests, the number of days' interval between the admission and surgery, the operative findings included adhesions, the degree of obstruction, intestinal complications, as well as the necessity of resection, the post-operative complications and the mortality. The admission test undertaken in this respect was the complete blood count, serum creatinine, serum electrolytes, random blood sugar, chest X-ray and erect plain abdominal X-ray, CECT abdomen. Determination when to intervene procedure to was done on the basis of clinical grounds. The patients who were immediately operated on also presented with different clinical manifestations, some of the manifestations consisted of fever, severe vomiting, rebound tenderness, tachycardia and overall the total count of white blood cells were more than 12000 /dl. This was in lieu of conservative management which was initially used on all the other patients.

RESULTS

The data was based on 782 patients attended at a tertiary hospital undergoing open appendectomy. The small bowel obstruction was seen in 47 patients only. The same constituted 28 (3.6%) males and 19 (2.4%) females. The patients were between 10 and 48 years old and the average age was 29 years old. Two patients (0.2%) were noted to have early postoperative small bowel obstruction within 6 months after being operated on through an appendectomy, 13 patients (1.6%) within 2 years and 32 patients (4%) more than 2 years after the procedure. The means of suturing inserted during the original surgery made use of the 2-0 Vicryl, silk as well as linen. The surgeries were done by the surgeons. Each patient demonstrated abdominal pain of different severities and clinically severe abdominal distension which represented small bowel obstruction at emergency department. Other clinical manifestations were fever, tachycardia, vomiting, dehydration, hyperactive bowel sounds and rebound tenderness. None of the patients had a silent abdomen. Four patients lead to the immediate surgery with a minimal pre-operative resuscitation. Eight patients who became tachycardic, fevered, leukocytic, or even rebondedly tender were taken into consideration as surgical exploration. Conservative treatment gave improvement in thirty-five patients and they were discharged when there was complete resolution of the signs of obstruction. During the operation itself band adhesions have been observed which produce complete obstruction in four patients. In one patient, a segment of bowel was rejected because of strangulating gangrene in the part of the adhesional band. The remaining seven patients presented filmy adhesions and adhesiolysis was executed without performing resection of the intestine. No instances of the obstruction of the small bowel via perforation of the bowel were observed, which is usually observed within days following appendectomy. No deaths were recorded following the surgery and every patient was able to leave the hospital. Three (0.3%) patients sustained wound infections during recovering, which were handled correctly. The research result showed more cases of SBO among patients whose appendix base was ligated using linen than it was among patients who had their appendix base ligated using Vicryl or silk. In the histopathology findings of the 782

patients being subjected to appendectomy, 648 appendices were inflamed, suppurative or perforated as indicated in Table 2:

A) Normal: No Inflammation Signs

B) Acutely Inflamed: Evidence of an Inflammation that is Both Macroscopical and Microscopical

C) Suppurative: Inflamed Macroscopically

Table 1: Demographic and Clinical Characteristics of Patients with Post-Appendectomy Small Bowel Obstruction (SBO)

Parameter	**Number of Patients (N=47)**	**Percentage**
Gender		
Male	28	59.6%
Female	19	40.4%
Age Range	10 - 48 years	
Mean Age	29 years	
Time of Onset Post-Appendectomy		
Within 6 months	2	0.2%
Within 2 years	13	1.6%
After 2 years	32	4%
Surgical Materials Used for Suturing		
2-0 Vicryl, Silk, Linen	-	
Clinical Presentation		
Abdominal Pain (different severities)	All patients	100%
Severe Abdominal Distension	All patients	100%
Fever	Present in most patients	
Tachycardia	Present in most patients	
Vomiting	Present in most patients	
Dehydration	Present in some patients	
Hyperactive Bowel Sounds	Present in most patients	
Rebound Tenderness	Present in some patients	
Silent Abdomen	None	0%
Management Approach		
Immediate Surgery	4	8.5%
Surgical Exploration (tachycardia, fever, leukocytosis, rebound tenderness)	8	17%
Conservative Treatment	35	74.5%
Intra-operative Findings		
Band Adhesions causing complete obstruction	4	8.5%
Bowel Resection (due to strangulating gangrene)	1	2.1%
Filmy Adhesions with Adhesiolysis (no resection)	7	14.9%
Postoperative Outcomes		
No Mortality	47	100%
Wound Infection	3	0.3%

Table 2: Histopathology Findings of Appendices (N=782)

Histopathological Findings	Number of Appendices (N=782)	Percentage
Normal	134	17.1%
Acutely Inflamed	648	83%
Suppurative	512	65.5%
Perforated	136	17.4%

Figure.1 Post-Appendectomy Small Bowel Obstruction Comprehensive Patient Management Analysis (N=47)

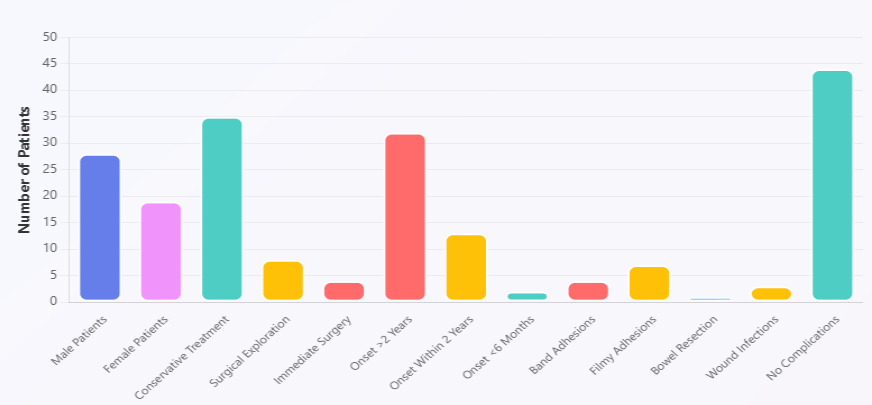
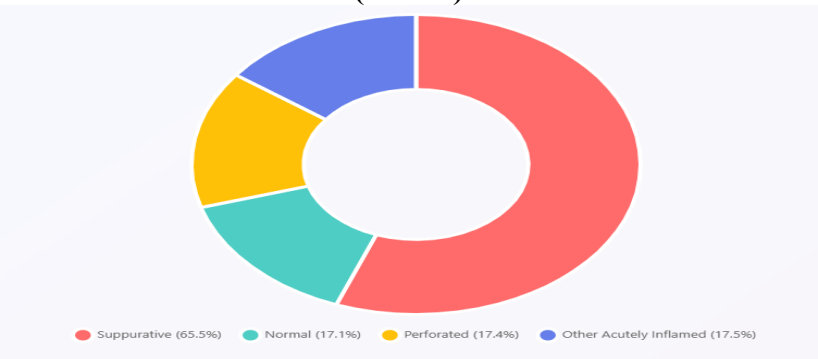


Figure.2 Histopathology Findings of Appendices Distribution of Appendiceal Pathology (N=782)



DISCUSSION

As stated by the prevailing conditions, small bowel obstruction may be caused by post-surgery adhesions, malignant tumors, herniation, inflammatory bowel disease, volvulus, and intussusception. Most frequently, adhesion after an earlier laparotomy is the most generally found small bowel obstruction in the United States and is credited towards nearly 60 percent of cases. Mechanical obstruction is one of the commonest surgical emergency [1-5]. The etiology of intestinal obstruction has with time changed and now the most important reason is postoperative adhesions. In many of the previous researches the most frequent prior surgery was appendectomy. The intra-abdominal adhesions are the adhesions that tend to appear after the peritoneum has been injured and may occur after intra-abdominal processes or non-operative irritation of the peritoneum. Surgeons face immense and arduous problem of postoperative intra-abdominal adhesions. There have been improvements on the pathophysiology, epidemiology, diagnosis and management of intra-abdominal adhesion. Research towards preventing adhesions following surgery is still being done, with minimal success. It is found that in 95 of all patients who undergo postoperative adhesion development are intra-abdominal procedures and the majority of them have no clinical relevance. Nevertheless, not all adhesions translate to serious complications with the most life-threatening condition being small bowel obstruction, which may either be simple or strangulated. The first two common causes of intraperitoneal adhesions formation nearly always pertain to acute appendicitis and appendectomy. Most authors believe in early post-operative adhesive small bowel obstruction that occurs within three

weeks of an appendectomy. In this series, clinically significant adhesive small bowel obstruction appeared more than six months after the appendectomy [6-10]. A patient who arrived at the early postoperative stage was one who was operated. Close vigilance is of great essence when identifying the early occurrence of postoperative adhesive small bowel obstruction due to the symptoms and signs being nonspecific in the initial stages and the radiological evidence being insufficient. Gastrointestinal resections are also caused mostly by late presentations. Most patients who presented with the cases of post-appendectomy adhesive small bowel obstruction had a single band adhesion that led to complete intestinal obstruction. It is however not quite clear why the single band adhesions are predominant after appendectomy. The appendicular stump can be of key importance, because it might lead to the origin of adhesive band. Pelvic adhesions may result because of the presence of pus in the pelvis, particularly those due to perforated appendicitis. It has been demonstrated that there are high chances of post-appendectomy adhesive intestinal obstruction among patients who had either normal appendix or perforated appendix [11-15]. The higher rate of occurrence of intestinal obstruction in those with normal appendix can be attributed to the fact that the presence of a normal appendix prompts further search of other pathologies that might further affect the serosa of the small bowel leading to increased chances of postoperative occurrence of adhesive obstruction. On the other hand, the level of inflammation in perforated appendicitis is associated with stronger healing response, and more fibrous adhesions are created, which may cause intestinal obstruction. To corroborate this point, our results indicate that infection and mechanical injury rank highly among those that contribute to adhesions. According to some of the researches, the risk of small bowel obstruction can be decreased by minimally invasive surgery as opposed to open appendectomy. Nevertheless, the use of laparoscopic appendectomy in the reductions of the complications still needs to be followed-up further and finally drawn a conclusive statement about it. Numerous studies were conducted recently, and they showed that the development of postoperative adhesions after abdominal surgeries decreased especially with the adoption of numerous substances [16-19]. The best biomaterial to prevent formation of adhesions would be such which would not make the surgery more difficult, would not complicate the healing process, and would permit subsequent entry of re-entry in a case where the patient may need repeated surgery. Nevertheless, the relationship between all the available substances requires additional assessment to prove that they can be indeed effective.

CONCLUSION

As an endpoint, the postoperative adhesive small bowel obstruction is an important complication of the abdominal surgeries, especially appendectomy. In spite of resurgence in surgical procedures, including minimally invasive procedures, postoperative adhesions are known to be one of the biggest hurdles of both short and long term morbidity. Various factors predispose to adhesive small bowel obstruction and these include the type of surgery that occurs, whether there was a normal or perforated appendix and the adhesions that are formed. This is important to mitigate the risk of delivering timely interventions because late presentation already results in much worse complications and needs more invasive surgeries like intestinal resections. Although a different range of strategies such as the implementation of biomaterials is under consideration to avoid the development of adhesions, more research and analyses should be conducted to identify the most effective strategies that could minimize postoperative complications. The bottom line is that, continuous striving to comprehend the pathophysiology of adhesions and the need to establish preventative therapies is important in enhancing patient outcomes during abdominal surgeries.

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