ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (*IJMSIR*)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 6, Issue – 6, December – 2021 , Page No. : 68 - 73

Surgical site infection in acute appendicitis with open appendicectomy

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Citation this Article: Dr. Raj Kumar Negi, “Surgical site infection in acute appendicitis with open appendicectomy”, IJMSIR- December - 2021, Vol – 6, Issue - 6, P. No. 68 – 73.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Acute appendicitis(AA) is one of the most common surgical emergencies. Failure to diagnose AA at an early stage leads to complications like perforation, abscess and peritonitis which is associated with higher morbidity and mortality. Management of AA is emergency appendicectomy. Laparoscopic appendicectomy is an effective alternative to open appendectomy. Surgical site infection (SSI) is most common complication after emergency appendicectomy.

Keywords: SSI, CT, USG, MAS.

Introduction

The lifetime risk of developing appendicitis is 8.6% for males and 6.7% for females, with highest incidence in the second and third decades {1}. Often, the exact etiology of acute appendicitis is unknown. The appendix contains a combination of aerobic and anaerobic bacteria, including Escherichia coli and Bacteroides spp. However, recent studies utilizing next-generation sequencing revealed a significantly higher number of bacterial phyla in patients with complicated perforated appendicitis {2}. The most common age group to be affected is 10 to 19 years{3}. Its complications are more in young children and elderly {4}. Lifetime prevalence rate of approximately one in seven {5}.The diagnosis of AA is most commonly based on clinical history, laboratory investigations and local examination. Though the diagnostic accuracy can be further improved through the use of ultrasonography (USG) and computer tomography (CT), but because of accessibility and affordability issue mostly at remote areas, their use are limited. Also, diagnostic modalities may lead to further delays in diagnosis and surgery. Different scoring systems are there in use to diagnose appendicitis, like -Alvarado scoring system and Modified Alvarado scoring(MAS) system .The most prominent of scoring system developed by Alfredo Alvarado in 1986 {6}. Alvarado score has six clinical variables and two laboratory parameter with a total of ten points. The scoring includes elements from the patient’s history, the physical examination and from laboratory tests.

1. Migratory right iliac fossa pain.
2. Anorexia
3. Nausea or vomiting
4. Tenderness in right iliac fossa
5. Rebound tenderness
6. Fever
7. Leukocytosis
8. Shift to left.

Tenderness in the right iliac fossa and leukocytosis are the two most important factors and are assigned two points each and six other factors are assigned one point each, for a total score of 10 points. A score of 1-4 indicates very unlikely appendicitis, 5-7 probable appendicitis and 8-10 highly probable appendicitis.

The classical Alvarado score included a left shift of neutrophil maturation along with other parameters for assessment. Despite being a common problem, it remains a difficult diagnosis to make, particularly among the young, elderly and females of reproductive age, where a genitourinary and gynecological condition can present with signs and symptoms that are similar to those of acute appendicitis. A delay in performing an appendicectomy increases the risk of appendicular perforation and sepsis, which leads to increase in morbidity and mortality. Risk factors for perforated appencidicits include extremes of age, male sex, pregnancy, immunosuppression, comorbid medical conditions and previous abdominal surgery.

Anatomic SSI classifications {7}.

Superficial incisional (SI) SSI: Infection occurs within 30 days after the operation and infection involves only skin and subcutaneous tissue of the incision and at least one of the following:

Purulent drainage, with or without laboratory confirmation, from the superficial incision.

Organism isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.

At least one of the following sign or symptoms of infection: pain or tenderness, localized swelling, redness, or heat and superficial incision are deliberately opened by surgeon, unless incision is culture negative.

Diagnosis of superficial incisional SSI by the surgeon or attending physician.

Deep incisional (DI)SSI: Infection occurs within 30 days after the operation if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operation and infection involves deep soft tissues (e.g fascial and muscle layers) of the incision and at least one of the following:

Purulent drainage from the deep incision but not from the organ/space component of the surgical site.

A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (>38 degree), localized pain, or tenderness, unless site is culture negative.

An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by Histopathologic or radiologic examination.

Diagnosis of a deep incisional SSI by surgeon or attending physician.

Organ / Space (OS) SSI: Infection occurs within 30 days after the operation if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operation and infection involves any part of the anatomy (e.g. organ or spaces), other than the incision, which was opened or manipulated during an operation and at least one of the following:

Purulent drainage from a drain that is placed through a stab wound into the organ/ space.

Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ space.

An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by Histopathologic or radiologic examination.

Diagnosis of an organ/space SSI by a surgeon or attending physician.

The National Research Council created a classification that is commonly used to predict the risk of SSI based on the level of perioperative contamination {8}. Surgical wounds are classified as clean, clean-contaminated, contaminated, or dirty and infected .This traditional approach used four classes of wounds based on the risk level and type of contamination expected or observed at operation. Clean-contaminated wounds (class II) are those in which generally exogenous and endogenous (aerobic-anaerobic) bacterial contamination occurs during elective operations; the infection rate in this category was estimated at 5% to 15% and is usually caused by the polymicrobial endogenous flora. Contaminated wounds (class III) are those with early endogenous leakage or delayed exogenous contamination in the absence of established clinical infection; their infection rate was more than 15%. In dirty infected wounds (class IV), in which active infection was encountered during operation, a postoperative infection rate of more than 30% was anticipated. The major limitation lies in the lack of attention to the varying risk for infection among patients in each class of wound. Haley et al{9}showed by using multivariate analysis that an operative time of more than 2 hours is the second greatest independent predictor of risk (wound contamination being the first).

Surgical wound classification

Class	**Criteria**
Class 1: Clean wounds	An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tract is not entered. In addition clean wounds are primarily closed and, if necessary, drained with closed drainage.
Class 2: Clean Contaminated wounds	An operative wound in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination. Operations involving biliary tract and appendix are included in this category, provided no evidence of infection or major break in technique is encountered.
Class 3: Contaminated wounds	Open, fresh, accidental wounds. In addition, operations with major break in sterile technique or gross spillage from the gastrointestinal tract, and incisions in which acute, non-purulent inflammation is encountered are included in this category.
Class 4: Dirty wounds	Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organism causing postoperative infection were present in the operative field before the operation.

Material and Methods

All patients with AA operated at Regional hospital during the study period from 2019-2021 were included in the study. Total 35 cases of emergency open appendicectomy were included. A formal consent was taken, anesthetist assessed the patient's fitness for surgery by pre- anesthetic checkup just before surgery. Patient who were nil per orally for 6 hours before surgery were immediately shifted to operation theater after stabilization with intravenous crystalloids, antibiotics, pain killers and pre-operative preparation. Wound class assessment of the degree of contamination of a surgical wound at the time of operation was done by a person involved in the surgical procedure. Empiric therapy antimicrobial agent used based on the underlying disease process (e.g., ruptured appendicitis) and continued in post-operative period for 3-5 days. Patients with clean-contaminated and contaminated wounds were discharged on 1-2nd postoperative day if stable after dressing. In the postoperative period, patients were examined for SSI, involving skin, subcutaneous tissue, musculofascial layers or infection in cavity organ. Surgical wounds were examined for pain, tenderness, redness, heat, localized swelling, purulent discharge or wound dehiscence. After the discharge of patients follow up for SSI was done for 30 days by a) Review in OPD. b) Telephonically.

Observations

The following observations were made. Age of patients in our study ranged from 6-66 years with mean age of 25.6 years. (Table 1).

Table 1: Age wise distribution of patients

Age	Number	Percentage
0-10	2	5.7
11-20	10	28.5
21-30	15	42.8
31-40	5	14
41-50	1	2.8
51-60	1	2.8
61-70	1	2.8
Total	35	100

The sex distribution of the study showed that out of 35 patients, 25(71.4%) were males and 10 (28.6%) were females. (Table 2)

Table 2: Sex distribution

Sex	Number of patients	Percentage
Male	25	71.4
Female	10	28.6

Out of 35 patients,7(20%) developed SSI. Out of these 35 operations 8(22.8%) were clean contaminated wounds with only 1(12.5%) SSI, 18(51.4%) were contaminated wounds with 3(16.6%) SSI and 9(25.7%) were dirty wounds with 3(33%) SSI. **(Table 3)**

Table 3: Class wise distribution of operative wounds

Class of wound	No of Operations with percentage	No and types of SSI	Percentage of SSI
Clean- contaminated	8(22.8%)	1(1SI)	12.5%
Contaminated	18(51.4%)	3(2SI+1DI)	16.6%
Dirty	9(25.7%)	3(1SI+2DI)	33%
Total	35	7	20%

Out of 35 patients, 4(57.1%) of SSI were SI,3(42.8) were DI and none of OS. (Table 4)

Table 4: Types of SSI

Types of SSI	No of SSI(n=7)	Percentage
Superficial Incisional	4	57.1
Deep Incisional	3	42.8
Total	7	100

Discussion

In study conducted by Berry J and Malt RA(1984) {10}, males were 60.2% and females were 39.8%. Another study conducted by Asfer S et al (2000) {11}, males were 69.5% and females were 30.5%. Male preponderance 71.4% males as seen in our study was evidenced by various studies (table 5){10,11}. (Table 5)

Table 5: Sex distribution in different series

Sex	Berry J and M RA(1984) n=246	Asfer S et al(2000) n=78	Present study
Male	148(60.2%)	54(69.5)	25(71.4%)
Female	98(39.8%)	24(30.5%)	10(28.6%)

In our study, maximum cases were in younger age group 21-30 years which is similar to study conducted by Lewis FR et al (1974){12}. In our study we observed that overall SSI rate was 20% in open appendicectomy. Petrosillo et al{13} have also reported higher rate of SSI in gastrointestinal procedures like colon surgery (18.9%), gastric surgery (13.6%) and appendectomy (8.6%). In our study class of wounds encountered were contaminated, dirty and clean contaminated in descending order. In our study rate of SSI increased with contamination of wounds as reported in various other studies. Lul Raka et al{14}, have also reported similar findings. They have reported 3.1% SSI in clean wounds, 9.8% in clean contaminated, 46.1% in contaminated and 100% SSI in dirty wounds. Since the removal of the appendix is performed because this organ is inflamed, it is clear that even after its resection there are residual bacteria in the abdominal cavity which may lead to further spread of the infection Traditionally, open appendicectomy has been done through a muscle splitting gridiron incision over McBurney's point made perpendicular to a line joining the umbilicus and anterior superior iliac spine or through a more cosmetically acceptable Lanz's incision. The proportion of open procedures done has fallen with the increased use of laparoscopic techniques. Compared with open surgery, a systematic review found that laparoscopic appendicectomy in adults reduces wound infections, postoperative pain, length of hospital stay, and time taken to return to work, although the number of intra-abdominal abscesses was higher after the laparoscopic approach{15}.Appendicectomy is a relatively safe procedure with a mortality rate for non-perforated appendicitis of 0.8 per 1000{16}. The mortality and morbidity are related to the stage of disease and increase in cases of perforation; mortality after perforation is 5.1 per 1000{16}.The rate of postoperative wound infection is determined by the intraoperative wound contamination. Rates of infection vary from < 5% in simple appendicitis to 20% in cases with perforation and gangrene. The use of perioperative antibiotics has been shown to decrease the rates of postoperative wound infections {17}.

Conclusion

SSI is one of the important complication of surgery. SSIs are associated with increased length of hospital stay, cost of treatment, loss of productivity in time off and increase in morbidity and mortality. Advances in the field of surgery in the form of minimal invasive techniques, better antibiotics and understanding about prevention of SSI has reduced the SSIs but it is still common in open appendectomy were contaminated and dirty wounds are mostly present.

References

1. AddissDG , Shaffer N , Fowler BS , Tauxe RV . The epidemiology of appendicitis and appendectomy in the United States . Am J Epidemiol.1990 ;132(5):910-925.
2. Bhangu A, Søreide K, Di Saverio S, Assarsson JH, Drake FT. Acute appendicitis: modern understanding of pathogenesis, diagnosis, and management. Lancet. 2015 Sep 26;386 (10000): 1278-1287.
3. Buckius MT, McGrath B, Monk J, Grim R, Bell T, Ahuja V. Changing epidemiology of acute appendicitis of acute appendicitis in the United States;study period 1993-2008. J Surg Res.2012;175(2):185-190.
4. Jain S, Gehlot A, Songra MC. Modified Alvarado score in diagnosis of acute appendicitis: A clinicopathological study. IntSurg J 2018;5:878-82.

5. Seal A.Appendicitis: A historical review. Can J Surg; 1981; 24: 427-33.
6. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med 1986; 15:557-64.
7. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR: The Hospital Infection control practices Advisory Committee Guidelines for the prevention of the surgical site infection. Infect Control HospEpidemiol 1999; 20:247-80.
8. Garner JS, Jarvis WR, Emori TG, Horan TC, Hughes JM.CDC definitions for nosocomial infections, 1988. Am J Infect Control 1988 ; 16: 128-40.
9. Haley RW, Culver DH, Morgan WM, White JW, Emori TG, Hooton TM. Identifying patients at high risk of surgical wound infection. A simple multivariate index of patient susceptibility and wound contamination. Am J Epidemiol 1985; 121:206-15.
10. Berry J Jr, Malt RA.Appendicitis near its centenary. Ann Surg.1984;200(5):567-75.
11. Asfar S, Safar H, Khoursheed M, Dashti H, al-Blader A. Wound measurement of C-reactive protein reduce rate of negative exploration for acute appendicitis.
12. Lewis FR, Holcroft JW, Boey J, Dunphy. Appendicitis. A critical view of diagnosis and treatment in 1000 cases. Arch Surg 1975;110(50:677-84.
13. Petrosillo N, Drapeau CMJ, Nicastri E, Martini L, Ippolito G, Moro ML et al. Surgical site infection in Italian Hospitals: a prospective multicenter study.BMCInfectiousDiseases2008.doi10.1186.http://biomedcentral.com/1471-23.
14. Raka L, Krasniqi A, Hoxha F, Musa R , MulliqiG , Krasniqi S, et al. Surgical site infections in an abdominal surgical ward at Kosovo Teaching Hospital. J Infect Developing Countries. 2007; 1(3):337-341.
15. Sauerland S, Lefering R, Neugebauer EA. Laparoscopic versus open surgery for suspected appendicitis. Cochrane Database Syst Rev 2004;(4):CD001546.
16. Blomqvist PG, Andersson RE, Granath F, Lambe MP, Ekbom AR. Mortality after appendectomy in Sweden, 1987-1996. Ann Surg 2001;233: 455-60.
17. Andersen BR, Kallehave FL, Andersen HK. Antibiotics versus placebo for prevention of postoperative infection after appendicectomy. Cochrane Database Syst Rev 2005;(3):CD001439.