

## A comparative study of perforated and non-perforated appendicitis with respect to clinical findings, radiological findings and post-operative management

Geeta S. Ghag<sup>1</sup>, Kamal S. Shukla<sup>2</sup>, Dhiraj kumar B.Shukla<sup>3</sup>, Upendra D. Bhalerao<sup>4</sup>

<sup>1</sup>Associate Professor, Department of Surgery, HBT Medical College and Dr. R. N. Cooper Hospital, Mumbai.

<sup>2</sup>Assistant Professor, Department of Surgery, HBT Medical College and Dr. R. N. Cooper Hospital, Mumbai.

<sup>3</sup>Assistant Professor, Department of Pathology, Krishna Institute of Medical Sciences University, Karad.

<sup>4</sup>Consultant Surgeon, Mumbai.

### ABSTRACT

**Introduction:** The vermiform appendix is considered by most to be a vestigial organ, its importance in surgery is only due to its tendency for inflammation resulting in the syndrome called acute appendicitis. Acute appendicitis is the most common cause of an “acute abdomen” in young adults. Appendectomy is the most frequently performed emergency abdominal operation. Present study was undertaken to evaluate the intraoperative features and postoperative outcome in pts with acute appendicitis presenting with or without perforation and to evaluate the relative importance of these determinants, effect of preoperative delay, prehospital antibiotic therapy with postoperative morbidity of perforated acute appendicitis. Materials and Methods: Present study was carried out in a tertiary care hospital over a period of two years. All patients were admitted in the emergency care unit as per hospital protocols. Patients were divided into two groups (Perforated and non-perforated). Patients found eligible as per inclusion and exclusion criteria were included. **Results:** 150 cases were studied with median age being 35 years. Male preponderance was noted. Symptom duration was higher in perforated appendicitis. Patients with perforated appendix had high Alvarado score. Appendectomy was the most common surgical procedure. Probe tenderness was seen in maximum patients. Extraluminal air and periappendiceal inflammation were statistically significant predictors for appendiceal perforation. **Conclusion:** Patients with longer duration of pain have higher incidence of perforation. Alvarado score can predict the likelihood of perforation. Hospital stay is more in cases of perforated appendix. Antibiotic sensitivity should be considered when change of antibiotic is contemplated.

**Keywords:** Perforated appendicitis, Non-perforated appendicitis, Alvarado Score, Gangrenous appendicitis

### Introduction

The vermiform appendix is considered by most to be a vestigial organ, its importance in surgery is only due to its tendency for inflammation resulting in the syndrome called acute appendicitis. Acute appendicitis is the most common cause of an “acute abdomen” in young adults. Appendectomy is the most frequently performed emergency abdominal operation. The life time rate of appendectomy is 12% for men and 25% for females [1]. Acute appendicitis is relatively rare in infants, becomes increasingly common in childhood &

early adult life, reaching a peak incidence in the teens & early 20s [2]. Obstruction of the appendix lumen is important, some form of luminal obstruction by either a fecolith or stricture is found in the majority of cases. Obstruction of orifice by tumor (carcinoma of the caecum) is a cause of acute appendicitis, in middle age & elderly. [2] Inflammation of appendix is associated with obstruction in 50 to 80% of cases, mostly due to fecolith less commonly due to tumor, gall stone or worms. Continuous secretion of mucinous fluid in an obstructed viscus lead to increase in intraluminal pressure sufficient to cause collapse of draining veins this leads to ischemic injury to the appendix. Ischemia favors bacterial proliferation with additional inflammatory edema and exudation. Further hampering the blood supply. It is observed that a significant minority of inflamed appendices does not have any

\*Correspondence

**Dr. Geeta S. Ghag**

Associate Professor, Department of Surgery,  
HBT Medical College and Dr. R. N. Cooper Hospital,  
Mumbai, India

**E mail:** [geetaghag1@gmail.com](mailto:geetaghag1@gmail.com)

luminal obstruction and the pathogenesis of inflammation remains unknown. Perforation of gangrenous appendix carries significant risk of morbidity and mortality. Overall rate of perforated appendicitis is 25.8% of the total cases. There are many factors that are associated with perforation but there is no single factor that independently predicted perforation of appendix. Considering this background this study was undertaken to evaluate the intraoperative features and postoperative outcome in pts with acute appendicitis presenting with or without perforation and to evaluate the relative importance of these determinants, effect of preoperative delay, prehospital antibiotic therapy with postoperative morbidity of perforated acute appendicitis.

### Material and Methods

Present study was carried out in a tertiary care hospital over a period of two years. All patients were admitted in the emergency care unit as per hospital protocols. All patients were clinically evaluated and investigated with routine haematological tests, Chest X-Ray, and Electrocardiogram (if required), which are necessary for preoperative fitness. All patients who are suspected to have acute appendicitis are subjected to X-ray chest and abdomen, ultrasonography and CT abdomen in selected case where there was disconnect between the ultrasound and the clinical findings. Intraoperative findings noted. Patients found eligible as per inclusion and exclusion criterias. Patient information sheets in three different languages were given to patients and their valid, written consents were taken. Data on patient characteristics was obtained by a proper

personal interview and documented. Patients were examined preoperatively. Following clinical, biochemical, microbiological, intraoperative and postoperative observations are made. Preoperative investigational criteria and laboratory parameters were recorded. Intraoperative findings and postoperative course of these patients were studied using a case record proforma.

#### Inclusion criteria

Patients presenting to a tertiary care center with intraoperative findings of appendicitis.

#### Exclusion criteria

Patients who are

1. Diagnosed to be suffering from other organ pathology of bowel.
2. Belonging to age group less than 12.
3. Patients who have undergone other abdominal surgery affecting the small bowel.

### Observations and Results

Total 150 cases were studied with 75 cases in each group (perforated and non-perforated). Median age for a patient with appendicitis was 35 years with values ranging from 12 to 78 years. The data shows maximum no patients are young adults and in the 2<sup>nd</sup> or 3<sup>rd</sup> decade of life. 34 patients (22.67%) patients belong to the age group of 20-29 years and 28 (18.67%) belong to the population of 30 -39 years (Table 1).

**Table 1: Age-wise distribution of the cases**

Age groups	No. of patients
10 – 19	20 (13.33%)
20 – 29	34 (22.67%)
30 – 39	28 (18.67%)
40 – 49	18 (12%)
50 – 59	18 (12%)
60 – 69	24 (18%)
70 AND ABOVE	8 (5.3%)
<b>TOTAL</b>	<b>150</b>

In the present study 63.33% of the patients were males and 36.67% were females (Table 2).

**Table 2: Sex-wise distribution of cases**

Sex	Perforated appendicitis	Non-perforated appendicitis	Total
Male	49	46	95
Female	26	29	55
<b>Total</b>	<b>75</b>	<b>75</b>	<b>150</b>

The statistical difference in these group is not significant (p value > 0.05)

Symptom Duration: 99 out of 150 (i.e. 64.00 %) of patients had symptom duration less than 5 days. In patients with symptom duration less than 2 days maximum had acute inflamed but non perforated appendicitis. (78.4% amongst patients with symptom duration up to 2 days). Patients who had perforated appendicitis when analyzed they were found to have symptom duration more frequently ranging from 3 -5 days (34 out of 75 i.e. 45.33 %) and 6 -7 days (20 out of 75 i.e.26.67%)

**Table 3: Distribution of cases on the basis of duration of symptom**

Symptom Duration	No. of patients	Perforated appendicitis (A)	Non perforated Appendicitis (B)
< 48 yrs(upto 2 days)	41 (27.33%)	9 (21.95%)	32 (78.04%)
3 – 5 days	55 (36.67%)	34 (61.81%)	21 (38.18%)
6 – 7 days	28 (18.67%)	20 (71.42%)	8 (28.57%)
More than 7 days	26 (17.33%)	12 (46.15%)	14 (53.84%)
<b>Total</b>	<b>150</b>	<b>75</b>	<b>75</b>

The difference of duration between these two groups is statistically significant (p value 0.0001)

Constitutional symptoms : Fever and vomiting were present in almost equal number of patients in perforated as well as non-perforated appendicitis. 115 out of 150 patients in the study presented with signs of localized peritonitis, 64 amongst them had perforated appendicitis (55.65%). Generalized peritonitis was seen in 47 patients, 36 out of them had perforated appendicitis (76.59%)

**Table 4: Distribution of cases on the basis of constitutional symptoms**

Symptom	No. of patients(N)	Perforated Appendicitis	Non perforated Appendicitis
Abdominal Pain	150	75	75
Fever (A)	77	37	40
Vomiting (B)	70	31	39
Localized peritonitis ( C )	115	64	51
Generalized peritonitis (D)	47	36	11

Alvarado score:A very small number of patients had Alvarado score between 4, 5 (3.33%). 40% of the patients have the score 6 or 7. 56.66% of patients had the Alvarado score as 8 or 9. The difference in the number of subjects having higher Alvarado score between pts having perforated and non-perforated appendicitis was found to be statistically significant (p value 0.01). (Table 5)

**Table 5: Alvarado Score wise distribution of cases**

Score	Total no. of patients	Patients with perforated appendicitis	Patients with non-perforated appendicitis
4,5	5 (3.33%)	1 (20%)	4 (80%)
6,7	60 (40%)	23 (38.33%)	37 (61.66%)
8,9	85 (56.66%)	55 (64.70%)	30 (35.29%)

Imaging modality

Ultrasonography: Ultrasonography was done in all 150 patients with appendicitis which were studied. Probe tenderness was seen in maximum (78%) of patients with appendicitis Free fluid in periappendiceal area was seen in 67.33% of patients Lump formation was observed in 4 % of patients. (Table 6)

**Table 6: Ultrasonography findings**

USG findings	No. of patients
Probe Tenderness	117 (78%)
Free fluid in abdomen	101 (67.33%)
Lump formation	6 (4%)

Computed Tomography of Abdomen

Extra-luminal air and moderate or severe periappendiceal inflammatory stranding are statistically significant independent predictors for appendiceal perforation. (Table 7)

**Table 7: Computed tomography findings**

CT finding	No.of patients
Wall thickening of the caecum and appendix	12
Extra-luminal air	5
Multiple mesenteric lymphadenopathy	10
Free fluids in the periappendiceal areas	14
Total no of patients	15

Intraoperative evaluation: McBurneys incision was the most preferred incision used in 110 patients (73.33%) patients in our study group in patients with advanced peritonitis due to appendicular perforation midline may be the choice of incision.(Table 8)

**Table 8: Distribution of the cases on the basis of incision**

Incision	Total no of patients	Pts with appendicitis	perforated	Patients with appendicitis	non-perforated
Mc Burneys	110(73.33%)	41 (37.27%)		69	
Rt paramedian	15 (10%)	11 (73.33%)		4	
Complete midline incision for exploratory laparotomy	25 (16.66%)	23 (75%)		2	
<b>Total</b>	<b>150</b>	<b>75</b>		<b>75</b>	

Using Pearson's Chi – square test the difference between the perforated versus non perforated group in relation to the incision taken is scientifically significant.

The choice of incision depend on the clinical finding and the surgeon's preference as well as the clinical profile of the patient.

Position of appendix: During surgery it was observed that most of the appendix were retrocaecal (57.33%) followed by pelvic (25.33%) and followed by postileal (6.67%)There is no significant difference as compared with rate of perforation and the position of appendix (p value 0.94 i.e. > 0.05). (Table 9)

**Table 9: Distribution of the cases on the basis of the position of appendix**

Position of appendix	No.of patients	Pts with perforated appendicitis	Patients with non-perforated appendicitis
Retrocaecal	86 (57.33%)	45 (52.32%)	41 (47.67%)
Preileal	2 (1.33%)	2	0
Paracaecal	6 (2/66%)	3	3
Pelvic	38 (25.33%)	20	18
Postileal	10 (6.67%)	5	5
Subcaecal	8 (5.53%)	0	8

Contamination: The amount of contamination was analyzed in following degrees. (Table 10)

**Table 10: Degree of contamination**

Nil	0
Mild (< 50 ml)	1 less than 50 ml
Moderate (50 – 150 ml)	2 50 -100 ml
Severe (more than 150 ml)	3 100-150 ml

77 (51.33%) patients had intra-abdominal contamination. Maximum patients in such patients had perforated appendicitis (56 out of 77 i.e. 72.72%). The difference in perforated and non-perforated groups in such patients was found to be statistically significant, (p value 00.001). In perforated group 26 had mild contamination (46.42%), 22 had moderate (39.28%) contamination, 8 had severe contamination (14.28%). (Table 11)

**Table 11: Distribution of cases as per the degree of contamination**

Contamination	Mild	Moderate	Severe
Perforated Appendicitis	26(55.53%)	22	8
Non perforated appendicitis	21 (44.47%)	0	0

Procedure done: Appendectomy was the solution in 89.33% i.e. 134 patients. The occurrence of perforation per se does not alter the surgical plan as the perforations occur at tip or distal to the obstruction caused by fecoliths. The rest 10.66% of patients required other procedures. 11 patients underwent local resection of bowel with primary anastomosis (14 out of 75 i.e. 14 %), 4 underwent hemi-colectomy with anastomosis (5.3%) . one patient required bowel exteriorization in the form of a ileostomy.(1.3%)

#### Complications

Complication frequency (Table 12): 45.33% of patients developed fever amongst the perforated appendicitis whereas 17.33% of patient had fever among the non-perforated group. Wound infection was seen in 18.67% of patients in perforated group and in 8% of patients in non-perforated group. Post-operative abdominal collection / paralytic ileus (13.33%), Burst Abdomen (5.33%), Fecal fistula (1.33%)

**Table 12: Frequency of complications**

Complication	Perforated appendicitis	Non perforated appendicitis	Total No. of patients
Fever	34 (45.33%)	13 (17.33%)	47
Wound infection	14 (18.67%)	6 (8%)	20
Post-operative abdominal collection / paralytic ileus	10 (13.33%)	0	10
Burst Abdomen	4 (5.33%)	4 (5.33%)	0
Fecal Fistula	1 (1.33%)	0	0

Hospital Stay: The average duration of hospital stay in perforated group is 8.8 days and in non-perforated group is 3.1 days. The difference in duration of hospital stay between the perforated and non-perforated group is statistically significant. (p value 0.021).

Antibiotic choice and assessment: All patients were administered a combination of 2 or 3 antibiotics for a period ranging from 3 to 12 days. Patients who have mild appendicitis on intraoperative evaluation were given Ciprofloxacin along with metronidazole. Moderate to severe appendicitis patients were subjected to III generation cephalosporin along with aminoglycoside (Garamycin or Amikacin) with metronidazole. Patients who have complicated appendicitis like perforated ones or in presence of gross intra-abdominal sepsis, choice of antibiotic were Ceftriaxone / Ceftriaxone Sulbactam / Piperacillin tazobactam with Amikacin and Metronidazole. Amongst the perforated group 25.33% of the patients were given Piperacillin Tazobactam and Amikacin with metronidazole. 66.67% of the patients were given III generation cephalosporin along with metronidazole and amikacin. Only 8% could be managed with Fluroquinolones and metronidazole. On the contrary amongst the non-perforated group 33.33% patients were managed by ciprofloxacin and metronidazole, 60% were managed by III generation Cephalosporin and only a small number required higher antibiotic like Piperacillin Tazobactam (6.66%).

Duration of antibiotic therapy: Average duration of intravenous antibiotic in perforated group was 7.5 days whereas in non-perforated group was 3 days. Change of antibiotic was required in 16 patients (10.66%), of which 9 belonged to the perforated group and 7 belonged to the non-perforated group. We analyzed the patient factors using multivariate analysis to know their relation with each other. It was detected that age of the

patients, duration of symptoms, complication rate, amount of contamination and hospital stay have a significant difference in their relation to perforated versus non perforated appendicitis.

### Discussion

Acute appendicitis is most common surgical emergency. Its clinical profile determines the need for emergent operative intervention. The preoperative symptom duration intraoperative findings are direct determinants of patient outcome.

### Age group

Appendicitis is considered as a disease of adolescent age groups. In the present study, maximum no of patients belong to 2<sup>nd</sup> or 3<sup>rd</sup> decade of life (age group of 20-29 had 22.67% of patients and 30-39 had 18.67% of patients) 13% of patients were from age group of 11-20 & 7% of the study population belong to the age group of more than 70 years of age. In comparison with the study done by Hale et al where median age was 23 years the results of our study are comparable.[5,1].

### Sex

It affects young adult male population more as compared to females. 63.33% of the patients in the study were males. 36.67% of patients were females in the study. In the study proposed by Hale Et al 64% of the population was males and 36% were females [5]. Similarly as per the study done by Hale et al[5] Females had a significantly higher rate of normal appendices (19% vs. 9%) and a lower rate of perforation (18% vs. 23%) Such an observation is not consistent with our study.



Symptom Duration

Duration of symptoms i.e. abdominal pain, vomiting etc can vary from less than 24 hrs to more than 7 days in patients with symptom duration less than 2 days maximum had acute inflamed but non perforated appendicitis. (78.4% amongst patients with symptom duration upto 2 days). Patients with long duration symptoms who remain unattended untreated presents with signs of peritonitis (local or generalized) and sepsis. Patients who had perforated appendicitis when analyzed they were found to have symptom duration more frequently ranging from 3-5 days (34 out of 75 i.e. 45.33%) and 6-7 days (20 out of 75 i.e.26.67%) These observation are consistent with the study done by Korner et al which concluded that patients with appendicular perforation has higher symptom onset to presentation duration. Similarly in a study conducted by David Olick et al patients with non-perforated appendicitis reported an average of 22 hours of symptoms prior to presentation to the hospital, while patients with perforated appendicitis reported an average of 57 hours.[3]Results of our study are comparable to both these studies described in literature.

Symptomatology

Fever and vomiting are present in almost equal number of patients in perforated as well as non-perforated appendicitis. 115 out of 150 patients in the study presented with signs of localized peritonitis, 64 amongst them had perforated appendicitis (55.65%). Generalized peritonitis was seen in 47 patients, 36 out of them had perforated appendicitis (76.59%) which suggest a possibility of complicated appendicitis.

Scoring systemAlvarado Scoring system was used in the study population.

A very small number of patients have Alvarado score between 4, 5 (3.33%). This indicates possibility of appendicitis [10].40% of the patients have the score 6 or 7. This represents high likelihood for appendicitis. 56.66% of patients had the Alvarado score as 8 or 9. A high Alvarado Score amongst the study group indicates complicated, perforated appendicitis [12].The difference in the number of subjects having higher Alvarado's score between pts having perforated and non-perforated appendicitis was found to be statistically significant. (p value 0.038) That implies that patients with perforated appendicitis always has significantly high Alvarado score. [6,5,12]

Imaging variationsUltrasound abdomen

Ultrasound finding of the patient are important clinical aid to confirm the diagnosis of acute appendicitis. Majority of the patients has probe tenderness on ultrasound evaluation this is sensitive but not specific of appendicitis. It can be present in all clinical stages of appendicitis but may be absent in advanced stages with gross contamination (39). 78% of the study patients had probe tenderness on ultrasound examination whereas 67.33% of patients had free fluid in the abdomen. Free fluid in the abdomen may be due to reactive inflammatory process or it may be secondary to pus discharge, accumulation and can rarely due to fecal matter spillage. 4% of our patient had lump formation on ultrasound examination they were explored in view of clinical judgment. There is no statistical co relation between the ultra sound finding to differentiate patients with perforated and non perforated appendicitis[12].It is also shown in some studies that in patients with low Alvarado Score it is difficult to rule in or rule out appendicitis. A clinical correlation is mandatory and increases the value if coupled with ultrasound examination[7].

Role of CT abdomen

15 out of 150 (10%) of the patients were subjected to Computed abdominal tomography. Wall thickening of caecum and appendix was seen in 12 patients (80% of those who were subjected to CT Abdomen). 5 patients had evidence of extraluminal air. (33.33%) Multiple mesenteric lymphadenopathy was seen in 10 patients (66.67%). Free fluid in the periappendiceal areas was seen in 14 patients. The facts that extra luminal air and moderate or severe periappendiceal inflammatory stranding are statistically significant in dependent predictors for appendiceal perforation are evident and corresponding to our study. (11) (38)It is also important to note that CT findings changes CT frequently changes management if the clinical diagnosis is indeterminate. (8) (38)

Intraoperative variablesChoice of incision

In patients with uncomplicated appendicitis McBurneys incision is the adequate approach for mobilization of appendix, visualization of the base of the appendix, and its subsequent removal. In patients with advanced stages of appendicitis, perforation or pus collection. McBurneys incision may limit the

exposure, hence Rutherford Morrison's incision, Right paramedian incision are often utilized. Patients with frank peritonitis often require a midline incision for taking care of the contamination adequately. An adequate incision is important for washing out the pus collection and control of abdominal sepsis. In the present study 73% of patients were explored by a Right paramedian incision was utilized in 10% of patients 16% of the patients were subjected to exploratory laparotomy by a midline incision out of which 75% of the patients had perforated appendicitis. The difference in patients explored by midline incision between perforated as well as non-perforated group was found to be statistically significant. (P value 0.0021)

#### Contamination assessment

77 (51.33%) patients had intra-abdominal contamination. It was grade in three grades. Maximum patients in such patients had perforated appendicitis (56 out of 77 i.e. 72.72%). The difference in perforated and non-perforated groups in such patients was found to be statistically significant, (p value 0.003). In perforated group 26 had mild contamination (46.42%), 22 and moderate (39.28%) contamination, 8 had severe contamination (14.28%) (25) (6)

#### Position of appendix

Intra-operatively maximum number of appendix were retrocaecal (57.33%) Followed by pelvic (25.33%) followed by post-ileal (6.67%). There is no significant difference as compared with rate of perforation and the position of appendix[10].

#### Choice of procedure

Appendectomy was the solution in 89.33% i.e 134 patients. The occurrence of perforation per se does not alter the surgical plan as the perforation occur at tip or distal to the obstruction caused by fecoliths. 11 patients underwent local resection of the adjacent bowel with primary anastomosis (14 out of 75 i.e. 14 %) 4 underwent Right hemi colectomy with anastomosis (5.3%) One patient required bowel exteriorization in the form of an ileostomy. (1.3%) The rate of bowel resection required in patients with perforated appendicitis in our study is higher as compared with the study done by Perovic Z et al in 2000. (42)

#### Post-operative complications

Fever 45.33% of patients developed fever amongst the perforated appendicitis whereas 17.33% of patient had

fever among the non-perforated group. Fever can be due to abdominal or non-abdominal causes. (41) Wound infection was seen in 18.67% of patients in perforated group and in 8% of patients in non-perforated group. Post-operative abdominal collection / paralytic ileus (13.33%), Burst Abdomen (5.33%), Faecal fistula (1.33%). The difference in the complication frequency in perforated versus non perforated group was statistically significant. In the study done by Perovic Z this frequency is upto 15%, slightly less than our study. (6) (20)

#### Hospital stay

The average duration of hospital stay in perforated group is 8.8 days and in non-perforated group is 3.1 days. The difference in duration of hospital stay between the perforated and non-perforated group is statistically significant. The results published by Hale Et al had the mean length of hospitalization for all patients was 4.3 days[5]. The mean length of stay for patients with normal appendix and acute appendicitis was 3.8 and 3.4 days, respectively. Patients with perforated appendicitis had a significantly longer hospital mean stay of 7.2 days. The results in our study population are in accordance with our patient profile (6, 20)

#### **Conclusion**

Perforated appendicitis can be distinguished from non-perforated appendicitis based on admission factors. Appendicitis who present with pain of two or more days duration, have a much higher incidence of perforation. Alvarado score is best preoperative determinant of appendicitis and can predict the likelihood of perforation in select cases. Management of patients with either very high or very low scores can proceed more expeditiously and with less expense. Ultrasound coupled with accurate clinical examination increases diagnostic accuracy of appendicitis, its complications and perforated nature. Computed tomography frequently changes management if the clinical diagnosis is indeterminate and is also important to determine the extent and nature of disease in perforated appendicitis. McBurney's incision is the preferred one in maximum no of cases of appendicitis, even in perforated cases with minimal contamination. Midline approach should be considered in severe complicated appendicitis with perforation with moderate to severe contamination. Fast and adequate surgical intervention followed by adequate antibiotic therapy successfully resolves the cases of perforated appendicitis. Perforation of appendix is associated with



mild contamination in most of the cases but can be severe in gross peritonitis with perforation. Appendectomy is the procedure of choice even in perforated appendicitis if base of caecum is healthy. Patient with associated caecal involvement and gross contamination require local resection, hemi-colectomy or exteriorization. Hospital stay is more in cases of perforated appendicitis as compared to non-perforated group. Complications like wound infection, Burst abdomen, Post-operative collection / ileus are more with perforated group than non-perforated. Antibiotic selection should be based on following criteria.

- Clinical parameters of grade of intra-abdominal sepsis
- Intraoperative contamination
- Procedure done

Ciprofloxacin (Fluroquinolones) with Metronidazole for mild appendicitis with no contamination. A combination regimen of third generation cephalosporin (Cefotaxim / Ceftriaxone) combined with aminoglycoside and metronidazole for moderate to severe appendicitis with minimal contamination. A higher spectrum of antibiotic Like Piperacillin Tazobactam along with Aminoglycoside and metronidazole should be utilized in complicated appendicitis with perforation with significant contamination or evidence of intra-abdominal sepsis.

#### References

1. Lewis FR, Holcroft JW, Boey J, Dunphy E. Appendicitis. A critical review of diagnosis and treatment in 1000 cases. Arch Surg. 1975; 110(5):677-684.
2. Korner H, Sondena K, Soreide JA, Andersen E, Nysted A, Lende TH, Kjellevoid KH. Incidence of acute non-perforated and perforated appendicitis: age-specific and sex-specific analysis. World J Surg. 1997; 21(3):313.
3. D A Hale, M Molloy, R H Pearl, D C Schutt, and D P Jaques. Appendectomy: a contemporary appraisal. Ann Surg. 1997; 225(3): 252-261
4. David Oliak, Dan Yamini, Vikram M. Udani, Roger J. Lewis, M.D., Hernan Vargas, M.D., Tracey Arnell, M.D., Michael J. Stamos, M.D. Can perforated appendicitis be diagnosed preoperatively based on admission factors? al J GASTRO SURG 2000;4:470-474.
5. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med 1986; 15:557-564
6. Dixon MR, Haukoos JS, Park IU, Oliak D, Kumar RR, Arnell TD, Stamos MJ. An assessment of the severity of recurrent appendicitis. Am J Surg. 2003;186(6):718-722.
7. Maxwell JM, Ragland JJ. Appendicitis. Improvements in diagnosis and treatment. Am Surg. 1991 May; 57(5):282-5.
8. Abdeldaim Y, Mahmood S, Mc Avinchey D. The Alvarado score as a tool for diagnosis of acute appendicitis. Ir Med J. 2007 Jan; 100(1):342.
9. Liang MK, Lo HG, Marks JL. Stump appendicitis: a comprehensive review of literature. Am Surg. 2006; 72(2):162-6.
10. Santos DA, Manunga J Jr, Hohman D, Avik E, Taylor EW. How often does computed tomography change the management of acute appendicitis?, Am Surg. 2009;75(10):918-21.
11. O. Sadr Azodi, D. Lindstrom, J. Adami, R. Bellocco, S. Linder, A. Wladis. Impact of body mass index and tobacco smoking on outcome after open appendectomy (p.751-757)
12. Baarnes Ba, Behringer Ge, Wheelock Fc, Wilkinsew Surgical sepsis: analysis of factors associated with sepsis following appendectomy. Ann Surg. 1962 Nov; 153:703-712
13. Herscu G, Kong A, Russell D, Tran CL, Varela JE, Cohen A, Stamos MJ. Retrocecal appendix location and perforation at presentation. Am Surg. 2006 ;72(10):890-3.
14. Perovic Z. Drainage of the abdominal cavity and complications in perforating appendicitis in children. Med Pregl. 2000; 53(3-4):193-6.
15. St Peter SD, Sharp SW, Holcomb GW 3<sup>rd</sup>, Ostlie DJ. An evidence-based definition for perforated appendicitis derived from a prospective randomized trial. JPediatr Surg. 2008;43(12):2242-5

**Source of Support: Nil**

**Conflict of Interest: None**