

Original article:

Hyperbilirubinemia-does it have a role in preoperative diagnosis of appendicular perforation

Dr RN Patil , Dr Shaikh MH* , Dr Aashay Shah , Dr Mudit Garg , Dr Janvi Tomar

Dept of surgery, Rural Medical College, Pravara Institute of Medical Sciences , Loni

Corresponding author*

Abstract:

Introduction: The appendix was first described in 1521 and inflammation of the appendix has been known to be a clinical problem since 1759. ^(1, 2) The term 'appendicitis', however, was not used until Reginald Fitz ⁽³⁾ described this condition in 1886. One of the commonest clinical presentations that require emergency surgery is acute appendicitis.

Methodology: This study included randomly all patients (62) with clinical diagnosis of acute appendicitis or appendicular perforation during the period from June 15th 2017 to September 30th 2017 in the Department of Surgery.

Results: Out of the 62 cases clinically diagnosed as acute appendicitis preoperatively, 52 had acute appendicitis, 4 had gangrenous appendix, 6 cases had perforated appendix and no patient had normal appendix. Among 62 cases, total serum bilirubin (TSB) was raised in 15 cases (24.19%) whereas 47 cases had normal TSB levels. TSB was more elevated in gangrenous and perforated appendix than those in acute appendicitis.

Conclusion: Serum bilirubin is a fast, simple, reliable, non-invasive, repeatable and safe diagnostic modality without extra expense. It is very handy in peripheral hospitals (rural India) where back up facilities like USG scan or CT scan is not available. It can be very helpful for junior doctors provided it is applied purposefully and objectively in patients of abdominal emergencies.

INTRODUCTION

The appendix was first described in 1521 and inflammation of the appendix has been known to be a clinical problem since 1759. ^(1, 2) The term 'appendicitis', however, was not used until Reginald Fitz ⁽³⁾ described this condition in 1886. One of the commonest clinical presentations that require emergency surgery is acute appendicitis. ^(4, 5) It is rare in infancy and amongst the elderly, but is common in children, teenagers and young adults. ⁽⁶⁾ Much effort has been directed towards early diagnosis and intervention as approximately 6% of the population will suffer from this disease during their life time. ⁽⁷⁾ Delay in diagnosis leads to increase morbidity and mortality. The classical signs and symptoms of acute

appendicitis were first reported by Fitz ⁽³⁾ in 1886. Since then it has remain the most common diagnosis of acute abdomen requiring laparotomy. ^(4, 5) The usual picture of appendicitis is often not classical, leaving many cases a diagnostic problem. It is well known fact that nothing can be so easy, or so difficult, as the diagnosis of appendicitis. It is because the clinical features and special investigations are non-specific and the list of differential diagnosis is too long. The diagnosis is particularly difficult in women of reproductive age group due to associated gynaecological problems and in elderly adults due to uncharacteristic abdominal pains. Thus a new marker for diagnosis of acute appendicitis would be welcomed. Elevated serum

bilirubin level will help in the early and accurate diagnosis of acute appendicitis and its serious complication, like appendicular perforation. Thus the need for this study is to conclude whether serum bilirubin can be considered as a new laboratory marker to aid in the diagnosis of acute appendicitis and if so, does it have the predictive capacity to warn us about appendicular perforation.

AIMS AND OBJECTIVES

1. To study the relationship between hyperbilirubinemia and acute appendicitis and to evaluate its credibility as a diagnostic marker for acute appendicitis.

2. To evaluate whether elevated serum bilirubin has a predictive potential for the diagnosis of appendicular perforation

MATERIALS AND METHODS

This study included randomly all patients (62) with clinical diagnosis of acute appendicitis or appendicular perforation during the period from June 15th 2017 to September 30th 2017 in the Department of Surgery.

INCLUSION CRITERIA: All patients with right iliac fossa pain clinically suggestive of appendicitis or appendicular perforation.

EXCLUSION CRITERIA:All patients documented to have a past history of Jaundice or liver disease,

positive HbsAg, cholelithiasis, cancer of hepatobiliary system.

METHOD:

Clinical signs of acute appendicitis determined by the surgeons and the duration of the symptoms were documented on admission. An informed consent was obtained from all registered cases.

In all patients with pain in right iliac fossa the provisional diagnosis of acute appendicitis was made on the basis of history, clinical signs and relevant clinical data.

Routine laboratory investigations were carried out like Haemoglobin, TLC count, Neutrophil count,Serum Bilirubin,Liver enzymes, which include SGPT (Alanine transaminase),SGOT (Aspartate transaminase),ALP (Alkaline phosphatase),Urine routine microscopy,X-Chest PA, X-Ray abdomen erect,Ultrasonography abdomen and pelvis,Urine pregnancy test in suspected pregnancy.

Observations and results

Table no. 1 Age Distribution:Among 62 cases of operated appendectomy in this study patients age group ranged from 0 - 10 to 60 years. Maximum group of patients belonged to 21 to 30 years (24 patients i.e. 38.71%).

Age in years	No. of Patients	Percentage
0 - 10.	5	8.06%
11 - 20.	20	32.25%
21 - 30.	24	38.71%
31 - 40.	7	11.29%
41 - 50.	4	6.45%
51 - 60.	2	3.22%
Total	62	100%

Table no. 2 Sex Distribution: Among 62 patients of operated appendectomy in this study, 28 were female (45.16%) and 34 were male (54.84%).

Sex	No. of patients	Percentage %
Male	34	54.84%
Female	28	45.16%
Total	62	62%

Table no. 3 Serum Bilirubin Findings: Out of total 62 patients, 47 (i.e. 75.81%) patients had normal serum bilirubin levels, rest 15 (i.e. 24.19%) had raised serum bilirubin levels.

Total No. of Cases	62	Percentage %
Raised Serum Bilirubin	15	24.19%
Normal Serum Bilirubin	47	75.81%

Table no. 4 WBC Findings: Out of 62 patients, 50 (i.e. 80.64%) were USG positive (appendicitis) and 20% (i.e. 19.35%) were USG negative (normal appendix).

WBC COUNT	TOTAL NO. OF CASES	PERCENTAGE %
>11,000 cmm	35	56.45%
<11,000 cmm	27	43.55%
TOTAL	62	100%

Table no. 5 Position of Appendix: Out of total 62 cases retrocaecal appendix was the most common position noticed (64.5%). There were 30.64% patient with pelvic position appendix, two with paracaecal and one with subcaecal appendix.

No. of Patients	Position Of Appendix					
	Retrocaecal	Post-ileal	Pre-ileal	Sub-caecal	Para-caecal	Pelvic
62	40	00	00	01	02	19

Table no. 6 Patient Distribution According to Anaesthesia: Out of 62 cases, 50 (i.e. 80%) underwent spinal anaesthesia while 12 underwent (i.e. 20%) general anaesthesia.

TOTAL NO. OF CASES	TYPE OF ANAESTHESIA	
	SPINAL ANAESTHESIA	GENERAL ANAESTHESIA
62	50	12

Table no. 7 Type of Incision:McBurney’s incision was taken over 48 patients (77.5%), and remaining 14 (22.5%) patients suspicious of perforated appendix Right Para-median incision was taken.

TOTAL NO. OF CASES	TYPE OF INCISION	
	MCBURNEY’S INCISION(MBI)	RIGHT PARA MEDIAN INCISION(RTP)
62	48	14

Table no. 8 Post-Operative Complication: In our study total 62 patients underwent appendectomy out of which 14.50% developed complication. Most common POC – wound infection (in 6 patient), 3% had suture abscess and 5% had paralytic ileus

TOTAL NO. OF CASES	POST OPERATIVE COMPLICATION		
	WOUND INFECTION(WI)	SUTURE ABSCESS(SA)	PARALYTIC ILEUS (PI)
62	6	2	3

Table no. 9 Clinical Features:

Clinical features	No. of patients	Percentage
Symptoms		
1.Pain	62	100%
2.Fever	38	62%
3.Anorexia	44	71%
4. Nausea, vomiting	41	66%
5.Diarrhoea	04	6.5%
6.Constipation	04	6.5%
7.Burning micturition and frequency	05	8%
Signs		
1.Tenderness at McBurney’s point	56	91%
2.Rebound tenderness(Blumberg’s sign)	36	58%
3.Rigidity	10	16%
4.Guarding	16	26%

5.Rovsing sign	22	35%
6.Obturator sign	10	16%
7.Psoas test	06	10%
8.Rectal tenderness	06	10%

Table no. 10 Correlation of Total Leucocyte Count with Serum Bilirubin: Out of the 62 cases, 24 cases had raised TLC with normal serum bilirubin levels and 11 cases had raised TLC with elevated serum bilirubin levels.

TLC	SERUM BILIRUBIN		TOTAL
	NORMAL	RAISED	
TLC - RAISED	24	11	35
TLC - NORMAL	23	4	27
TOTAL	47	15	62

Table no. 11 Correlation of Total Serum bilirubin with Intraoperative Findings:

Total Serum Bilirubin	INTRA OPERATIVE FINDINGS (IOF)		Total
	Inflamed Appendix	Perforated / Gangrenous Appendix	
Raised	05	10	15
Normal	47	00	47
Total	52	10	62

Sensitivity: 100% Specificity: 90.38%

PPV: 66.67% NPV: 100%

Out of the 62 cases clinically diagnosed as acute appendicitis preoperatively, 52 had acute appendicitis, 4 had gangrenous appendix, 6 cases had perforated appendix and no patient had normal appendix. Among 62 cases, total serum bilirubin (TSB) was raised in 15 cases (24.19%) whereas 47 cases had normal TSB levels. TSB was more elevated in gangrenous and perforated appendix than those in acute appendicitis. The mean of total serum bilirubin (TSB) in acute appendicitis cases without perforation or gangrene was 0.72 mg/dl and the mean of TSB in

cases with perforated or gangrenous appendix was 1.61 mg/dl.

DISCUSSION

This study was done in Department of General Surgery, Pravara Institute of Medical Sciences, Rural Medical College from June 2013 to May 2015. A total of 62 patients were included in this study. Appendicitis is relatively rare in infants and becomes increasingly common in childhood. ⁽¹¹⁾ It's most frequently seen in patients in their 2nd through 4th decades of life, with a mean age of 31.3 years and a

median age of 22 years. There is a slight male: female predominance (1.2 to 1.3:1).⁽¹²⁾

Obstruction of the lumen is believed to be the major cause of acute appendicitis. (19) Fecaliths are found in 40% of cases of simple acute appendicitis, 65% cases of gangrenous appendicitis without rupture and 90% cases of gangrenous appendicitis with rupture. (31) The appendix perforates about 48 hours after the onset of acute appendicitis. Overall rate of perforation is 25.8%. Children <5 years and patients >65 years of age have highest rates of perforation. Appendicular perforation occurs most frequently distal to the point of luminal obstruction along the anti-mesenteric border.⁽¹²⁾

The study on the association of hyperbilirubinemia with appendicitis is being carried out recently and there are only a few studies in this regard. It was hypothesized that an association exists between the presence of hyperbilirubinemia and appendicitis and its complications.⁽³⁴⁾ Out of 62 patient 28 were female and 34 were male. Maximum group of people belong to 21 to 30 years (24 patients i.e. 38.71%). Appendicitis is mainly a disease of adolescents and young adults.⁽¹⁴⁾ In this study of 62 patients, hyperbilirubinemia was found in 15 patients. Out of 15 patients 10 had gangrenous / perforated appendicitis and 5 had acute appendicitis. This hyperbilirubinemia was mixed in type (both conjugated and unconjugated) in most of the patients. At the same time there was no elevation in ALT and AST. Similarly, ALP was also within the normal range.

For gangrenous / perforated appendicitis, the P value of serum bilirubin was <0.001, sensitivity 100%, specificity 90.38%, positive predictive value 66.6% and negative predictive value was 100%. The level of serum bilirubin was higher than 1.5 mg/dl in

cases of gangrenous / perforated appendicitis while in cases with acute appendicitis it was lower than 1.5 mg/dl. We can say that it was predominantly isolated hyperbilirubinemia in majority of cases. It was demonstrated by Sisson et al.⁽¹⁵⁾ in 1971 that in appendicitis mucosal ulceration occurs early and this facilitates invasion of bacteria thereby causing classical acute suppurative appendicitis. Subsequent events lead to oedema, elevated intraluminal and ischemic necrosis of mucosa, causing tissue gangrene and perforation.^(15,16)

This study shows that isolated hyperbilirubinemia without much elevation in the liver enzymes is a significant predictor of appendicular perforation. This was demonstrated by a study by Estrada et al.⁽¹⁷⁾ and other studies^(18,19) showing nearly a threefold risk of perforated appendicitis in patients with total serum bilirubin levels greater than 1.5 mg/dl. The other factors which were studied in this series were age, total leucocyte count, ultrasonography. The positive predictive value of serum bilirubin was 66.67%.⁽³⁾ The negative predictive value of serum bilirubin was 100% in our study. Therefore, in suspected cases of appendicitis elevation of serum bilirubin can be used as a criterion to diagnose and manage acute appendicitis with perforation and / or gangrene. Both sensitivity and specificity of elevated total serum bilirubin in acute appendicitis with perforation and / or gangrene is higher as compared to total leucocyte count and liver enzymes. This finding is similar to other reported studies.^(96, 37, 102)

Therefore, serum bilirubin estimation, a simple cheap and easily available test in every laboratory can be added to the routine investigations list of clinically suspected cases acute appendicitis with perforation and / or gangrene for the confirmation of diagnosis. Since the rise of serum

bilirubin was significantly higher in patients with appendicular perforation, it has a definite predictive potential in these cases. Therefore, obtaining serum bilirubin values upon admission can be used in conjunction with more modern diagnostic tests such as computed tomography (CT) scan, ultrasonography to help determine the presence of perforation and thus aid in prompt clinical management.

SUMMARY

The present study was conducted in 62 patients who had been clinically diagnosed of having acute appendicitis and posted for appendectomy in Department Of General Surgery, Pravara institute of medical sciences, Loni during the period of June 15th 2017 to september 30th 2017. The aim of this study was to determine role of serum bilirubin in diagnosis

of acute appendicitis and to study if it has predictive capacity to warn us about appendicular perforation.

CONCLUSION

Serum bilirubin is a fast, simple, reliable, non-invasive, repeatable and safe diagnostic modality without extra expense. It is very handy in peripheral hospitals (rural India) where back up facilities like USG scan or CT scan is not available. It can be very helpful for junior doctors provided it is applied purposefully and objectively in patients of abdominal emergencies. The application improves diagnostic accuracy and consequently reduces negative appendectomy and thus reduces complication rates. Thus we recommended use of elevated serum bilirubin levels in rural hospitals where other diagnostic modalities are not available.

References:

- [1] Williams GR. Presidential address: a history of appendicitis. With anecdotes illustrating its importance. *Ann Surg* 1983;197:495-506.
- [2] Scott GB. The primate caecum and appendix vermiformis: a comparative study. *J Anat* 1980; 131:549-63.
- [3] Langman J, Sadler TW. *Langman's Medical Embryology* 9th revised ed. UK:Lippincottwilliams and Wilkins, 2003.
- [4] Puylaart JB. Acute appendicitis ultrasound evaluation using graded compression. *Radiol.* 1986; 158: 355-60.
- [5] Pearson RH. Ultrasonography for diagnosing the appendicitis. *Br Med J.* 1988; 297: 309-10.
- [6] Jones DJ. Appendicitis. *Br Med J.* 1993; 301: 207-10.
- [7] Anonymus. A Sound approach to the diagnosis of acute appendicitis (editorial) *lancet.* 1987; 1:198-200.
- [8] Seal.A. Appendicitis: a historical review. *Can J Surg.*1981;24:427-433.(PubMed)
- [9] Busuttill RW, Davidson RK, Fine Merione, ThomkensRK, Effect of prophylactic antibiotics in acute non perforated appendicitis. *Ann. Surg.* 1965; 194:502-508.
- [10] Norman S. Williams et al. *Bailey and Love's Short Practice Of Surgery.* 25TH ed. London: Edward Arnold (Publishers) Ltd; 2008.
- [11] F. Charles Brunivardi et al. *Schwartz's Principles of Surgery.* 10th ed. McGraw Hill; 2010.
- [12] Joaquin J. Estrada et al. Hyperbilirubinemia in appendicitis: a new predictor of perforation. *Journal of Gastrointestinal Surgery* (2007) 11: 714 – 718.
- [13] Sand M, Bechara G. et al. Diagnostic value of hyperbilirubinemia as a predictive factor for appendiceal perforation in acute appendicitis. Department of General and Visceral Surgery, Academic Teaching Hospital of the Ruhr Hospital, Bochum Germany. *The American Journal of Surgery* (2009); Vol. 198: No. 2: 193 – 198.

- [14] J Iqbal,MAfzal,FSami,A G Rehan,C Reactive Protein;A diagnostic tool for acute appendicitis;A.P.M.C;Vol:1 No.1 2007;p 37-42.
- [15] Sisson RG, Ahlvin RC, Harlow MC. Superficial mucosal ulceration and the pathogenesis of acute appendicitis. *Am J Surg* 1971; 122:378 – 380.
- [16] Bennion RS, Wilson SE, Serota AI, Williams RA. The role of gastrointestinal micro flora in the pathogenesis of complications of mesenteric ischemia. *Rev Infect Dis* 1984;6:S132 – S138.
- [17] Bennion RS, Wilson SE, Serota AI, Williams RA. Early portal bacteremia in mesenteric ischemia. *Arch Surg* 1984; 119:151 -155.
- [18] Estrada JJ, Petrosyan M, Barnhart J, et al. Hyperbilirubinemia in appendicitis: a new predictor of perforation. 2007; 11:714 – 718.
- [19] Bennion RS, Baron EJ, Thompson JE, Finegold SM. Gangrenous and perforated appendicitis with peritonitis: treatment and bacteriology. *ClinTher* 1990; 12:31 – 44.