

## Original Research Article

# A study of deranged liver function as an early predictor of perforated appendix

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### ABSTRACT

**Introduction:** Appendectomy accounts for 1% of all surgical operations. Portal blood carries nutrients and substances absorbed from gut including bacteria. It is commonly cleared by detoxification and immunological action of reticuloendothelial system. When bacterial load overwhelms the Kupffer cell function, causes dysfunction or damage to the hepatocytes. It reflects, rise in serum bilirubin alone or in combination with liver enzymes depending upon the type, severity and site of lesion. Recently, another substance known as cytokines have also been labelled to be responsible for depressed excretory function of liver. To study deranged liver function test as a predictor of perforated appendix.

**Methodology:** This is a prospective study conducted at Dr. BR Ambedkar Medical college and Hospital between 2015-2017. Clinically suspected cases are investigated to confirm the diagnosis. Subsequently these cases are operated and clinical diagnosis was confirmed pre-operatively and post-operatively by histopathological examination of the specimen. Their clinical and investigative data are compiled and analysed and following observations are obtained. Routine liver function test results are compared with laboratory reference values.

**Results:** In present study non-perforated cases mean total bilirubin was 1.25 and in perforated group 1.83. SGOT in non-perforated cases was 44.58IU/L and perforated cases 107.33IU/L. SGPT in non-perforated cases was 52.19IU/L and perforated cases was 113.33IU/L. Hyperbilirubinemia in perforated appendicitis vs simple appendicitis had a specificity of 75% for perforated appendicitis, a sensitivity of 100%.

**Conclusions:** Elevated serum bilirubin has a high potential in predicting perforation of appendix in clinically suspected cases.

**Keywords:** Appendectomy (liver parenchyma), Tumour necrosis factor

### INTRODUCTION

Acute appendicitis continues to be the most common cause of an acute abdomen in young adult's appendicitis is sufficiently common that appendectomy is the most frequently performed urgent abdominal operation and is often the first major procedure performed by a surgeon in training and accounts for about 1% of all surgical operations.<sup>1</sup> Even in this modern era of surgery, morbidity ranges from 5-8% mainly due to delay in

diagnosis. Appendicular perforation increases the morbidity.

Hyperbilirubinemia is a new diagnostic tool for perforated appendicitis. Hyperbilirubinemia is the result of imbalance production and excretion of bilirubin by the liver. It may be because of hepatocellular, cholestatic or hemolytic disease. Portal blood carries nutrients and other substances absorbed from gut including bacteria and its products (toxins).

In a small percentage, even in normal healthy people, bacteria are found in blood. It is commonly cleared by detoxification and immunological action of the reticuloendothelial system in the liver that acts as a first line defense in clearing the toxic substances, but when bacterial load overwhelms the kupffer cells function, it may cause dysfunction or damage to hepatocytes (liver parenchyma) which reflects rise in serum bilirubin alone or in combination with liver enzymes depending upon the severity and site of the lesion.<sup>2</sup> Cytokines (IL 4), tumour necrosis factor (TNF) has also been considered responsible for depressed excretory function of liver and may lead to increased serum bilirubin levels without rising liver enzymes.

Objectives of research work to study of deranged liver function as an early predictor of perforated appendix. To study the clinical presentation of acute appendicitis, association between hyperbilirubinemia and appendicitis, diagnostic value of bilirubin in perforated appendicitis, difference of rise in serum bilirubin direct and indirect and the effects of appendicitis on the hepatocytes and liver enzymes.

## METHODS

### Source of data

Patients admitted in the Surgical ward of Dr. B.R. Ambedkar medical college hospital between the period of 2015-17 will be taken into study. Cases of suspected acute appendicitis who fulfil inclusion criteria will be selected. Pretest counselling will be given to the patients after taking informed written consent from patients/attenders. Case will be enrolled in pre-designed semi structured questionnaire. Patient evaluation was done by detailed examination, history taking and investigation. This was a prospective study. Hospital based study of 45 patients who fulfil the inclusion criteria.

### Inclusion criteria

Patient with acute appendicitis and its complications with HBsAg negative and no past history of jaundice after taking consent and admitted in Dr. B.R. Ambedkar Medical College.

### Exclusion criteria

Patient with acute appendicitis and its complications with HBsAg positive and with past history of jaundice. Patients above 60 years.

Clinically suspected cases were subjected to investigations to confirm diagnosis, total leucocyte count, differential leucocyte count, urine analysis, liver function tests, ultrasound abdomen. These cases were confirmed by post-operative histopathological examination of specimen and investigations.

## Statistical analysis

The data collected was analysed statistically using descriptive statistics namely mean, standard deviation, percentage wherever applicable. Un paired 't' test and chi-Square test was used for analysis.

## RESULTS

Most of the patients in present study were in between the age group of 21-30(40%). The present study of 45 cases 57.8% were males and 42.2% were females. Most common presenting complaint was pain with vomiting (Table 1). Majority of the cases had all the triad of murray's triad. In our study 53.3% had features of acute appendicitis and recurrent appendicitis seen 26.7% and 20% cases presented with features of peritonitis.

**Table 1: Clinical profile of study patients**

Variables	Categories	n	%
Age in years	11 - 20	13	28.9%
	21 - 30	18	40.0%
	31 - 40	9	20.0%
	41 - 50	2	4.4%
	>50	3	6.7%
Sex	Males	19	42.2%
	Females	26	57.8%
Presenting complaints	Pain	10	22.2%
	Pain+fever	11	24.4%
	Pain+Vomiting	10	22.2%
	Pain+vomiting+fever	14	31.2%
Severity of presentation	Acute Appendicitis	24	53.3%
	Recurrent Attacks	12	26.7%
	Peritonitis	9	20.0%
Associated disease	DM	1	2.2%
	HTN	2	4.4%
	Nil	42	93.3%
Previous disease	LSCS	2	4.4%
	Tubectomy	1	2.2%
	Nil	42	93.3%
Appendix inflamed	Yes	29	64.4%
	Not Visualized	16	35.6%
ASA grade	Grade 1	41	91.1%
	Grade 2	4	8.9%

In present study the mean operation time for perforated appendix was 94.44 mins and for non perforated 46.53 mins ( $P<0.001$ ) (Table 2). Two patients had previous LSCS, 1 patient had tubectomy, 1 patient had diabetes and 2 patients had hypertension. 91% patients belonged to ASA grade 1, 8.9% of patients had grade 2.

In present study non-perforated cases mean total bilirubin was 1.25 and in perforated group 1.83 ( $P<0.001$ ) (Table 3). Direct bilirubin in non-perforated cases was 0.35 and in perforated cases 1.07 ( $P<0.001$ ). Indirect bilirubin in

non-perforated cases was 0.84 and perforated cases 0.84 (P <0.001).

SGOT in non-perforated cases was 44.58IU/L and perforated cases 107.33IU/L (P <0.001). SGPT in non-perforated cases was 52.19IU/L and perforated cases was 113.33IU/L (P <0.001).

Specificity analysis for estimating the accuracy of total bilirubin levels vs severity of presentation in detecting the actual patients with perforated appendicitis as performed. It showed a sensitivity of 100%, specificity of 75%, positive predictive value of 50%, negative predictive value 100% and an accuracy of 80% (Table 4).

**Table 2: Comparison of mean duration of time taken for performing the surgery (in mins) between perforated and non-perforated appendicitis using independent student t test.**

Parameters	Appendicitis	N	Mean	SD	Mean Difference	t	P-Value
Duration of Surgery	Nonperforated	36	46.53	18.43	-47.91	-7.537	<0.001*
	Perforated	9	94.44	8.82			

**Table 3: Comparison of mean values of liver function test parameters between perforated and nonperforated appendicitis using independent student t test.**

Parameters	Appendicitis	N	Mean	SD	Mean diff	t	P-Value
Total bilirubin	Nonperforated	36	1.25	0.45	-0.58	-3.796	<0.001*
	Perforated	9	1.83	0.10			
Direct bilirubin	Nonperforated	36	0.35	0.26	-0.72	-7.836	<0.001*
	Perforated	9	1.07	0.19			
Indirect bilirubin	Nonperforated	36	0.65	0.11	-0.19	-4.877	<0.001*
	Perforated	9	0.84	0.09			
SGOT	Nonperforated	36	44.58	29.26	-62.75	-5.629	<0.001*
	Perforated	9	107.33	32.60			
SGPT	Nonperforated	36	52.19	33.24	-61.14	-5.183	<0.001*
	Perforated	9	113.33	23.45			

**Table 4: Sensitivity and specificity analysis for estimating the accuracy of total bilirubin levels vs severity of presentation in detecting the actual patients with perforated appendicitis.**

Diagnosis	Severity of presentation		
	Perforated	Non perforated	
Total bilirubin indication			
Perforated	9	9	
Non-perforated	0	27	
Diagnostic value of total bilirubin	%	95% confidence interval	
		Lower	Upper
Sensitivity	100	66.4	100
Specificity	75	57.8	87.9
Positive predictive value	50	36.2	63.8
Negative predictive value	100	85.6	100
Accuracy	80		

## DISCUSSION

Appendicitis is one of the commonest causes of abdominal pain requiring emergency surgery. Often, it is difficult to reach a proper diagnosis. Diagnosing acute appendicitis clinically still remains a common surgical problem. Diagnostic accuracy is improved by the employing additional laboratory tests, scoring systems, various imaging modalities and laparoscopy.<sup>3</sup> None of

these methods stands alone as they all come in support of, and are secondary to a primary clinical assessment. Hyperbilirubinemia is a new diagnostic tool for perforation of appendix.<sup>4</sup>

In present study non-perforated cases mean total bilirubin was 1.25 and in perforated group 1.83. Direct bilirubin in non-perforated cases was 0.35 and in perforated cases 1.07. Indirect bilirubin in non-perforated cases was 0.84

and perforated cases 0.84. SGOT in non-perforated cases was 44.58IU/L and perforated cases 107.33IU/L. SGPT in non-perforated cases was 52.19IU/L and perforated cases was 113.33IU/L. Hyperbilirubinemia in perforated appendicitis vs simple appendicitis had a specificity of 75% for perforated appendicitis, a sensitivity of 100%.

In present study mean VRS score of non-perforated appendix was 3.22 and in perforated was 6.89 in 1st postoperative day. Mean VRS score during discharge was 0.72 in nonperforated and 2 in perforated cases.

In present study duration of iv analgesics was given on 5<sup>th</sup> postoperative day was 8.3% in non-perforated patients and 100% in perforated cases. Initiation of oral feeds was started on 5<sup>th</sup> postoperative day was 8.3% in non-perforated cases and 100% in perforated cases. Wound infection was seen in 4 cases (8.8%) and in 2 cases 4.4%. wound infection was seen more in perforated than non-perforated cases. Comparison of present study with other similar studies are shown in Table 5.<sup>5-10</sup>

**Table 5: Comparison of the present study with other similar studies.**

Study	Type of study	Sample size	Findings
Estrada et al <sup>5</sup>	Retrospective	170	Hyperbilirubinemia 17.1 micromol/L and perforated appendicitis, P = 0.031
Sand et al <sup>6</sup>	Retrospective	538	Hyperbilirubinemia 26.5 micromol/L, P = 0.005
Kaser et al <sup>7</sup>	Retrospective	725	Hyperbilirubinemia 20 micromol/L, P = 0.005
Emmanuel et al <sup>8</sup>	Retrospective	351	Hyperbilirubinemia 17.1 micromol/L, P = 0.05
Khan et al <sup>9</sup>	Prospective	472	Hyperbilirubinemia 20.5 micromol, P = < 0.001
Beliran et al <sup>10</sup>	Prospective	110	Hyperbilirubinemia 18.81 micromol, P = < 0.001
Present study	Prospective	134	Hyperbilirubinemia 18.3 micromol/L, P = < 0.001

## CONCLUSION

Serum bilirubin is significantly elevated in cases of appendiceal perforations. So, this can be included in routine investigation list of clinically suspected case of acute appendicitis and has high potential in predicting perforation of appendix.

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