"COMPARATIVE STUDY TO ACCESS EFFICACY OF MODIFIED ALVARADO SCORING SYSTEM VERSUS RIPASA SCORING SYSTEM IN EFFECTIVE DIAGNOSIS OF PATIENTS WITH ACUTE APPENDICITIS IN A TERTIARY CARE HOSPITAL –A ONE YEAR PROSPECTIVE ANALYTICAL STUDY"

BY
Reg no – BH0119010

Dissertation

Submitted to the
KLE Academy of Higher Education and Research,
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In partial fulfillment
Of the requirements for the degree of

MASTER OF SURGERY

IN

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DEPARTMENT OF GENERAL SURGERY
J.N. MEDICAL COLLEGE
BELAGAVI- 590010 KARNATAKA

APRIL 2022

KLE ACADEMY OF HIGHER EDUCATION AND RESEARCH,

BELAGAVI, KARNATAKA

Endorsement by the HOD/ Principal/ Head of the Institution

This is to certify that the dissertation entitled **"COMPARATIVE STUDY TO ACCESS EFFICACY OF MODIFIED ALVARADO SCORING SYSTEM VERSUS RIPASA SCORING SYSTEM IN EFFECTIVE DIAGNOSIS OF PATIENTS WITH ACUTE APPENDICITIS IN A TERTIARY CARE HOSPITAL – A ONE YEAR PROSPECTIVE ANALYTICAL STUDY"** is a bonafide research work done by **Reg no – BH0119010.**

Dr. A. S. Gogate **MS (Gen Surgery)**
Professor and Head,
Department of General surgery,
J. N. Medical College,
Nehru Nagar, Belagavi – 10

Date:
Place: Belagavi

Dr.(Mrs.)N.S.Mahantshetti **MD(Paed.)**
Principal,
J. N. Medical College,
Nehru Nagar, Belagavi – 10

Date:
Place: Belagavi

PLAGIARISM CERTIFICATE

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Nehru Nagar, Belagavi- 590 010, Karnataka, INDIA

0831 - 2471350 0831 - 2470759 www.jnmc.edu principal@jnmc.edu

Ref No: MDC/PG/ Date: 16-11-2021

ACCEPTANCE LETTER

The softcopy of thesis entitled: **"COMPARATIVE STUDY TO ACCESS EFFICACY OF MODIFIED ALVARADO SCORING SYSTEM VERSUS RIPASA SCORING SYSTEM IN EFFECTIVE DIAGNOSIS OF PATIENTS WITH ACUTE APPENDICITIS IN A TERTIARY CARE HOSPITAL – A ONE YEAR PROSPECTIVE ANALYTICAL STUDY"**." has been submitted for Anti-Plagiarism check through Turnitin software. The scan has been carried out and the scanned output reveals a match percentage of **05%** which is within the acceptable limits of **10%** as per the guidelines given by UGC.

Ramesh

Guide.

Associate Professor
Dept of General Surgery

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Dr. (Mrs.) N.S. Mahantashetti.
Chairperson-Antiplagiarism Committee &
Principal,
J. N. Medical College, Belagavi.

To,
Reg. No. BH0119010.
Postgraduate Student,
2019-20 Batch,
Department of General Surgery,
J. N. Medical College, Belagavi.

From,
2nd year Junior Residents [2019-2022]
Department of General Surgery,
J N Medical College,
Belagavi

To,
The Principal
KAHER University
J N Medical College
Belagavi – 10

(Through proper Channel)

Sub : Letter requesting Sample size reduction for the Dissertation.

Respected Madam,

Hereby requesting you to give us the permission to reduce our sample size in our dissertation, due to inevitable situation of COVID – 19 pandemic , which lead to reduction in the number of admitted cases for the year of 2020.

The following are the name of the candidates for reduction of the sample size.

NAME OF THE CANDIDATES	NAME OF THE GUIDE	SIGNATURE OF THE GUIDE

Kindly do the needful.
Thanking you,
Yours sincerely,

28/11/2020

Signature of The HOD
Department of General Surgery

Enclosed is the detailed list of dissertation

LIST OF ABBREVIATIONS

MAS	-	Modified Alvarado Scoring System
RIPASA	-	Raja Isteri Pengiran Anak Saleha Appendicitis
OPD	-	Out Patient Department
AA	-	Acute Appendicitis
TLC	-	Total Leucocyte Count
RIF	-	Right Iliac Fossa
HPR	-	Histopathology report
RLQ	-	Right Lower Quadrant
DLC	-	Differential Leukocyte Count
USG	-	Ultrasonography
NPV	-	Negative Predictive Value
PPV	-	Positive Predictive Value
Sn	-	Sensitivity
Sp	-	Specificity
CT	-	Computed Tomography

ABSTRACT

Introduction-

Acute appendicitis is the most common cause of acute abdomen requiring surgery. Acute appendicitis has lifetime incidence of 8.6% in males and 6.7% in females. The accuracy of clinical examination in diagnosing acute appendicitis is 70-87%. Approx. 20-30% of patients with suspected acute appendicitis have atypical findings making clinical diagnosis difficult.

Clinical scoring systems were developed to reduce the negative appendectomy rate to 5%–10%. The most popular scoring system among surgeons is the Alvarado score, which was developed in 1986 as the simple addition of points related to eight clinical parameters. The modified Alvarado score omitted the last point of the original score (shift to the left Neutrophils) . It has been shown that there were no significant differences between the outcomes of the two scores.

More recently, a new clinical scoring system was established, called the Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score, and it was developed in 2008 at the Department of Surgery, Raja Isteri Pengiran Anak Saleha Hospital, Brunei Darussalam. This score includes 14 clinical parameters, and has a higher sensitivity, specificity and diagnostic accuracy than the Alvarado scoring system, especially in Asian population.

The diagnosis of acute appendicitis is often a challenging job for surgeon so my study will help to find a scoring system which is more efficient in diagnosing the problem early & henceforth less complications.

Aim

Compare of efficacy of Modified Alvarado Scoring System with RIPASA Scoring system in diagnosing Acute Appendicitis.

Materials & Methods

This will be a Prospective Analytical Study done in the department of surgery in KLE Dr. PRABHAKAR KORE CHARITABLE HOSPITAL AND MEDICAL RESEARCH CENTRE from 1st January, 2020 to 31st December, 2020. All consecutive patients fulfilling the criteria and who give informed consent during the period of study will be the sample of this study. Comparison of the modified Alvarado and RIPASA scoring systems with regard to the sensitivity (Sn), specificity (Sp), positive predictive value (PPV), negative predictive value (NPV), diagnostic accuracy (DA), predicted negative appendectomy

Results

In this present study, it is seen that majority of the patients were falling in the age group of 18 – 39.9 years i.e. 68.3% & least number of cases are seen in >65 years of age i.e., 8.3%. In this study out of 60 patients who presented to our hospital 66.6 % (40 patients) were having male preponderance. The male: female ratio is 2:1. In this present study all the patients present with pain in the right iliac fossa (100%), fever was noticed in 70% patients, 61.6% has Rovsing sign positive, leukocytosis is seen in 53.3% of patients.

Using the RIPASA scoring system in the present study, at score >7, 92.3 % patients were diagnosed with acute appendicitis were actually having acute appendicitis in comparison to MAS where only 9.6% patients were diagnosed

accurately. RIPASA has the specificity of 100% & with excellent diagnostic accuracy of 96.3%. Whereas, the diagnostic accuracy of MAS is 84.2% & Negative predictive value (NPV) of 14.5%.

Conclusion

RIPASA is a straightforward, reliable, accurate, easy to access, with high diagnostic efficacy system along with 100% specificity & 100% positive predictive value. It is a great tool to rapidly diagnose the patient on OPD basis & to prevent unnecessarily hospital stay along with costly investigations like CT scan.

Keywords- Appendicitis, Modified Alvarado Scoring System, RIPASA scoring system

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INTRODUCTION

- Acute appendicitis is indeed one of the commonest surgical problems encountered by surgeons worldwide.
- It has lifetime incidence of 8.7% in males and 6.7% in females.
- The Diagnostic efficacy of clinical examination in diagnosing acute appendicitis is 70-87%.
- Approx. 20-30% of patients with who are suspected to have Acute Appendicitis have atypical features which increases the diagnostic dilemma.

In 1886, Reginad Fitz identified appendix as cause of right iliac fossa inflammation he conceived the term appendix and early surgical intervention.

Fig 1: First Appendectomy was performed by Claudis Amyland in London.

The diagnosis of acute appendicitis remains an ongoing challenge for most surgeons, because acute appendicitis presents with atypical symptoms in 50% of the cases.

The diagnosis of acute appendicitis is based on the patient's medical history, a clinical examination and laboratory investigations.

Worldwide, a negative appendectomy rate of 20%–30% has been accepted previously.

Clinical scoring systems were developed to reduce the negative appendectomy rate to 5%–10%. The most popular scoring system among surgeons is the Alvarado score, which was developed in 1986 as the simple addition of points related to eight clinical parameters.

The modified Alvarado score omitted the last point of the original score (shift to the left Neutrophils). It has been shown that there were no significant differences between the outcomes of the two scores.

More recently, a brand-new clinical scoring system was established, called the Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score, & it was developed in 2008 at the Department of Surgery, Raja Isteri Pengiran Anak Saleha Hospital, Brunei Darussalam. It includes 14 clinical parameters, and has a higher sensitivity, specificity and diagnostic accuracy than the Alvarado scoring system, especially in Asian populations.

On the basis of this knowledge, the objective of this study is to compare two systems RIPASA scoring system & Modified Alvarado Scoring System. In this study we Sensitivity, Specificity, (NPV) negative predictive value, (PPV) positive predictive value, (DA) diagnostic accuracy, predicated negative appendectomy of both Scoring Systems will be compared.

On a concluding note, to diagnose a patient who is suffering from acute appendicitis is regarded as a challenging job to surgeon. Delayed diagnosis can lead to complications with high mortality and morbidity compared to non-perforated appendicitis.

For these reasons negative appendectomy should be minimized by improving diagnostic efficacy.

ANNEXURE - I - ETHICAL CLEARANCE

K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed - to-be University)
Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (GoI)

JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)

Website: http//www.jnmc.edu
E-Mail : dome@jnmc.edu

Phone: (+91-(0)831 Office : 2472550
Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref: MDC/DOME/ 274 **Date: 24/12/2019**

To,

PG student in Surgery,
J.N.Medical College,
BELAGAVI.

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"COMPARATIVE STUDY TO ACCESS EFFICACY OF MODIFIED ALVARADO SCORING SYSTEM VERSUS RIPASA SCORING SYSTEM IN EFFECTIVE DIAGNOSIS OF PATIENTS WITH ACUTE APPENDICITIS IN A TERTIARY CASE HOSPITAL – A ONE YEAR PROSPECTIVE ANALYTICAL STUDY"**, is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Anita Dalal)
Member Secretary
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

(Dr. Roopa M Bellad)
Chairman,
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

ANNEXURE – II – CONSENT FORM

CONSENT FOR PARTICIPATION IN RESEARCH STUDY

Mr./Mrs. _____ we are requesting you to enroll yourself in study titled **"COMPARISON OF EFFICACY OF MODIFIED ALVARADO SCORING SYSTEM VERSUS RIPASA SCORING SYSTEM – A ONE YEAR PROSPECTIVE ANALYTICAL STUDY"** conducted by Dr. _____, Postgraduate in M.S. General Surgery under the guidance of Dr. _____ Associate professor in Department of General Surgery, J.N. Medical College, Belgaum under KAHER, Belagavi.

Purpose of study: To reduce the negative appendectomy rate by effective diagnosis of acute appendictis clinically.

Type of Study: Prospective analytical study

Participant selection: We are inviting all Acute Appendicitis cases who visit our hospital for further management to participate in this study.

Voluntary Participation: Your participation in research is voluntary. It is your choice whether to participate or not. Your decision whether to participate in the study or not will not change present or future health care services offered to you and will not affect your relationship with J.N. Medical College. If you choose not to participate in this study, you will still be offered the routine treatment of acute appendicitis that is given at our hospital. You will continue to receive the routine care at our hospital even if you decline to participate in this study. If you decide to participate you are free to withdraw at any time.

Information of treatment procedures: Confidentiality will be maintained. This means that researchers will not let anyone, not a part of the study to, see the information you provide. Dr. _____ and Dr. _____will have the access to the information collected. Results of this study may be published but your name will not be revealed.

BENEFITS : The study will lead to effective diagnosis of Acute Appendicitis.

RISK INVOLVED: The side effects of this study is nil.

Financial Incentives for participation: No financial incentives are being offered to enrolled patients.

Privacy and Confidentiality: The only people who will know that you are the research subject will be the members of the research team. No information about you or information provided by you during the research will be disclosed to others without your written permission except:

1. In emergency to protect your rights and welfare.

2. If required by law.

Authorization to Publish Results: When the results of the research are published or discussed, in a conference, no information will be displayed that would disclose your identity. Any information that is obtained in connection with this study and that can be identified with you will remain confidential. Results of the study will be used to compare the two procedures on the points listed above.

Right to refuse or withdraw from study: You do not have to participate in this research if you do not wish to. You can withdraw at any time from the study. There will be no penalty for withdrawal. Your treatment and care in this hospital will not change irrespective of whether you agree to participate or not. You can be removed from the study if necessary.

Alternative: You are free to withdraw yourself from this study at any point of time. You will continue to receive the routine care even if you decline to participate in the study. You will be treated for the same even if you have declined from the study. You will be informed about any new information that may affect your decision to participate in the study.

Institutional/sponsor's policy: In the event of any injury related to the study, treatment will be made available through KLE's Hospital & MRC, Belgaum. There is no compensation or payment for such medical treatment by law. If you are injured you may contact Dr. _____, Post graduate student, Department of General Surgery, KLE's Hospital& MRC.

Contact details: In case you have any questions related to the study, in future or in case of study related injury or illness, you can contact Dr. RITIKA, Post graduate student, Department of General Surgery, KLE's Hospital and MRC or Dr. _____Associate Professor, Dept. Of General Surgery, KLE's Hospital and MRC, Belgaum.

If you have any queries about your rights as a study participant, you may contact Dr. Roopa M Bellad, Prof. of Pediatrics as Chairman of J. N. Medical College Institutional Ethics Committee on Human Subjects Research, Phone No.0831 2473777 ext-1527 at J. N. Medical College, Belgaum.

CONSENT TO PARTICIPATE IN THE STUDY

Study title: **"COMPARATIVE STUDY TO ACCESS EFFICACY OF MODIFIED ALVARADO SCORING SYSTEM VERSUS RIPASA SCORING SYSTEM IN EFFECTIVE DIAGNOSIS OF PATIENTS WITH ACUTE APPENDICTICS IN A TERITARY CARE HOSPITAL – A ONE YEAR PROSECPTIVE ANALYTICAL STUDY"**

Subject's name: _____

(i) I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions. ☐

(ii) I understood that my participation in the study is voluntary and that I am free to withdraw at anytime, without giving any reason, without my medical care or legal rights being affected. ☐

(iii) I understood that doctor of the clinical trial, others working on the doctor's behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to this access. However, I understood that my identity will not be revealed in any information released to third parties or published. ☐

(iv) I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s). ☐

(v) I agree to take part in the above study. ☐

Subject name: _____

Signature (or thumb impression) of the subject: _____

Date (dd-mm-yyyy): ☐☐ - ☐☐ ☐☐☐☐

Name of the person obtaining informed consent: _____

Signature of the person obtaining informed consent: _____

If a patient has limited ability to read and write, In these instances the patient his/her thumb impression in the place of the signature.

Patient's Legally Acceptable Representative's Statement:

I, as the patient's legally acceptable representative, was present during the consenting procedure and understand the preceding information describing this study. All of the questions regarding the study and the patient's participation in it have been answered to my satisfaction and that of the patient. I state that all aspects of the study were clearly presented during the consent procedure. The patient is willing to participate in the study and I sign below on his/her behalf testifying to this effect.

Name of the patient: _____

Name of the Legally Acceptable Representative: _____

Relationship to the Patient:_____

ANNEXURE - III - PROFORMA

SCREENING FORM

1. Patient's UHID No. :
2. Age (in years) :
3. Gender:
    a. Male
    b. Female
4. DOD (dd/mm/yy) :
5. Date of Interview (dd/mm/yy) :
6. Address:
        a. Belagavi
        b. Outside Belagavi
7. Occupation:
    a. Unemployed
    b. Unskilled
    c. Semi-Skilled
    d. Skilled
    e. Professional
8. Education:
        a. Illiterate
        b. Primary (1^{st} - 7^{th} Std)
        c. High School (8^{th} – 10^{th} Std)
        d. Intermediate
        e. Degree and above

9. Socio – Economic status
    a. Low
    b. Middle
    c. High
10. Applicant is willing to give consent:
    a. Yes
    b. No
11. Final results:
    a. Ineligible
    b. Eligible but refused
    c. Eligible and participating

- ❖ CHIEF COMPLAINTS
- ❖ HISTORY OF PRESENT ILLNESS
- ❖ PAST HISTORY
- ❖ PERSONAL HISTORY
- ❖ FAMILY HISTORY

GENERAL PHYSICAL EXAMINATION

- ➢ Built and Nourishment :
- ➢ Pallor :
- ➢ Icterus :
- ➢ Cyanosis :
- ➢ Clubbing :
- ➢ Edema :
- ➢ Lymphadenopathy :

VITALS

- PR : /min
- BP : /mmHg
- RR : /min
- Temp- :

PER ADBOMEN EXAMINATION

- Inspection
- Palpation: (with special mention to right iliac fossa tenderness)
- Percussion:
- Auscultation:

SYSTEMIC EXAMINATION

- ✓ CNS-
- ✓ CVS-
- ✓ RS-

CLINICAL IMPRESSION –

INVESTIGATIONS –

MANAGEMENT –

RIPASA SCORE

Patient's Name –

Age -

IP No. –

Sex -

Date of Assessment –

Time of Assessment –

PATIENT DEMOGRAPHIC	SCORE
Female	
Male	
Age < 39.9 yrs.	
Age > 40 yrs.	
SYMPTOMS	
RIF plan	
Pain migration of RIF	
Anorexia	
Nausea & Vomiting	
Duration of symptoms < 48 yrs.	
Duration of symptoms > 48 yrs.	
SIGNS	
RIF tenderness	

Guarding	
Rebound Tenderness	
Rovsing's Sign	
Fever > 37^0 C, < 39^0 C	
INVESTIGATIONS	
Raised WBC	
Negative Urinalysis	
ADDITIONAL SCORE	
Foreign NRIC	
Total	

MODIFIED ALVARADO SCORE

Patient's Name –

Age -

IP No. -

Sex -

Date of Assessment –

Time of Assessment –

SYMPTOMS	SCORE
Migratory right iliac fossa pain	
Nausea/ Vomiting	
Anorexia	
SIGN	
Tenderness in right iliac pain	
Rebound Tenderness in right iliac fossa	
Elevated Temperature	
LABORATORY	
Leucocytosis	
TOTAL	

ANNEXURE - IV - KEY TO MASTER-CHART

P - Positive

N - Negative

AIMS & OBJECTIVES

Compare of efficacy of Modified Alvarado Scoring System with RIPASA Scoring system in diagnosing Acute Appendicitis.

REVIEW OF LITERATURE

The term vermiform is a Latin word derived from “worms” and Appendix is considered as a vestigial organ. It also has other roles to play in maintaining both Immune functions & Gut flora.

ANATOMY

It is a blind ending muscular tube-like structure with is attached to the caecal base and it becomes tubular after differential growth of appendix with respect to Caecum at around 2yrs of age. It consists of 4 layers – mucosa, submucosa, muscular & serosa layer.

There are various positions in which the appendix lies- most common being the Retrocaecal Intraperitoneal Appendix but the tip usually lies Extra peritoneally.

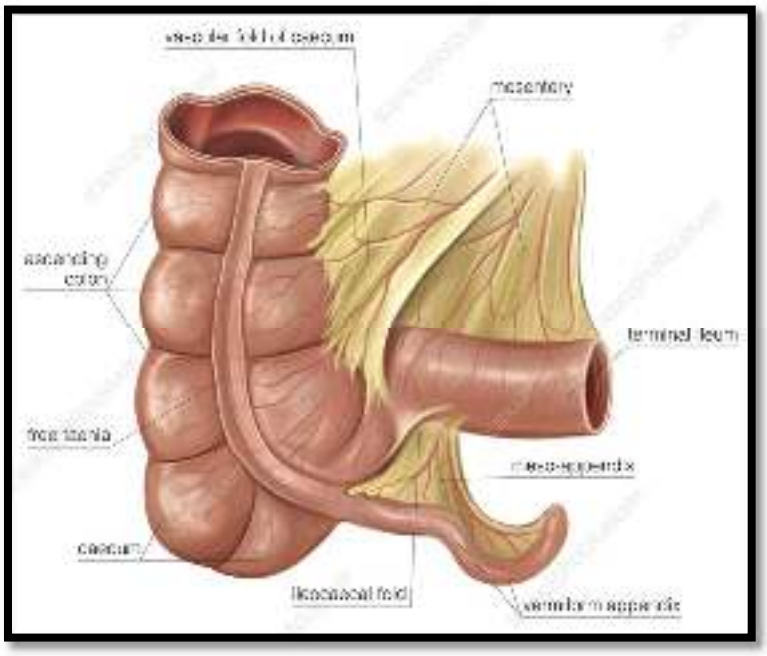


Fig 2: Anatomy of Appendix

In case of Malrotation of gut or Mobile caecum, appendix does not lie in its usual position and causes diagnostic difficulty.

Position of caecal base is constant, the juncture where the three taeniae coli meet to form outer longitudinal muscle layer. During surgeries gentle traction of the taenia will guide the surgeon towards Appendix.

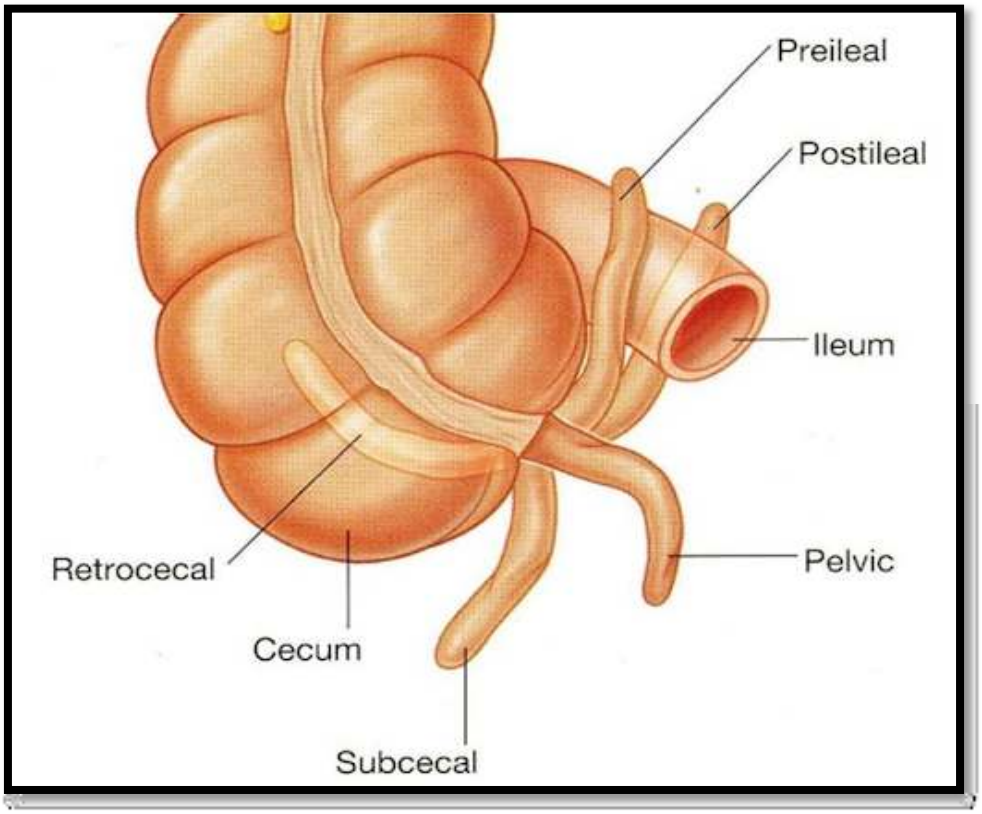


Fig 3: Various Positions of Appendix

BLOOD SUPPLY

Appendicular artery, branch of Ileocolic Artery passes behind the ileum and enter the mesentery of appendix i.e., mesoappendix. An accessory artery,

Artery of Seshachalam is the end artery supplying the appendix, thrombosis of which can lead to gangrenous appendicitis.

Appendicular Vein drains the appendix into ileocolic vein.

LYMPHATIC DRAINAGE

There are 4 -6 groups of Lymph nodes which drain the Lymph from the appendix and empty into ileocolic nodes after traversing the mesoappendix.

MICROSCOPIC ANATOMY

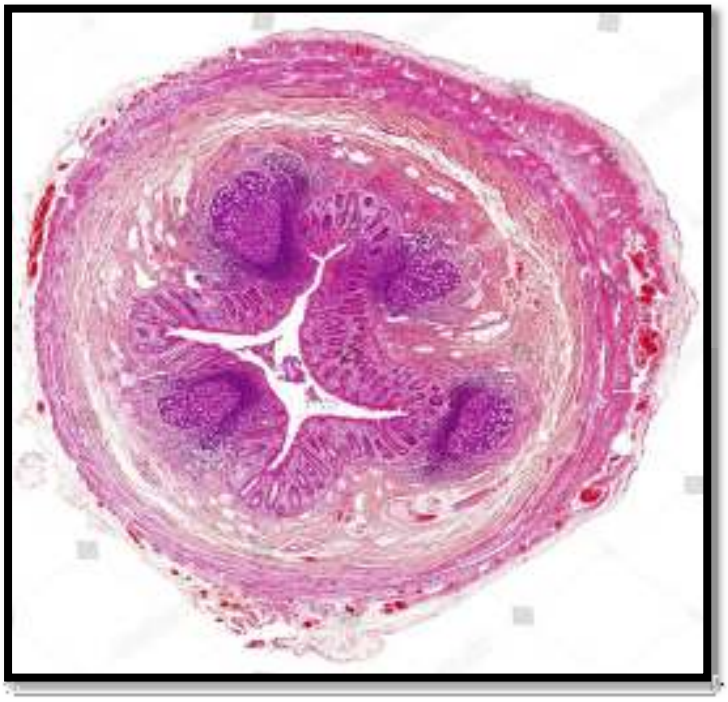


Fig 4: Microscopic anatomy of appendix

The mucous membrane is lined by columnar intestinal mucosa. Lumen is irregular & crypts are lined by Argentaffin cells. It is the most common site of Carcinoid tumor.

Acute Appendicitis

In late 1500, Reginald Fitz, who presented a paper in America gave the clinical entity of acute appendicitis. Afterwards Charles McBurney described clinical manifestation of point of maximum tenderness in right iliac fossa, so is the name of the point.

Incidence of appendicitis is equal in both the genders before puberty, but after the age of 25 it is more in female than in males.

AETIOLOGY

There are different schools of thoughts regarding etiology of appendicitis as follows-

- Decreased Dietary fiber in diet
- Increased refined carbohydrates in diet
- Fecalith in Appendix
- Stricture
- Foreign body and mass
- Carcinoma
- Intestinal parasites

PATHOLOGY

Obstruction of lumen of appendix is the root cause of its inflammation and in due course will lead to gangrene and perforation. Seasonal variation is also seen in its incidence with more no of cases in May & August.

Whenever there is obstruction, there is continuous mucus secretion & lymphoid hyperplasia also takes place which leads to further narrowing of the lumen and it also increases the intraluminal pressure.

Also, Bacterial translocation start to take place to submucosa with ulceration. This is the point where resolution can occur either with antibiotics or spontaneously on its own.

If the condition continues to worsen it will lead to complete luminal obstruction, ischemia, gangrene, perforation, bacterial overgrowth and spread to peritoneal cavity. Greater omentum & loops of ileum coils around the appendix & wall it off completely preventing its spread leading to peritonitis.

There are various risk factors leading to perforation of appendix- Extremes of ages, Immunosuppression, Diabetes, Faecolith obstruction, Pelvis appendix, previous abdominal surgery.

CLINICAL FEATURES

History- patient will complain of pain in the periumbilical region as it is a midgut structure, poorly defined colicky abdominal pain. It is also associated with nausea, anorexia, vomiting.

When the inflammation increases the parietal peritoneum is also inflamed, becomes irritated, produces more intense pain & aggravates on sudden movement & cough. A pelvic appendix will produce more of suprapubic pain & tenderness is appreciated on rectal examination.

Patient also complains of fever, tachycardia, tachypnoea. Two syndromes are associated first acute catarrhal type & acute obstructive type of appendicitis.

Signs- There are various clinical signs associated as low-grade pyrexia, muscle guarding, generalized abdominal tenderness, rebound tenderness, pain on deep inspiration.

- **Pointing sign**- Patient complaints of maximum pain at Mc Burney's point.
- **Rovsing sign** – On palpating the abdomen in left iliac fossa paradoxically patient complaints of pain in right iliac fossa

- **Psoas sign-** In this pain in elicited when patient will extend the hip joint as the inflamed appendix touches the psoas muscle.
- **Obturator sign-** here the pain is caused by passively internal rotation & flexion of hip, suggesting pelvic position of appendix.

SPECIAL FEATURES AS PER THE AGE OF THE PATIENT

INFANTS- It's rare in infants, and often there is delay in the diagnosis as patient cannot give history & so usually the patient presents late to the hospital.

CHILDREN- They usually presents with complete aversion to food.

ELDERLY- Due to obesity & laxity of abdominal wall these patients can have gangrenous appendix, it mimics the picture of subacute intestinal obstruction.

OBESE- Here almost all the said clinical signs are obscured and investigations only help to reach the diagnosis. Diagnostic laparoscopy has a role to play in such individuals.

PREGNANCY- here the diagnosis is usually delayed as the initial presentation & symptoms are thought of to be of pregnancy. Here the patient has right upper quadrant pain in 2^{nd} & 3^{rd} trimesters.

DIAGNOSIS

The diagnosis is mainly through clinical examination. But around 15-30% of normal appendix are being operated based only on the clinical suspicion of appendicitis.

That's why different scoring systems are widely used for the diagnosis of acute appendicitis, merely in the emergency department without any radiological

investigation to save time & to reduce the negative appendectomy rate. It is a cost-effective tool and it enhances the clinical examination & diagnostic efficacy of surgeon.

In patients where the scoring system show a score which is equivocal in those cases Radiological investigations come in play- Abdominal ultrasound & Contrast enhanced CT scan.

Abdominal ultrasound is safe even in pregnancy, thin individuals, children, also it is cost-effective, radiation free, bedside available with diagnostic efficacy of 90%.

CT Scans – Contrast enhanced is more sensitive & specific in the diagnosis & it further reduces the negative appendectomy rate.

In many hospitals CT scan is done mostly in all cases prior to surgery but radiation hazard still persists.

It is also cost effective in the sense that it will decrease the hospital stay of the patient.

Fig 5 – CT Scan Showing features of Acute Appendicitis

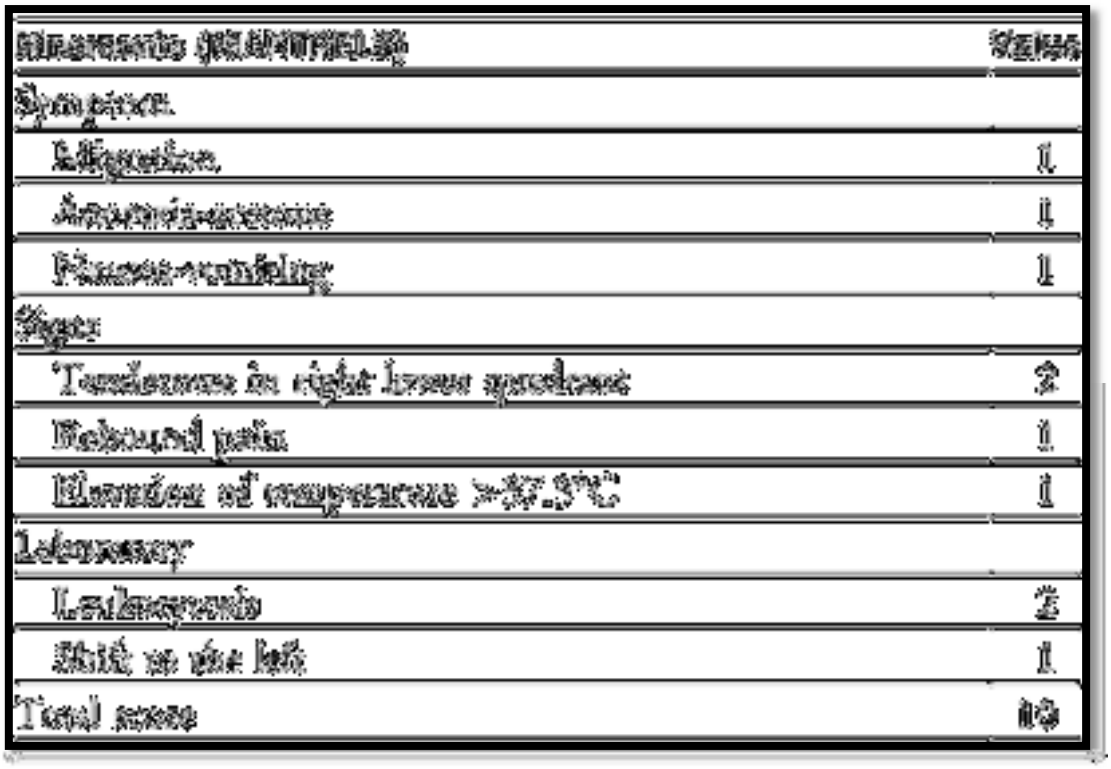


Fig 6- Modified Alvarado Scoring system

In the last 2 decades various scoring systems were introduced & tested by various individuals e.g., Lidverg, Ohman, Alvarado, Tzanaki, Fenyo etc.

- The cut off score for modified Alvarado score is 7

➢ Score 1-4= Very unlikely of acute appendicitis

➢ Score 5-7= Probable of acute appendicitis

➢ Score 8-10= Definitive of acute appendicitis

Parameter		Score
Sex:	Male	1.0
	Female	0.5
Age:	<39.9 years	1.0
	>40.0 years	0.5
RIF pain		0.5
Migration of RLQ pain		0.5
Anorexia		1.0
Nausea and vomiting		1.0
Duration of symptoms:	<48 hours	1.0
	>48 hours	0.5
RIF tenderness		1.0
RIF guarding		2.0
Rebound tenderness		1.0
Rovsing's sign		2.0
Fever		1.0
Raised WBC		1.0
Negative urinalysis		1.0
Foreign NRIC		1.0

Fig 7- RIPASA Scoring System

It has cut off score of 7.5. More number of parameters are added which leads to high sensitivity & specificity.

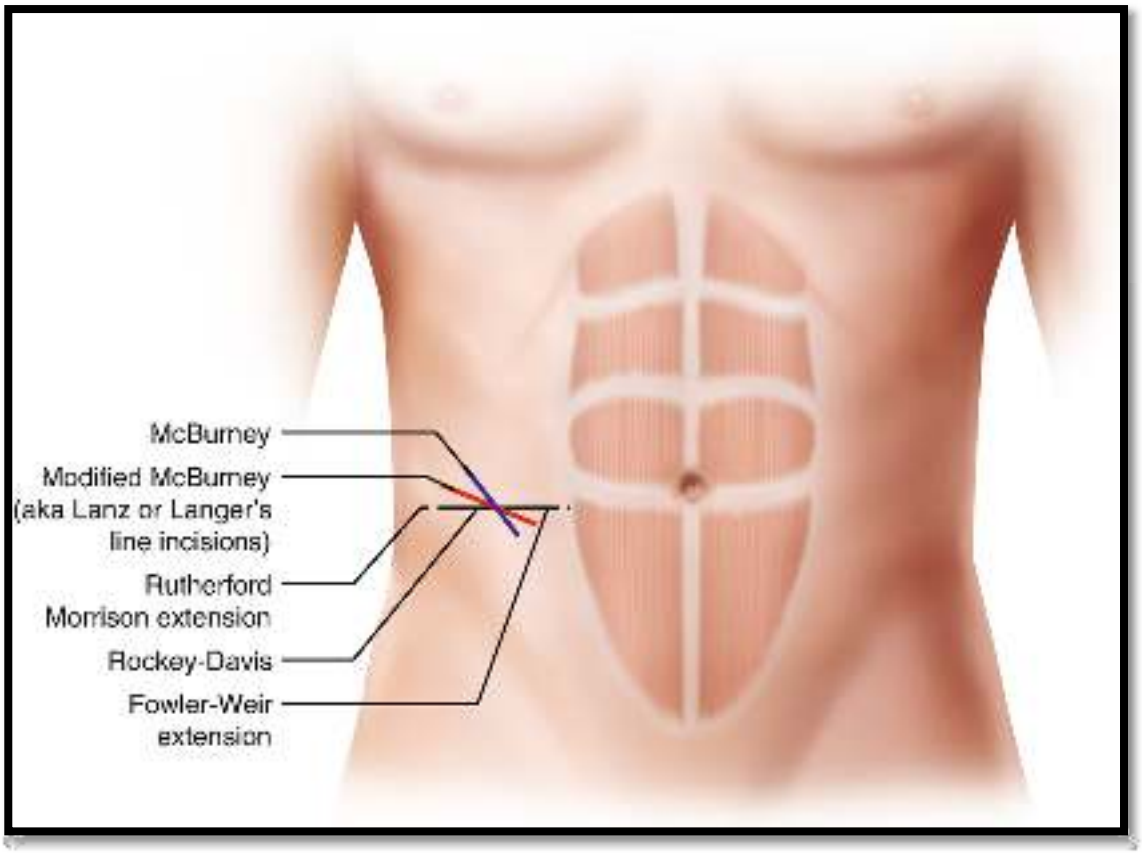


Fig 8- Various positions of Open Appendectomy

There are various options for Surgery most common being laparoscopic surgery & in difficult cases some surgeons prefer Open Appendectomy.

Open procedure leads to prolonged hospital stay, scar mark, delayed return of bowel activity, more pain at incision site.

There are various incisions taken in the procedure of open appendectomy shown in the above image

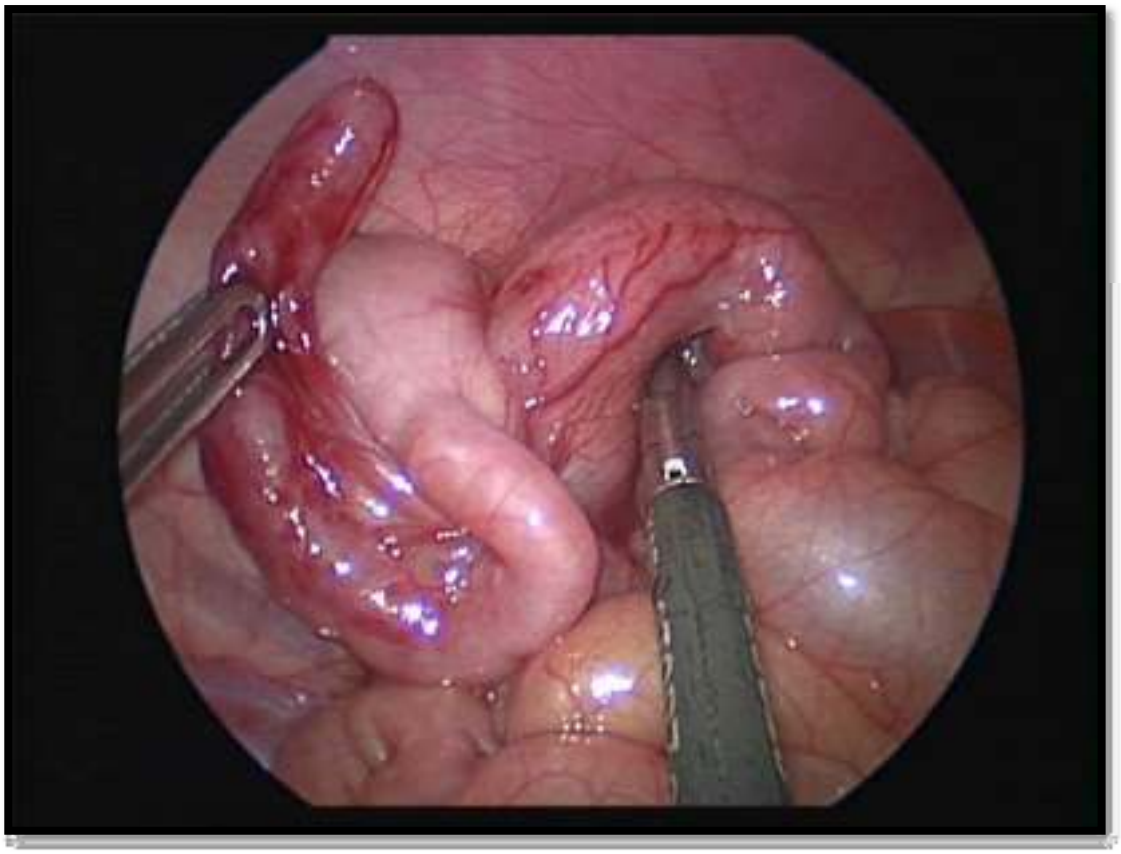


Fig 9 – View of Laparoscopic Appendectomy

This is the most preferred surgery as far as Surgeon & patients are concerned. With just 3 incisions, two of which are of 10 mm & third one of 5 mm whole of the procedure can be done very efficiently.

With Laparoscopy, patient is discharged very next day, with early return of bowel activity, cosmetically better option, less pain & wound healing also takes place at excellent pace.

METHODOLOGY

This will be a Prospective Analytical Study done in the department of surgery in KLE Dr.PRABHAKAR KORE CHARITABLE HOSPITAL AND MEDICAL RESEARCH CENTRE.

- **STUDY DESIGN**- Prospective Analytical study
- **INCLUSION CRITERIA-**
  - Patient above 18 years of age attending surgery OPD.
  - Have been diagnosed and getting admitted for acute appendicitis in KLE Dr.Prabhakar Kore Hospital and Medical Research Centre, Belagavi.
- **EXCLUSION CRITERIA-**
  - Patient not fit for surgery
  - Previous history of urolithiasis
  - Patient not willing to give consent for the study
- **STUDY PERIOD** – 1st January, 2020 to 31st December, 2020
- **SAMPLE SIZE**= 60

It is calculated based on following equation,

n= 4 x sensitivity x (100-sensitivity)/ L2 x P

n= Sample size

L= Permissible error up to 5 %

P= Prevalence of appendicitis in our hospital = 6.8%

Sensitivity of RIPASA scoring system = 91.48%

Applying above formula, n= 45.84

So minimal Sample size is 45

SAMPLING PROCEDURE:

All consecutive patients fulfilling the criteria and who give informed consent during the period of study will be the sample of this study.

METHOD & PLAN FOR ANALYSIS-

- A total of 60 patients clinically diagnosed to have acute appendicitis will be studied from January 2020 to December 2020.
- Every year an average of 180 patients of acute appendicitis gets admitted & operated upon.
- By Stratified Random Sampling every 3rd patient will be selected for the study.
- Upon admission Scoring sheets are filled by the admitting Surgeon.
- Both Scoring Systems will be applied to all patients.
- Scores will be tallied accordingly.
- Post-operatively specimen will be sent for the Histopathological Examination for confirming the diagnosis & efficacy of scoring system will be checked on the basis of histopathological report.
- Age & Sex distribution charts will be prepared.
- Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV), Diagnostic Accuracy (DA) of both scoring systems will be compared.
- **Decision as per scoring**-

Patient having score less than or equal to 5 were observed.

Patients with score > 5 to 7 were kept under observation for 24 hours, then again evaluated.

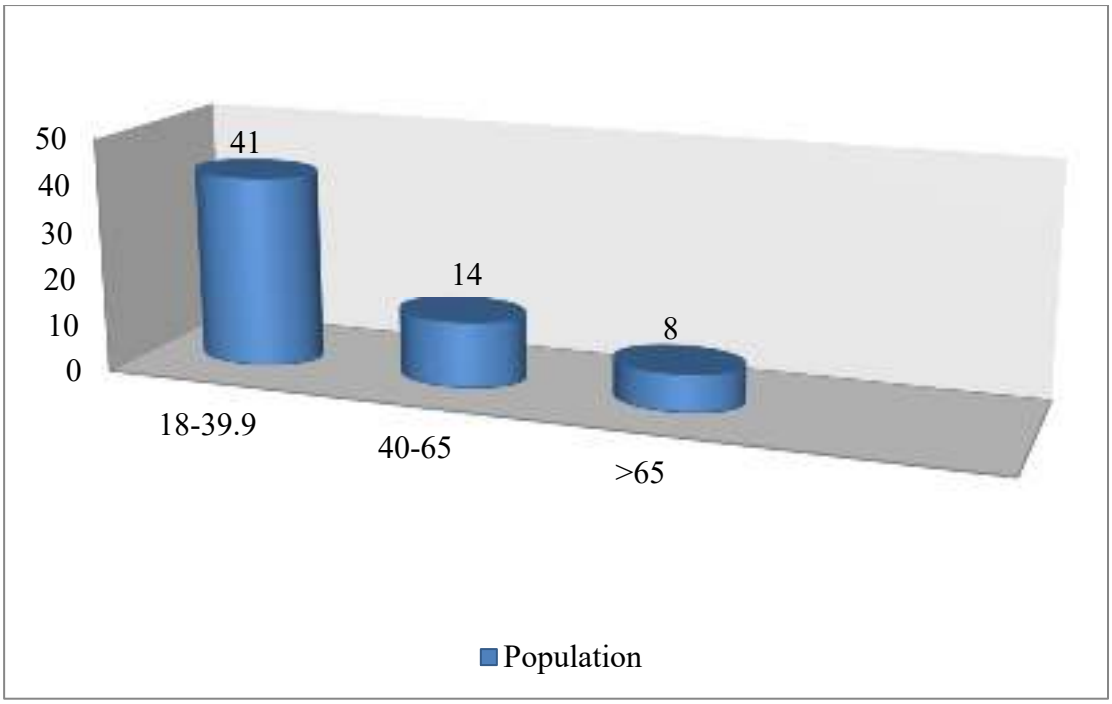
If at any point of time clinical condition of patient worsens then that patient was immediately taken up for surgery.

RESULTS

Table 1- Distribution of study population according to Age

Age – group (in years)	Number	Percentage (%)
18-39.9	41	68.3
40-65	14	23.3
>65	5	8.3
	60	100

Graph 1-Distribution of study population according to Age

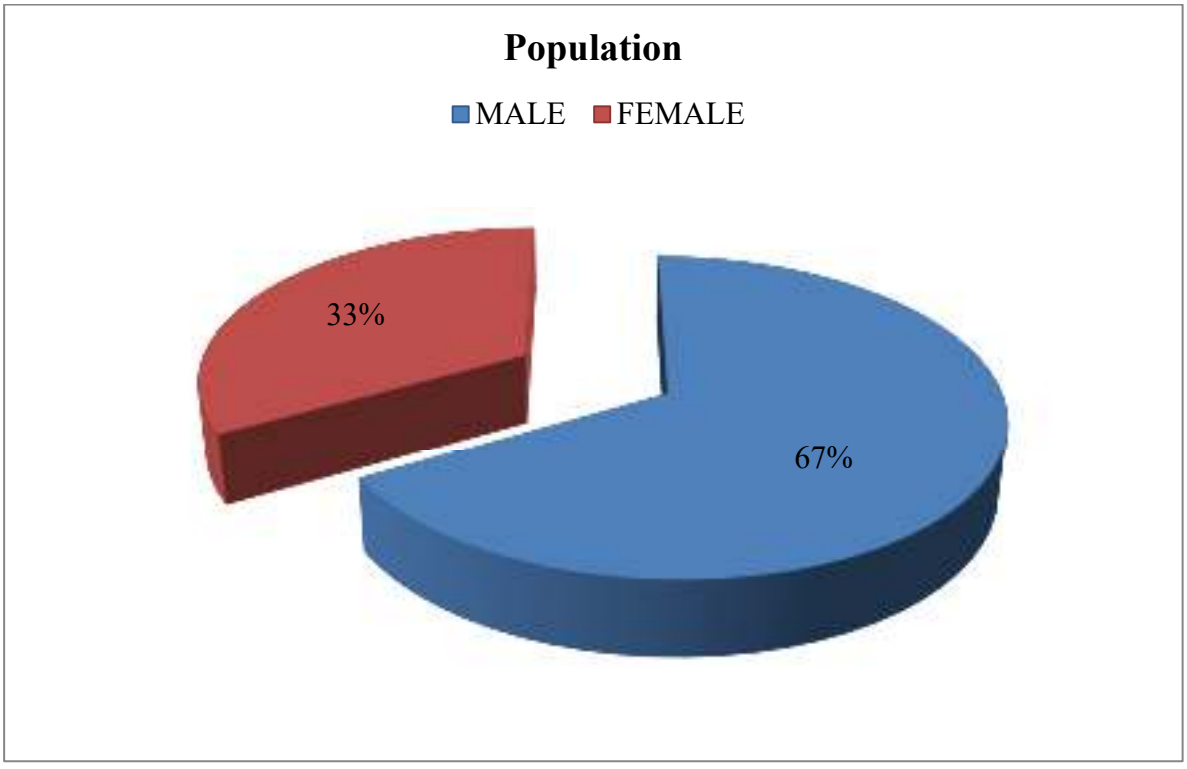


Major chunk of Study population falls between 18-39.9 yrs.

Table 2- Distribution of study population according to Sex

SEX	NUMBER	PERCENTAGE(%)
MALE	40	66.6
FEMALE	20	33.3
TOTAL	60	100

Graph 2- Distribution of study population according to Sex



Males constitutes the major portion of Study Population

Table3-Distribution of study population according to Signs & Symptoms

SYMPTOMS	NUMBER	PERCENTAGE
Pain in RIF	60	100
Anorexia	29	48.3
Fever	42	70
Nausea / Vomiting	28	46.6
Migratory Pain	24	40
Abdominal Guarding	26	43.3
Tenderness in RIF	24	40
Rebound Tenderness	24	40
Rovsing Sign	37	61.6
Leukocytosis	32	53.3

In this study, 100 % of the patients presented with pain in RIF, 70% have fever, 61.6% have Rovsing sign positive.

Graph 3 -Distribution of study population according to Signs & Symptoms

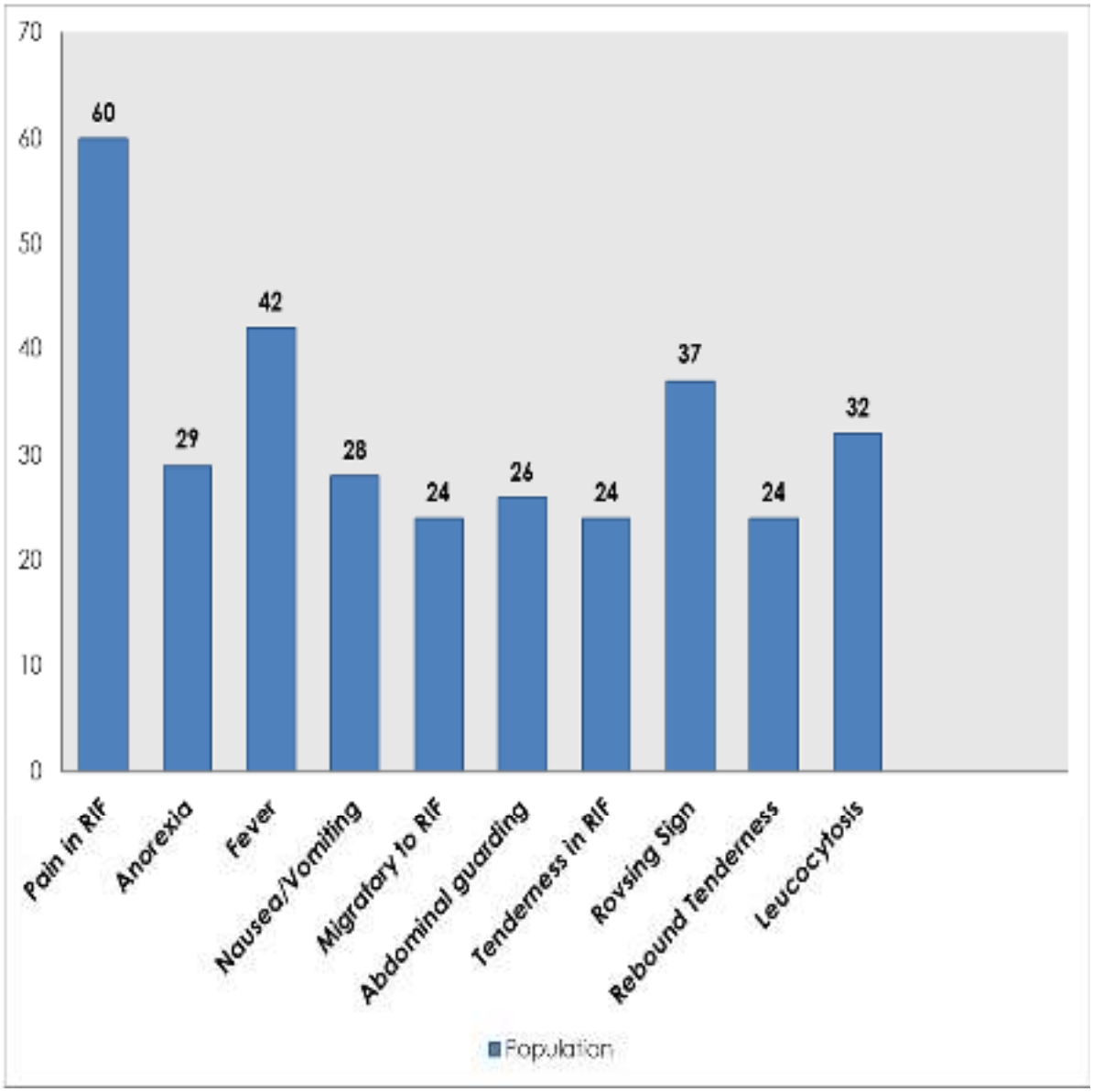
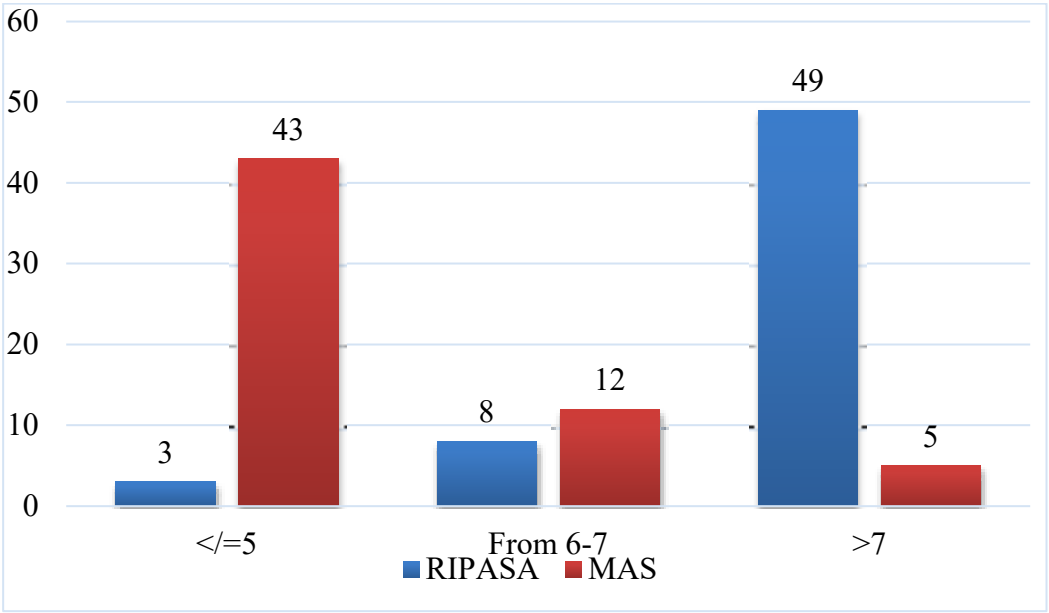


Table 4: Distribution of Study Population as per Scores

SCORE	RIPASA	MAS	HPR
≤5	03	43	Acute Appendicitis 52
6-7	08	12	Chronic Appendicitis 08
>7	49	05	
Total	60	60	60

Graph 4: Distribution of Study Population as per Scores



Maximum number of patients were present in the score range of >7.

So, as per RIPASA scoring system 49 out of 60 patients & as per MAS 5 out of 60 patients lie in the category range of >7.

Table 5 : MAS with HPR

Score	Acute Appendicitis	Chronic Appendicitis	Total
>7	05	0	05
≤7	47	08	55
Total	52	08	60

MAS (at score >7) has correctly diagnosed in 5 patients with zero false positive cases.

Table 6: RIPASA with HPR

Score	Acute Appendicitis	Chronic Appendicitis	Total
>7	48	0	48
≤7	04	8	12
Total	52	8	60

RIPASA score is able to diagnose 48 patients of acute appendicitis (at score ≥7) with zero False positive case.

DISCUSSION

Acute Appendicitis is a Surgical Emergency & Diagnosis which is made only by thorough History taking, Clinical Examination, routine blood investigations can be tricky in certain scenarios.

If there is a delay in diagnosis & further management then the disease can further progress to acute inflammed Appendix then to perforation or gangrenous appendicitis & then further bacterial translocation can lead to signs Acute Abdomen due to Peritonitis. This can further lead to increase in mortality & morbidity.

There is a diagnostic dilemma in detecting this condition in elderly n pregnant females due to atypical clinical features & a long list of Differntial Diagnosis.

The use of Radiological investigations like CT scan is done in many centres now-a-days as it is difficult to come to a definite diagnosis because of the varied presentation.

But, it has increased the cost of health care, has exposed the patient to radiation, With the advent of CT Scan,even the cases of mild appendicitis which can be treated conservatively with antibiotics are undergoing Appendectomies.

To make a diagnosis of Acute Appendicitis in OPD has posed problems to almost all surgeons now and then, so to combact that multiple scoring systems have been developed e.g., Alvarado system, Tzanakis's system, Modified Alvarado Scoring System, Acute Inflammatory Response Syndrome etc.

But above all, in 2010 a new scring system has come up – RIPASA , where History taking, Clinical examination, Urinalysis only is sufficient enough to diagnose

a patient with acute appendicitis. It's a very easy to reinforce, cost effective, rapid, reliable, high accuracy scoring system which has lead to early diagnosis & has saved the patient time to start the further management.

It is a basic & straightforward framework which helps us to reach a definitive diagnosis & has drastically decreased the negative appendectomy rate.

In this present study , it is seen that majority of the patients were falling in the age group of 18 – 39.9 years i.e. 68.3% & least number of cases are seen in >65 years of age i.e, 8.3%.

In this study out of 60 patient who presented to our hospital 66.6 % (40 patients) were having male preponderance. The male:female ratio is 2:1 which can be compared with the study conducted by Atreya et al.[27]

In this present study all the patients presented with pain in the right iliac fossa (100%), fever was noticed in 70% patients, 61.6% has Rovsing sign positive, leukocytosis is seen in 53.3% of patients.

Using the RIPASA scoring system in the present study, at score >7 , 92.3 % patients were diagnosed with acute appendicitis were actually having acute appendicitis in comaprison to MAS where only 9.6% patients were diagnosed accurately.

RIPASA has the specificity of 100% & with excellent diagnostic accuracy of 96.3%.

Whereas, the diagnostic accuracy of MAS is 84.2% & Negative predictive value(NPV) of 14.5%.

The PPV of RIPASA is 100% with NPV of 66.6% . this data can be compared with the study of Chong et al. [4]

Table 7: RESULTS

	RIPASA	MAS
SCORE	>7	>7
SENSITIVITY	92.3 %	9.6 %
SPECIFICITY	100 %	100%
PPV	100 %	100%
NPV	66.6 %	14.5%

CONCLUSION

RIPASA is a straightforward, reliable, accurate, easy to access, with high diagnostic efficacy system alongwith 100% specificity & 100% positive predictive value. It is a great tool to rapidly diagnose the patient on OPD basis & to prevent unnecessarily hospital stay alongwith costly investigations like CT Scan.

In our present study RIPASA has outperformed MAS in diagnosing patients with Acute Appendicitis.

SUMMARY

- ✓ This study was performed in KLE Dr. Prabhakar Kore Hospital & MRC, Belgaum, Karnataka.
- ✓ In this study a total of 60 patients participated after taking proper consent.
- ✓ Out of 60 , 40 patients that presented to our hospital were male patients, M:F= 2:1
- ✓ Most of the patients were belonging to age group of 18 – 39.9 years.
- ✓ Almost all patients presented to us with Right lower quadrant pain & around 70 % of patients presented with fever.
- ✓ In the Histopathology Report, out of 60 patients 52 were having Acute Appendicitis & rest 8 were having Chronic Appendicitis.
- ✓ Histopathological Report was taken as the gold standard investigation in the present study.
- ✓ RIPASA scoring system has 100% specificity,92.3% Sensitivity, 100% PPV & a higher diagnostic accuracy.
- ✓ It's a straightforward system with minimal investigations to diagnose the patient without performing unnecessarily expensive investigations.
- ✓ RIPASA has outperformed MAS in the present strudy.

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ANNEXURE - V - MASTER-CHART

S.NO	IPD NO	Age	Sex	Pain in RIF	Migratory Pain in RIF	Tenderness in RIF	Anorexia	Fever	Nausea/Vomiting	Rebound Tenderness	Raised TLC	Abdominal Guarding	Symptoms<48 hrs	Symptoms>48 hrs	Urinalysis	Rovsing sign	RIPASA Score	MAS	Clinical Diagnosis	Histopathology Report
1	919929	27	M	P	N	N	N	P	P	N	P	N	P	N	N	N	7.5	4	Acute Appendicitis	Acute Appendicitis
2	992949	88	F	P	N	N	N	N	P	N	P	N	P	N	N	P	7.5	3	Acute Appendicitis	Acute Appendicitis
3	994104	20	M	P	N	P	P	P	N	P	N	P	P	N	N	N	9.5	5	Acute Appendicitis	Acute Appendicitis
4	995933	25	M	P	N	N	N	P	N	N	N	P	P	N	N	P	9.5	1	Acute Appendicitis	Acute Appendicitis
5	998594	30	M	P	N	N	P	P	N	N	P	P	P	N	N	N	9.5	4	Acute Appendicitis	Acute Appendicitis
6	992877	56	F	P	P	P	P	P	N	P	N	P	N	P	N	P	10.5	6	Acute Appendicitis	Acute Appendicitis
7	998361	42	M	P	P	P	P	P	N	P	P	N	P	N	N	P	10.5	8	Acute Appendicitis	Acute Appendicitis
8	999032	29	M	P	N	N	N	N	P	N	N	P	N	P	N	N	7	1	Acute Appendicitis	Chronic Appendicitis
9	9933380	30	F	P	N	N	P	P	N	N	P	P	P	N	N	P	11	4	Acute Appendicitis	Acute Appendicitis
10	994350	54	M	P	P	P	P	P	N	P	N	N	N	P	N	P	9	6	Acute Appendicitis	Acute Appendicitis
11	994345	22	M	P	P	N	P	N	P	N	P	N	N	P	N	N	7.5	5	Acute Appendicitis	Acute Appendicitis
12	994713	36	M	P	N	N	P	P	N	N	N	P	P	N	P	P	10.5	2	Acute Appendicitis	Acute Appendicitis
13	997400	42	M	P	N	P	P	N	P	P	N	N	N	P	N	P	8.5	5	Acute Appendicitis	Acute Appendicitis
14	997431	38	M	P	P	N	N	P	P	N	P	P	N	P	N	P	11.5	5	Acute Appendicitis	Acute Appendicitis
15	998602	28	F	P	N	N	N	P	P	N	N	P	P	N	P	P	10	2	Acute Appendicitis	Acute Appendicitis
16	999204	18	M	P	P	P	P	P	P	P	P	P	P	N	N	N	12	9	Acute Appendicitis	Acute Appendicitis
17	995438	50	M	P	N	P	N	P	N	P	P	N	N	P	N	P	8.5	6	Acute Appendicitis	Acute Appendicitis
18	997262	46	M	P	N	P	N	P	P	P	N	N	P	N	N	P	9	5	Acute Appendicitis	Acute Appendicitis
19	998105	35	F	P	N	P	N	P	P	P	P	N	N	P	N	P	9.5	7	Acute Appendicitis	Acute Appendicitis
20	1000940	27	F	P	N	P	N	P	N	P	N	P	P	N	N	P	10	4	Acute Appendicitis	Acute Appendicitis
21	1002044	19	M	P	N	N	N	P	N	N	N	P	P	N	N	P	9.5	1	Acute Appendicitis	Acute Appendicitis
22	1002965	53	M	P	P	P	N	N	P	P	P	N	N	P	N	P	9	7	Acute Appendicitis	Acute Appendicitis
23	1014810	26	M	P	P	N	P	P	N	N	N	N	N	P	P	N	5.5	3	Acute Appendicitis	Chronic Appendicitis
24	1000252	21	M	P	P	P	P	P	P	P	P	P	P	N	N	P	14	9	Acute Appendicitis	Acute Appendicitis
25	1002551	59	M	P	N	P	P	N	P	P	P	P	N	P	N	P	11.5	7	Acute Appendicitis	Acute Appendicitis
26	1005009	39	M	P	N	N	N	N	P	N	N	N	N	P	N	P	7	1	Acute Appendicitis	Chronic Appendicitis
27	1005429	42	M	P	P	N	N	P	P	N	P	P	P	N	N	N	9.5	5	Acute Appendicitis	Acute Appendicitis
28	1013285	26	M	P	N	N	N	P	N	N	N	N	N	P	N	N	5	1	Acute Appendicitis	Acute Appendicitis
29	1015506	38	F	P	N	N	N	P	P	N	P	P	P	N	N	P	11	4	Acute Appendicitis	Acute Appendicitis
30	1020515	31	F	P	P	P	N	P	N	P	N	N	P	N	N	N	6.5	5	Acute Appendicitis	Chronic Appendicitis
31	1022664	78	M	P	P	P	P	P	N	P	P	P	N	P	N	P	12	8	Acute Appendicitis	Acute Appendicitis
32	1023477	34	M	P	N	P	P	N	N	P	N	N	P	N	N	P	8.5	4	Acute Appendicitis	Acute Appendicitis
33	1024261	45	M	P	P	N	P	P	N	N	P	P	P	N	N	P	11.5	5	Acute Appendicitis	Acute Appendicitis
34	1024890	84	M	P	P	N	P	P	N	N	P	N	P	N	N	N	7.5	5	Acute Appendicitis	Acute Appendicitis
35	1024864	20	F	P	N	N	N	P	P	N	N	N	N	P	N	P	7.5	2	Acute Appendicitis	Acute Appendicitis
36	1029072	38	F	P	N	N	N	N	P	N	P	P	P	N	P	P	9	3	Acute Appendicitis	Acute Appendicitis
37	1030346	42	M	P	P	N	N	P	N	N	N	N	N	P	N	P	7.5	2	Acute Appendicitis	Acute Appendicitis
38	1031032	18	M	P	P	P	N	N	N	P	P	N	N	P	N	N	7	6	Acute Appendicitis	Chronic Appendicitis

S.NO	IPD NO	Age	Sex	Pain in RIF	Migratory Pain in RIF	Tenderness in RIF	Anorexia	Fever	Nausea/Vomiting	Rebound Tenderness	Raised TLC	Abdominal Guarding	Symptoms<48 hrs	Symptoms>48 hrs	Urinalysis	Rovsing sign	RIPASA Score	MAS	Clinical Diagnosis	Histopathology Report
39	1033202	76	F	P	N	P	N	P	N	P	P	N	P	N	N	N	6	6	Acute Appendicitis	Acute Appendicitis
40	1035017	35	F	P	P	P	N	N	P	P	P	P	P	N	P	P	10.5	7	Acute Appendicitis	Acute Appendicitis
41	1035057	28	F	P	P	P	P	P	P	P	N	N	P	N	N	P	10.5	8	Acute Appendicitis	Acute Appendicitis
42	1001005	36	M	P	N	N	P	P	P	N	P	P	N	P	N	P	12	5	Acute Appendicitis	Acute Appendicitis
43	10131136	23	F	P	N	N	P	P	P	N	N	N	P	N	N	P	9	3	Acute Appendicitis	Acute Appendicitis
44	1033656	41	M	P	N	N	P	P	N	N	P	P	P	N	N	N	9	4	Acute Appendicitis	Acute Appendicitis
45	1034336	35	M	P	N	N	P	P	P	N	P	N	N	P	N	N	8	5	Acute Appendicitis	Acute Appendicitis
46	1001192	32	M	P	N	N	P	N	N	N	N	N	P	N	N	P	7	1	Acute Appendicitis	Chronic Appendicitis
47	1002498	29	M	P	P	N	P	P	N	N	P	N	P	N	N	N	8	5	Acute Appendicitis	Acute Appendicitis
48	1005525	62	F	P	P	N	P	P	N	N	N	P	N	P	N	N	7.5	3	Acute Appendicitis	Acute Appendicitis
49	1006420	29	F	P	P	N	P	N	N	N	P	N	P	N	P	P	7.5	4	Acute Appendicitis	Acute Appendicitis
50	1003264	35	M	P	N	N	N	N	P	N	P	N	N	P	N	N	6	3	Acute Appendicitis	Acute Appendicitis
51	1010832	39	M	P	N	N	N	P	N	N	N	P	P	N	N	P	9.5	1	Acute Appendicitis	Acute Appendicitis
52	1016460	27	M	P	N	N	N	N	N	N	N	N	P	N	P	N	3.5	0	Acute Appendicitis	Chronic Appendicitis
53	1026099	33	M	P	N	P	N	P	P	P	N	N	N	P	P	N	6	5	Acute Appendicitis	Acute Appendicitis
54	1035308	20	F	P	N	P	P	P	P	P	N	N	P	N	N	P	10	6	Acute Appendicitis	Acute Appendicitis
55	1001526	69	M	P	N	P	N	P	N	P	P	P	N	P	N	P	10.5	6	Acute Appendicitis	Acute Appendicitis
56	1002737	28	F	P	P	P	N	P	N	P	P	P	P	N	N	N	9.5	7	Acute Appendicitis	Acute Appendicitis
57	1004186	34	M	P	P	N	P	N	P	N	N	N	P	N	N	P	9	3	Acute Appendicitis	Acute Appendicitis
58	1015673	49	F	P	P	N	N	N	N	N	P	N	N	P	N	N	4.5	3	Acute Appendicitis	Chronic Appendicitis
59	1023689	19	M	P	N	N	P	P	P	N	P	P	P	N	P	N	9.5	5	Acute Appendicitis	Acute Appendicitis
60	1023778	36	M	P	N	N	N	P	N	N	N	N	P	N	N	P	7.5	1	Acute Appendicitis	Acute Appendicitis