

## EFFICACY OF CLINICAL SCORING SYSTEM IN DIAGNOSING ACUTE APPENDICITIS

K. Sri Charan<sup>1</sup>, I. Anil Kumar<sup>2</sup>, M. Narasimha Raju<sup>3</sup>, V. Hari Krishna<sup>4</sup>

### HOW TO CITE THIS ARTICLE:

K. Sri Charan, I. Anil Kumar, M. Narasimha Raju, V. Hari Krishna. "Efficacy of Clinical Scoring System in Diagnosing Acute Appendicitis". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 20, May 18, 2015; Page: 2982-2991.

**ABSTRACT:** Emergency procedures in the medical fraternity are a challenge in current day scenario. Most commonly sought after surgical emergency procedure is Appendectomy. Over the decades of evolvement in surgical procedures much advancement has occurred in aspects of surgical techniques and materials, but the fairer part is actual diagnosis and confirmation which has not been given a keen look into area. This current article gives an insight into diagnosing Acute appendicitis with a scoring system. The detailed study of the wide array of cases at KIMS General Hospital, Amalapuram tells us that age factor is not significant parameter for acute appendicitis. The few predisposing causes considered by us for the effect of acute appendicitis has helped in evaluating and elucidating the score system based upon symptoms, Signs and Investigational reports. The analysis of 15 cases in detail comprising various facts of Appendicitis has formed the basis for inclusion and exclusion criteria method for the current study in aspects of Sex incidence, Clinical features, Ultrasonography (USG) findings, and Age prevalence. The scoring system gives a significant conclusion as more accurate and efficacy procedure in the diagnosis along with also being economically viable for the patient avail benefit aspect. Hence, this clinical scoring system is an effective method for diagnosing the appendicitis. And also prevented negative appendectomy rate, by earlier and precise diagnosing which eventually lowers the mortality due to timely intervention.

**KEYWORDS:** Appendicitis, Alvarado Score, Appendix, Ileo-Caecal region.

**INTRODUCTION:** Acute appendicitis is a fore most common acute abdominal emergency. Appendectomy for acute appendicitis is the commonest emergency surgical operation performed at most of the health care facilities available. It is a universal disease. Acute appendicitis has no discrimination of age, sex, nationality and religion.

The history of Ac. Appendicitis is as old as the history of our civilization but the first appendectomy was performed in 1736 by Claudius Amyand. It was removed from a hernial sac of a boy. But Lawson Tait was the first person to perform deliberate appendectomy for acute appendicitis in May, 1880.

Various aspects of acute appendicitis have been briefly reviewed in this article and a statistical review of 120 cases of acute appendicitis managed in Konaseema Institute of Medical Sciences General Hospital, Amalapuram are presented. A detailed study of 15 cases of acute appendicitis diagnosed clinically and managed is also presented.

Since a decade, no remarkable advances have been made, but there have been improvements in technique and materials, better understanding of pathology and diagnosis,

# ORIGINAL ARTICLE

---

relative reduction of mortality rate with the improvements in anaesthesia and availability of many antibiotics.<sup>(1,2,3,4)</sup>

## **AIM:**

1. To prove the efficacy of Alvarado score in diagnosing Acute appendicitis.
2. To prevent negative appendicectomy rate by using this clinical scoring method.

**HISTORICAL ASPECTS:** Recognition of appendix as an anatomical structure dates back to early Egyptian times, who referred to it as "worm of the bowel but observation on physiology seldom appeared before 1800".

Other uses of Appendix are used for Ureteric reconstruction and for Retrograde enemas.

**ANATOMY:** It is a narrow worm shaped tube which arises from the posteromedial wall of the caecum, below the terminal part of the ileum. Mc Burney marked the base of the appendix, opposite the junction of the lateral and middle thirds of the line joining anterior superior iliac spine to the umbilicus (Spino-umbilical line).

The three taeniae coli of the ascending colon and caecum converge on to the base of the appendix.

**DEVELOPMENT:** During fifth week of intrauterine life, a small diverticulum appears on the caudal limb of U-loop of the digestive tube from primitive gut. It is later differentiated into caecum and vermiform appendix. Until the fifth month this diverticulum has a conical outline, but from that time onwards its distal part remains rudimentary and this forms vermiform appendix.

At birth the vermiform appendix is from the apex of caecum. But due to the unequal growth in the walls of caecum, as the caecum begins to expand the lateral part of the wall grows more rapidly. The appendix subsequently comes to open on the medial side of the caecum.

**POSITION:** The vermiform appendix is the only organ in the body, which has no fixed position. It may occupy one of several positions. The symptomatology and the complications may vary depending upon the position of the appendix. So it is very important to know various positions.

**MESOAPPENDIX:** It springs from the lower surface of the mesentery of the ileum. It connects the appendix to the through mesentery. This fold is more or less triangular in shape. Sometimes the distal third or appendix is without meso-appendix. In childhood the meso-appendix is so transparent that the contained blood vessels can be seen. In many adults it becomes laden with fat, which obscures these vessels. In the layers of mesoappendix vessels, nerves, lymph vessels of the appendix and inconstant lymph node can be seen.

**VASCULAR SUPPLY:** In view of its rich blood supply and histological differentiation the appendix is probably more correctly regarded as a specialized than as a degenerative, vestigial structure. Appendicular artery arises from ileocolic or from its iliac branch or rarely from anterior or from posterior caecal arteries or both. They are end arteries. It passes behind the terminal

# ORIGINAL ARTICLE

---

ileum to enter the meso appendix, short distance from the base of appendix. It gives a recurrent branch, which anastomose with the posterior caecal artery. It then comes to lie in the meso-appendix. The terminal part of the artery however lies actually on the wall of the appendix and may become thrombosed in the inflammation of the appendix resulting in the gangrene of the distal part of the appendix.

An accessory appendicular artery is present in nearly 50% of cases it is described by Dr. T. Seshachalam that it arises from a branch of the posterior caecal artery, and hence, when present requires a separate ligation during appendicectomy.

**LYMPHATIC DRAINAGE:** Appendix contains abundant lymphoid tissue. So it is called "Abdominal Tonsil". From the body and the tip of the vermiform appendix about 8 to 15 vessels ascend between the layers of its mesentery, one or two being interrupted in to the lymph nodes, which lie in this peritoneal fold. They unite to form 3 or 4 vessels, which drain partly into the lower and partly into the upper lymph nodes of the ileocolic chain. The vessels from the root of the appendix and from the caecum, comprise anterior and a posterior group. The anterior vessels pass in front of the caecum and end in the anterior ileocolic lymph nodes and in upper and lower lymph nodes of the ileocolic chain. The posterior vessels ascend over the back of the caecum and terminate in posterior ileocolic lymph nodes and lower lymph nodes of the ileocolic chain.

**NERVE SUPPLY:** Sympathetic comes from superior mesenteric plexus and parasympathetic from vagus. Because of the same nervous distribution of small bowel, pain is felt at the epigastrium or umbilicus in appendicitis (T 10).

**PHYSIOLOGY:** The vermiform appendix in humans does not perform any known special function. But still it is uncertain about its function. The abundant lymphoid tissue in the appendix acts as a first line of defence against intestinal bacteria. It secretes mucus, which is passed into the caecum. If appendicular obstruction is present, the lumen gets distended with mucus. This results in Mucocoele. Where mucus is absorbed in the appendix and inspissation of contents may occur and excess absorption of water will take place (Bursa of Fabricus).

Because of the rich presence of lymphoid tissue in the appendix, it is supposed to take part in "immunology" this is still under process of study.

**AETIOLOGY OF ACUTE APPENDICITIS:** Although appendicitis is such a common disease, its exact aetiology still remains obscure. Several predisposing factors and determining causes were put forth.

## **PREDISPOSING CAUSES:**

- **Age:** No age is exempt but the commonest age is between 10 and 30 years, probably to the abundance of lymphoid tissue and vessels at that appendix at that age and their readiness to become infected.
- **Sex:** More in males than females.

# ORIGINAL ARTICLE

---

- **Race and civilization:** It is established that this disease is less common in primitive people than in civilized races. It is common in highly civilized countries and urban communities.
- **Geographical:** It is more frequent in U.S.A. than other countries.
- **Diet:** The use of high protein diet with low residual or departure from simple diet rich in cellulose to one rich in meat is significant in causing appendicitis.
- **Familial susceptibility:** May be accounted for by the hereditary malformation of the organ eg. Long retrocaecal appendices in the whole family.
- **Occupation:** People with sedentary habits are more prone than those who lead active life.
- **Anatomical position of appendix:** Mal positions, kinks, twists due to adhesions etc., may predispose to infection.
- **Bowel habit:** Stasis of caecal contents, poor or incoordinated caecal function produces retrograde passage of faecal matter into lumen and obstruction.
- **Trauma:** A blow on abdomen may cause a concretion to move completely in to the appendix or force the faecal matter at the base of appendix into the lumen.
- **Malignancy:** Carcinoid and adenocarcinoma occasionally obstruct the lumen of the appendix.
- **Parasites:** Worms, commonly oxyuria vermicularis and other intestinal parasites eg. Round worms, Entamoebahistolytica may injure the mucosa or block the lumen.
- **Barium:** In the course of barium meal studies it may get inspissated in lumen of appendix causing appendicitis.

**Determining causes:** The two important factors are obstruction and infection. Both together produce appendicitis but infection without obstruction cannot produce much inflammation usually. All gangrenous specimens showed obstruction of lumen, but in only 70% of acute suppurative appendicitis was obstruction demonstrable. Experimental studies by Wangenstein Dennis show that obstruction of lumen of normal appendix resulted in elevation of intraluminal pressure, leading to destruction of mucosa, ischaemic necrosis and acute suppurative appendicitis by invasion of bacteria from the lumen and gut. Gangrene may be precipitated in the presence of obstruction and infection.

## CAUSES OF OBSTRUCTION:

- Intraluminal - Faecolith; Foreign body; Parasites.
- Intramural - Inflammation; Carcinoid tumour; Stricture.
- Extramural - Adhesions and Kinks.
- Acute inflammation of the appendix may take a variety of forms catarrhal form – It may be mild with correspondingly mild symptoms.
- Chronic appendicitis – A patient may suffer from succession of mild attacks.
- Acute suppurative appendicitis – The inflammation is severe and purulent.
- In gangrenous appendicitis – gangrene may be present particularly when there is an element of obstruction.

# ORIGINAL ARTICLE

---

These descriptive names have been applied to the acutely inflamed appendix removed at operation. But these need not be detailed if it is remembered that the inflammation is suppurative one caused by pyrogenic bacteria and precipitated or aggravated by the element of obstruction. The infection seems to begin at the bottom of one of the crypts where a small focus of suppuration is formed in the mucosa. The organisms apparently do not spread readily through mucosa, because that coat may be apparently normal apart from one or two points of abscess formation although the rest of appendix is acutely inflamed. The spread takes place in the loose submucosa and from there through the muscularis along the line of penetrating vessels to the subserous coat where it again becomes diffuse. So at this stage in looking for evidence of inflammation, the sub mucosa and subserosa should be looked at. By the time the appendix is removed, the muscularis and peritoneal surface are also inflamed.

The appendix is swollen and elongated, bright red in colour with dilated sub peritoneal vessels and a fibrinous or purulent exudates on the surface. There may be yellow spots on the surface indicating the beginning of an abscess. The tip is usually swollen and the whole process is more marked in the distal than in the proximal part. When the appendix is opened the mucosa is seen to be swollen and very congested. The surface is granular or warty. Superficial erosions are common. The lumen may be narrowed due to swelling of mucosa but if that layer is destroyed it may be dilated and filled with pus.

Diagnosis of acute appendicitis is usually easy. Because of the frequency of the condition, some do not trouble to attempt a differential diagnosis. Careful history taking and clinical examination avoids many errors in diagnosis. The typical case is with central or generalized abdominal pain followed by vomiting and succeeded by pain localized to right iliac fossa. When tenderness and sometimes rigidity of the overlying muscles, if carefully made out even in the absence of fever, the diagnosis is almost certain.

## **The problems arise only in:**

1. Atypical cases,
2. Early stages of abdominal pain,
3. Children, Old and Pregnant women.
4. Advanced stages of inflammation or complications.

Only acute abdomen can be made out in those conditions. So, as in all other acute abdominal emergencies, the temperature, pulse, respirations and blood pressure should be recorded at frequent intervals. Repeated examination of the patient at intervals give a definite indication when surgical interference is necessary; the evidence of appendicitis gained from patient's history that pain has localised in the right iliac fossa is correlated by surgeon's examination. Cardiovascular and respiratory systems should be examined thoroughly to exclude a number of conditions. In addition to clinical examination, a few investigations may occasionally help to confirm the diagnosis.<sup>(5)</sup>

# ORIGINAL ARTICLE

---

## ALVARADO SCORING SYSTEM

Symptoms	Score
Migratory RIF Pain	1
Anorexia	1
Nausea/Vomiting	1
Signs	
RIF tenderness	2
Rebound tenderness	1
Increase in Temperature	1
Lab findings	
<u>Leucocytosis</u>	2
Shift to the left	1
=====	
TOTAL	10
=====	

1-4	Appendicitis unlikely
5-6	Appendicitis possible
7-8	Appendicitis probable
9-10	Appendicitis definitive

**MATERIAL & METHODS:** Reports of 15 cases of Acute appendicitis are presented in detail. In all cases full history and detailed clinical examination and relevant laboratory investigations are done.

The study comprises of various facts of Acute appendicitis in reference to Alvarado scoring.

120 cases of Acute Appendicitis in which emergency Appendicectomy was done have been statistically analysed and the figures compared from several statistical literature wherever possible.

### INCLUSION CRITERIA:

- Patients who presented with migrating RIF pain.
- Both Male and Female patients are included.
- All age groups are included.
- It includes 120 cases.

### EXCLUSION CRITERIA:

- Patients presenting with appendicular mass
- Patients who underwent elective & interval appendicectomy

A statistical analysis of 120 cases of acute appendicitis treated at KIMS General Hospital, Amalapuram is presented.

# ORIGINAL ARTICLE

**AGE INCIDENCE:** The youngest patient in whom acute appendicitis occurred was 7 years old. He presented with acute appendicitis with peritonitis, appendicular perforation was noted on opening the abdomen. Appendicectomy and peritoneal toilet was done which cured the disease. Oldest patient in whom acute appendicitis occurred was 70 years, presented with acute appendicitis and surgery was done.

## TOTAL CASES: 120

Age group	No. of cases	Percentage
0 – 10 years	05	04%
11 – 20 years	50	42%
21 – 30 years	30	25%
31 – 40 years	20	16%
41 and above	15	13%
<b>TOTAL</b>	<b>120</b>	<b>100%</b>

Table 1

If we consider the age range of 11-40 years nearly 85% of cases are reported in this age range. Hence acute appendicitis is less common in both extremes of age. Age Distribution of 120 patients with Acute Appendicitis

## SEX INCIDENCE:

Males	84 70%
Females	36 30%

The male, female ratio is (2.3: 1). The age and sex incidence are highly consistent with the several published reports from India and others (Dhawan 1962 etc.)

The average duration from the onset of symptoms to the time of admission ranges from 1 hour to 6 days. 45 cases reported within 10 hours, 38 cases within 24 hours, 25 cases within 48 hours and 12 cases after 48 hours. Those who are local people and residents of Amalapuram reported early, rural people took from moderate delay and slightly long time to report. Illiteracy, lack of proper transport facilities and treatment by quack medical practitioners are also the few additional factors responsible for delay in reporting.

**CLINICAL FEATURES:** Symptoms prevalence among the cases operated.

Symptoms	No. of cases	Percentage
Pain in the RIF	120	100%
Vomiting	93	77%
Fever	35	29%
Constipation	20	16%

# ORIGINAL ARTICLE

Diarrhoea & dysentery	08	6%
Symptoms of urinary tract infection	10	8%
Leucorrhoea	08	6%

Table 2

**ULTRASONOGRAPHY:** All the cases are subjected to ultrasonography and high frequency probe was used in most of the cases.<sup>(6,7,8)</sup>

USG Findings	No. of patients	Percentage
Visualisation of appendix	40	33
Diameter > 6mm	08	06
Wall thickness >3mm	28	23
Free fluid	05	04
Local adynamic ileus	75	62
Probe tenderness	100	83

Table 3

## ALVARADO SCORING SYSTEM:

Score	No. of cases
1 – 4	24
5 – 6	16
7 – 8	60
9 – 10	20

Table 4

**DISCUSSION:** Acute appendicitis is a very common abdominal emergency. It accounts for 30%-40% of the total emergency surgical operations performed at KIMS General Hospital, Amalapuram. Most of the cases with sudden pain in right iliac fossa are being labeled as acute appendicitis.<sup>(9)</sup> A total of 120 cases diagnosed as acute appendicitis, which were operated. Remaining cases were treated conservatively and some cases done as interval appendicectomy which are not included in our study.

Acute appendicitis is common in young adults, in our study, the male to female ratio is 2.3: 0.1 with 84 male and 36 female. Acute appendicitis is most common in second decade of life with 52% and the median age being 24 years. In the current study discussed here acute appendicitis is most common in second decade of life with 42%. As it is a disease affecting people in the prime of life, hence techniques of management are being advocated to cut down the mortality figures.

The location of pain in most cases was umbilical – 49%, followed by right lower quadrant – 32% and 94.6% lately presented with pain in right iliac fossa. In my study all the patients had

# ORIGINAL ARTICLE

---

pain in RIF with 58% patients having pain initially around the umbilicus and 42% having pain in the lower abdomen. vomiting is noted in 78% of the patients and nausea in 84% of the patients.<sup>(10,1,9,11)</sup> Schwartz reported 75% of the patients presented with vomiting in acute appendicitis. In my study 77% of the patients had vomiting and nausea upon presentation to hospital. In my study, the overall negative appendectomy rate with Alvarado score of 1-4 is 20%.

**SUMMARY AND CONCLUSION:** A detailed study of the cases of acute appendicitis is carried out and presented in this article. It is observed in our study that the age group 20-30 years is commonest for its affliction; acute appendicitis is a disease of young adults.

It is observed that it is more predominantly common in males than in females (2.3:1). And, it is also the commonest emergency surgical operation performed accounting upto 60% of the emergency surgical procedures. It was observed in most of the cases with enlarged & inflamed appendix were showing the score between 7 – 8 & 24 cases showed normal appendix with score 1 – 4.<sup>(5,12,13,14)</sup> Hence Alvarado score was useful to prevent negative appendectomy rate as well as to prove the efficacy of this scoring in diagnosing acute appendicitis.

Alvarado scoring system when combined with ultrasound had prevented further negative appendectomy rate by increasing diagnostic accuracy. It is an economic and significantly inexpensive way of confirming acute appendicitis. Alvarado score <6 leads to 35% negative appendectomy rate & score > 7, the accuracy of the diagnosis is >75%. The earlier the diagnosis, hence lower the mortality due to timely intervention.

## BIBLIOGRAPHY:

1. Salim AS, Ahmed TM. Antibiotic treatment of acute appendicitis – initial observations. Saudi Med J. 2001 Jul; 22(7): 643-4.
2. Wang HT, Sax HC. Incidental appendectomy in the era of managed care and laparoscopy. J Am Coll Surg. 2001 Feb; 192(2): 182-8.
3. Neumann U, Fielitz J, Ehlert HG. Perforation of the cecum by a toothpick- a rare differential acute appendicitis diagnosis. Case report and review of the literature. Chirurg. 2000 Nov; 71(11): 1405-8.
4. Jones PF. Suspected acute appendicitis: trends in management over 30 years. Br J Surg. 2001 Dec; 88(12): 1570-7.
5. Chan MY, Teo BS, Ng BL. The Alvarado score and acute appendicitis. Ann Acad Med Singapore. 2001 Sep; 30(5): 510-2.
6. Coumbaras M, Le Hir P, Jomaah N, Arrive L, Tubiana J. Adductor muscle pyomyositis simulating acute appendicitis: CT and MR imaging findings. J Radiol. 2001 Apr; 82(4): 488-90.
7. Simonovsky V. Detection of diseases mimicking acute appendicitis using ultrasonography. Rozhl Chir. 2001 Sep; 80(9): 480-6.
8. Soda K, Nemoto K, Yoshizawa S, Hiniki T, Shizuya K, Konishi F. Detection of pinpoint tenderness on the appendix under ultrasonography is useful to confirm acute appendicitis. Arch Surg. 2001 Oct; 136(10): 1136-40.

# ORIGINAL ARTICLE

9. Fingerhut A, Yahchouchy-Chouillard E, Etienne JC, Ghiles E. Appendicitis or non-specific pain in the right iliac fossa? Rev Prat.2001 Oct 1; 51(15): 1654-6.
10. Bannister SL, Wong AL, Leung AK. Acute appen dicitis in an incarcerated inguinal hernia. J Natl Med Assoc.2001 Dec; 93(12): 487-9.
11. Kelm C, Ponsel O, Benz AC, Stolte M, Henneking K. Difficult diagnosis: acute appendicitis and appendiceal/cecal carcinoma. Chirurg. 2001 Apr; 72(4): 444-7.
12. Galindo Gallego M, Fadrique B, Neito MA, Calleja S, Fernandez-Acenero G, Ais G et al. Evaluation of ultrasonography and clinical diagnostic scoring in suspected appendicitis. Br J Surg 1998; 85: 37–40.
13. Kalan M, Talbot D, Cunliffe WJ, Rich AJ. Evaluation of the modified Alvarado score in the diagnosis of acute appendicitis: a prospective study. Ann R Coll Surg Engl. 1994 Nov; 76(6): 418–419.
14. Bhattacharjee PK, Chowdhary T, Roy D. "Prospective evaluation of Modified Alvarado score for diagnosis of acute appendicitis" J Indian Med Assoc, May,2002; 100(5): 310-1,314.

## **AUTHORS:**

1. K. Sri Charan
2. I. Anil Kumar
3. M. Narasimha Raju
4. V. Hari Krishna

## **PARTICULARS OF CONTRIBUTORS:**

1. Assistant Professor, Department of General Surgery, Konaseema Institute of Medical Sciences & Research Foundation, Amalapuram.
2. Associate Professor, Department of General Surgery, Konaseema Institute of Medical Sciences & Research Foundation, Amalapuram.
3. Research Scholar, Department of General Surgery, Konaseema Institute of Medical Sciences & Research Foundation, Amalapuram.

4. Associate Professor, Department of General Surgery, Konaseema Institute of Medical Sciences & Research Foundation, Amalapuram.

## **NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:**

Dr. M. Narasimha Raju,  
KIMS & RF; NH-216,  
Chaitanya Nagar,  
Amalapuram-533201,  
Andhra Pradesh.  
E-mail: mandapatis@mail.com

Date of Submission: 03/05/2015.  
Date of Peer Review: 04/05/2015.  
Date of Acceptance: 07/05/2015.  
Date of Publishing: 16/05/2015.