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"Perforated Appendicitis In Children"

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Abstract: Background: *- Many aspects of the management of perforated appendicitis in children remain controversial.* ***PATIENT AND METHOD****: -Prospective study 86 cases of appendicular perforation in children were carried out from Jan.2007 to Feb.2012 at I.G.M.C Nagpur.*
RESULTS: *- Total of 86 children, 34 females and 52 males diagnosed as a perforated appendicitis were studied prospectively. 43 patients were included randomly in both the group, group-1(early appendectomy after 24hours of diagnosis) and group-2 (Interval appendectomy after 6 to 8 week from diagnosis). The maximum number of patients 55.81% was found in the age group of 11 to 14 years. Intraoperative position of appendix was retrocaecal in 36(41.86%) patients, followed by pelvic in 40(46.51%) patients. The maximum overall adverse effects was observed in group-2 than group-1 patients. overall postoperative scar was better in all patients of group-1 than group-2 patients. Average total government hospital charges per patient including medicine and operation was Rs.1000/-in group-1 patients and Rs.2500/- was in group-2 patients. Average total government hospital cost per patient was Rs.3500/- in group-1and Rs.6500/- was seen in group-2 patients after discharge. Hospital stay was below 4 days in 34(79.07%) patients of group-1and in 16(37.20%) patients of group-2.Minimal morbidity with no mortality were observed in present series and 4 (4.65%) patients were lost to follow up ingroup-2.* ***CONCLUSION:*** *- The overall adverse event rate after early appendectomy was significantly lower than that after interval appendectomy. Early appendectomy for perforated appendicitis in children significantly reduced the time away from normal activities, overall adverse event rate, hospital cost and charges.*

I. Introduction: -

Many aspects of the management of perforated appendicitis in children remain controversial. Childhood appendicitis is one of the most common conditions that pediatric general surgeons treat. About one third of appendicitis cases in children younger than 18 involve a perforated or ruptured appendix. That causes fluid to spill into the peritoneal cavity, increasing risk for infection and other complications. With a perforated appendix, the perforation isn't the problem. It's all the spillage that has spread around the peritoneal cavity. Almost all children with a perforated appendix will get better with either treatment but the question is which therapy will let you get better sooner and does one cost more? In 1938, a statement about appendicitis and late diagnosis was made, which is true till today.

We must not, as we might easily do, shift blame to an ignorant laity who will not consult their physician early, but wait until the effects of ice bag, cathartic and time have been tried and the golden opportunity for a simple, safe and easy cure has passed", Caldwell (1938).

In 1887 Thomas Morton performed the first successful appendectomy in the United States. In 1889 Nicholas Senn was one of the first surgeons to diagnose acute appendicitis correctly perform an appendectomy have the patient recover and report the case. In this same year, Charles McBurney described the clinical findings of acute appendicitis, including the point of maximal tenderness, which still bears his name [1].

Laparoscopic appendectomy is an established approach to simple appendicitis also in children. The role of laparoscopic surgery in the treatment of complicated appendicitis has been more controversial. Some investigators have advocated that laparoscopy should not be used in children with complicated disease because of increased postoperative morbidity [2].

Hospital charges for children who had a perforated appendix removed 24 hours after diagnosis were about $10,000 lower than charges for children who had the surgical procedure six to eight weeks later, after first being treated for abdominal infections and contamination from the perforated appendix. Further, hospital costs for the patients who were treated early were approximately $5,000 lower than those who underwent an appendectomy at a later time. One primary reason for the lower costs was that early appendectomy patients had better clinical outcomes and fewer adverse events [3].

Acute appendicitis is clinically challenging surgical disease, particularly difficult to diagnose in children less than 5 years of age. High incidence of perforation in the children is a consequence of delayed diagnosis, difficulty in diagnosis has been ascribed to a variety of coexisting factors, it is difficult for young children to communicate and localize pathology precisely, the presence of a pathological process may render

children irritable and anxious, and this is reflected in the continued high incidence of appendiceal perforation. A perforation rate of 90% for children under 4 years of age was reported by [4].

"For the Paediatic surgeon who sees the child in the hospital, acute appendicitis is like the tiger, when seen behind bars at the zoo. For the pediatrician seeing the child at home, appendicitis is like the tiger lurking in the high grass waiting his chance to strike". This statement was made by author Shaw (1958) which is also true till today.

Thus, the purpose of this prospective study is to look at the features at clinical presentation, management of appendicular perforation and financial factors in children.

II. Patients and Methods:-

A prospective study of 86 patients of appendicular perforation was carried out from Jan.2007 to Feb. 2012 in the department of surgery at I.G.G.M.C, Nagpur. The diagnosis of appendicular perforation was considered by clinical, radiological, ultrasonography and was confirmed by laparotomy. The age of the patients varied between zero and 15 years. This study included 34 females and 52 males. Patients more than 14 years of age, acute appendicitis, and gangrenous appendicitis, appendicular mass or abscess were excluded from the study. Acute appendicitis patient having perforation on laparotomy were included in this study.

A standard management approach was utilized throughout in this study. Patients were operated on promptly as soon as they were stabilized. All patients were started broad spectrum antibiotic coverage with three drug regimes .1) Cefotaxime + Metronidazole + Gentamycin =12 years of age or more. 2) Cefotaxime + Cloxaciline + Metronidazole = 12 year of age or less. Antibiotic were continued for 3 days postoperatively. Right lower Para median incision was undertaken in all the cases. Fluid encountered on entering peritoneal cavity was taken for culture. Abdominal drain was kept into pelvic cavity and brought out through separate stab incision. Drain was removed after 2 or 3 days and nasogastric suction was maintained post operatively until return of normal bowel sounds. Details of complication and hospital cost, charges were recorded and five years follow up were taken.

III. Results:

Total of 86 children, 34 females and 52 males (Fig-1) diagnosed as a perforated appendicitis were studied prospectively. 43 patients were included randomly in both the group, group-1(early appendectomy after 24hours of diagnosis) and group-2 (Interval appendectomy after 6 to 8 week from diagnosis).

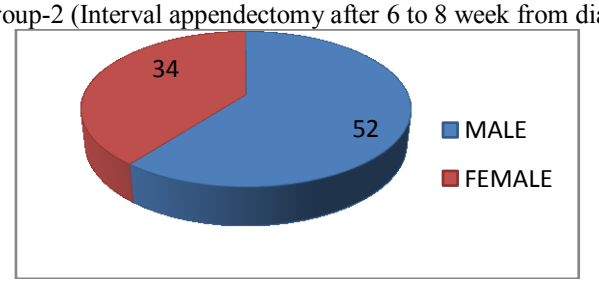

Fig-1] Pia diagram showing Sex incidence

Table -1: Showing incidence of perforation in various age groups.

Age	No. of cases in group-1	No. of cases in group-2	Total
6-10 years	27(62.79%)	11(25.58%)	38(44.19%)
11-14 years	16(37.21%)	32(74.42%)	48(55.81%)
Total	43(50%)	43(50%)	86 (100%)

Above table shows the maximum number of patients 55.81% was found in the age group of 11 to 14 years. The minimum number of patients 25.58% was in group-2 in the age group of 6 to 10 years of age.

Abdominal pain was the single most consistent symptoms observed in all the cases and was associated with vomiting in 36(83.72%) patients of group 1 and in 39(90.70%) patients of group-2. High-grade fever with chills but without rigors was seen in 41(95.35%) patients in group -1 and in 37(86.05%) patients in group-2. In 4 patients of group-2 history of previous attack was also observed in present study. Maximum number of cases 34(39.53%) reported within 12 hours from the onset of pain, 28(32.56%) patients reported up to 24 hours. 24(27.91%) patients reported up to 48 hours from onset of pain prior to onset of surgery in the present study. History of initial site of pain at periumbilical region was present in 32(74.42%) patients in group-1 and in 38(88.37%) patients in group-2, followed by diffuse pain was observed in all the patients.

Tenderness, rigidity and absent bowel sounds were the most commonest sign observed in all the patients. Per rectal examination revealed tenderness in 37(80.05%) patients in group-1 and in 41(95.35%) patients of group-2 patients. On standing radiograph no evidence of gas under diapragm were observed in all the

patients. Ultrasonography of abdomen was suggestive of perforated appendicitis with periappendicular and pelvic collection in 32(74.42%) patients in group-1 and in 39(90.70%) patients in group-2 patients.

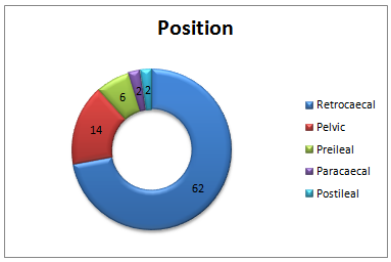

Fig-2] Doughnut showing position of appendix

Intraoperative position (Fig-2) of appendix was retrocaecal in 36(41.86%) patients, followed by pelvic in 40(46.51%) patients and preileal position was observed in 6(6.98%) patients. Paracaecal and postileal position was observed in two patients each. The entire appendicectomy specimen was subjected for histopathology which was suggestive of acute ulcerative pathology.

Table- 2] Complication Rate

Sr.No	Type of complication	No. of patients		Total
		Group-1	Group-2	
1	Wound infection	1(20%)	3(27.27)	4(25%)
2	Residual pelvic abscess	2(40%)	4(36.36%)	6(37.5%)
3	Early postoperative intestinal obstruction	2(40%)	3(27.27%)	5(31.25%)
4	Paralytic ileus	0	1(9.09%)	1(6.25%)
	Total	5(31.25%)	11(68.75%)	16(100%)

From the above table maximum overall adverse effects was observed in group-2 than group-1 patients. Wound infection was seen in 3(27.27) patients, Residual pelvic abscess in 4(36.36%) patients which was drained per rectally and early postoperative intestinal obstruction in 3(27.27%) patients of group-2 which was managed conservatively.

As per Government of Maharashtra resolution 2010 following are Government Medical College rates which excludes sister, doctor, attendant and suture material charges.

TABLE-3] HOSPITAL CHARGES PER PATIENT.

Parameters	**Rates per patient**
Ultrasonography abdomen	Rs.100/-
X-Ray abdomen	Rs.75/-
PS	Rs.35/-
Hb%	Rs.30/-
KFT	Rs.80/-
LFT	Rs.150/-
Lipid profile	Rs.200/-
CBC	Rs.50/-
Hospital bed charge	Rs.20/- for general ward
	Rs.150/- for paying ward
CT Abdomen	Rs.300/-
Minor operation	Rs.300/-
Major operation	Rs.500/-

Table-4) showing surgical outcome, cost and hospital charges.

Sr. no	Outcome	No. of patients	
		Group-1	Group-2
1	Postoperative Scar	Invisible scar in 34 patients and linear visible scar in 09	Linear visible scar in 32 patients, keloid in 5 patients and hypertrophic in 06 patients.
2	Average total government hospital charges per patient including medicine/operation.	Rs.1000/-	Rs.2500/-
3	Average total government hospital cost per patient after discharge	Rs.3500/-	Rs.6500/-
4	Average time away from normal activities	12.9 days	20.6 days

From the above table overall postoperative scar was better in all patients of group-1 than group-2 patients. Average total government hospital charges per patient including medicine and operation was Rs.1000/-in group-1 patients and Rs.2500/- was in group-2 patients. Average total government hospital cost per patient was Rs.3500/- in group-1and Rs.6500/- was seen in group-2 patients after discharge.

Hospital stay was below 4 days in 34(79.07%) patients of group-1and in 16(37.20%) patients of group-2 , it was up to 10 days and more in 9(20.93%) patients of group-1 and in 27(62.79%) patients of group-2.Four patients of group-2 were lost to follow up and there was no death in the present study**.**

IV. Discussion: -

Acute appendicitis which can precede a perforated appendix disproportionately affects young people ages 10 to 19. However, the condition is more likely to progress to a perforation in children younger than age 4, according to previous research findings. It is estimated that approximately 77,000 children are hospitalized for appendicitis and similar conditions each year and one third of them will have a perforation before having an appendectomy as reported by the author [5]. The risk of perforation is highest in the first 4 years of life and was reported in more than 70% of children in this age group. By comparison, the rate of perforation in adolescents is 10-20% reported by the authors [15, 16].

In the present study no patient was found less than 5 years of age in either group. Appendicitis is uncommon in children younger than 5 years of age and extremely rare in infants younger than 6 month of age was observed by other authors [4, 6, 7, 8, 12, 15, 25]. In children below 10 years of age there is wide communication of appendix with caecum, such a configuration of appendix in this age makes obstruction of lumen unlikely. Males outnumbered females by a ratio of 1.47:1 in the present study. This male preponderance was also noted by other authors [6, 8, 9, 12, 15, 25, 28, 29, 30, 31, 32, 34] .The high incidence in male is probably because males are more exposed to environmental and dietary changes than females.

The highest age incidence was found in 11-14 years of age group in present study, it could be explained on the basis that the growth of lymphoid tissue is at its peak during this period. Lymphoid tissue first appears in the human appendix about 2 weeks after birth, the number of lymphoid follicles gradually increases to a peak of about 200 between the age of 12 and 20 years. Hypertrophy of this lymphoid follicle is one of the preceding factors for obstructive appendicitis and causes thrombosis of branches of appendicular artery leads to appendicular perforation.

The symptoms of appendicitis can vary according to a child's age. In kids 2 years old or younger, the most common symptoms are vomiting and a bloated or swollen abdomen, accompanied by pain [7]. The medical records of children aged 17 years or younger with a postoperative diagnosis of acute appendicitis were retrospectively reviewed. The patients were divided into with and without ruptured appendicitis. Of the 228 patients, 140 had a postoperative pathological diagnosis of a nonperforated appendix, and 88 had a diagnosis of perforated appendix, resulting in a perforation rate of 38.6%. Younger age, longer duration of abdominal pain, fever, muscle guarding, and elevated C-reactive protein level were significantly associated with a perforated appendix as observed by the author [10]. Pain was the consistent symptom present in all the cases. Pain was associated with vomiting and fever, fever was above 102˚f and associated with chills but without rigor in perforated appendicitis, similar findings were also observed by other authors [4, 6, 8, 25, 33, 34]. Diarrhea was observed in 14(11.27%) cases. Dehydration and distention of abdomen was a constant feature of perforated appendicitis present in all the cases, similar finding was also observed by different author [6, 8, 9, 12, 15, 25, 34].

In neonates (from birth to 30 days old) abdominal distention and vomiting are frequently noted, often with irritability and lethargy. In most infants (< 2 years old), vomiting, pain and fever are present and diarrhea is not uncommon as observed by the various authors [11, 12, 15]. Irritability, grunting respiration and right hip complaints were also described. Vomiting is often the first symptom noted in preschool children (2-5 years old) frequently followed by abdominal pain as observed by [13]. Fever is also present inmost, but not all patients. Anorexia frequently occurs. Most children have symptoms for at least 2 days prior to a diagnosis [8]. In school-aged children (6-12 years), abdominal pain and vomiting are present, but often without the typical migration of periumbilical pain to the right lower quadrant. Other prominent symptoms include fever, anorexia and pain with movement [14]. Diarrhea, constipation and dysuria are less frequent, but occur often enough to potentially confuse the diagnosis. In adolescents (13 years and older), the clinical features of appendicitis are similar to those in adults and include anorexia, right lower quadrant abdominal pain and vomiting. The onset of pain typically occurs before vomiting and is a sensitive indicator of appendicitis as reported by the author [15].

Ultrasonography of abdomen was suggestive of tenderness at Mc.Burny point with noncompressible appendix along with free fluid in peritoneal cavity in 32(74.42%) patients in group-1 and in 39(90.70%) patients in group-2 patients. Ultrasonography of abdomen is a fast 70% sensitive and 80% specific in clinically equivocal cases as observed by[13].

Out of 131 patients younger than 18 years with a preoperative diagnosis of perforated appendicitis early appendectomy compared with interval appendectomy significantly reduced the time away from normal activities (mean, 13.8 vs. 19.4 days; P < .001). The overall adverse event rate was 30% for early appendectomy vs. 55% for interval appendectomy (relative risk with interval appendectomy, 1.86; 95% confidence interval, 1.21-2.87; P = .003). Of the patients randomized to interval appendectomy, 23 (34%) had an appendectomy earlier than planned owing to failure to improve (n = 17), recurrent appendicitis (n = 5), or other reasons (n = 1) was observed by the author [16].

Reviewed the medical records of children admitted to their hospital over a 5 year period with the diagnosis of perforated appendicitis. Patients were divided into two groups based on the operative approach: laparoscopic vs. open appendectomy. There was no difference between the laparoscopic (n = 43) and open (n = 77) groups with respect to gender, duration of presenting symptoms, initial WBC or length of stay. However, patients in the laparoscopic group had a significantly lower complication rate than those in the open group (6/43 vs. 23/77, P = 0.05). Infectious complications were no different between groups. Patients in the laparoscopic group tended to be older than patients in the open group (10.6 +/- 3.3 years vs. 8.5 +/- 4.1 years, P = 0.003). Laparoscopic appendectomy for children with perforated appendicitis has the same infectious complication rate and a lower overall complication rate than open appendectomy was observed by the author [17].

The outcomes of 25 children with complicated appendicitis, 13 in the laparoscopic group and 12 in the open appendectomy group were analyzed. Children, their parents and research nurses were blinded to which procedure had been performed and remained blinded until the control visit 7 days after the operation. All 25 children completed a 30 day follow up. There were no differences in terms of patient age, sex, weight, height and appendiceal histology between the 2 groups. All laparoscopic procedures were completed without conversion. The mean (SD) operating time was 63 (31) minutes in the laparoscopic group and 37 (18) minutes in the open appendectomy group (mean difference 26 minutes, 95% CI 5 to 47 minutes, P .02). There were 2 major complications in the laparoscopic group in children with appendiceal masses. One child had an enterocutaneous fistula of the residual appendiceal tip that needed open reoperation. Another child had a pelvic abscess that resolved with antibiotic treatment. Superficial wound infections were encountered in 2 patients in the open appendectomy group as observed by the author [2].

A retrospective review was conducted of all children with perforated appendicitis undergoing Laparoscopic appendicectomy at one institution during a five year period. Laparoscopic appendicectomy was completed in 49 children with perforated appendicitis evident at operation and confirmed on histopathology. Nine children (18%) developed some type of complication: six (12%) developed an intra-abdominal abscess that required drainage; two (4%) required readmission and intravenous antibiotics to treat a phlegmon; and one child (2%) developed a small bowel obstruction that required surgical intervention and adhesiolysis. Preoperative duration of symptoms, operative appearance and operative time did not affect the rate of complications. Length of antibiotic use and the experience of the surgeon seem to influence the rate of complications as observed by the author [18].

Out of 247 patients, 98 Acute Appendicitis (40%), 53 Ruptured Appendicitis (21%) and 97 not appendicitis (39%).Median age was 10 years old. The overall accuracy of the pediatric surgeon's preoperative diagnosis was 92%. Sensitivity and specificity for the diagnosis of RA were 96% and 83% respectively. Multivariable regression analysis identified generalized tenderness on examination, duration of symptoms longer than 48 hours, WBC - 19,400 cells/L, abscess and fecalith on CT scan as independent predictors for RA. A novel scoring system was developed with these variables and when applied to the study population, the specificity for the diagnosis of RA improved to 98% as observed by the author [19].

A randomized 131 pediatric appendicitis patients was divided into two groups. One group was assigned to receive an early operation after diagnosis of perforated appendicitis, while the other would undergo the procedure up to eight weeks after diagnosis. The five participating surgeons performed the appendectomy according to the patient's randomization group. Each participating child's resource usage and cost data, including labor costs, supplies, facility services and patient support services (i.e. nutrition, social work and family support) were then collected and analyzed. Analyses also included administrative and overhead costs, such as medical records management, information technology, admissions, and billing procedures. Patients who underwent the later appendectomy (interval appendectomy) received more medical interventions than those who had the early appendectomy. Later appendectomy patients stayed in the hospital two days longer, and 87 percent received a central venous catheter, compared with only 44 percent of patients who had the early operation. Of all patients who received catheters, 43 percent of later appendectomy patients were discharged with it, compared with only 9 percent of early appendectomy patients by [16].

The first study considered which treatment allowed a child to return to "normal activities" more quickly. Results showed early appendectomy was favorable, allowing normal activities to resume six days sooner. The second study, published in the April paper, examined if either treatment was more cost effective than the other. The cost analysis involved 131 patients who were randomized to receive one of the two treatments at a

Memphis hospital. Interval therapy showed to have significantly higher costs, which were primarily associated with an increase in adverse events such as wound infections, bowel obstruction and unplanned readmissions [20].

Hospital charges for children who had a perforated appendix removed 24 hours after diagnosis were about Rs. 1000/- lower than charges for children who had the surgical procedure six to eight weeks later after first being treated for abdominal infections and contamination from the perforated appendix. Further, hospital costs for the patients who were treated early were approximately Rs.3500/- lower than those who underwent an appendectomy at a later time. One primary reason for the lower costs was that early appendectomy patients had better clinical outcomes and fewer adverse events in the present study.

Dr. Blakely said the biggest contributor to higher costs of delaying the operation was the increased likelihood of delayed appendectomy patients having an adverse event, such as an intra abdominal abscess or an intestinal blockage. These adverse events led to emergency room visits and unplanned readmissions, more than doubled hospital charges and costs. The authors found that 30 percent of the early appendectomy patients had an adverse event, compared with 55 percent of those who had the operation at a later time.

Out of 131 patients aged under 18 who were diagnosed with a perforated appendix, 64 patients randomly selected for early appendectomy and other 67 patients were randomly assigned to undergo an appendectomy separately, They found that the average time compared to normal activity was less than 14 days for early appendectomy and more than 19 days for interval appendectomy. The overall rate of adverse event was 30% for the first appendectomy and 55% for the range appendectomy. The average length of hospital stay was more than two days less for first appendectomy group. The appendix perforates usually two or three days after the onset of pain which is often before the abdomen in half and then moves to right lower quadrant. They found that those treated with appendectomy return soon to their normal activities on average five days earlier because time away from a child ability to limit normal activities for parents to work [21].

Table-5] Review of perforated appendicitis in children .

Study	No. Of patients	Mean age (years)	Protocol					Infectious complication	
			Triple	Drain	Lavage	Skin	Hospital stay	Wound infections	Abdominal Abscess
David(29)	86	8.9	Yes	+/-	Saline	Closure	12	8.3	4.9
Schwartz(30)	143	9.0	Yes	2	Cephalothin	Closure	12.1	1.4	2.8
Karp(31)	88	9.0	Yes	None	Saline	Closure	11	3.4	1.1
Mackeller(32)	139	?	Yes	None	Saline	Closure	10	1.4	1.4
Samelson(33)	170	9.1	No	None	Saline		11.8	2.4	1.8
Elmore(34)	102	?	Yes	None	Saline	Closure	8	0	1.3
Neilson(22)	117	10.2	Yes	None	Saline	Closure	6.9	1.7	1.7
Fishman(25)	150	7.5	Yes	1	Saline	Closure	9.5	2.7	3.3
Kokoska(26)	279	7.7	Yes	1	Saline	Closure	10	5.8	3.6
Present series	86	7.0	Yes	1	Saline+weak betadine	Closure	7	4.6	4.6

+/- Metronidazole and Cefotaxim or Ampicilline and Gentamycine. Yes= Ampicilline+ Gentamycine +clindamycine

A randomized prospective trial was to compare two management strategies for children with perforated appendicitis in order to determine which was most cost-effective. They had previously conducted a randomized prospective trial of early appendectomy (<24 hours after admission and following fluid resuscitation and antibiotics) versus initial medical management with delayed (interval) appendectomy 6 to 8 weeks after onset in 131 children and suggested that early appendectomy was most cost effective [23].

Out of 285 children with perforated appendicitis, 279 underwent immediate operative treatment. Mean patient age was 7.7 years and there were no deaths. Major postoperative complications included intra-abdominal abscess (n = 17), ileus (n = 7), mechanical intestinal obstruction (n = 6), and wound infection (n = 4). All children who had a postoperative abscess had more than 5 days of symptoms before operation. Within this subgroup, drain placement was associated with not only decreased postoperative abscess formation and but also shorter duration of fever and length of hospitalization. The incidence of mechanical obstruction or ileus was not increased and the rate of wound infection was actually lower after drainage [26].

In all patients pus was sent for culture and sensitivity and empirical antibiotic treatment was started immediately after appendectomy. Organisum could be grown in 68 pus samples and 18 samples were sterile. The most common strain cultured was E.coli found in 42(61.76%) cases, Staphyllococus in 16(23.53%) and Pseudomonas in 10 (14.71%) cases of perforated appendicitis (Fig-3). These finding of present series are compared and correlated with different authors [12, 27]. In present series, in 18(20.93%) cases no organism

could be grown, it could be found in the fact that at least half of the varieties of bacteria found are anaerobic [27]. Anaerobic organism must be cultured immediately in appropriate media since a delay of one or more hours will frequently result in negative culture results, since we had no facilities for immediate anaerobic culture methods, the incidence of sterile culture reports can be well explained.

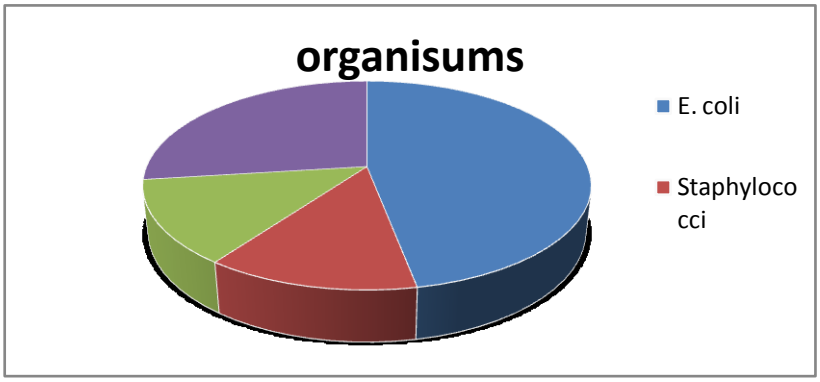

Fig-3] Pie diagram showing organisum in pus culture.

Maximum overall adverse effects was observed in group-2 than group-1 patients. Wound infection was seen in 3(27.27) patients of group-2 in the present series could be due to cross infection and hospital acquired infection. The present rate of wound infection is also compared and correlated with those reported by different authors [4, 12, 18]. The mortality rate was found to be zero percent in the present series, it has been stated that the risk of death from perforated appendicitis should be the risk of death from general anaesthesia. However, the mortality rate appears higher in newborn or premature infants who develop perforated appendicitis. Also, factors contributing to the death of children may include delay in diagnosis, inadequate fluid replacement, immunotheraphy and postoperative infection or vascular complications.

V. Conclusions:

The overall adverse event rate after early appendectomy was significantly lower than that after interval appendectomy. Early appendectomy for perforated appendicitis in children significantly reduced the time away from normal activities, overall adverse event rate, hospital cost and charges. Drain placement appears to be helpful in children with late diagnosis but is of little benefit when the duration of symptoms is less than four days. Thus it is likely that drains are most useful in patients with well established and localized abscess cavities.

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