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Site of Appendicular Perforation and Surgical outcomes

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I. Introduction

Acute appendicitis is the most common abdominal surgical emergency and appendicectomy is a commonly performed procedure globally[1,2].Inflammation of appendix may progress to gangrene,perforation or extend to adjacent bowel or peritoneum there by causing bowel perforation,obstruction,adhesions ,abscess or even peritonitis and even death[3,4]. Appendicular perforation is reported in over 41% of cases of acute appendicitis[5,6] Complications may warrant an adjunct procedure from simple drain placement to need for a laparotomy or even stoma in some cases[7,8]The contribution of site of perforation in appendix to adverse outcome and extent of surgery was found to be a grey area .

Research Question : Is there an association between site of perforation of appendix ,extent of surgical procedure and adverse outcomes in patients of appendicular perforation?
Aim and Objective : To assess the the association of site of perforation with the gravity of

1. Adjunct procedure with appendicectomy
2. Adverse outcomes after appendicectomy

II. Material and Methods

The study was conducted at a tertiary care center . The Sample size was statistically calculated and the study was conducted over a period of two years after obtaining clearance from scientific and ethics committee
A population of cases of appendicectomy was studied over a period of two years till the criteria of 40 successive cases of appendicitis without perforation(ANP) ,20 successive cases of Appendicular Base Perforation(ABP) and 20 successive cases of Appendicular Tip Perforation(ATP) were enrolled..Cases of appendicitis and appendicular perforation with malignancy, associated pregnancy,neonates and infants and were excluded from the study.
Gravity of procedure was graded as as High or Low
Gravity of Adverse outcome was graded as High Grade /Low Grade/Mortality
Definitions :
Base of appendix : proximal 1/3rd
Tip of appendix : distal 2/3rd
Adjunct procedure : Associated laparotomy,fashioning a stoma,bowel resection and anastomosis,adhesiolysis,band release,drain placement,abscess drainage,procedure for Meckels diverticulum.
High Gravity procedure : Appendicectomy associated with laparomy/need for stoma/ bowel resection/ruptured liver abscess management
Low gravity procedure : Appendicectomy with access from Right Iliac fossa incision including for managing all associated pathologies except creating stoma with this access
Low grade adverse events : Clavienn Dindo I-3
High Grade : Clavien Dindo >3 ,statisticcaly signicant increase in hospital stay over 7 days,readmission, enterocutaneous fistula
Mortality : Clavien Dindo Grade 5

III. Observations and Results

Appendicitis was most commonly witnessed in the age group of 11-30 years.Perforation at the tip was most common in 11-20 yrs while that at the base in 21-30 years.Peforation was witnessed in all age groups in varying ranges.
Appendicitis in general was a more commonly encountered pathology in male gender.
Clinical presentation of Generalized peritonitis was seen in 20% of cases with perforation at the tip and 90 % at the base while no case without perforation presented with features of frank generalized peritonitis.Features of

localized peritoneal irritation wee witnessed in all cases of appendicitis without perforation ,80% with perforation at the tip and only 10 % with perforation at the base.These findings were statistically significant. With Ultrasonography 80% of cases of appendicular tip perforation could be diagnosed ,75% of acute appendicitis and only 9% of cases of appendicular base perforation .These findings were s tatistically significant.

Table 1 : ADJUNCT PROCEDURES WITH APPENDICECTOMY

SNo	Adjunct procedure	Appendicitis with no perforation (ANP)[%]	Appendicular tip perforation (ATP)	Appendicular base perforation(ABP)	Sttistically significant Yes(Y)/No(N) [p value]
1.	**Laparotomy**	**0**	**4 [20%]**	**18 [90%]**	**(Y) [0.000]**
2	Drain placement	0	7[35%]	14[70%]	(Y) [0.027]
3.	**stoma**	**0[100%]**	**0[100%]**	**6[30%]**	**(Y) [0.000]**
4.	Adhesiolysis	4[10%]	6[30%]	6[30%]	N(0.05%]
5.	Resection f bowel	0	0	0	0

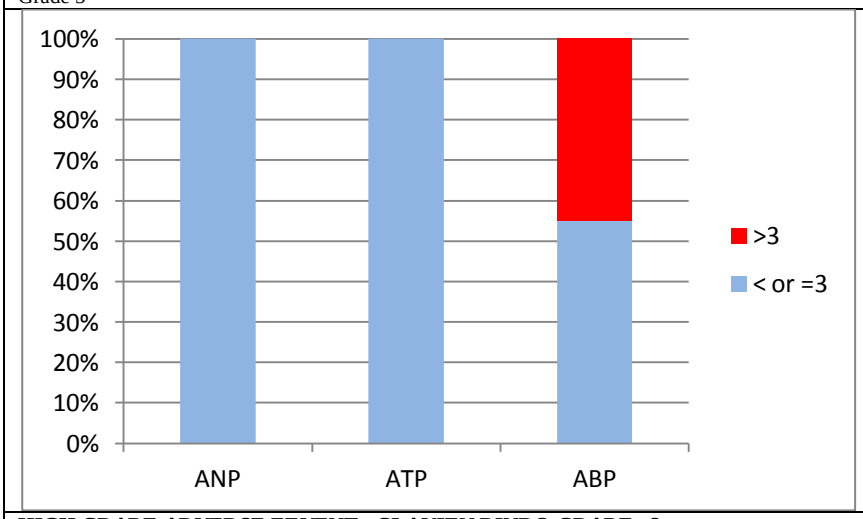
TABLE 2 : GRADE OF ADJUNCT PROCEDURES WITH APPENDICECTOMY

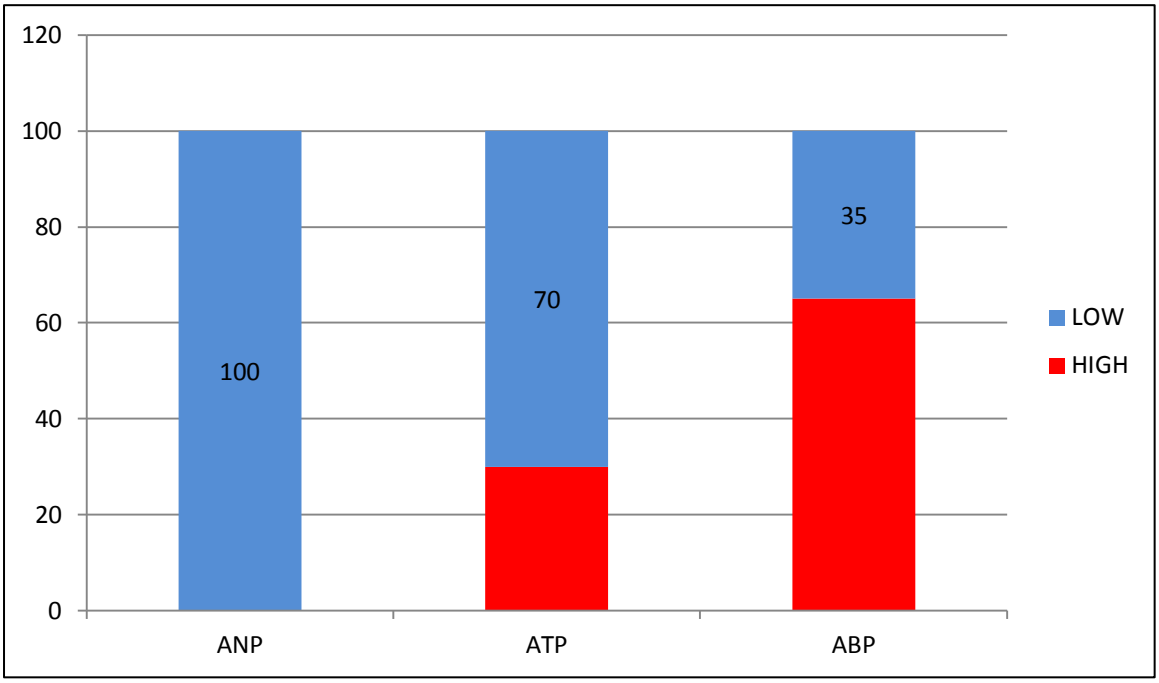
GRADE OF PROCEDURE	ANP[%]	ATP[%]	ABP[%]
HIGH	0[0%]	30%	**65%**
LOW	40{100%]	70%	35%

TABLE 3 : ADVERSE EVENTS AFTER APPENDICECTOMY

Adverse Event	ANP	ATP	ABP
SSI	0	3[15%]	**4[20%]**
Hospital stay >7 days	0	4[20%]	**15[75%]**
Enterocutaneous fisula	0	0[0%]	**2[10%]**
Readmissions	0	0[0%]	**7[35%]**

TABLE 4 : CLAVIEN DINDO GRADE OF ADVERSE EVENTS AFTER APPENDICECTOMY

Clavien Dindo Grade	ANP	ATP	ABP
Grade 1	40	0	0
Grade 2	0	18	7
Grade 3a	0	2	2
Grade 3b	0	0	2
Grade 4 a	0	0	**7**
Grade 4b	0	0	**2**
Grade 5	0	0	0
	40(100%) ANP	20(100%) ATP	11(55%) ABP
HIGH GRADE ADVERSE EEVENT : CLAVIEN DINDO GRADE >3	0	0	**9(45%)**



A statistically significant higher grade of adjunct procedures and adverse outcomes was noted in perforation at the base of appendix with respect to perforation at the base during appendicectomy.
This statistical significance directly translates into clinical significance in terms of explaining the decision regarding gravity of addition of an adjunct procedure or adverse outcome based on site of perforation,if present per operatively during appendicectomy.

IV. Discussion

A 41% perforation rate of appendix is reported in literature [1]and a three times higher rate of complications after perforation is reported. A mortality of 3% is reported,higher in the perforated group.In this study no mortality during appendicectomy was observed ,a three times hiher duration of stay was noted in patients with perforation at the base with respect to perforation at the tip , how ever no patient without perforation exceeded the seven day hospital stay. Enterocutaneous fistula and readmissions were seen only in perforation at the base in this study there by highlighting the more grievous consequences of perforation at the base with respect to the tip.

Perforations have been reported to occur most commonly at the tip with respect to base[9]. We have considered an equal number of perforations in both groups to compare the gravity of adverse events and need for a high grade adjunct procedure.

Limited ileocolic resection, hemicolectomyis described in literature[10,11]. If the adjacent cecum is severely inflamed intraoperatively,a decision to do an ileocecal resection with a double barrel ileostomy is advisable[12,13,14].Diversion ileostomy in perforations at the baseof appendix have also been described in other stusies[7,8].In this study no hemicolectomy was performed , however diversion ileostomy was added as an adjunct procedure in 6 cases (30%) of appendicular base perforations. Other adjunct procedures performed in our study were adhesiolysis or placement of drain .Drain however was retained for more than seven days only in cases of appendicular base perforations.

V. Conclusion

Appendicular Perforation at the Base of Appendix is associated with high gravity adjunct procedures and adverse events after appendicectomy than cases of Appendicular Perforation at the Tip.

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