The **THAI**
***Journal of* SURGERY**
Official Publication of the Royal College of Surgeons of Thailand

Vol. 29 October - December 2008 No. 4

Accuracy of Per-rectal Examination for Diagnosis and Predicting Type of Appendix in Patients with Acute Appendicitis

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Abstract ***Introduction:*** **Type of appendix is a well-recognized factor responsible for difficulty in appendectomy. Traditionally per-rectal examination should be performed in all patients with acute abdomen. Our goal of this study was to demonstrate the accuracy of per-rectal examination for diagnosis of acute appendicitis and to predict type of appendix by the result of per-rectal examination.**

Material and Methods: **We reviewed the relationship between positive per-rectal examination and all types of appendix in patients with acute appendicitis from January 2006 to October 2006 at our institution.**

Results: **There were 142 patients in the study including 68 males. The mean age at diagnosis was 32.8 years in male and 40.7 years in female. Per-rectal examination was performed in 113/142 (80%) patients. At operation, pelvic type was the most common type. Accuracy of per-rectal examination for diagnosis of acute appendicitis and predicting pelvic-type appendicitis are 52.3% and 48% respectively.**

Conclusion: **Our study demonstrated that the accuracy of per-rectal examination as one of clinical diagnostic tools had low sensitivity and specificity and could not be used routinely as a predictor of type and diagnosis of acute appendicitis.**

Keywords: acute appendicitis, per-rectal examination, appendix type.

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Introduction

Appendectomy is still one of the most common operations performed on emergency basis.[1] Appendicitis still remains a difficult clinical diagnosis.[2] When diagnosis of acute appendicitis is not made and the operation is delayed, especially more than 36 hours after the onset of pain, the rupture rates rise significantly.[3] Also, the anatomic location of the appendix determines the presentation of symptoms and signs during an episode of appendicitis.[4] Difficult appendectomy results from various factors such as obesity, stage of appendicitis at presentation and type of appendix. Per-rectal examination (PR), when correctly performed, should be a reliable bed-sided physical examination for diagnosis and predicting the type of inflamed appendix. The tip of appendix which points upward should not be felt by per-rectal examination and be reported as negative per-rectal examination. Subcecal type and pelvic type appendicitis are two types that should be theoretically elicited as a positive per-rectal examination.[5]

The present study aimed to demonstrate the accuracy of per-rectal examination for diagnosis of acute appendicitis and predicting pelvic type of acute appendicitis.

Table 1 Distribution of appendix locations

Type of appendix	Number (%)
Tip of appendix did not point upward	
Pelvic type	49/142 (34.5)
Subcecal type	7/142 (4.9)
Tip of appendix point upward	
Retrocecal type	46/142 (32.4)
Prececal type	13/142 (9.2)
Paracecal type	10/142 (7)
Retroileal type	6/142 (4.2)
Preileal type	11/142 (7.8)

Materials and Methods

From January 2006-October 2006, 206 cases of appendectomy were performed at the Department of Surgery, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand. Ten patients were excluded from this review because of incomplete data. All patients with ruptured appendicitis were excluded due to difficulty for interpretation of positive per-rectal examination. One hundred and ninety-six patients with complete preoperative and intraoperative records were reviewed. Characteristic data of patients, result of per-rectal examination, type of appendix, and both intraoperative and postoperative complications were obtained from chart reviewed. Twenty-three patients were excluded because the pathological diagnoses were not acute appendicitis and 31 patients were excluded because the appendix types were not mentioned intraoperatively. Therefore, 142 patients were included in the analysis. "Positive per-rectal examination" is defined as tenderness at right lower quadrant when elicited by examiner. The association between positive rectal examination and type of appendix was analyzed.

Results

There were 142 patients in the study including 68 males. The mean age at diagnosis is 32.8 years in male and 40.7 years in female. All appendectomies were performed on emergency basis. Our rate of ruptured appendicitis was 13.1% (24/183). Per-rectal examinations were performed in 80.0% of cases (113/142). The common locations of appendix were pelvic type, followed by retrocecal type and prececal type (Table 1). Rate of positive per-rectal examination varied from 33.3% in retroileal type to almost 72.4% in prececal type appendix (Table 2). Accuracy of positive per-

Table 2 Correlation between type of appendix and result of per-rectal examination

Type of appendix/ results of PR	Pelvic	Subcecal	Retrocecal	Preileal	Retroileal	Paracecal	Prececal	Total
Positive PR (%)	21 (53.8)	3 (60)	20 (52.6)	4 (57.1)	1 (33.3)	4 (44.4)	8 (72.7)	61 (54)
Negative PR	18	2	18	3	3	5	3	52
Not performed	10	2	8	4	2	1	2	29
Total	**49**	**7**	**46**	**11**	**6**	**10**	**13**	**142**

Table 3 Accuracy of positive per-rectal examination to predict pelvic type of acute appendicitis

	Pelvic type of acute appendicitis		
	Positive	**Negative**	**Total**
Per-rectal examination			
Positive	21	40	61
Negative	18	34	52
Total	**39**	**74**	
Sensitivity 21/39	= 53%		
Specificity 34/74	= 45%		
Accuracy 21+34/113	= 48%		

Table 4 Accuracy of positive per-rectal examination for diagnosis of acute appendicitis

	Pathologically confirmed acute appendicitis		
	Positive	**Negative**	**Total**
Per-rectal examination			
Positive	61	10	71
Negative	52	7	59
Total	**113**	**17**	
Sensitivity 61/113	= 53.9%		
Specificity 7/17	= 41.2%		
Accuracy 61+7/113+17	= 52.3%		

rectal examination to predict pelvic type of acute appendicitis was 48%. (sensitivity 53%, specificity 45%) (Table 3). Overall accuracy of positive per-rectal examination for diagnosis of acute appendicitis was 52.3% (sensitivity 53.9%, specificity 41.2%) (Table 4).

Discussion

The routine use of digital rectal examination has been considered a necessary component in the evaluation of patients in whom appendicitis is suspected. This traditional teaching is still mentioned in surgical textbooks. However, several studies do not agree with this suggestion. In 1979, Bonello and Abrams performed a limited retrospective analysis of rectal examination in 495 patients undergoing surgery for possible appendicitis.[6] The result of rectal examination was positive in only 46% (228/495) of those patients with confirmed appendicitis. Fifty-three percent (262/495) of patients without appendicitis had false-positive results. The authors concluded that the rectal examination does not confirm or rule out the diagnosis of acute appendicitis.[6]

The largest study on the use of rectal examination in patients with possible appendicitis is reported by Dixon et al in 1991. Of 1,204 patients, ranging in age from 7-87 years and with chief complaint of right lower quadrant pain, 85% (1024/1204) had rectal examination. Right-sided rectal tenderness present in 309 of those examined was more common in patients with acute appendicitis (odds ratio 1.34, $p < 0.05$). This odds ratio was considerably less than that for other clinical signs: namely, tenderness in the right lower quadrant (5.09), rebound tenderness (3.34), guarding (3.07), and muscular rigidity in the abdomen (5.03). The authors concluded that rectal examination is not necessary in patients with right lower quadrant abdominal pain and rebound tenderness.[7]

Recently, Manimaran et al. reported a study describing about the role of rectal examination in patients with abdominal pain. This study demonstrates limited role of routine digital rectal examination in adults with no anorectal or gastrointestinal symptoms during their initial evaluation for acute abdominal pain.[8]

Our results showed that pelvic type was the most common type (34.5%). Both pelvic and retrocecal type represented almost 70% of cases. The largest published study about the common type of appendix is reported by Wakeley et al. who analyzed a postmortem dissection of 10,000 cases of appendix and described the frequency of appendix type as follows: retrocecal 65.3%, pelvic 31%, subcecal 2.3%, preileal 1%, right paracolic and postileal 0.4%.[9] However, our result from which the types of appendix were reported in living population with acute appendicitis was not compatible to this study.

The positive per-rectal examination in acute appendicitis can be explained by 2 mechanisms. One is the palpation of examiner's finger tip from inside of rectal wall in direct contact to parts of inflamed appendix. The other is that palpation force is transmitted via bowel loop to the inflamed appendix. Per-rectal examinations were performed in 113/142 (80%) of our patients. The rates of positive per-rectal examinations in all types of inflamed appendix were not different ranging from 33.3 to 72.7% with overall accuracy for diagnosis 52.3%. It is not known why the rate of positive per-rectal examination in pelvic type

and subcecal type appendicitis, which theoretically should be elicited easily by per-rectal examination, is low. One of the explanations is that the appendix is so short, hence the examiners could not palpate directly to the inflamed appendix tip. On the other hand, retrocecal type is one of appendix types that theoretically should not be elicited by per-rectal examination. In our study, the rate of positive per-rectal examination in this type was quite high (51.3%, 20/39). The tenderness at rectal examination in this scenario may probably be due to transmission force from rectal wall via small bowel loop to cecum, and then eventually to the inflamed retrocecal type appendix. Rectal examination to aid diagnosis is rarely done in children. In a large study involving 100 consecutive children with appendicitis, rectal examination only 3% of cases contributed to the diagnosis.[10]

Our study has several limitations. This study is retrospective study, which is prone to bias and error. There are several missing data in patients who refused per-rectal examination (29/142). The location of vermiform appendix was not reported in 15% (31/206) of cases. Our data collection was retrospective with only one-year period at our institution. Thus the number of patients was relatively small. Also this study did not take into account many potential confounders namely in the technique and gentleness of per-rectal examination, the length of examiners' finger, experience of examiners and cooperation of patients.

Conclusion

The result of our study suggested that per-rectal examination might not be considered as a predictor of pelvic type of appendix in patients with acute appendicitis because of its low accuracy (48%). Positive per-rectal examination alone has little utility in guiding the diagnosis of acute appendicitis, with accuracy 52.3%. This examination should be used to rule out specific conditions and might not be considered as part of routine physical examination in every patient suspected of having acute appendicitis.

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