Benefit of Rectal Examination in Children with Acute Abdomen

Wasun Nuntasunti MD*,
Mongkol Laohapensang MD**

** Department of Surgery, Sisaket Hospital, Sisaket, Thailand*
*** Department of Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand*

Background: *Acute abdomen is a condition that often mandates urgent treatment. PR or DRE (per rectal examination or digital rectal examination) is one of the fundamental physical examinations that doctors use to differentiate causes of acute abdominal pain. However, it is not a pleasant examination to undergo. Sometimes doctors ignore this examination. The benefit of per rectal examination has rarely been studied in children.*
Objective: *This study was designed to demonstrate the benefit of rectal examination for contribution to the diagnosis of acute abdominal pain in children and reduction of unnecessary operation.*
Material and Method: *A prospective cross sectional study of children ages 3 to 15 years old who presented with acute abdominal pain from January 2012 to December 2013 was conducted. The clinical parameters including DRE results were correlated to the diagnosis. The diagnoses prior to and after DRE were compared. The accuracy of DRE was analyzed by pair response analysis of pre and post-DRE results using McNemar's Chi-square test.*
Results: *A total of 116 children with acute abdominal pain were enrolled in the study. The final diagnoses were appendicitis accounting for 27%, constipation 28%, non-surgical gastrointestinal diseases such as gastritis, diarrhea and food poisoning 9%, diseases of the female reproductive system 7% and others 29%. In comparing the diagnoses prior to and after digital rectal examination, it was demonstrated that rectal examination significantly helped differentiate diagnosis in 38.8% of patients, whereas 19% of the patients gained no benefit.DRE corrected the diagnosis in 45 cases which was significantly higher than misguiding the diagnosis in 3 cases. The efficacy of DRE was true positive rate of 81% and false positive rate of 19%. In subgroup analysis of 81 patients with suspected appendicitis, which accounted for 70% of patients with acute abdominal pain, DRE helped in the diagnosis which reduced unnecessary surgery in 32% of these patients.*
Conclusion: *The presented study recognizes the benefit of DRE as a guide in the diagnosis of pediatric acute abdominal pain which reduces unnecessary investigation and operation. It should be considered as an essential part of complete physical examination in patients with acute abdominal pain before proceeding to imaging investigation.*

Keywords: *acute abdomen, abdominal pain, children, digital rectal examination, per rectal examination, appendicitis*

J Med Assoc Thai 2017; 100 (Suppl. 2): S109-S114
Full text. e-Journal: *http://www.jmatonline.com*

Acute abdomen is a condition that mandates urgent treatment. Patients often come to the hospital with abdominal pain which could have various etiologies both surgical and non-surgical such as acute appendicitis, intestinal obstruction, gastroenteritis or even constipation. In Siriraj Hospital, we have surgical consultations in children with acute abdominal pain about 60-80 patients per year. Rectal examination is a basic physical examination that doctors use to help in the diagnosis of urologic, gynecologic and gastrointestinal conditions including acute abdomen, it can be called Digital rectal examination (DRE) or per rectal examination (PR). Rectal examination composes of the evaluation of the perianal area and genitalia, thus it is a sensitive examination that must gain both cooperation and understanding of the child and parent especially in older children and adolescent. It is also an unpleasant and uncomfortable physical examination which can elicit pain[1-5] and abdominal discomfort or even tenderness.

The majority of acute abdominal pain in children is mostly caused by non-surgical conditions such as gastritis, acute gastroenteritis or constipation, some of which could be diagnosed by rectal examination[6]. Rectal examination can provide other diagnostic information in acute abdominal pain such

Correspondence to:
Laohapensang M, Division of Pediatric Surgery, Department of Surgery Faculty of Medicine, Siriraj Hospital Mahidol University, Bangkok 10700, Thailand.
Phone +66-2-4198027 Fax +66-2-2-4129160
E-mail: simlh@mahidol.ac.th

as imperforated hymen, vaginal atresia, twisted ovarian cyst and localizing pain but this information can only be gained in about 50% of children with acute abdominal pain[7,8]. However we cannot imply that the benefit of rectal examination in acute appendicitis is the same as in acute abdominal pain. It is controversial whether complete physical examination (including rectal examination) has benefit in the diagnosis of acute appendicitis because some of acute appendicitis could be diagnosed using history and abdominal examination only. Additionally, clinical scores that had been developed as diagnostic tools for appendicitis such as Alvarado score[9] and Pediatric appendicitis score[10] did not include findings from rectal examination.

Nowadays complete physical examination and close active observation has become less standard having been replaced by imaging investigations, comparatively ultrasonography and computer tomography, which were proven to be accurate in giving the diagnosis for a case with acute appendicitis. Nevertheless the study of 250,783 patients who underwent appendectomy in the United States of America in 2000-2006 demonstrated negative appendectomy rate to increase from 5% to 6.7% compared with before 1989[11-13]. Another recent studies indicated negative appendectomy rate as high as 12.4%-16.5%[14,15]. Can we assume that the rising of negative appendectomy rate in the imaging era has some association with over investigation or neglecting of rectal examination in particular?

Regarding a study in Siriraj Hospital from 2000-2001 the negative appendectomy rate was 4.5%[16], which all children with acute abdominal pain in Siriraj Hospital had complete physical examination including rectal examination and admitted for active observation in pediatric surgery ward. Most of them did not have imaging investigation. The researchers then believed that complete physical examination should contribute in the diagnosis of acute abdominal pain and can reduce unnecessary investigation and unnecessary operation comparatively negative appendectomy in children.

Material and Method

The clinical data of children aged 3-15 years old, who presented with acute abdominal pain and were admitted to pediatric surgery ward from January 2012-December 2013, were prospectively collected.

Inclusion criteria

1. Patient had acute abdominal pain.
2. Presence of DRE result and final diagnosis.

Exclusion criteria

1. Patient had profound pain from perianal area such as perianal abscess or anal fissure.
2. Patient had inguinal pain such as incarcerated hernia or torsion testis.
3. Patient with known history of surgical procedure from other hospital.

Withdrawal or termination criteria

1. Patients who were lost to follow-up.

Study design

This study was a cross-sectional study. Clinical data were examined correlating to the following parameters: age, sex, underlying disease, presenting symptoms, differential diagnoses before DRE, DRE results, differential diagnoses after DRE, surgery, and final diagnosis.

Statistical analysis

The accuracy of pre-DRE differential diagnoses compared with post-DRE differential diagnosis and analysis pair response using McNemar's Chi-square test. SPSS Statistics was used for statistical calculation.

Ethical considerations

This study was performed according to the protocol and approval of SiRB (Siriraj Hospital Institutional Review Board).

Results

A total of 116 children with acute abdominal pain from January 2012 to December 2013 in Siriraj Hospital were enrolled in the study. Patient characteristics were described in Table 1.

The two most common causes of acute abdominal pain in the study group were appendicitis accounting for 27% and fecal impaction from constipation for 28%, followed by other gastrointestinal diseases such as gastritis, diarrhea and food poisoning (9%) and diseases of the reproductive system (7%) as shown in Table 2. Each patient's diagnoses were categorized into 3 groups.

Dx1 = PrePR = the diagnosis before PR
Dx2 = PostPR = the diagnosis after PR
Dx3 = FinalDx = the final diagnosis

The diagnoses groups were compared and analyzed to find the correlation patterns. The benefit

of DRE was defined and categorized into patterns of correlation with regards to the final diagnosis. Example of this pattern was shown in Table 3.

PrePR≠FinalDx, PostPR=FinalDx = True benefit

PrePR=FinalDx, PostPR=FinalDx = Support diagnosis

PrePR≠FinalDx, PostPR≠FinalDx = False first diagnosis

PrePR=FinalDx, PostPR≠FinalDx = Mislead diagnosis

After DRE, the results of DRE have statistical significantly confirmed the diagnosis of acute abdominal pain in 94 out of 116 patients (81%) and also DRE changed the diagnosis to the right one more than misleaded the diagnosis to the false one (*p*-value <0.001, odds ratio = 6.8 (95% CI 1.91-24.88)).

Considering all patients had DRE and none of the final diagnosis was acquired without DRE, thus sensitivity and specificity of DRE could not be calculated from this study.

Table 1. Patient characteristics (n = 116)

	Frequency (No.)	Percent (%)
Age		
Total	116	100
3-5 years	21	18.1
6-8 years	22	19
9-11 years	38	32.8
12-14 years	35	30.2
Mean ± SD = 9.36±3.3 years		
Mode = 10 years		
Sex		
Male	56	48.3
Female	60	51.7

Table 2. Final diagnosis

Final diagnosis	Patients
Fecal impaction (constipation)	33
Acute appendicitis	31
Appendiceal abscess	2
Acute gastroenteritis, ileitis and enterocolitis	14
Typhlitis of colon (neutropenic enterocolitis)	1
Food poisoning, gastritis and dyspepsia	7
PID and pelvic abscess	4
Mesenteric adenitis	1
Spontaneous bacterial peritonitis	1
Gut obstruction	3
Intussusception	1
Menstruation	1
Twisted/torsion ovarian cyst	2
Acute pyelonephritis	2
Henoch-Schonlein purpura	1
Cyclic vomiting	1
Muscle strain, traumatic bladder or bowel injury	3
Intraabdominal and pelvic tumor	2
Other miscellaneous diseases	6
Total number (N)	116

Discussion

This study demonstrated that DRE can provide diagnostic information in about 81% of children with acute abdominal pain which was higher than in the previous study[7,8] by confirming the diagnosis and therefore excluding non-surgical conditions such as gastritis, acute gastroenteritis or constipation[6]. In subgroup analysis, benefits of DRE can be categorized into 3 different aspects;

1. DRE can confirm the diagnosis. DRE was found supporting the diagnosis in 49 cases (42.3%).

In subgroup of patients with suspected constipation, DRE can confirm the diagnosis of constipation in 50% of patients by finding fecal impaction and these patients were given low rectal enema. In subgroup analysis of gut ileus, DRE can identify the causes of gut ileus which were enterocolitis, fecal impaction, Hirschsprung's disease and pelvic tumor, therefore digital rectal examination can aid in the diagnosis of 54 % of patients with gut obstruction.

2. DRE can help in differentiating the cause of acute abdominal pain. From this study, DRE can change the diagnosis to a correct one in 45 cases (38.8%) which was significantly higher than misleading to a false diagnosis in 3 cases (2.5%) (*p*-value <0.001). The efficacy of DRE is true positive rate = 81% and false positive rate = 19%

3. DRE can reduce unnecessary operation by differentiating non-surgical from surgical causes. In subgroup analysis of 81 patients with suspected appendicitis, accounting for 70% of patients with acute abdominal pain, rectal examination can be helpful in the diagnosis (excluding acute appendicitis) which reduced unnecessary surgery in 26 cases (32%). Nonsurgical conditions which were differentiated from appendicitis by DRE included diarrhea, constipation, menstrual cramps and pelvic inflammatory disease.

Table 3. Example of 4 patterns of correlation and usefulness of DRE in children with acute abdominal pain

Patterns (DRE usefulness)	PrePR (Dx1)	PostPR(Dx2)	FinalDx (Dx3)
True benefit	Appendicitis	Constipation	Constipation
Support diagnosis	Constipation	Constipation	Constipation
False first diagnosis	Appendicitis	Appendicitis	Constipation
Mislead diagnosis	Appendicitis	Constipation	Appendicitis

According to the patterns of correlation analysis, rectal examination significantly helped in the diagnoses of acute abdominal pain in 45 out of 116 patients (38.8%). However, we found no benefit after rectal examination in 22 out of 116 patients (18.9%) as shown in Table 4.

Table 4. Patterns of correlation with regards to the final diagnosis using information gained from per rectal examination

	PostPR false = 0 Dx2≠Dx3	PostPR correct = 1 Dx2=Dx3	Total
PrePR false = 0 Dx1≠Dx3	False first diagnosis PR didn't change diagnosis = 19 (16.4%)	True benefit PR change to correct = 45 (38.8%)	64
PrePR correct = 1 Dx1=Dx3	Mislead diagnosis PR change to false diagnosis = 3 (2.5%)	Support diagnosis PR confirm correct diagnosis = 49 (42.3%)	52
Total	22	94	116*

* McNemar 's Chi-square test *p*-value <0.001, ODDS ratio = 6.8 times (95%CI 1.91-24.88), Efficacy of PR is true positive rate = 81.11%, false positive rate = 18.9%
The diagnosis before DRE was statistical significantly different from the diagnosis after DRE (*p*-value <0.001).

Constipation was the etiology of abdominal pain in 25 cases (30%) of suspected appendicitis patients, which could be diagnosed immediately after DRE in this study.

The majority of patients in the study group did not have imaging investigations and the diagnoses were made mainly based on physical examination and close active observation. The researchers believe that the presented study recognizes the benefit of digital rectal examination by aids in the diagnosis of pediatric acute abdominal pain, in addition reduces unnecessary investigation and operation.

Conclusion

In conclusion, digital rectal examination should be performed in standard practice of approaching children with acute abdominal pain. The digital rectal examination provides diagnostic information in about 81% of children with acute abdominal pain and can help differentiate non-surgical from surgical causes which generally impacts the course of therapy by reducing unnecessary surgery in 32% of patients with suspected appendicitis. It should be considered as an essential part of complete physical examination before proceeding to imaging investigation.

What is already known on this topic?

The digital rectal examination can provide other diagnostic information in acute abdominal pain such as imperforated hymen, vaginal atresia, twisted ovarian cyst and localizing pain but this information can only be gained in about 50% of children with acute abdominal pain.

What this study adds?

From this study, the digital rectal examination provide diagnostic information in about 81% of children with acute abdominal pain and can help differentiate non-surgical from surgical causes which generally impacts the course of therapy by reducing unnecessary surgery in 32% of patients with suspected appendicitis.

Potential conflicts of interest

None.

References

1. Brewster GS, Herbert ME. Medical myth: a digital rectal examination should be performed on all individuals with possible appendicitis. West J Med 2000; 173: 207-8.
2. Bonello JC, Abrams JS. The significance of a

"positive" rectal examination in acute appendicitis. Dis Colon Rectum 1979; 22: 97-101.
3. Manimaran N, Galland RB. Significance of routine digital rectal examination in adults presenting with abdominal pain. Ann R Coll Surg Engl 2004; 86: 292-5.
4. Werner JC, Zock M, Khalil PN, Hoffmann J, Kanz KG, Jauch KW. Evidence for the digital rectal examination in the emergency assessment of acute abdominal pain. Zentralbl Chir 2013; 138: 669-76.
5. Moll vC, de Jongh TO. Physical examination of patients with acute abdominal pain. Ned Tijdschr Geneeskd 2011; 155: A2658.
6. Scholer SJ, Pituch K, Orr DP, Dittus RS. Use of the rectal examination on children with acute abdominal pain. Clin Pediatr (Phila) 1998; 37: 311-6.
7. Safder S, Rewalt M, Elitsur Y. Digital rectal examination and the primary care physicians: a lost art? Clin Pediatr (Phila) 2006; 45: 411-4.
8. Dickson AP, MacKinlay GA. Rectal examination and acute appendicitis. Arch Dis Child 1985; 60: 666-7.
9. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med 1986; 15: 557-64.
10. Samuel M. Pediatric appendicitis score. J Pediatr Surg 2002; 37: 877-81.
11. Thomson HJ, Jones PF. Active observation in acute abdominal pain. Am J Surg 1986; 152: 522-5.
12. Goldin AB, Khanna P, Thapa M, McBroom JA, Garrison MM, Parisi MT. Revised ultrasound criteria for appendicitis in children improve diagnostic accuracy. Pediatr Radiol 2011; 41: 993-9.
13. Oyetunji TA, Ong'uti SK, Bolorunduro OB, Cornwell EE 3rd, Nwomeh BC. Pediatric negative appendectomy rate: trend, predictors, and differentials. J Surg Res 2012; 173: 16-20.
14. Kutasy B, Hunziker M, Laxamanadass G, Puri P. Increased incidence of negative appendectomy in childhood obesity. Pediatr Surg Int 2010; 26: 959-62.
15. Scammell S, Lansdale N, Sprigg A, Campbell D, Marven S. Ultrasonography aids decision-making in children with abdominal pain. Ann R Coll Surg Engl 2011; 93: 405-9.
16. Tantemsapya N, Laohapensang M, Udompunturak S. Validation of clinical scoring system in the primary care of children with suspected acute appendicitis. Siriraj Med J 2005; 57: 481-5.

ประโยชน์ของการตรวจทางทวารหนักในผู้ป่วยเด็กที่มีภาวะเฉียบพลันของช่องท้อง

วสันต์ นันทสันติ, มงคล เลาหเพ็ญแสง

ภูมิหลัง: ภาวะเฉียบพลันของช่องท้องเป็นภาวะที่ต้องการการรักษาเร่งด่วน การตรวจร่างกายทางทวารหนักเป็นหนึ่ง ในการตรวจที่แพทย์ใช้ในการวินิจฉัยแยกสาเหตุของอาการปวดท้องเฉียบพลัน แต่เนื่องจากเป็นการตรวจที่ไม่สุขสบายทำให้บางครั้งแพทย์ได้ละเลยการตรวจนี้ไป โดยเฉพาะในผู้ป่วยเด็ก มีการศึกษาถึงประโยชน์ของหัตถการนี้น้อย

วัตถุประสงค์: เพื่อศึกษาถึงประโยชน์ในการตรวจร่างกายทางทวารหนักในการวินิจฉัยแยกโรคผู้ป่วยเด็กที่มีอาการปวดท้องเฉียบพลัน และลดการผ่าตัดที่ไม่จำเป็นลง

วัสดุและวิธีการ: เป็นการศึกษาแบบ prospective cross sectional study ของผู้ป่วยเด็กอายุ 3 ถึง 15 ปี ที่มาด้วยอาการปวดท้องเฉียบพลัน ตั้งแต่เดือนมกราคม พ.ศ. 2555 ถึง ธันวาคม พ.ศ. 2556 โดยศึกษาตัวแปรทางคลินิก การวินิจฉัยโรคก่อนและหลังการตรวจร่างกายทางทวารหนัก เปรียบเทียบกับการวินิจฉัยโรคครั้งสุดท้าย

ผลการศึกษา: จากประชากรในการศึกษา 116 คน โรคที่พบมากสุด คือ โรคท้องผูก 28% และไส้ติ่งอักเสบ 28% รองลงมา คือ กลุ่มโรคกระเพาะอาหาร โรคท้องเสีย และอาหารเป็นพิษ 9% และโรคระบบสืบพันธุ์สตรี 7% นอกนั้นเป็นโรคอื่น 2% ในกลุ่มที่สงสัยจะเป็นโรคไส้ติ่งอักเสบ 81 คน ซึ่งคิดเป็น 70% ของผู้ป่วยที่มีอาการปวดท้องทั้งหมด พบว่าการตรวจร่างกายทางทวารหนักช่วยลดการผ่าตัดที่ไม่จำเป็นลงไปได้ 32%

สรุป: การตรวจร่างกายทางทวารหนัก มีประโยชน์สำหรับผู้ป่วยเด็กที่มีอาการปวดท้องเฉียบพลัน ช่วยลดการตรวจ พิเศษ และการผ่าตัดที่ไม่จำเป็นลงไปได้ จึงควรที่จะพิจารณาการตรวจนี้เป็นหนึ่งในขั้นตอนการตรวจร่างกายอย่างสมบูรณ์ก่อนการผ่าตัดหรือทำการตรวจพิเศษอื่น