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การศึกษาเปรียบเทียบลักษณะภาพเอกซเรย์คอมพิวเตอร์ที่ช่วยแยกระหว่างไส้ติ่งอักเสบเป็นหนองกับมะเร็งลำไส้ใหญ่

Comparison of Computer Tomographic Findings Associated with Appendiceal Abscess and Colon Adenocarcinoma

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บทคัดย่อ

หลักการและเหตุผล : ภาวะไส้ติ่งอักเสบเป็นหนองและมะเร็งลำไส้ใหญ่ด้านขวา มีการรักษาที่แตกต่างกัน แต่มักมาด้วยอาการที่คล้ายคลึงกัน ทำให้แยกออกจากกันได้ยาก ในปัจจุบันการตรวจด้วยรังสีคอมพิวเตอร์ช่องท้อง มีบทบาทสำคัญสามารถใช้ช่วยในการวินิจฉัยแยกโรคทั้งสองออกจากกันได้ เพื่อช่วยในการวางแผนรักษาที่เหมาะสม

วัตถุประสงค์ : ศึกษาเปรียบเทียบลักษณะภาพเอกซเรย์คอมพิวเตอร์ที่ช่วยแยกระหว่างไส้ติ่งอักเสบเป็นหนองกับมะเร็งลำไส้ใหญ่ด้านขวา

วิธีการศึกษา : เป็นการศึกษาแบบ retrospective study เก็บข้อมูลผู้ป่วยที่ได้รับการวินิจฉัยจากอาการทางคลินิกว่าเป็นไส้ติ่งอักเสบเป็นหนองที่ได้รับการตรวจด้วยเอกซเรย์คอมพิวเตอร์ช่องท้อง โดยแบ่งผู้ป่วยออกเป็น 2 กลุ่ม คือ กลุ่มที่เป็นไส้ติ่งอักเสบเป็นหนองกับกลุ่มที่เป็นมะเร็งลำไส้ใหญ่ด้านขวา เพื่อเปรียบเทียบลักษณะที่พบทางรังสีวิทยา ดังนี้ หนองในช่องท้อง ต่อมน้ำเหลืองโต การพบไส้ติ่งที่ผิดปกติ ขนาดของไส้ติ่ง ก้อนหินปูนในไส้ติ่ง ผนังลำไส้ใหญ่ซีคัมหนาตัว อากาศที่ผิดปกติในช่องท้อง การอักเสบของไขมัน ก้อนในลำไส้ใหญ่ ก้อนในเยื่อบุช่องท้อง มะเร็งกระจายไปที่ตับ และน้ำในช่องท้อง

ผลการศึกษา : ผู้ป่วยจำนวน 120 คน แบ่งเป็นกลุ่มที่เป็นไส้ติ่งอักเสบเป็นหนอง 86 คน กับกลุ่มที่เป็นมะเร็งลำไส้ใหญ่ด้านขวา 34 คน พบว่า ลักษณะทางรังสีวิทยาที่มีโอกาสเป็นไส้ติ่งอักเสบเป็นหนอง ได้แก่ พบหนองในช่องท้อง ขนาดของหนองในช่องท้องที่ใหญ่ การพบไส้ติ่งที่ผิดปกติและก้อนหินปูนในไส้ติ่ง (p-value <0.001, 0.010, <0.001, และ 0.004 ตามลำดับ) ลักษณะทางรังสีวิทยาที่มีโอกาสเป็นมะเร็งลำไส้ใหญ่ด้านขวา ได้แก่ ผนังลำไส้ใหญ่ซีคัมหนาตัว ต่อมน้ำเหลืองโต และ ก้อนในลำไส้ใหญ่ (p-value <0.001, 0.002 และ <0.001 ตามลำดับ) multivariate analyses ที่มีโอกาสเป็นไส้ติ่งอักเสบเป็นหนอง ได้แก่ พบหนองในช่องท้อง (p-value 0.047) และ การพบไส้ติ่งที่ผิดปกติ (p-value <0.026)

สรุป : ลักษณะทางรังสีวิทยาที่มีโอกาสเป็นไส้ติ่งอักเสบเป็นหนอง ได้แก่ การพบไส้ติ่งที่ผิดปกติและการพบหนองในช่องท้อง ในขณะที่การพบก้อนในลำไส้ใหญ่ มีโอกาสเป็นมะเร็งลำไส้ใหญ่ด้านขวา

คำสำคัญ : ไส้ติ่งอักเสบเป็นหนอง มะเร็งลำไส้ใหญ่ด้านขวา มะเร็งลำไส้ใหญ่ซีคัม ภาพฉายเอกซเรย์คอมพิวเตอร์ ลักษณะทางรังสีวิทยา

ABSTRACT

Background : The patients who had an uncertain diagnosis of appendiceal abscess were concerned about malignancy. Consequently, computer tomography (CT) scan was important to differentiate benign from malignant conditions.

Objective : The aim of this study was to compare the CT findings associated with appendiceal abscess and right-sided colonic adenocarcinoma.

Methods : A retrospective study of patients who first diagnosed with appendiceal abscess and underwent abdominal CT scans. The patients were divided into two groups based on the pathological results, which included the appendiceal abscess group and the right-side colonic or cecal cancer group. CT findings were compared between the two groups, including intra-abdominal collection, lymph node enlargement, identification of abnormal appendix, appendix size, presence of fecalith, cecal wall thickness, abnormal free air, fat reticulation, colonic mass, peritoneal nodule, liver metastasis, and ascites.

Results : A total of 120 patients were included. Eighty-six patients were in appendiceal abscess group and 34 patients were in the right-side colonic or cecal cancer group. The CT findings which increased risk of the appendiceal abscess were the intra-abdominal collection, larger size of the abdominal collection, abnormal appendix, and fecalith (p-value <0.001, 0.010, <0.001, and 0.004 respectively). The CT finding that increased risk of cancer were cecal wall thickness, lymph node enlargement and colonic mass (p-value <0.001, 0.002 and <0.001 respectively). Multivariate analyses that increased risk of appendiceal abscess were intra-abdominal collection (p-value 0.047) and identified abnormal appendix (p-value <0.026).

Conclusion : Abnormal appendix and intra-abdominal collection were the CT findings favored appendiceal abscess. Conversely, the colonic mass increased the risk of right-side colonic or cecal carcinoma.

Keywords : Appendiceal abscess, right-side colonic adenocarcinoma, cecal carcinoma, computer tomography, CT finding.

Introduction

The appendiceal abscess was complicated after the patients who diagnosed with acute appendicitis. The incidence of appendiceal abscess formation was 2-7%.[1, 2] The management of this condition was controversial. Immediate surgery was performed in some patients. However, most patients who underwent early surgery often performed exploratory laparotomy with ileocecectomy or right-side hemicolectomy due to these

conditions could not be differentiated from malignancy, thus oncologic resection should be performed. Nowadays, the management of appendiceal abscess is non-surgical treatment followed by interval appendectomy after malignancy has been excluded by colonoscopy.[1, 3-5]

Although, the interval appendectomy was performed for preventing the recurrence of appendicitis but the risk of recurrence was shown relatively small.[3, 5] Some previous study was supported non-surgical treatment without interval appendectomy in patients who diagnosed with appendiceal abscess or phlegmon.[6]

However, in patients who had uncertainly diagnosed appendiceal abscess and were concerned about the malignancy of the right-side colon, immediate surgery with right-side hemicolectomy and oncologic resection should be performed even though the surgery was increased acceptable morbidity.[7-10]

Recently, computer tomography (CT) was developed with high quality which had helpful and improved the diagnosis of abdominal lesions especially acute appendicitis with complications. However, the CT finding of acute appendicitis with complications could be seen in an appendiceal abscess or phlegmon formation, or malignant process especially right-side colonic cancer which involved the appendix.[11-13] Consequently, imaging especially a CT scan was an important role to differentiated benign from the malignant lesion for further management. The aim of this study was to compare the CT findings associated with appendiceal abscess and right-side colonic adenocarcinoma in order to aid the treatment process.

Materials and Methods

Study Subjects

All patients aged greater than 18 years with first diagnosed appendiceal abscess who underwent thin-section abdominal CT scan at the Department of Radiology, Buri Ram Hospital, Buri Ram, Thailand from January 2020 to December 2021 were retrospectively reviewed. The patients who had underlying malignancy or previous appendectomy were excluded. After treatment of an appendiceal abscess. The patients who underwent appendectomy or right hemicolectomy had their pathological results reviewed. Subsequently, the patients were divided into two groups based on the pathologic results, which included the appendiceal abscess group and the right-sided colonic or cecal cancer group. The data were collected including age, sex, pathologic result, and CT findings. A comparison cohort of appendiceal abscess and right-side colonic cancer was performed.

Imaging and imaging interpretation

CT examinations were obtained with a 128-slice multi-detector row CT (Philips or Toshiba) with scanning parameters of 120 kVp and 250 mAs. A Spiral CT scan was obtained during full inspiration with or without contrast media administration.

The CT findings were assessed by two radiologists, and conclusions were reached by consensus. The pattern of abnormal abdominal findings were intra-abdominal collection (Figure 1, 2), lymph node enlargement (≥1.0 cm in short axis diameter) (Figure 1), identified abnormal appendix (>0.6 cm), size of the appendix, fecalith (Figure 3), cecal wall thickness (>0.5 cm), abnormal free air, fat reticulation, colonic mass (Figure 4), peritoneal nodule, liver metastasis, and ascites.

Statistical Analysis

The age of patients and CT finding including the size of the collection, size of the appendix, and size of colonic mass are expressed as mean. All qualitative data, including gender, pathological findings, and CT findings are described as frequency and percentage.

The baseline characteristics of patients and CT findings were compared by using the Chi-square test or Fisher's exact test for categorical variables and the t-test for continuous variables. The CT findings of appendiceal abscess and right-side colonic cancer were analyzed using multivariate logistic regression models. A p-value <0.05 was considered to be statistically significant.

Ethics consideration

This study was reviewed and approved by Buri Ram Hospital ethic committee following the ethical guideline of the 1975 declaration of Helsinki (Reference number BR 0033.102.1/24)

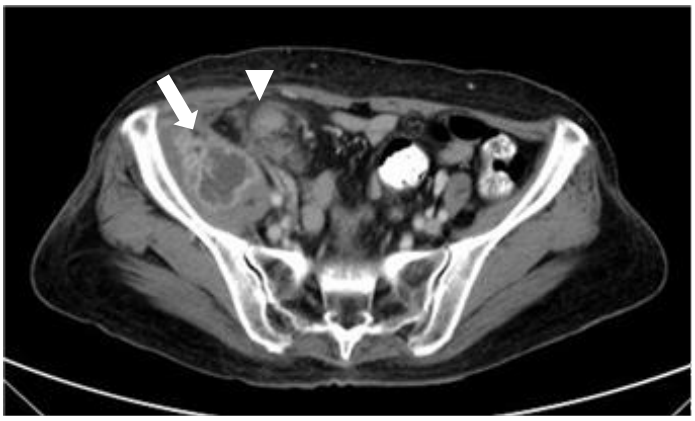

Figure 1. *A 64-year-old female presented with right lower abdominal mass and fever. Axial abdominal CT scan demonstrated intraabdominal collection (arrow) and lymphadenopathies (arrow head). The final diagnosis was CA ascending colon.*

Figure 2. *A 62-year-old female with right lower abdominal pain. Axial abdominal CT scan demonstrated peri-appendiceal fluid collection size 5.9 x 5.4 cm (arrow). The final diagnosis was appendicitis.*

Figure 3. *A 23-year-old male presented with right lower abdominal pain. Axial abdominal CT scan demonstrated an enlarged appendix with fecalith (arrow). The final diagnosis was appendicitis.*

Figure 4. *A 64-year-old female with right lower abdominal pain. Axial abdominal CT scan shows irregular enhancing mass size 6.7 x 5.8 cm (arrow). The final diagnosis was colonic cancer.*

Results

Patient characteristics

A total of 120 patients who clinically diagnosed with appendiceal abscess were divided according to pathology results into the appendiceal abscess group was 86 patients and the right-side colonic or cecal cancer group was 34 patients. The patients' characteristics and CT findings of appendiceal abscess and cecal or right-side colonic cancer were shown in table 1. The patients' mean age of the right-side colonic or cecal cancer group was older than the appendiceal abscess group by statistically significant (p-value 0.016). However, the patient's age ≥40 years were not shown statistically significant in both groups (p-value 0.051).

Imaging interpretation

The CT scan findings which increased the risk of appendiceal abscess were patients with intra-abdominal collection, the larger size of the abdominal collection, abnormal appendix, and fecalith that identified from CT scan by statistically significant (p-value <0.001, 0.010, <0.001, 0.004 respectively). On the contrary, the factors that increased the risk of cecal or right-side colonic carcinoma were cecal wall thickness, lymph node enlargement ≥1 cm. and colonic mass (p-value <0.001, 0.002, and <0.001 respectively).

Table 1 *Patients characteristic and CT findings of appendiceal abscess and cecal or right-side colonic cancer.*

Factors	Appendiceal abscess n=86 (%)	Cecal / Right-side colonic cancer n=34 (%)	p-value
Age (years), mean (± SD)*	51.6 (±17.9)	59.7 (±11.6)	0.016
Age ≥40 years old	70 (81.4%)	22 (64.7%)	0.051
Sex Male	37 (43.1%)	19 (55.9%)	0.203
Female	49 (56.9%)	15 (44.1%)	
CT Findings			
Intra-abdominal collection	80 (93.0%)	16 (47.1%)	<0.001
Collection size, mean(±SD)	4.8 (±1.9)	3.6 (±2.1)	0.010
Collection size ≥4 cm.	42 (62.7%)	18 (52.9%)	0.346
Identified abnormal appendix	68 (79.1%)	8 (23.5%)	<0.001
Appendix size, mean(±SD)	1.4 (±0.5)	1.3 (±0.5)	0.325
Fecalith	22 (25.9%)	1 (2.9%)	0.004
Cecal wall thickness	25 (29.1%)	22 (64.7%)	<0.001
Abnormal free air	13 (15.1%)	2 (5.8%)	0.168
LN† enlargement ≥1 cm.	5 (5.8%)	9 (26.5%)	0.002
Fat reticulation	76 (88.4%)	25 (75.8%)	0.086
Colonic mass	3 (3.5%)	25 (73.5%)	<0.001
Mass size; mean ±SD	6.6 ±0.2	5.5 ±2.6	0.300
Peritoneal nodule	0	2 (5.9%)	0.079
Liver metastasis	0	2 (5.9%)	0.079
Ascites	9 (10.5%)	3 (8.8%)	0.787

*SD, standard deviation; †LN, lymph nodes.

The factors associated with appendiceal abscess were analyzed by multivariate analysis (table 2). The factors which increased the risk of appendiceal abscess were intra-abdominal collection (OR 4.15, 95% CI 1.0.-16.92 and p-value 0.047), and abnormal appendix (OR 4.01, 95% CI 1.17-13.67 and p-value <0.026). The factors which increased risk of malignancy was colonic mass (OR 0.09, 95% CI 0.02-0.43 and p-value <0.002).

Table 2: *Univariate and multivariate logistic regression analysis of factors associated with appendiceal abscess.*

Variable	Univariate			Multivariate		
	OR*	95% CI†	p-value	OR	95% CI	p-value
Intra-abdominal collection	15	4.65-52.12	<0.001	4.15	1.01-16.92	0.047
Identified abnormal appendix	12.28	4.38-36.11	<0.001	4.01	1.17-13.67	0.026
Fecalith	11.52	1.68-489.67	0.004	1.99	0.21-18.45	0.541
Cecal wall thickening	0.22	0.09-0.56	<0.001	0.61	0.16-2.28	0.470
LN enlargement ≥1 cm.	0.17	0.04-0.64	0.002	0.30	0.05-1.57	0.156
Colonic mass	0.01	0.00-0.06	<0.001	0.09	0.02-0.43	0.002

*OR, Odd ratio; †CI, Confidence interval

Discussion

The CT scan was effective and highly accurate for the diagnosis of acute appendicitis, especially in cases with complications such as rupture or abscess formation.[14, 15] However, the manifestation of CT findings in some patients was mimic the right side colonic or cecal carcinoma. A report of acute appendicitis that first manifested mimicked the colonic carcinoma was 0.8% and the incidence of colonic cancer had increased 36.5-fold in patients older than 40 years old with appendicitis.[16] In this study, the mean age of patients with colonic or cecal carcinoma group was older than the appendiceal group. However, the patient's age ≥40 years old was not shown statistically significant between both groups because the mean age of patients in both groups was older than 50 years old.

In the previous study, Watchorn et al. was reported that the CT scan finding of colonic carcinoma could be manifested as appendicitis for example thickening wall of the cecum or dilatation of the appendix.[13] Several case reports were shown the appendiceal abscess associated with colonic carcinoma from the CT finding that found the peri-appendiceal collection, cecal wall thickening, or complex mass with peripheral rim enhancement.[13, 17, 18] This study reported the CT findings of appendiceal abscess and right side colonic and cecal carcinoma which first clinically presented with appendiceal abscess. Univariate analysis shown that the CT findings which increased risk of appendiceal abscess were intra-abdominal collection, abnormal appendix and fecalith. Conversely, cecal wall thickness, lymph node enlargement ≥1 cm. and colonic mass were increased risk of colonic carcinoma. However, after multivariate analysis was performed. Intra-abdominal collection and abnormal appendix were CT findings which increased risk for appendiceal abscess by 4.15-fold and 4.01-fold, respectively. Like the previous reports, Horrow et al, reported that the CT finding criteria for diagnosis of complicated appendicitis that included appendiceal abscess were abdominal collection, appendicolith, or extraluminal air.[19] Kim et al. documented the CT scan finding of complicated appendicitis were appendicolith, abscess, extraluminal air, appendiceal wall defect, and fat stranding.[20] However, this study reported not only CT findings of an appendiceal abscess but also documented of diffentiated between appendiceal abscess and right-side colonic or cecal carcinoma. However, the difference in CT scan findings of both conditions was important to consider treatment with an appropriate approach including immediate surgery or medical treatment.

Limitations

This study had some limitations. First, the retrospective nature of our study made it difficult to control factors, such as CT protocol (with or without contrast media administration, delayed or no delayed bladder phase, whole abdominal study or only lower abdominal study, and slice thickness). Second, there was a substantial asymmetry between the two groups (diagnosed appendiceal abscess and right-side colonic or cecal carcinoma). It is possible that these factors could have adversely influenced the results of our statistical analyses.

Conclusion

CT scan in patients who clinically diagnosed with appendiceal abscess was useful for differentiating between appendiceal abscess and right-side colonic or cecal carcinoma. Abnormal appendix and intra-abdominal collection favored appendiceal abscess. Conversely, the colonic mass increased the risk of right-side colonic or cecal carcinoma.

References

1. Tannoury J, Abboud B. Treatment options of inflammatory appendiceal masses in adults. World J Gastroenterol 2013;19(25):3942-50. doi: 10.3748/wjg.v19.i25.3942.
2. Kim JK, Ryoo S, Oh HK, Kim JS, Shin R, Choe EK, et al. Management of appendicitis presenting with abscess or mass. J Korean Soc Coloproctol 2010;26(6):413-9. doi: 10.3393/jksc.2010.26.6.413.
3. Willemsen PJ, Hoorntje LE, Eddes EH, Ploeg RJ. The need for interval appendectomy after resolution of an appendiceal mass questioned. Dig Surg 2002;19(3):216-20. doi: 10.1159/000064216.
4. Hurme T, Nylamo E. Conservative versus operative treatment of appendicular abscess. Experience of 147 consecutive patients. Ann Chir Gynaecol 1995;84(1):33-6. PMID: 7645908
5. Mosegaard A, Nielsen OS. Interval appendectomy. A retrospective study. Acta Chir Scand 1979;145(2):109-11. PMID: 463439
6. Andersson RE, Petzold MG. Nonsurgical treatment of appendiceal abscess or phlegmon: a systematic review and meta-analysis. Ann Surg 2007;246(5):741-8. doi: 10.1097/SLA.0b013e31811f3f9f.
7. Thompson JE Jr, Bennion RS, Schmit PJ, Hiyama DT. Cecectomy for complicated appendicitis. J Am Coll Surg 1994;179(2):135-8. PMID: 8044380
8. Kim Y, Al-Sawat A, Lee CS. Laparoscopic cecectomy for complicated appendicitis using a new articulating instrument: A video vignette. Asian J Surg 2022;45(1):527-8. doi: 10.1016/j.asjsur.2021.09.025.
9. Sarkar R, Bennion RS, Schmit PJ, Thompson JE. Emergent ileocecectomy for infection and inflammation. Am Surg 1997;63(10):874-7. PMID: 9322662
10. Weixler B, Warschkow R, Ramser M, Droeser R, von Holzen U, Oertli D, et al. Urgent surgery after emergency presentation for colorectal cancer has no impact on overall and disease-free survival: a propensity score analysis. BMC Cancer 2016;16:208. doi: 10.1186/s12885-016-2239-8.
11. Pinto Leite N, Pereira JM, Cunha R, Pinto P, Sirlin C. CT evaluation of appendicitis and its complications: imaging techniques and key diagnostic findings. AJR Am J Roentgenol 2005;185(2):406-17. doi: 10.2214/ajr.185.2.01850406.
12. Suthikeeree W, Lertdomrongdej L, Charoensak A. Diagnostic performance of CT findings in differentiation of perforated from nonperforated appendicitis. J Med Assoc Thai 2010;93(12):1422-9. PMID: 21344805
13. Watchorn RE, Poder L, Wang ZJ, Yeh BM, Webb EM, Coakley FV. Computed tomography findings mimicking appendicitis as a manifestation of colorectal cancer. Clin Imaging 2009;33(6):430-2. doi: 10.1016/j.clinimag.2009.01.009.
14. Mun S, Ernst RD, Chen K, Oto A, Shah S, Mileski WJ. Rapid CT diagnosis of acute appendicitis with IV contrast material. Emerg Radiol 2006;12(3):99-102. doi: 10.1007/s10140-005-0456-6.
15. Rud B, Vejborg TS, Rappeport ED, Reitsma JB, Wille-Jørgensen P. Computed tomography for diagnosis of acute appendicitis in adults. Emergencias 2020;32(6):429-30. PMID: 33275365.
16. Lai HW, Loong CC, Tai LC, Wu CW, Lui WY. Incidence and odds ratio of appendicitis as first manifestation of colon cancer: a retrospective analysis of 1873 patients. J Gastroenterol Hepatol 2006;21(11):1693-6. doi: 10.1111/j.1440-1746.2006.04426.x.

17. Fiume I, Napolitano V, Del Genio G, Allaria A, Del Genio A. Cecum cancer underlying appendicular abscess. Case report and review of literature. World J Emerg Surg 2006;1:11. doi: 10.1186/1749-7922-1-11.
18. Chandra Mohan S, Gummalla KM, H'ng MWC. Malignant Tumours Mimicking Complicated Appendicitis and Discovered upon Follow-Up after Percutaneous Drainage: A Case of Two Patients. Case Rep Radiol 2017;2017:3253928. doi: 10.1155/2017/3253928.
19. Horrow MM, White DS, Horrow JC. Differentiation of perforated from nonperforated appendicitis at CT. Radiology 2003;227(1):46-51. doi: 10.1148/radiol.2272020223.
20. Kim MS, Park HW, Park JY, Park HJ, Lee SY, Hong HP, et al. Differentiation of early perforated from nonperforated appendicitis: MDCT findings, MDCT diagnostic performance, and clinical outcome. Abdom Imaging 2014; 39(3):459-66. doi: 10.1007/s00261-014-0117-x.