

Necessary for CT Whole Abdomen in Post Chemoradiation of Rectosigmoid Cancer Stage 3: A Comparative Study

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ABSTRACT

Objective: To study the reliability of CT scan interpretation in pre- and post-operative chemoradiation of rectosigmoid cancer.

Methods: Retrospective review CT scan of 12 patients with diagnosis of rectosigmoid cancer stage 3 or more in pre and post operative chemoradiation were done by 2 radiologists. Data analysis included maximum wall thickness, distance of lesion above anal verge, perirectal involvement, regional node, distant metastasis. Chest radiograph (CXR), endorectal ultrasound (ERUS), barium enema (BE), colonoscopy and treatment information were reviewed.

Results: Reliability of TNM staging by CT scan interpretation were .66, .50 and .75, respectively total reliability is .75 and overall validation of CT scan staging is .40 with statistic significant at .05 reference with pathological staging.

Conclusion: There was CT scan interpretation reliability in pre- and post- chemoradiation for rectosigmoid cancer patients.

Keywords: CT scan; Rectosigmoid cancer

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Rectosigmoid cancer had high prevalence in Thailand narrated by Siriraj Institute of Cancer¹ in 2003 that there were the second in male cancer and the third in female cancer finally there were the third place for total cancer patients that were 6.30 percent. With the treatment options, surgery was the standard procedure however, from the literature there were complication for example, adhesion band, bowel obstruction, these were the limitation in the surgery so chemoradiation were accomplished with pre or post-operation for the improving results, whereas, pre-operation chemoradiation had intention for better result²⁻⁶ such as

1. Local recurrence rate reduction
2. Late complication reduction such as bowel obstruction
3. Pre-operation radiation were increase the tissue oxygenation for higher radiation sensitivity than post- operation radiation
4. Some part of small bowel could be mal position from surgery procedure or adhesion band could be occurred too, so pre-operative radiation could be reduce side effects to G.I. system in these situation

5. Increase the probability in down staging of the cancer
6. Increase the sphincter preservation in abdomino-peritoneal resection (APR) method
7. Tumor spillage reduction in operation

Researchers were interested in the reliability of the interpretation of CT scan in pre- and post- chemoradiation in pre-operative rectosigmoid cancer patients for evaluation of the benefit of CT scan in pre- chemoradiation.

Purpose

To study the reliability of the interpretation of CT scan in pre- and post- chemoradiation in pre- operative rectosigmoid cancer patients.

MATERIALS AND METHODS

The research was the retrospective review CT scan of 12 patients with diagnosis of rectosigmoid cancer stage 3 or more in pre- and post- chemoradiation in pre-operative patients, interpretation were done by 2 radiologists. Data analysis included the factors that physicians were interested and be the treatment resulting data

1. Maximum wall thickness in centimeters
2. Distance of lesion above anal verge in centimeters

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TABLE 1. Reliability of interpretation of CT whole abdomen.

Staging	Value	Reliability
T	8/12	.66
M	6/12	.50
N	9/12	.75
Total	9/12	.75

3. Perirectal involvement
4. Regional node at perirectal, internal iliac and external iliac node in size and numbers
5. Distant metastasis to other locations such as para-aortic node, inguinal node, liver and adjacent organ

However, the result of chest radiograph (CXR), endorectal ultrasound (ERUS), barium enema (BE), colonoscopy and treatment information were reviewed too.

Patient preparation and CT whole abdomen protocols

1. 600-800 ml. for oral contrast in 35-45 min. prior to study and 200 ml. Prior to scan.
2. 200-500 ml. contrast enema and vaginal tampon for female was recommended.
3. IV contrast with bolus injection at 4 ml./sec flow rate, 75-100 cc. in volume.
4. Inspiration and hold when scan were done with 10 mm. slice thickness and 10 mm. slice interval.
5. Supine position was recommended.
6. Scan region were set from dome of liver to pubic symphysis.
7. Exposure technique for spiral CT (PHILIPS model Tomoscan AV) was 120 kVp, 300 mA. Scan time 1 sec with filter 4-5.
8. Exposure technique for conventional CT (PHILIPS model CXQ) was 120 kVp, 250 mA. Scan time 4.5 sec with filter 2.

All of patients were performed twice CT whole abdomen with triple contrast administration in pre- and post- chemoradiation. Then patients were operated in 4-6 weeks later and tissue diagnosis results were proved. CT image were interpreted by 2 radiologists for TMN and staging and reliability were analyzed.

RESULTS

1. Internal reliability in T N M A %0 total staging interpretation by 2 radiologists were showed in Table 1.

From Table 1 were shown that M staging and total staging had .75 in internal reliability so we could used one of both interpretation for further comparison.

2. Staging interpretation of pre- and post- chemoradiation CT whole abdomen were compared with tissue diagnosis and overall accuracy was .40.
3. Paired sample t-test were performed to analyze the interesting 4 factors shown in Table 2.

TABLE 2. T-test in investigated factors of pre- and post-chemoradiation CT whole abdomen.

Factor	df	t	p
Maximal wall thickness	10	-.949	.365
Distance of lesion above anal verge	10	.80	.441
Perirectal node size	11	2.24*	.046
Number of perirectal node	11	1.48	.166

From Table 2 shown that distance of lesion above anal verge in centimeter, perirectal involvement, perirectal node size and number and perirectal, internal iliac and external iliac node have no statistical difference, only perirectal node size have statistical difference with confidence at 95% ($t=2.24$ $p<.05$).

DISCUSSION

1. CT image interpretation could specified only the lesion that invasion into muscularis propria, sub-serosa or perirectal tissue and other nearby organ or other internal perforation, but limitation for interpretation of lesion which is occupied only in mucosa level.
2. Landmark of anal verge definition were not clearly identified because of the scan techniques with auto reconstruction that represented the difference anal verge position so the interpretation of the pathological position would be affected too.
3. Chemoradiation effect led to the bowel wall edema causes difficulty in interpretation.
4. Post- chemoradiation CT scan did not performed for compared to the pathological results because of the radiation effect on the bowel wall edema and dirty of fat stranding that made poor interpretation.
5. A discreted mass or focal wall thickening.
 - 3 mm. normal distended bowel wall
 - 3-6 mm. intermediate
 - > 6 mm. definite abnormal bowel wall

From the CT images

T₁-T₂ (Tumor seed in the large bowel wall) shown the smooth outer border no folding of soft tissue (Fig 1).

T₃ (Tumor seed in the large bowel wall) shown the rough border of case and there are soft tissue stranding at the outer side of the wall (Fig 2).

T₄ (Tumor invade to outside the large bowel wall) shown the loss of fat plane between the large bowel wall and the related muscles (Fig 3).

6. Tumor size: indicated by the most thickest bowel wall.
7. The invasion to the serosa: indicated by irregularity of outer bowel wall.
8. The invasion to other related organs: indicated by absent of fat plane between urinary bladder and

**Fig 1.** Colorectal cancer (T1-2, tumor confine in colonic wall)

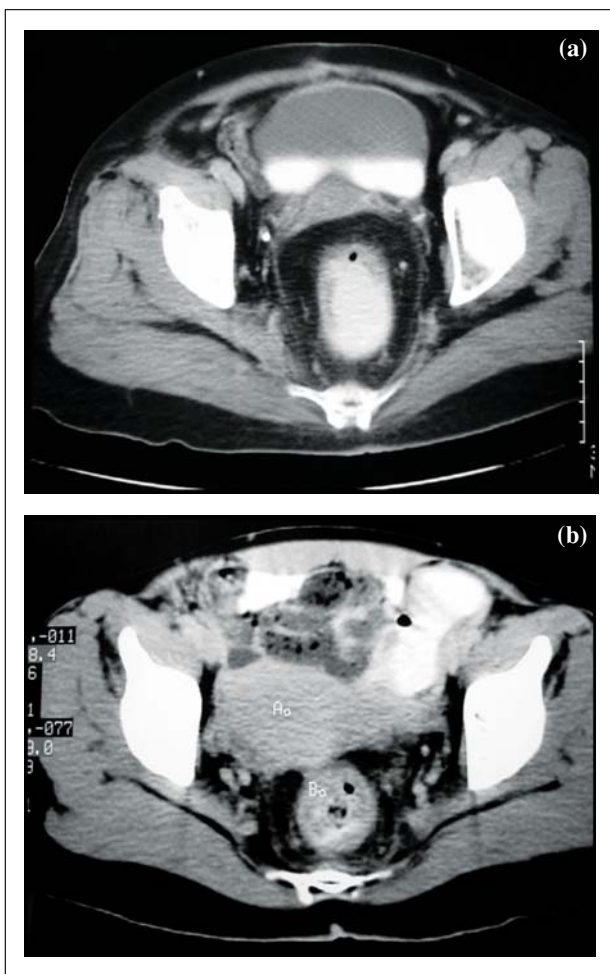


Fig 2 (a&b). Colorectal cancer (T3, tumor invade through layers of colonic wall with perirectal fat stranding)

tumor mass, fat plane between tumor mass and levator ani for the obliterate, if there are shown that there were metastasis state, in male investigated fat plane between prostate gland, seminal vesicle and the tumor mass, in female investigated fat plane between uterus and tumor mass.

9. Area of anal verge: investigated the inferior pubic rami.
10. Mesorectal invasion: investigated the stranding

of the soft tissue in the surrounding area.

11. Lymph nodes interpretation:

- Normal lymph node should not larger than 1 cm.
- If larger lymph node, probably metastasis or infection.

12. Metastasis: consideration no. of paraortic node, liver, inguinal node with chest x-ray or ultrasound modality.

Technique recommendations

1. Short scan time for improves the resolution of post contrast CT images.
2. Thin slice scan in the interested area for the detection of small lesion.
3. CT colonoscopy to additional detection of the lesion
4. Well bowel enema and distend rectum for clearly detection of the lesion.
5. CT scan in peak mural enhancement that could indicated the bowel wall, levator ani and sphincter clearly.

CT utilization

High accuracy in the invasion period of tumor into surrounding tissue and metastasis.

Study limitation

1. Small sample size: the sample were only 12 patients due to the retrospective study selection the patient who had operation result, pathological results and other modality diagnostic results for completely comparison, lesser sample size cause to less diagnostic difference probably.
2. Difference machine: patients were scanned by the difference CT machine that the scan technique difference took part in the quality of the CT images and also affected the precious interpretation.
3. Time difference: post- chemoradiotherapy patients got the scan in difference period because of the scan queue, sometimes these factor might affected the difference of results of chemoradiation results too.

CT limitation for preoperative staging

1. CT image could not definite the metastasis node
2. CT image could not measured the depth of the tumor as MRI image
3. Small tumor size should under detectable with CT scan
4. CT images were less in tumor specificity definitely for lymphoma, leiomyosarcoma, adenocarcinoma

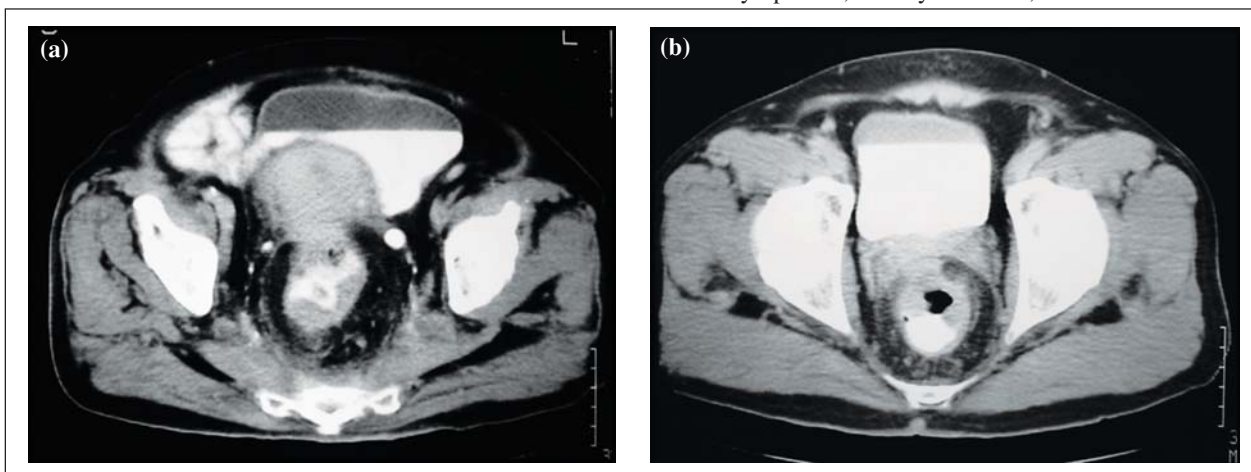


Fig 3 (a&b). Colorectal cancer (T4, tumor penetrate outward through colonic serosa and involved extracolonic tissue and adjacent muscles or organs such as urinary bladder)

CONCLUSION

The study showed the difference in CT images significantly in pre and post chemoradiation of the rectosigmoid cancer only in the size of perirectal lymph node. So we could summarized that CT scan could not show the statistical significant of the interpretation of the tumor response from the chemoradiation, so with the field of utilization, CT scan should not necessary for post chemoradiation evaluation and for the benefit of the patient willing to pay and the third party.

REFERENCES

1. Siriraj Cancer Center, Annual Report. Bangkok: 2003: 25-7.
2. Fucjskager MH, Maier AG, Schima W, Zebedin E, Herbst F, Mittlbock M, et al. Comparison of transrectal sonography and double-contrast MR imaging when staging rectal cancer. *AJR Am J Roengenol* 2003;181: 421-7.
3. Sosna J, Morrin MM, Kruskal JB, Farrell RJ, Nasser I, Raptopoulos V, et al. Colorectal neoplasms: role of intravenous contrast-enhanced CT colonography. *Radiology* 2003;228:152-6.
4. Neri E, Giusti P, Battolla L, Vagli P, Boraschi P, Lencioni R, et al. Colorectal cancer: role of CT colonography in pre-operative evaluation after incomplete colonoscopy. *Radiology* 2002;223:615-9.
5. Hulsmans FJ, Tio TL, Fockens P, Bosma A, Tytgat GN. Assessment of tumor infiltration depth in rectal cancer with transrectal sonography: caution is necessary. *Radiology* 1994;190:715-20.
6. Rivadeneira DE, Wong WD. Pre-operative staging of rectal cancer. *Clin Col Rec Surg* 2002;15:7-26.
7. Yee J, Akerkar GA, Hung RK, Steinauer-Gebauer AM, Wall SD, McQuaid KR. Colorectal neoplasia: performance characteristics of CT colonography for detection in 300 patients. *Radiology* 2001;219:685-92.
8. Compton CC. Staging of rectal cancer and the pathologist's role in assessing the quality of rectal cancer surgery. *Clin Col Rec Surg* 2002;15:7-16.
9. Thoeni RF. Colorectal cancer. Radiologic staging. *Radiol Clin North Am* 1997;35:457-85.

บทคัดย่อ

ความจำเป็นในการตรวจเอกซเรย์คอมพิวเตอร์ช่องท้องทั้งหมดในผู้ป่วยโรคมะเร็งลำไส้ใหญ่ส่วนปลายระยะที่ 3: การเปรียบเทียบก่อนและหลังการรักษาด้วยการให้รังสีรักษาและการให้เคมีบำบัด

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วัตถุประสงค์: เพื่อศึกษาความน่าเชื่อถือได้ของการแปลผลภาพเอกซเรย์คอมพิวเตอร์ก่อนและหลังการให้รังสีรักษาและยาเคมีบำบัดในผู้ป่วยที่เป็นมะเร็งลำไส้ใหญ่ส่วนปลาย

วิธีการ: เป็นการศึกษาย้อนหลังในผู้ป่วยที่ได้รับการเลือกทำ pre-operative chemoradiation เป็นจำนวน 12 ราย โดยผู้ป่วยทุกรายได้รับการวินิจฉัยเป็นมะเร็งลำไส้ใหญ่ส่วนปลายและมีผลพยาธิวิทยาเป็น adenocarcinoma stage III ขึ้นไป โดยให้รังสีแพทย์จำนวน 2 ท่าน ทำการ review ภาพเอกซเรย์คอมพิวเตอร์ ทั้งก่อนและหลังการให้รังสีรักษาและยาเคมีบำบัดในหัวข้อ ได้แก่ maximum wall thickness, distance of lesion above anal verge, perirectal involvement, regional node, distant metastasis และยังพิจารณาพร้อมกับผล CXR, ERUS, BE, colonoscopy รวมถึงการให้รังสีรักษาและการให้ยาเคมีบำบัด

ผลการศึกษา: การ review ค่า T staging มีความน่าเชื่อถือ .66, N staging มีความน่าเชื่อถือ .50, M staging มีความน่าเชื่อถือ .75 และ total staging มีความน่าเชื่อถือ .75 โดยมีค่าความเที่ยงตรงในการอ่าน staging จากภาพ CT เทียบกับผล pathological staging มีความเที่ยงตรงโดยรวม .40 ที่นัยสำคัญทางสถิติ .05

สรุป: มีความน่าเชื่อถือในการแปลผลภาพเอกซเรย์คอมพิวเตอร์ก่อนและหลังการให้รังสีรักษาและยาเคมีบำบัดในผู้ป่วยที่ได้รับการวินิจฉัยเป็นมะเร็งลำไส้ใหญ่ส่วนปลาย