Short report
UDC:616.351-006:616.072:616-089.8:615.837

Tomislav PETROVIĆ
Zoran RADOVANOVIĆ
Milan BREBERINA

Role of endorectal ultrasonography in preoperative staging of rectal cancer

KEY WORDS: *Rectal Neoplasms; Ultrasonography; Neoplasm Staging; Colorectal Neoplasms+dignosis+therapy*

DEPARTMENT OF SURGICAL ONCOLOGY,
INSTITUTE OF ONCOLOGY SREMSKA KAMENICA, YUGOSLAVIA

Archive of Oncology 2002,10(1):37-38©2002, Institute of Oncology Sremska Kamenica,Yugoslavia

Colorectal cancer is the fourth most common type of cancer worldwide yet there continues to be controversy and confusion regarding the best methods and techniques for its diagnosis and management. The treatment of rectal carcinoma is mainly determined by its local extension. Preoperative staging of rectal carcinoma can be assessed by different methods: digital rectal examination, transrectal ultrasound, computed tomography, and magnetic resonance imaging.

The first articles about endorectal ultrasonography (ERUS) and its application in diagnostics of anorectal diseases date since 1956. Its use in clinical practice was limited mostly because of the bad technical characteristics of probes (1,2). Over the past several years, the tremendous improvements in endorectal and endoanal ultrasonography allowed a much more accurate evaluation of both benign and malignant anorectal diseases and what is more important staging of rectal tumors and surrounding lymph nodes. Moreover, ERUS provides visualization and diagnostic of prostate gland, seminal vesicles, vagina, urinary bladder and rectouterine (Douglas) space (1-4). Usually, 7.5-MHz, 10-MHz and 12-MHz radial scanning transducers are used. These transducers provide transverse 360∞ scans in the longitudinal axis of the rectum. The patient is in the left lateral decubitus position. The echoendoscope is inserted up to 25 cm from the anal verge, to the location of the root of the inferior mesenteric artery. For acoustic contact, the rectal lumen is filled with latex balloon inflated with degassed water. The examination is complete when the entire tumor, rectum, mesorectum and surrounding structures are visualized thoroughly.

Address correspondence to:
Assist. Dr. Tomislav Petrović, Institute of Oncology Sremska Kamenica, Institutski put 4, 21204 Sremska Kamenica, Yugoslavia

Manuscript was received: 05.02.2002.

Accepted for publication: 13.02.2002.

Using ERUS, rectal wall is represented by concentric circles of alternating hyperechoic and hypoechoic bands. The majority of investigators agree on a 5-layer model of the rectal wall (from inside out) (5,6):

1. The first hyperechoic line - mucosa
2. The first hypoechoic line - lamina muscularis mucosae
3. Middle hyperechoic line - submucosa
4. Second hypoechoic line - muscularis propria
5. Third hyperechoic line - serosa.

During past decades staging of rectal cancer was determined mainly with digital rectal examination and radiography, later on with computed tomography (CT) and magnetic resonance imaging (MRI). In recent years, ERUS is becoming the leading diagnostic procedure for cancer of anus and rectum. There are many reasons for this: ERUS is inexpensive and quick diagnostic procedure; it is well tolerated by patient; there is no radiation; depth of penetration and nodal status in rectal cancers can be defined with high accuracy degree; good visualization of perirectal tissue and pelvic organs.

Many studies compare diagnostic accuracy between ERUS, CT and MRI. The results are very interesting. ERUS shows much better results versus CT in tumor staging while diagnostic accuracy of MRI and ERUS is similar. Concerning lymph node status the results are little different. MRI has the best accuracy following ERUS and CT (7-10).

For example, the results of one French study showed that digital rectal examination had a diagnostic accuracy between 68 and 83 percent. The accuracy of transrectal ultrasound was between 67 and 93 percent for tumor staging and between 62 and 88 percent for lymph node staging. The accuracy of computed tomography was between 33 and 77 percent for tumor staging and between 22 and 73 per cent for lymph node staging. The overall accuracy of magnetic resonance imaging with body coil was between 59 and 95 per cent, and between 39 and 95 percent for lymph node staging.

Use of an endorectal coil allows a slightly more consistent degree of accuracy, with tumor staging accuracy between 66 and 91 percent, and lymph node staging accuracy between 72 and 79 percent. Preoperative radiation therapy makes transrectal ultrasound and computed tomography less effective as staging techniques (11).

Table 1. TNM classification of rectal cancer (15)

TNM Classification of rectal cancer (15)
T_x – Primary tumor cannot be assessed
T_0 – No evidence of primary tumor
T_{is} – Carcinoma in situ
T_1 – Invasion through muscularis mucosae into submucosa (ERUS: middle hyperechc line broken)
T_2 – Tumor is confined to the muscularis propria (ERUS: widening of the outer hypoechoic line but no break in the outer hyperechoic line)
T_3 – Tumor invades through muscularis propria into subserosa or into nonperitonealiz pericolic or perirectal tissues (ERUS: the outer hyperechoic line broken)
T_4 – Tumor directly invades other organs or structures and/or perforates visceral peritoneum
N_x – Regional lymph nodes cannot be assessed
N_0 – No regional lymph node metastasis
N_1 – Metastasis in 1 to 3 perirectal lymph nodes
N_2 – Metastasis in 4 or more perirectal lymph nodes
N_3 – Metastasis in any lymph node along the course of a named vascular trunk
M_x – Presence of distal metastasis cannot be assessed
M_0 – No distant metastasis
M_1 – Distant metastasis

Inflammatory and associated reactive changes in rectum wall and perirectal tissue and preoperative radiotherapy are main causes of overstaging. They are presented as hypoechoic lesions and can be confused with carcinoma. In stenotic cancers optimum positioning of the ultrasound probe can be difficult with possible understaging of the depth of tumor invasion.

In general, assessment of regional lymph node involvement is not accurate as that of tumor invasion depth. The overstaging is primarily caused by the presence of reactive swollen lymph nodes. Reasons for understaging are difficulty in detecting very small involved nodes (less than 2 mm) and lateral pelvic lymph nodes like the obturator nodes (located so far from the rectum that they can not be effectively imaged with the available probes) and inadequacy of criteria for involved node (12,13).

It would be difficult today to practice colon and rectal surgery without endorectal ultrasonography performed by a surgeon. ERUS provides accurate data on degree of wall penetration and pararectal lymph node involvement. This is of great importance for adequate therapy planning. Careful assessment of the uT and uN stages is critical in determining the success of therapies and directing treatment algorithms. Transanal local resections with curative intent are limited to patients with T1N0 rectal cancers. Conservative management may also be extended to patients identified with significant underlying comorbid conditions staged preoperatively with unfavorable T2/T3 lesions, often combined with adjuvant therapies in a palliative setting (14). In addition, ERUS may have a role in the selection of those patients with more advanced lesions to neoadjuvant radiochemotherapy or radiotherapy alone, followed by radical resection.

ERUS is evolving in its role of rectal cancer staging and postoperative follow-up of patients and can lead to the early detection of local recurrences. Because of its advantages over CT and MRI, ERUS is becoming widespread and soon it will be standard diagnostic modality.

REFERENCES

1. Law PJ, Bartram CI. Anal endosonography technique and normal anatomy. Gastrointestinal Radiol 1989;14:349-53.
2. Kurjak A, Fučkar Ž, Ghabri HA. Ultrazvuk abdomena i malih organa.(Ultrasound of abdomen and small organs). Belgrade-Zagreb: Medicinska Knjiga; 1990. p. 354-60.
3. Goldman S, Arvidsson H, Norming U, Lagerstedt U, Magnusson I, Frisell J. Transrectal ultrasound and computed tomography in preoperative staging of lower rectal adenocarcinoma. Gastrointest Radiol 1991;16:259-63.
4. Inoue T, Suzuki T, Watariue T. Ultrasonographic inspection for lymph node metastases of rectal cancer. International Society of University Colon and Rectal Surgeons. In: XIV biennial congress, Crete, Greece, October, 1992.
5. Rauch I. Preoperative endoluminal sonography in rectal carcinoma. Central European Symposium of Coloproctology. November 1993, Brno, Moravia, Czech Republic. 1993.
6. Šaranović Đ, Krivokapić Z. Preoperative staging of rectal neoplasms with endorectal ultrasonography. Arch Oncol 2001;9(Suppl 2):3.
7. Slezák V, Prochotsky A. Endorectal sonography at management of treatment of surgical therapy of carcinoma recti. Central European Symposium of coloproctology. November, Brno, Czech Republic, 1993.
8. Ivanov K, Ignatov V, Temelkov T. Endoscopic and ultrasound examination of rectal cancer. Preoperative staging and postoperative follow up. International Society of University Colon and Rectal Surgeons, XIV biennial congress, Crete, Greece, October, 1992.
9. Langer C, Liersch T, Wustner M, Muller D, Kilian D, Fuzesi L, Becker H. Endosonography in epithelial rectal tumors. Value of a differentiated therapy concept. Chirurg 2001;72:266-71.
10. Senesse P, Khemissa F, Lemanski C, Masson B, Quenet F, Saint-Aubert B et al. Contribution of endorectal ultrasonography in preoperative evaluation for very low rectal cancer. Gastroenterol Clin Biol 2001;25:24-8.
11. Pessaux P, Burtin P, Arnaud JP. Staging for locoregional extension of rectal adenocarcinoma. Ann Chir 2001;126:10-7
12. Kim JC, Yu CS, Jung HY, Kim HC, Kim SY, Park SK, Kang GH, Lee MG. Source of errors in the evaluation of early rectal cancer by endoluminal ultrasonography. Dis Colon Rectum 2001;44:1302-9.
13. Akasu T, Sugihara K, Moriya Y, Fujita S. Limitations and pitfalls of transrectal ultrasonography for staging of rectal cancer. Dis Colon Rectum 1997;40(Suppl):S10-S15.
14. Kim HJ, Wong WD. Role of endorectal ultrasound in the conservative management of rectal cancers. Semin Surg Oncol 2000;19:358-66.
15. Fleming ID, Henson DE, Cooper JS et al. In: Cancer Staging Manual. 5th ed. American Joint Committee on Cancer. Philadelphia: Lippincot-Raven; 1997.