Comparative Study for Preoperative Staging of Rectal Cancer

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A comparative study of preoperative evaluation of rectal cancer is
presented. Sixty-eight patients with rectal cancer were examined dig-
itally and by computerized tomography and transrectal ultrasound.
Preoperative staging was compared with pathologic findings at
surgery. Digital examination and transrectal ultrasound were accurate
in 82.8 and 76.2 percent, respectively and were superior to CT, which
was accurate in 65.5 percent of cases for assessment of rectal wall
invasion. All three modes play a role in preoperative assessment, but
digital examination and rectal ultrasound appear to be more effective.
[Key words: Rectal cancer; Staging; Transrectal ultrasound.

ESTABLISHMENT OF THE preoperative stage of a rectal
cancer is of primary importance in determining the man-
agement and operative procedure. Conventional exami-
nations for rectal cancer, such as proctoscopy and contrast
barium enema, yield limited evidence regarding the
depth of invasion. Modern technology has introduced
computerized tomography (CT) and transrectal ultra-
sound as diagnostic tools for rectal carcinoma and there
are reports of favorable results using these modes.[1-5]

The authors adopted CT and transrectal ultrasound
examination as complementary to rectal digital examina-
tion and performed a prospective study to assess rectal
cancer preoperatively.

Material and Methods

Sixty-eight patients (46 men, 22 women) with primary
rectal cancer were examined prospectively. Ages ranged
from 28 to 82 years (average, 65). All tumors were located
between 3 and 10 cm from the anal verge. Duration of
symptoms was 1 to 12 months before diagnosis (Fig. 1).
Preoperative assessment included: clinical examination,
intravenous pyelography, contrast barium enema, CT,
and transrectal ultrasound. Digital and CT examinations
were performed on all 68 patients. Histologic results were
obtained in all but ten patients. Eight of the ten were
inoperable and two underwent local excision with indef-
inite pathologic examination. Later in the study transrec-
tal sonar was introduced as an additional examination.
Transrectal ultrasound was performed with the ultra-
sound scanner manufactured by Brul and Kjur Real Time
Rotating Trans Rectal Ultrasound with a 4 mHz probe.
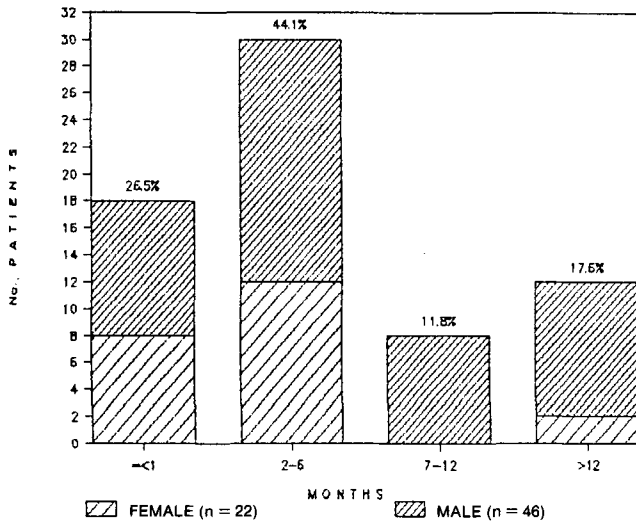The latter 52 consecutive cases were examined using all

FIG. 1. Duration of symptoms before diagnosis in 68 patients.

three modes. Pathologic staging was according to the Dukes and Bussey classification.[6,7]

Clinical Examination: Rectal digital examination was undertaken by two physicians, one of whom was a consultant. Clinical examination was graded as follows: A: small tumor mobile over rectal wall. B: tumor mobile but not separable from the rectal wall; C: tumor fixed to surrounding tissues.

Radiographic Grading: Radiographic grading as found at CT examination was as follows: A: tumor invasion to muscularis mucosa; B: tumor invasion to serosa; C1: tumor invading perirectal fat and near lymph nodes; C2: C1 with further positive lymph nodes.
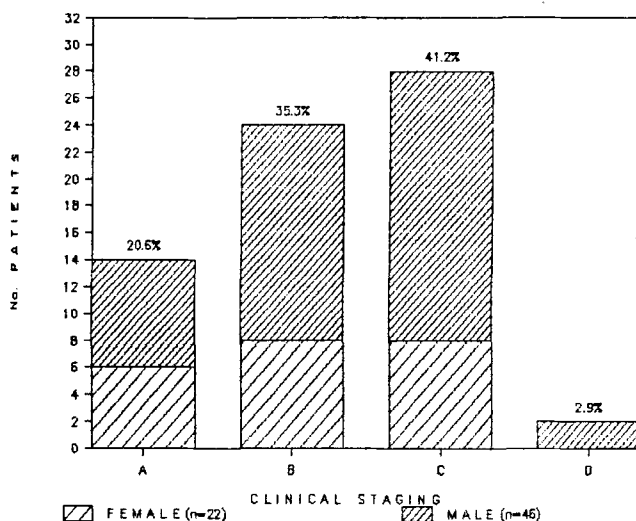

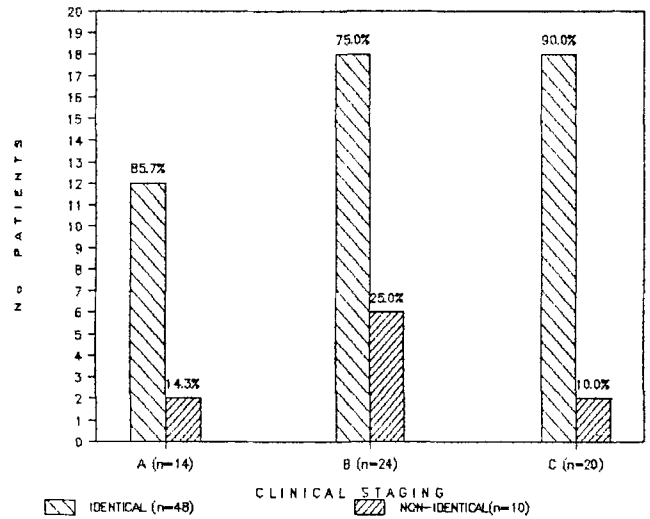FIG. 2. Preoperative digital examination grading in different stages (68 patients).

FIG. 3. Accuracy of digital examination in the different stages according to histologic findings. Comparison of clinical vs. pathologic staging in 58 patients.

Ultrasound Grading: Ultrasound grading assessed tumor invasion without exhibiting lymph-node spread as follows: A: tumor invasion to mucosa and submucosa; B: tumor invasion to muscular wall; C: tumor invasion to perirectal fat and/or surrounding organs.

Results

Preoperative digital examination grading results are described in Fig. 2. Fourteen patients (20.6 percent) were diagnosed as stage A, 24 patients (35.3 percent) as stage B, 28 patients (41.1 percent) as stage C, and stage D was two patients with liver metastases.

Pathologic grading was done in 58 of 68 patients and was compared with preoperative examination. Digital examination was correct in 48 patients (82.8 percent), (Fig. 3). In stage A, 12 of 14 patients (85.7 percent) were diagnosed correctly; in stage B, 18 of 24 patients (75 percent); and in stage C, 18 of 20 patients (90 percent) were diagnosed correctly. The overall sensitivity was 88.8 percent, and positive predicted value was 92.3 percent.

Radiologic grading was based on CT examination augmented by barium enema and intravenous pyelography to assess involvement of the ureter. CT grading was accurate in 10 of 14 stage A patients (71.4 percent), 10 of 18 stage B patients (55.6 percent), 18 of 26 stage C patients (69.2 percent, Fig 4). Overall accuracy was 65.5 percent, sensitivity was 82.6 percent, and positive predicted value, 76 percent.

Ultrasound grading compared with postoperative histologic findings in 42 patients was accurate in two stage A patients, 14 of 18 stage B patients, (77.8 percent) and 16 of 22 stage C patients (72.7 percent, Fig. 5). Overall accuracy was 76.8 percent, sensitivity, 88.8 percent, and posi-
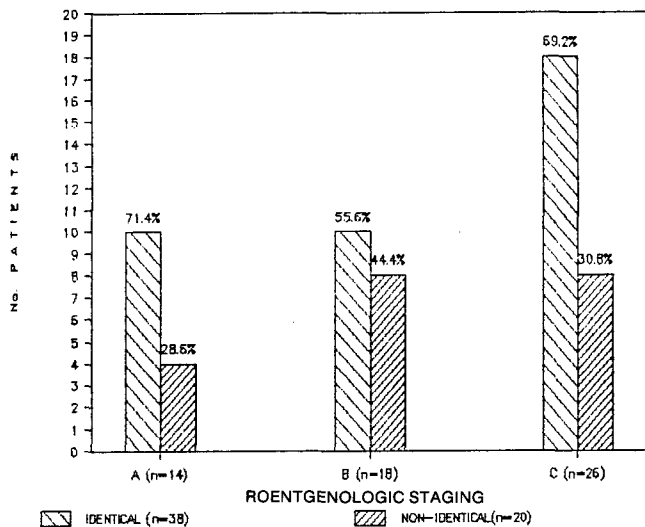
FIG. 4. Roentgenologic staging in different stages compared with postoperative histologic findings (58 patients).
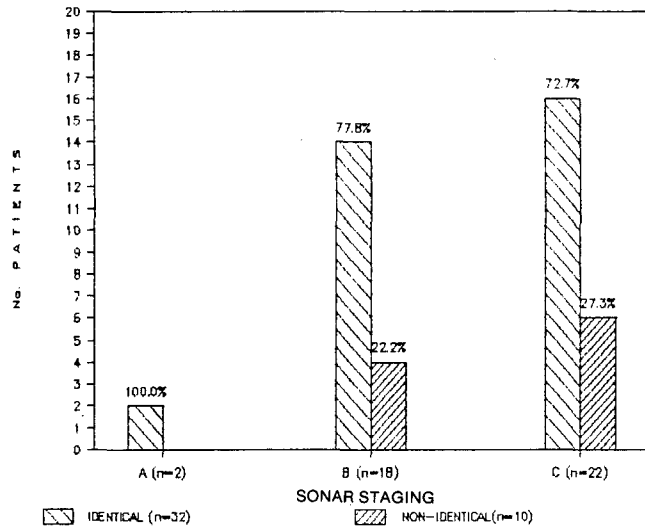

FIG. 5. Transrectal ultrasound grading compared with postoperative histologic staging (42 patients).

tive predicted value 84.2 percent.

Comparing all methods of examination with postoperative histology yields the following accuracy results (Fig. 6): digital examination, 48 of 58 patients (82.8 percent); CT, 38 of 58 patients (65.5 percent); transrectal ultrasound, 32 of 42 patients (76.2 percent).

Discussion

Adequate treatment of rectal cancer warrants exact preoperative diagnosis because the range and options of operative procedures are large. Tumor invasion of the rectal wall and spread to surrounding tissue must be accurately assessed preoperatively.

Nicholls et al.[8] found a positive correlation between digital examination and pathologic findings: Dukes' A—70 percent, Dukes' B—75 percent, and Dukes' C—90 percent.

Hildebrand and Feifel[1] found a positive correlation between preoperative digital examination and postoperative pathologic findings in 82 percent of patients, while Beynon et al.[9] reported a positive correlation in only 68 percent.

In this study, 68 patients had positive rectal digital examinations, 58 were operated on, and correlation to postoperative pathology yielded an overall accuracy of 82.8 percent with a sensitivity of 88.8 percent and a positive predicted value of 92.6 percent. The highest accuracy was noted in group C—90 percent (Fig. 3).

Because rectal examination is a subjective test limited to the length of the examining finger, and cannot define the upper border of the tumor, additional tests must be adopted. CT has entered many diagnostic fields with impressive results. This was tested previously in a study of

preoperative assessment of rectal cancer.[3-5] A positive correlation between CT and pathologic findings has been reported in up to 92 percent of patients studied.[3]

CT examination results in this study point to its important role in tumoral spread to surrounding organs and lymph nodes. Invasion of the rectal wall was not exhibited as well. In only 38 of 58 patients (65 percent) was CT accurate with sensitivity of 82.6 percent and positive predictive value of 76 percent. The best correlation was among the Dukes' C group. Beynon et al.,[9] Thoeni et al.,[3] and Williams et al.[10] found a positive correlation in 82 percent, 92 percent, and 94 percent of patients, respectively. Although the present results were
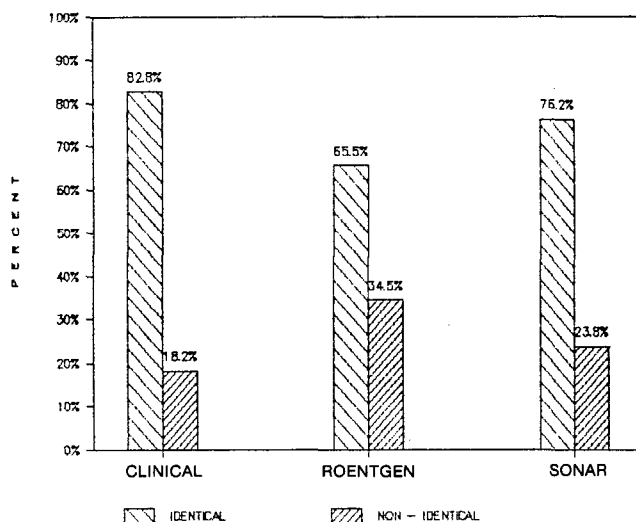

FIG. 6. Comparison of all methods (digital examination, CT, and transrectal ultrasound) with pathologic results.

relatively inferior with CT preoperative diagnosis, some authors[3,9,10] found this mode to be the most reliable, with accurate results. Information regarding extracolonic tumoral spread gives CT a solid and valuable role in the preoperative diagnosis of rectal cancer.

Transrectal ultrasound effectiveness in the presumptive diagnosis of rectal cancer is reported consistently in different studies.[1,2,9-12] It is especially helpful in rating invasion of the rectal wall because it can differentiate up to five separate layers of the rectal wall.[11] The accuracy of transrectal ultrasound in preoperative diagnosis is reported to be 88 to 100 percent.[12] Romano et al.[13] were the only group to compare transrectal ultrasound and CT directly and reported similar degrees of accuracy. Beynon et al.[9] recently reported transrectal ultrasound to be superior to CT and digital examination, with 91 percent accuracy and 94 percent sensitivity. CT produced 82 percent accuracy and 88 percent sensitivity.

This study found digital examination and transrectal ultrasound to be superior to CT examination, with an accuracy of 82 percent, 76 percent, and 65 percent, respectively.

Transrectal ultrasound is the simplest test for ascertaining the degree of invasion. CT has the ability to accurately diagnose pathologic lymph nodes in the rectal surroundings with a good prediction of invasion. Nevertheless, the price of CT examination and side effects of radiation place it second to transrectal ultrasound. In the long run, transrectal ultrasound may offer an accurate and inexpensive method of follow-up and recognition of local recurrence.

In the authors' opinion, the best preoperative evaluation should include rectal digital examination, transrectal ultrasound, and CT. These combined tests may bring physicians closer to defining preoperative stage and enable institution of appropriate treatment in almost every case of rectal carcinoma.

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