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TRANSRECTAL ENDOSONOGRAPHY - GENERAL PRINCIPLES AND APPLICATIONS

SUMMARY

This study is a prospective clinical investigation that includes 596 patients aged 54 years on average, with symptoms such as perirectal pain, rectal bleeding, and change in bowel habit and tenesmus that had been investigated at the Clinic. Rectal cancer was diagnosed by endoscopy and was pathohistologically confirmed in 377 cases.

Demonstration of tumor, extension into perirectal fat and lymph node involment were evaluated. Tumors were successfully imaged by endorectal ultrasound.

According to the endosonographical results, patients were divided into 3 groups: operable, inoperable and control group.

All patients from the first group classified endosonographically as operable rectal carcinoma were compared with the definite surgical diagnosis. Endosonographicaly, 55 pts (9.5%) had I degree, 115 pts (19.5%) had II degree. The group classified as inoperable rectal tumors (207 pts) is compared with the operative findings of palliatively operated patients. Due to the complications of the primary process (ileuses), 55 pts were operated and endosonographic diagnosis was confirmed by the operation findings.

The control group of patients (219 pts) which was endosonographically classified to be without signs of primary and secondary neoplasmatic process in the rectal wall was compared with all the findings obtained by rectoscopy, colonoscopy and their combination with histology. Adenocarcinoma ovarii were found in 45 pts (20.5%), Ovarial cyst in 26 pts. (12%), Myoma uteri in 22 pts. (10%), Adeocarcinoma uteri in 37 pts (17%), Adenocarcinoma prostatae in 41 pts (19%), Adenoma prostate in 19 pts (8.5%), IBD in 19 pts (8.5%), perirectal abscesses in 7 pts (3%), M. Hirschprung's disease in 2 pts and torsion of the sigmoid colon in one patient.

The results suggest that transrectal sonography has an important role in the determination of operability of rectal malignoma, following and predicting degree of infiltration and determining precise borders of intramural infiltration. The utility of blind endosonography (BUS) is evident, the method is non-invasive and there are no contraindications. It permits fast, easy and precise evaluation of the rectal cancer extension as well as the diseases of the adjacent organs.

Key words: transrectal endosonography, rectal tumors

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INTRODUCTION

In the last decade of the XXth century, transcutaneous gray scale ultrasonography has progressed extensively in medical diagnosis. The heart, large vessels, and parenchymatous organs can now be visualized clearly with a safe, non-invasive and repeatable technique. However, certain organs could not be explored well because of bones and intestinal gas interference. Also, fat deteriorates the quality of transabdominal ultrasonic images. Intraluminal scanning has been considered to overcome these situations and obtain a close scanning of intra-abdominal structures.

Wild and Reid in 1957 first attempted blind intraluminal scanning of the rectum. Since then, internal transducers have been used routinely. In 1976, Lutz introduced an A mode ultrasonic probe which could be introduced via the biopsy channel of an endoscope (1,2).

Endosonography has distinct advantages over other imaging modalities such as computed tomography, because it can be performed as a bed-side procedure and can be easily repeated without patient experiencing discomfort.

The advent of newer surgical techniques has permitted the preservation of the anal sphincter in many patients with rectal cancer who previously required abdomino-perineal resection. These and other approaches frequently utilize preoperative radiotherapy depending upon the stage of cancer (3-5).

Until recently, computed tomography has been the only accepted imaging modality for staging rectal cancer. Recently, reports have shown that endorectal ultrasound is a satisfactory alternative study that may complement computed tomography (6,7).

We have extended our early clinical trials to evaluate a large-scale population of patient to assess the accuracy of endorectal ultrasound and computed tomography in the staging of rectal malignancies.

MATERIAL AND METHODS

Ultrasonic examination was performed with a "General Electric" RT 3600 with a 7.5 MHz blind endorectal probe. It has a penetration depth of approximately 10 cm and a theoretical axial resolution of 0,2 mm. This type of transducer can perform good evaluation of the rectal wall and the surrounding tissue.

The transducer attached to the top of the side-viewing probe is routinely covered with a water-filled balloon to improve the ultrasonic image by making optimal contact with the mucosa. However, there is no possibility for optical viewing the transducer maneuvering upward or downward from the axis. By rotating the instrument, the transducer can be moved around its axis (3,5,8,9).

All patients were examined in the left lateral decubitus position. A previous preparation of patient was not required. The inserted portion of the transducer was always covered with a condom prior to rectal insertion. No portion of the rectal mucosa came into direct contact with the endorectal probe.

Water was then introduced through specially designed orifices in the transducer to permit proper acoustic interfacing between the transducer crystals and the rectal wall. Any residual air within the transducer-condom interface was removed via the same portals prior to rectal insertion (Figure1). Prior to endosonographic examination, a digital rectal study was performed to exclude the presence of stricture, fissure or obstructing mass.

The endosonographic image of the rectal wall shows a five-layered structure, three hypoechoic and two hyperechoic, which are in good correspondence with histological layers, *Figure 1*.
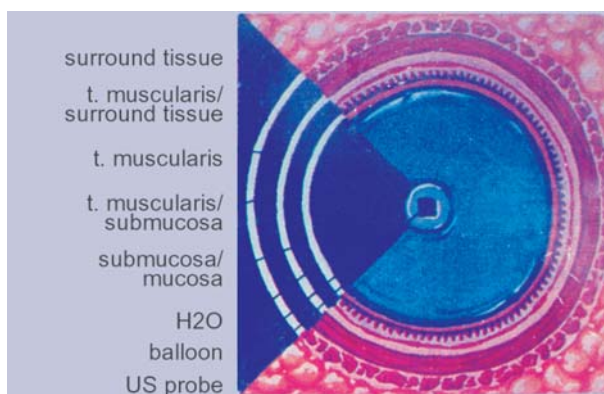

Figure 1. Endosonographic layers of the rectal wall

First layer: hyperechoic, corresponds to the tin part of the water balloon and mucosa of the rectal wall.

Second layer: hypoechoic, corresponds to the border between mucosa and submucosa.

Third layer: hyperechoic, corresponds to the muscularis propria.

Fourth layer: hypoechoic, corresponds to the tunica muscularis.

Fifth layer: hyperechoic, corresponds to the border between tunica muscularis and the surround tissue.

An endoscopical (rectoscopy and colonoscopy), barium enema, computed tomography and endosonographical examination were performed in 596 patients, 271 (45.5%) of which were male and 325 (54.5%) female, with average age of 54 years. The investigation was conducted at the Clinic of Gastroenterohepatology.

Primary detection and diagnosis of rectal

carcinoma was made by endoscopic procedures including pathohistology. Transrectal endosonography was used as a supplementary method which gave additional data about the extent of the neoplasm.

RESULTS

The examination was performed in 596 pts. with the following symptoms: abdominal pain, rectal bleeding, change in bowel habit, diarrhea, constipation or tenesmus. Rectal cancer was diagnosed by endoscopy and was pathohistologically confirmed in 377 (64%) cases.

According to endosonographic findings, patients were divided into 3 groups: operable group consisting of 170 pts (28.5%), inoperable group of 207 pts. (35%) and control group of 219 pts (36.5%).

Endosonographic findings of the patients from the first group, classified as operable rectal carcinoma, were compared with the definitive surgical findings. Endosonographicaly, 55 pts (9.5%) had I degree and 115 pts (19.5%) had II disease degree. According the histopathological Duke's classification, there were 5 pts (3%) stage Duke's A, 45 pts (26.5%) stage B and 120 pts (70.5%) stage Duke's C. The results revealed that the patients in group with I disease degree, according to endosonographic findings, included patients with Duke's A and B hystopathologically classified, while the patients in the group with II disease degree, according to endosonographic findings, included patients staged Duke's C, *Figure 2*.
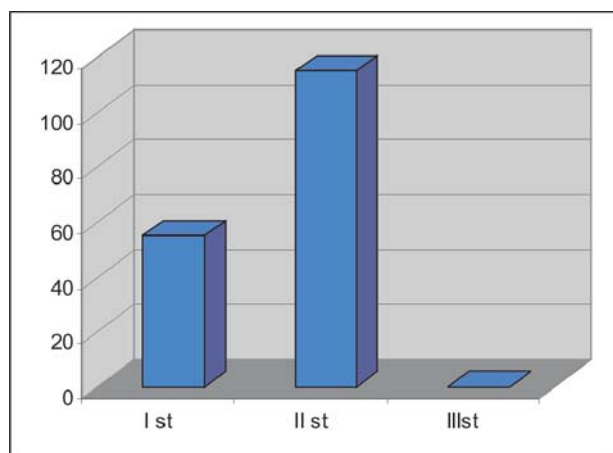

Figure 2. Endosonographic finding in operable group

The group classified as inoperable rectal tumors (207 pts) was compared with the operative findings of the palliative operated patients. Palliative surgery was performed because of the complications due to the primary process (tumor obstruction). 55 pts were operated and endosonographic diagnosis was confirmed by surgical findings.

Endosonographic findings of the control group (219 pts), without signs of primary or secondary malignancy of the rectal wall, were compared with the findings obtained by rectoscopy, colonoscopy and histology. The following diseases were diagnosed: ovarian carcinoma in 45 pts (20.5%), ovarian cyst in 26 pts. (12%), myoma uteri in 22 pts. (10%), carcinoma uteri in 37 pts (17%), carcinoma prostate in 41 pts (19%), adenoma prostate in19 pts (8.5%), IBD in 19 pts (8.5%), perirectal abscesses in 7 pts (3%), M. Hirschprung's disease in 2 pts and torsion of the sigmoid colon in one patient. Summarized data are presented in Table 1.

Table 1. Endosonographic findings of control group

Diagnosis	No.
Adenocarcinoma ovarian	45 (20,5%)
Ovarian cyst	26 (12,0%)
Myoma uteri	22 (10,0%)
Adenocarcinoma uteri	37 (17,0%)
Adenocarcinoma prostate	41 (19,0%)
Adenoma prostate	19 (8,5%)
IBD	19 (8,5%)
Perirectal abscesses	7 (3,0%)
M. Hirschprung	2 (1,0%)
Torsion of sigmoid	1 (0,5,0%)
Total	**219 (100%)**

Statistical analyses of the results included sensitivity, specificity, positive and negative predictive value.

Nosologic and diagnostic values were computed separately for the operable and inoperable group, as well as the summary of the whole series of examined patients, where there was a great degree of sensitivity (95%) and specificity (97%) of the endosonographic method, with low false positive results (0.02) and high predictive value of the positive finding (98%).

DISCUSSION

Preliminary results of endorectal ultrasound have suggested that it is an accurate and relatively sensitive technique for detection of rectal tumor mass, infiltration into the perirectal fat as well as the lymph node involvement (7,9,11). Our study including a large series of patients has indicated that cancer staging for rectal malignancy is more accurate by endorectal ultrasound than other imaging techniques presently in use.

A major limitation of these techniques, as in other imaging studies, is an inability to differentiate

normalized normal lymph nodes from normalized tumor infiltrated lymph nodes. Additionally, distinguishing tumor enlarged nodes from enlarged non-malignant lymph nodes is not possible. This deficiency concerns both CT and ultrasound. The major difference in the ability to detect lymph node involvement by endorectal ultrasound as opposed to CT is that no strict criteria for ultrasound have been devised as in case of CT (1,2,8,12). Generally, computed tomography will only diagnose lymph nodes as abnormal if they are greater that 1 cm in diameter. In our study, all lymph nodes were defined as abnormal if they were detected by endorectal ultrasound, regardless of their diameter.

Another weakness of endorectal ultrasound is the inability to differentiate more cephalad or caudal level I and III lymph nodes. The computed tomogram can detect enlarged (theoretically tumor infiltrated) lymph nodes in these areas.

Endorectal ultrasound does nor require previous preparation of patients. It takes 5 to 10 min to complete the study and is an adjunct to routine sigmoidoscopic examination. Equipment is relatively inexpensive, particularly compared to CT (2,4). Its advantage over magnetic resonance imaging can not be ascertained now because of the limited experience with MRI. Perhaps, as time progresses, MRI will be able to delineate those areas of abnormality that endorectal ultrasound cannot.

CONCLUSION

Endorectal ultrasound is a safe, simple, and relatively inexpensive procedure when compared with other techniques. The results suggest that transrectal sonography has an important role in determination of the operability of rectal malignancy, following and predicting the degree of infiltration and determining the precise borders of the intramural infiltration which is of great influence for postoperative prognosis. The utility of blind endosonography (BUS) is evident, the method is non-invasive, and there are no contraindications. It permits fast, easy and precise evaluation of the rectal cancer extension as well as diseases of the neighbouring organs.

As its use is expanded, it should have great impact on determining appropriate therapy for patients with rectal cancer.

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TRANSREKTALNA SONOGRAFIJA OPŠTI PRINCIPI I PRIMENA

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SAŽETAK

Studija predstavlja prospektivno kliničko ispitivanje koje uključuje 596 pacijenata čija je prosečna starost 54 godine. Pacijenti su kao simptome naveli perirektalni bol, rektalno krvarenje, promenu u radu creva i tenezmus. Rektalni kancer je dijagnostifikovan endoskopijom i patohistološki potvrđen u 377 slučajeva.

Procenjivan je izgled tumora, njegovo širenje u perirektalno masno tkivo i uključenost limfnih čvorova. Tumori su uspešno snimljeni endorektalnim ultra zvukom.

Prema endosonografskim rezultatima pacijenti su bili podeljeni u tri grupe: operabilnu, inoperabilnu i kontrolnu grupu.

Svi pacijenti iz prve grupe, kod kojih je endografski klasifikovan operabilni rektalni karcinom, upoređivani su sa konačnom hirurškom dijagnozom. Endosonografski, kod 55 pacijenata (9.5%), određen je I stepen, a kod 115 (19.5%) II stepen. Grupa kod koje su klasifikovani inoperabilni rektalni tumori (207 pacijenata) upoređivana je sa operativnim nalazima palijativno operisanih pacijenata. Zbog komplikacija primarnog procesa (ileus), 55 pacijenata je operisano i endosonografska dijagnoza je bila potvrđena operativnim nalazima.

Kontrolna grupa pacijenata (219 pacijenata), koja je endosonografski klasifikovana kao grupa bez znakova primarnog i sekundarnog neoplazmatičnog procesa u rektalnom zidu, upoređena je sa svim nalazima dobijenim rektoskopijom, kolonoskopijom, i njihovom kombinacijom sa histologijom. Adenocarcinoma ovarii je dijagnostifikovana kod 45 pacijenata (20.5%), ovarijalne ciste kod 26 pacijenata (12%), Myoma uteri kod 22 pacijenata (10%), Adenocarcinoma uteri kod 37 pacijenata (17%), Adenocarcinoma prostatae kod 41 pacijenta (19%), Adenoma prostatae kod 19 pacijenata (8.5%), IBD kod 19 pacijenata (8.5%), perirektalni abscesi kod 7 pacijenata (3%), M. Hirschprung-ova bolest kod 2 pacijenta i torzija sigmoidnog kolona kod jednog pacijenta.

Rezultati ukazuju da transrektalna sonografija ima važnu ulogu u određivanju operabilnosti rektalnog malignoma, na taj način što se prati i predviđa stepen infiltracije i određuju jasne granice intramuralne infiltracije. Korisnost slepe sonografije je očigledna, metoda je neinvazivna i nema kontraindikacija. Omogućava brzu, laku i tačnu procenu opsega rektalnog kancera kao i oboljenja okolnih organa.

Ključne reči: transrektalna endosonografija, rektalni tumori