Best Practice & Research Clinical Gastroenterology 23 (2009) 663–670

Contents lists available at ScienceDirect

Best Practice & Research Clinical Gastroenterology

4

Endosonographic staging of lower intestinal malignancy

Alexis M.P. Schizas, MRCS [a], Andrew B. Williams, MS, FRCS [a], John Meenan, MD, PhD, FRCPI, FRCP [b,*]

[a] Department of Colo-rectal Surgery, Guy's and St. Thomas' Hospital, 1st Floor North Wing, London SE1 7EH, UK
[b] Department of Gastroenterology, St. Thomas' Hospital, 1st Floor College House, London SE1 7EH, UK

Keywords:
cancer
staging
colo-rectal
EUS
endosonography

The use of EUS in the assessment of rectal pathology is well established. The accurate staging of lower intestinal tumours predicts prognosis and guides the planning of individual patient treatment. Increased experience and the development of high resolution three-dimensional EUS has lead to the greater accuracy of rectal staging with EUS of rectal tumours now considered the gold standard showing T stage accuracy that ranges from 75% to 95%, with N stage accuracy ranging from 65% to 80%. The use of EUS in the staging of colonic pathology, however, is not so well established though advances in miniprobe EUS has improved the assessment of colonic tumours. EUS is also of benefit in the assessment of anal pathology though here, accurate correlation with histology has not been firmly established.

Introduction

The major application of ultrasound in the lower bowel is in the assessment of benign disease processes such as fistulous anal disease and sphincter disturbances. Such endo-anal ultrasound is usually viewed as an area of expertize distinct to that of endoscopic ultrasound, this being for historical and technical reasons.

Colo-rectal EUS using a flexible and rigid probes are of definable value in the diagnosis and staging of rectal cancer and in the management of other niche processes such as sub-epithelial lesions and carcinoids. Mirroring the application of EUS in the upper gastrointestinal tract, the great strength offered by EUS, in addition to the provision of high resolution images of local structures, is the ability to

* Corresponding author. Fax: +44 020 7188 2484.
E-mail address: john.meenan@gstt.nhs.uk (J. Meenan).

1521-6918/$ – see front matter © 2009 Published by Elsevier Ltd.
doi:10.1016/j.bpg.2009.06.006

sample tissue such as lymph nodes and pari passu, in the therapy of pelvic collections. Unfortunately, such strengths are blunted by the combination of local anatomy and poor instrument design.

General

The prognosis, risk of recurrence and treatment options in patients with lower intestinal malignancies is dependent on the degree of tumour extension through the rectal wall, the presence of lymph node metastasis and extent of any distant spread. The preoperative TNM staging (Table 1) guides individual patient treatment.

The main role of EUS has been in the staging of rectal lesions. Patients with very early stage disease (T1 or T2 without lymph node invasion), local resection with or without chemoradiation may be adequate therapy. For those patients with T3 or greater rectal cancers or with lymph node metastasis, standard therapy consists of neoadjuvant chemoradiotherapy, though some patients with high T3 tumours may be at sufficiently low risk of local recurrence to justify omission of radiotherapy [1]. The additional information provided by EUS has been found to change managements in 38% of patients with rectal cancer who had only had a CT scan. Additionally, information provided by EUS guided fine needle aspiration of nonjuxtatumoral lymph nodes changed therapy in 19 % of these patients [2].

EUS of the rectum utilises a transducer that rotates through 360° within a water-filled balloon in order to provide acoustic coupling. The ultrasonic anatomy has been detailed by scanning dissected specimens. It comprises alternating bands of reflection created by the interfaces between the different anatomical structures present [3]. The first hyperechoic layer corresponds to the water-filled balloon, the second hypoechoic layer to mucosa, the third hyperechoic layer to submucosa, the fourth hypoechoic layer to muscularis propria and the fifth hyperechoic layer to interface between muscularis propria and perirectal fat [3,4].

EUS has also been used to assess the involvement of the anal sphincters in low rectal tumour and in the staging of anal squamous-cell carcinomas. The anal canal mucosa is generally not seen on endo-anal studies. The sub-epithelial tissue is highly reflective and surrounded by the low reflection from the internal anal sphincter. Both the external anal sphincter and the longitudinal muscle are of moderate reflectivity. The intersphincteric space often returns a bright reflection.

The development of high resolution three-dimensional endo-anal ultrasound studies constructed from a synthesis of standard two-dimensional cross-sectional images produces a digital volume that may be reviewed and used to perform measurements in any plane, yielding greater information on rectal pathology and the anal sphincter complex, including reliable volume measurements [5]. Another development in the use of three-dimensional studies is the Volume Render Mode. This allows analysis of information inside a three-dimensional volume by digitally enhancing individual voxels. By use of the different post processing display parameters, the volume-rendered image provides better visualization performance when there are not large differences in the signal levels of pathologic structures compared with surrounding tissues. This allows for the presence of submucosal invasion in early rectal

Table 1
TNM classification of colo-rectal carcinoma.

TNM staging system
Tumour
T1 Tumour invades submucosa.
T2 Tumour invades muscularis propria.
T3 Tumour invades through the muscularis propria into the subserosa, or into the pericolic or perirectal tissues.
T4 Tumour directly invades other organs or structures, and/or perforates.
Node
N0 No regional lymph node metastasis.
N1 Metastasis in 1–3 regional lymph nodes.
N2 Metastasis in 4 or more regional lymph nodes.
Metastasis
M0 No distant metastasis.