

Variation in the staging of colorectal carcinomas: a survey of current practice

M G T Raraty FRCS*

Senior House Officer

J H R Winstanley BDS MD FDS FRCS

Consultant Surgeon

Department of Surgery, Royal Liverpool University Hospital, Liverpool

Key words: Colorectal neoplasm; Neoplasm staging

Dukes' staging is the most common means of staging and grouping colorectal carcinomas and is also used to determine which patients will be offered adjuvant therapies or entered into clinical trials. This study was performed to assess the degree of variation in the staging of colorectal carcinomas in normal clinical practice.

Seven consultant surgeons and two consultant pathologists returned questionnaires asking them to stage 14 carcinomas on the basis of their pathology reports alone. The results show agreement among all nine in only six out of the 14 cases. In two cases there was a close to 50:50 split in perceived stage. Between them, the nine consultants produced eight different sets of staging results.

These results indicate difficulties in the application of Dukes' staging system for several possible reasons. There may be misinterpretation of the written report, misapplication of the staging system because of unfamiliarity or confusion between the various modifications of Dukes' system which have been published.

A more precisely defined staging system based on a standard proforma may be more appropriate in modern clinical practice.

The use of staging systems for various carcinomas has become important, not only in assessing the prognosis of individual cases, but also in the comparison of cases from different series which may be separated both geographically and temporally. In particular, in the development and evaluation of new modes of treatment, it is important

to be able to assess how these compare with current treatment modalities. It is crucial, therefore, for different studies to use similar systems for classifying their study groups so that valid comparisons may be made. If the groups of patients in two studies are not initially similar then perceived differences in outcome are rendered meaningless.

One area in which such group comparisons have become particularly important is in the assessment of the benefits of the adjuvant therapy. The use of adjuvant therapies has become well established in breast carcinoma and their use in colorectal carcinoma is currently under investigation. It is clear from studies on breast carcinoma that a good staging system is important in order to define the success, or otherwise, of particular treatment options and to make valid comparisons between groups.

The basis of most staging systems for colorectal carcinoma is the system first described by C E Dukes in 1932 (1), though he had based his pathological stages on the clinical stages previously described by Lockhart-Mummery in 1926 (2). Dukes divided cancers of the rectum into three stages which he described as:

- A Growth limited to the wall of the rectum.
- B Extension of growth to extrarectal tissues but no metastases in regional lymph nodes.
- C Metastases in regional lymph nodes.

Using this system Dukes was able to show differences in survival between these three groups, thus demonstrating the prognostic value of a system for staging tumours.

Since the original description, various authors have modified this system in an attempt to refine its prognostic accuracy, including Dukes himself who, in 1935, subdivided stage C into C₁ and C₂ depending on the extent of lymphatic involvement (3,4):

- C₁ Lymph nodes positive but apical node negative.
- C₂ Apical lymph node positive.

* Present appointment: Research Registrar in the Department of Surgery, Royal Liverpool University Hospital

Correspondence to: Mr M G T Raraty, 1 Pendle Close, Upton, Wirral L49 6QN

Kirklin *et al.* (5) in 1949, modified the system to include colonic tumours as well as rectal, since he had shown that the site of a tumour above or below the peritoneal reflection did not affect survival. He also modified it to place more emphasis on the depth of tumour invasion such that stage A indicated a lesion limited to the mucosa, B₁ lesions extending into the muscularis propria but not through it, and B₂ lesions which extended through the muscularis propria but without nodal involvement. Stage C remained as a single stage indicating nodal involvement.

Astler and Collier (6) used similar A, B₁ and B₂ groups to Kirklin *et al.* (5), but introduced a new subdivision of stage C based on the degree of local extension associated with lymphatic involvement, thus more specifically separating the two prognostic factors:

- C₁ Lesions limited to the bowel wall with positive nodes.
- C₂ Lesions extending through all bowel wall layers and having positive nodes.

It should be noted that these C₁ and C₂ categories are not the same as those earlier defined by Dukes.

In 1967, Turnbull *et al.* (7) added the D category to their staging of tumours to indicate the presence of metastatic disease or invasion of adjacent organs. This is a staging category that Dukes himself never used. Finally, Newland *et al.* (8) modified the system to include a total of nine subcategories based on depth of invasion, and including stages D₁ indicating local tumour remaining after resection (and, therefore, partly based on the opinion of the surgeon at the time of operation) and D₂ indicating the presence of distant metastases. This system is sometimes referred to as the Australian system.

All these classifications, based as they are on Dukes' original, tend to be referred to as 'Dukes' classification' without authors necessarily specifying which of the various modifications they are using. Indeed, even standard surgical textbooks do not all give the same classification when describing a Dukes' system. Line-weaver (9), in a sample of 11 surgical textbooks, found eight different staging systems for colorectal carcinoma in use.

In recent years, the TNM system has been developed for staging carcinomas of all types in order to more precisely define the depth of tumour invasion or size of the tumour (T), the presence or absence of nodal involvement (N) and the presence or absence of metastatic disease (M) (10). It can be applied with minor variations to tumours in any site, including the colon and rectum (Table I), and is gaining in popularity owing to its reproducibility and the fact that other classifications can be converted to allow comparison (11) (Table II). It is not yet universally employed, however, and colorectal carcinomas are generally still classified using the Dukes' system since this is simple, having only three grades, and studies have consistently shown its value in predicting relative prognosis.

In practice, the staging of a particular case often depends very much on the specific system used as similar

Table I. TNM classification of colorectal cancer

T	Primary tumour
T _x	Primary tumour cannot be assessed
T ₀	No evidence of primary tumour
T _{is}	Carcinoma <i>in situ</i>
T ₁	Tumour invades submucosa
T ₂	Tumour invades muscularis propria
T ₃	Tumour invades through muscularis propria into the subserosa or into non-peritonealised pericolic or perirectal tissues
T ₄	Tumour perforates the visceral peritoneum or directly invades other organs or structures (including other segments of bowel)
N	Regional lymph node involvement
N _x	Regional lymph nodes cannot be assessed
N ₀	No regional lymph node metastasis
N ₁	Metastasis in 1 to 3 pericolic or perirectal lymph nodes
N ₂	Metastasis in 4 or more pericolic or perirectal lymph nodes
N ₃	Metastasis in any lymph node along a named vascular trunk
M	Distant metastasis
M _x	Presence of metastasis cannot be assessed
M ₀	No distant metastasis
M ₁	Distant metastasis present

Table II. Stage groupings for the TNM system and a comparison with Dukes' system

TNM stage	Tumour	Nodes	Metastasis	Dukes' stage
0	T _{is}	N ₀	M ₀	
I	T ₁	N ₀	M ₀	A
	T ₂	N ₀	M ₀	
II	T ₃	N ₀	M ₀	B
	T ₄	N ₀	M ₀	
III	Any T	N ₁	M ₀	C
	Any T	N ₂ , N ₃	M ₀	
IV	Any T	Any N	M ₁	D

NB—Both stages B and C incorporate two groups of differing prognosis

tumours are classified differently in different modifications. A tumour that extends into the muscularis propria but without lymph node involvement is a stage A in Dukes' original system but would be staged as B₁ in the Kirklin or Astler–Coller systems (12). Thus, while a Dukes' C should be easily identifiable by the presence of nodal involvement, it is not always easy, or indeed possible, to ascertain whether a stage B tumour described in one paper is the same as a stage B tumour described in another, or whether others might regard it as an A, since the precise criteria used for classification are not always specified. Similarly, the different definitions of C₁ and C₂ available make direct comparisons difficult if the definitions used are not specified.

Thus, it is important to have standard criteria for staging colorectal tumours, for deciding on entry into clinical trials, for assessing the results of those trials, and particularly for comparing the results of separate trials.

The aims of this survey were to determine the consistency with which pathology reports are interpreted with regard to Dukes' staging among a group of surgeons and pathologists all working within the same NHS Trust, particularly with regard to colorectal cancers without nodal involvement.

Methods

This study was based on a sample of 14 pathology reports obtained from one hospital during a 12 month period. Cases in which the pathology report specified nodal involvement were excluded since it was felt that this category should be easy to identify as C and, therefore, unlikely to cause controversy. However, two reports were included in which the pathologist had described islands of tumour tissue beyond the bowel wall not obviously contained within lymphatic tissue and we wished to see how these would be interpreted, whether as nodal spread or as direct extension of tumour (Cases 9 and 14).

Any indication of the original pathologist's interpretation of Dukes' stage given in the report was deleted and the resulting reports were sent to ten consultant surgeons and two consultant pathologists working within the same hospital trust. The respondents were asked to interpret each report and to stage it in the form of Dukes' classification.

To evaluate the degree of inter-rater agreement a κ test was used, pairing surgeons and pathologists.

Results

The responses obtained are shown in Table III. Each respondent's list of stagings for each of the 14 case reports is given, together with a list of the majority verdict for each report and an indication of the number of times each respondent disagreed with the majority verdict.

A total of nine out of the 12 questionnaires were returned, including both of those from the pathologists (respondents 8 and 9). One surgeon felt unable to classify three reports and one surgeon was unable to classify one report, the reasons for this were not given.

It is obvious from Table III that a degree of variation existed in how these reports were interpreted by the different surgeons and pathologists and complete agreement was achieved in only six out of the 14 reports (42%). Of the remaining eight reports, one or two respondents differed from the majority in six cases, leaving only two cases (Cases 3 and 4) where marked differences of opinion were observed. Analysed statistically, the κ values for inter-rater variation ranged from 0.46 to 1.00 which represents a moderate to very good result. Interestingly, the best agreement was seen between two of the surgeons and not between the two pathologists whose value was 0.57, representing only moderate agreement.

The two cases included in which islands of tumour tissue outside the bowel wall were observed were both interpreted as Dukes' C by all the surgeons; however, one of the pathologists interpreted one of these cases as Dukes' B.

Only one case had been described as Dukes' A in the original report (Case 4) and this case resulted in one of the most marked splits of opinion, although both of the pathologists agreed on it being an A. Only two

Table III. Staging of 14 pathology reports by nine consultants showing the verdict of the majority for each case and the number of times each consultant differed from this verdict. The points of disagreement are highlighted

Reports	Respondents									Majority	Split	
	1	2	3	4	5	6	7	8	9			
1	B	B	B	B	B	B	B	B	B	B	B	
2	B	B	B	B	B	B	B	B	B	B	B	
3	A	B	B	A	B	B	A	A	A	A	A	5:4
4	A	B	B	A	B	A	A	A	A	A	A	6:3
5	B	B	B	B	B	B	B	B	B	B	B	
6	A	B	B	B	B	B	B	B	B	A	B	7:2
7	B	B	B	B	B	B	B	B	B	B	B	
8	A	—	B	B	B	B	B	B	B	B	B	7:1
9	C	—	C	C	C	C	C	C	B	C	C	7:1
10	B	B	B	B	B	B	B	B	B	B	B	
11	B	B	B	B	B	B	A	B	B	B	B	8:1
12	A	—	A	B	A	—	A	A	A	A	A	6:1
13	B	B	B	B	B	B	B	B	B	A	B	8:1
14	C	C	C	C	C	C	C	C	C	C	C	
Variation from majority	2	2	2	1	2	1	1	1	1	2		

respondents were in complete agreement throughout (3 and 5).

Discussion

Although this is only a small study, the results suggest that there is a range of interpretation of what is meant by Dukes' staging between surgeons and pathologists. A number of possible explanations exist for this that revolve around the interpretation by surgeons of histological and pathological terms. It is equally likely that surgeons and pathologists have become liberal in their definition of Dukes' staging.

The original definition was very simple, the tumour was confined within the bowel wall, had breached the serosa or involved the lymph nodes. The first two stages were often definable on macroscopic examination of the specimen. With the introduction of the various modifications of the staging system, however, which introduce subcategories dependent on microscopic depths of invasion, the basic definitions in Dukes' staging have become blurred. It is therefore important in talking about Dukes' staging to make it clear whether it is the original Dukes' staging or a modified version that is being discussed.

Previously, it was argued by some that knowledge of Dukes' staging was of academic interest only since it did not alter treatment. This is not so now. Staging is important in deciding suitability for entry to trials such as QASAR and, with the increasing demand for quantification of treatment outcomes, consistency in definition of staging is very important if valid comparisons are to be made between surgeons and hospitals.

The purpose of this study was not to evaluate the merits of Dukes' staging but to determine the consistency with which surgeons and pathologists apply that staging. The results support the advice in The Royal College of Surgeons of England guidelines encouraging clinico-pathological meetings so that cases can be discussed and documented using a proforma in which all the individual prognostic criteria are noted and tumours staged according to the information recorded (13).

References

- 1 Dukes CE. The classification of cancer of the rectum. *J Path Bact* 1932; **35**: 323–32.
- 2 Lockhart-Mummery JP. Two hundred cases of cancer of the rectum treated by perineal excision. *Br J Surg* 1926; **14**: 110–24.
- 3 Gabriel WB, Dukes CE, Bussey HJR. Lymphatic spread in cancer of the rectum. *Br J Surg* 1935; **23**: 395–413.
- 4 Dukes CE, Bussey HJR. The spread of rectal cancer and its effect on prognosis. *Br J Cancer* 1958; **12**: 309–20.
- 5 Kirklin JW, Dockerty MB, Waugh JM. The role of the peritoneal reflection in the prognosis of carcinoma of the rectum and sigmoid colon. *Surg Gynecol Obstet* 1949; **88**: 326–31.
- 6 Astler VB, Coller FA. The prognostic significance of direct extension of carcinoma of the colon and rectum. *Ann Surg* 1954; **139**: 846–52.
- 7 Turnbull RB Jr, Kyle K, Watson FR, Spratt J. Cancer of the colon: the influence of the no-touch isolation technique on survival rates. *Ann Surg* 1967; **166**: 420–27.
- 8 Newland RC, Chapius PH, Pheils MT, Macpherson JG. The relationship of survival to staging and grading of colorectal carcinoma. *Cancer* 1981; **47**: 1424–9.
- 9 Lineaweaver W. Staging colon cancer. *Contemp Surg* 1984; **25**: 19–24.
- 10 American Joint Committee on Cancer. *Manual for the Staging of Cancer*. 4th Edition. Philadelphia: JB Lippincott Co, 1992.
- 11 Fielding LP, Arsenault PA, Chapuis PH *et al*. Clinicopathological staging for colorectal cancer: an international documentation system (IDS) and an international comprehensive anatomical terminology (ICAT). *J Gastroenterol Hepatol* 1991; **6**: 325–44.
- 12 Williams ST, Beart RW. Staging of colorectal cancer. *Semin Surg Oncol* 1992; **8**: 89–93.
- 13 The Royal College of Surgeons of England & Association of Coloproctology of Great Britain and Ireland. Guidelines for the management of colorectal cancer. June 1996.

Received 24 November 1997