Original article

Redefining surgery for gastric cancer

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Abstract:

Background. Despite encouraging retrospective and non-randomized trials, two large prospective, randomized trials of D1 vs D2 resections show double the mortality in the D2 group, with no increase in long-term survival. However, the D2 resection still offers the only hope of cure when N2 nodes are involved. We propose a reclassification of the International Union Against Cancer TNM “N” staging to a system with an anatomical basis that is useful in defining the surgery performed. Junctional nodes lying between the N1 and N2 tiers will act as a guide to surgery. Where these nodes are uninvolved, the probability of gastric bed (N2) involvement is low and the radical D2 dissection with its higher mortality and morbidity can be avoided.

Conclusion. Such “stage-appropriate” surgery will reduce the number of D2 resections while ensuring that patients with N2 disease are not denied curative surgery. A prospective, randomized, controlled trial of targeted surgery is required.

Key words: gastric neoplasms, surgery, classification

Introduction

It is in the interest of a patient with gastric cancer to have all the disease removed with the minimum of risk. For this to be achieved there is a need for a system which allows accurate staging, defines the most appropriate operation, and allows accurate documentation of the surgical procedure performed. Currently, none of these criteria are being met. The correct operative procedure remains controversial. Despite marked improvements, results in the West are not yet comparable to those from the Far East. Recent randomized controlled

trials have questioned the value of D2 resections compared with D1 [1,2]. The increased morbidity of the extended lymphadenectomy is criticised and survival advantages have not been demonstrated. These randomized trials of surgery have, however, been confounded by variations in the standard type of operations performed by individual surgeons and the difficulty in accurately recording procedures performed. Further difficulties have arisen in staging the disease. Accurate staging requires diligent postoperative dissection of the specimen by both surgeon and pathologist. The reclassification of the nodal disease in the TNM system by the International Union Against Cancer (UICC) to stage solely on the number of involved nodes found, while attempting to simplify matters, will increase confusion.

A system that allows the operation to be defined and the efficacy of the procedure to be investigated requires both simple, accurate staging and accurate documentation of the surgical procedure performed. These are areas that are poorly served by the current TNM and D1/D2 classification. Surgery should be tailored to meet the needs of the individual patient, minimizing both risks of recurrent disease and postoperative complications. A method of defining lymph node stage and a protocol for operative surgery that takes into account the stage of the disease and also allows accurate recording of the extent of lymphadenectomy performed is proposed.

Radical surgery

The Japanese have enormous experience of radical gastric surgery, and their D2 resection is considered the gold standard gastric resection. Many thousands of D2 resections have been performed, with reported 5- and 10-year survival rates for the early cancers in excess of 95% and 90% [3,4]. These successes have been achieved

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with remarkably low postoperative complication rates, with mortality reported at less than 1% [5].

Results from the West have not been able to match those of the Japanese. Although overall survival has improved considerably, mortality and morbidity remains a problem, with mortality reported between 4% and 13% [6–9]. The effect of D2 node dissection is a matter for debate. Several retrospective and non-randomized trials have reported improved survival for D2 groups, with only marginally worse mortality and morbidity [10–12]. However, two large prospective randomized trials have demonstrated significantly higher postoperative mortality for the D2 groups [1,2], with no improvements in survival [13].

The gastric lymph nodes

The nodes around the stomach have been classified by the Japanese research Society for Gastric Cancer (JRS GC) into four groups on an anatomical basis. This has proved useful in terms of prognostic significance and also for descriptive purposes in defining operations. The Japanese D1 and D2 operations remove the N1 and N2 nodes, respectively. However, there are problems in describing the more traditionally undertaken British “D1½” gastrectomy which involves the excision of nodes to the origin of the left gastric artery, extending beyond the N1 classification but not including other N2 nodes.

The present UICC TNM node classification is numerical and has largely evolved from work which has

shown that prognosis may be related to the number of nodes involved [14,15]. Staging relies solely on the number of nodes involved, N1 having 1 to 6 nodes involved; N2, 7 to 15 nodes; and N3, more than 15 involved. Although this nodal classification was supported by further German studies [16], it leaves the classification of the operation performed as much to the diligence of the pathologist searching for nodes as to the surgeon removing them. Additionally, it offers no indication of the sites of the nodes removed and is therefore of little use in recording the type of surgery performed.

Proposals for a new “N” classification (Table 1)

Clearly, a system is needed that has an anatomical basis, and which also includes the number of nodes removed and is useful in defining the type of surgery routinely undertaken. The gastric lymph nodes can be divided into perigastric and gastric bed nodes. The perigastric nodes are those along the lesser and greater curvatures. The gastric bed nodes are those from the celiac axis and along the common hepatic and splenic arteries. In operative surgery this is the real difference, since it is this dissection of the gastric bed nodes which is likely to cause the increased mortality and morbidity associated with the “D2” resection. Redefining N1 nodes as the perigastric nodes, N2 nodes as those of the gastric bed, and N3 as the para-aortic nodes would allow the maintenance of D type classifications and would allow a more appropriate description of the types of surgery commonly undertaken.

Table 1. Proposed perigastric (N1) and gastric bed (N2) nodes

Node stations; descriptive	Station no. by JRS GC	Nodal tier by JRS GC ^a
Proposed N1 (perigastric) tier		
Right Cardial	1	1 or 2
Left cardial	2	1, 2, or 3
Lesser curve	3	1
Short gastric	4sa	1
Left gastroepiploic	4sb	1
Right gastroepiploic	4d	1 or 2
Supra-pyloric	5	1 or 2
Infra-pyloric	6	1 or 2
Left gastric	7	2
Proposed N2 (gastric-bed) tier		
Anterior hepatic	8a	2
Posterior hepatic	8p	3
Celiac artery	9	2
Splenic hilum	10	2 or 3
Splenic artery	11	2 or 3

^a Note, nodal tier classified by Japanese Research Society for Gastric Cancer (JRS GC) depends on the original site of the tumor

Stage-appropriate surgery

A method of reliably distinguishing potentially curable from incurable disease and perigastric (proposed N1) from gastric bed (proposed N2) disease is needed to allow stage-appropriate surgery to be performed in which the level of lymph node clearance is dictated by the stage of the disease. Nodes lying at junctions between these two systems may act as indicators for the type of radical surgery needed.

We propose a new operative protocol based on these ideas. To accurately stage lymph node metastasis, intra-operative frozen section biopsies of a para-aortic (proposed N3) node and junctional nodes need to be performed. Para-aortic node involvement is indicative of incurable disease and militates against radical surgery. The junctional (Table 2) nodes are the last of the easily dissected perigastric groups. Patients without involvement of junctional nodes have a low probability of lymph node disease in the gastric bed and are best served by excision of the perigastric (proposed N1) nodes only. This is the equivalent of the traditional "D1½" resection and preserves the nodes of the gastric bed, minimizing the risks of post-operative complications. Positive junctional node biopsies indicate a greater probability of gastric bed (proposed N2) involvement, and the remaining nodes should be removed to minimize the risk of recurrent disease.

These proposals could significantly reduce the number of D2 resections required. In the Medical Research Council (MRC) trial, 216 left gastric lymph nodes were recovered from 399 patients of which nodes 63% (137/216) had no metastasis [13]. Lymph node metastases progress in a stepwise manner and skip lesions are thought to occur in less than 5% of cases [17,18]. The majority of patients without left gastric involvement are unlikely to have N2 disease and could be spared the greater mortality and morbidity of the D2. This is supported by results from our unit. Between June 1997 and December 1998, 24 patients had gastrectomies performed with macroscopic clearance of disease and no para-aortic node involvement on frozen section. The specimens were examined by a single pathologist with a special interest in gastric cancer. Parameters recorded

included lymph node stations retrieved, the number of lymph nodes recovered from each station, and the number of involved nodes from each station. To identify which nodes should be classed as junctional (Table 2), the cases were divided into upper, middle, and lower thirds of stomach. Where a tumor straddled the antrum and body it was included with the lower-third tumors. Where the cardia and body were involved, it was classified as upper third. There were 8 upper-, 3 middle-, and 13 lower-third tumors. Six patients had involvement of nodes in the gastric bed (proposed N2) of which all had junctional node involvement. Eighteen patients had no gastric bed involvement and of these 13 were junctional node-negative.

Discussion

Stage-appropriate surgery aims to remove the tier of lymph nodes that are involved with tumor, offering a "relative curative" resection. There are theoretical advantages in removing a further tier, a so-called "absolute" curative resection, but, as with the D2, these advantages have never been convincingly demonstrated. In the hands of Western surgeons at least, theoretical advantages are outweighed by large, demonstrated disadvantages in mortality. A more pragmatic solution is required, and the use of targeted surgery has considerable merits. The results from our unit indicate that the proposals may save as many as 70% (13/18) of patients who do not have gastric bed involvement an unnecessary radical lymph node dissection, while allowing all (6/6) patients with gastric bed involvement to have potentially curative surgery.

Reclassifying the perigastric and gastric bed nodes to N1 and N2 will allow an accurate assessment of the type of operation performed to be recorded. This will remove many of the confounding influences that can trouble randomized controlled trials and will allow differing surgical managements to be compared fairly, thus improving the validity of any future trials of surgery.

Stage-appropriate surgery is nothing new; the greatest supporters of radical and super-radical gastric

Table 2. Junctional nodes for tumors of upper, middle, and lower thirds of stomach

Site of tumor	Junctional nodes; descriptive	Station number by JRS GC
Upper third	Left gastric	7
	Short gastric of left gastroepiploic	4sa or 4sb
Middle third	Left gastric	7
	Supra-pyloric	5
Lower third	Left gastric	7
	Supra-pyloric	5

surgery, the Japanese, already practise it. In certain well defined subtypes of early gastric cancer, the probability of lymph node metastasis is so low that endoscopic mucosal resections are feasible [19]. Where lymph node metastasis can be confidently excluded, lymphadenectomy does not need to be performed. The proposals for stage-appropriate surgery outlined here are a logical progression of developments in Japan and should be further investigated by a prospective, randomized, controlled trial with randomization between the surgeon's preferred operation and targeted, stage-appropriate surgery.

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