

The Road to Modified D2 Gastrectomy

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KEY WORDS: gastric cancer, D2 gastrectomy, lymphadenectomy

IMAJ 2015; 17: 768–769

D2 gastrectomy (gastrectomy with extended lymphadenectomy which includes the perigastric lymph nodes as well as lymph nodes along the celiac artery branches) is lately gaining popularity in the Western world. However, some controversy exists as to the oncologic benefit in every patient, the extent of surgery within the D2 definition, and the risk of morbidity and mortality associated with the extended lymphadenectomy.

In this issue of *IMAJ*, Lavy and colleagues [1] report their experience with 100 D2 gastrectomies. Although the study was retrospective in nature, the number of patients operated at one medical center is remarkable for Israel. The authors have shown a higher number of retrieved lymph nodes (average 30 nodes) in the D2 patients compared to operations with a less extensive dissection. This was achieved with an acceptable rate of complications and re-admissions.

The survival of patients undergoing surgery for gastric cancer in East Asia was reported to be higher than in Western countries even when patients were matched for post-resection stage [2]. Differences in tumor biology and location, the stage migration phenomenon, as well as the difference in surgical approach (i.e., D1 versus D2 resection) were all suggested as possible explanations.

This difference in oncologic outcome has led to the implementation of several prospective randomized trials comparing D1 to D2 gastrectomies. Three of these

studies were completed in Western countries. In the MRC trial [3] in the United Kingdom, 400 patients were randomized to D1 and D2 resection. The 5 year survival rates did not differ between the two arms, with 35% for D1 resection and 33% for D2 resection. Disease-free survival did not differ either. The authors concluded that D2 resection offers no survival advantage over D1 resection, but did suggest that D2 resection without pancreatico-splenectomy may be superior to standard D1 resection. The Dutch study randomized 711 patients to D1 and D2 resection. They published their early results [4] as well as their late results, with more than 10 years follow-up [5]. The findings demonstrated a significant increase in postoperative morbidity and mortality in the D2 group (10% vs. 4% mortality) associated with stations 10 and 11 dissections that necessitated splenectomy and distal pancreatectomy. A non-statistical significant marginal increase in overall survival for D2 (35% vs. 30%) with a potential advantage in N2 patients was shown in a subgroup analysis. They concluded that the higher postoperative mortality offsets the long-term effect in survival and that extended lymph node dissections may be of benefit only if morbidity and mortality can be avoided possibly with spleen and pancreas-preserving D2 resection. The third European prospective randomized study was conducted by the Italian Gastric Cancer Study Group. They reported both early [6] and late [7] results and showed no difference in postoperative morbidity and mortality, or in 5 year survival between the D1 and D2 approach (66% vs. 64%). However, a subgroup analysis showed a 5 year disease-specific survival benefit in D2 patients with pT2-4 status and positive lymph nodes (59% vs. 38%, $P = 0.055$). Interestingly,

patients with pathological tumor (pT) 1 disease in the D2 group had a worse prognosis compared to D1 (83% vs. 98% for the D2 group, $P = 0.015$). They concluded that D2 lymphadenectomy may be a better choice for patients with advanced disease and lymph node metastases.

A meta-analysis evaluating these three studies and another three studies conducted outside of Europe [8] suggested that routine D2 gastrectomy is associated with more anastomotic leaks, more complications, higher 30 day mortality rate, and no survival benefit. However, in response to this meta-analysis, Cushieri and Hanna [9] criticized these conclusions and claimed that all these trials were performed more than 20 years ago and may not be applicable to modern surgical treatment of gastric cancer since practice has changed significantly. They suggested that the non-favorable results were in part due to limited surgical experience and inclusion of low volume centers. In conclusion they stated that they believe these results reflect the failure of the Western surgical community to address the quality issues of technical performance and postoperative care required for D2 gastrectomy.

A second meta-analysis assessing the same data [10] offers a more personalized approach with a consideration for more extensive D2 lymph node dissection among patients with advanced stage and D1 dissection for early gastric cancers as this subgroup of patients may not benefit from more extensive Ln dissection.

After reviewing the available data with the understanding that routine D2 gastrectomy should be practiced in a modified way omitting the routine dissection of stations 11 and 10 that may necessitate distal pancreatectomy and splenectomy, it is reasonable to state that D2 gastrectomy

should be performed in most patients with advanced gastric cancer. A lesser dissection may be reserved for early gastric tumors. Improvement in gastric cancer surgical practice in general and the gradual adoption of novel surgical techniques including laparoscopy and robotic surgery [11] may further improve the postoperative outcome.

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