An audit of pathology lymph node dissection techniques in pylorus preserving Kausch–Whipple pancreatoduodenectomy specimens

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Abstract

Aims—To determine whether or not identifying recognised anatomical groupings of lymph nodes (LNs) improves LN yield in pancreatoduodenectomy resection specimens.

Methods—All the pathology reports from pancreatoduodenectomy resection specimens between January 1997 and September 1999, for one specialist pathologist at the Royal Liverpool University Hospital, were examined retrospectively. The total number of LNs found in each specimen was determined and the method of identifying LNs established for each case. LNs were found using either (1) the UICC TNM anatomical groupings, termed “grouped”; (2) the Japanese Pancreatic Society classification, termed “numbered”; or (3) neither the “grouped” nor “numbered” classification, termed “non-grouped”.

Results—A total of 50 reports (45 neoplastic, five chronic pancreatitis) were studied, 11 with non-grouped LNs, 14 with grouped LNs, and 25 with numbered LNs, including the five inflammatory cases. A median of 7.0 LNs was found in non-grouped cases, a significantly lower number than in the grouped cases (median, 12.0; Mann-Whitney U, p < 0.039) and numbered cases (median, 17.0; p < 0.0001). There was no significant difference in the LN yield between grouped and numbered cases (p = 0.1066). LNs were found most frequently in the inferior, posterior pancreaticoduodenal, and infrapyloric regions.

Conclusions—A detailed knowledge of the anatomical distribution of LNs in pancreatoduodenectomy resection specimens significantly improves LN yield. It is suggested that illustrations of LN sites in resection specimens should be included in pathology guidelines/proformas to improve LN detection and, therefore, pathological prognostic data.

Materials and methods

All the pathology reports from pylorus preserving Kausch–Whipple pancreatoduodenectomy resection specimens (which include the head of pancreas, duodenum, distal bile duct, and gall bladder) between January 1997 and September 1999, for one specialist pathologist in the department of pathology at the Royal Liverpool University Hospital, were examined retrospectively. The total number of LNs found in each specimen was determined from each
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report and the method of identifying LNs for each case established by reviewing the paraffin wax block taking records. LNs were identified either according to (1) the UICC TNM anatomical groupings,\textsuperscript{21} termed “grouped”; (2) the Japanese Pancreatic Society classification system,\textsuperscript{22} termed “numbered”; or (3) neither the “grouped” nor “numbered” methods, termed “non-grouped”.

Before 1998, LNs were sampled from the resection specimens without specific knowledge of the lymphatic drainage of the pancreas (termed “non-grouped” LNs). “Grouping” of LNs was introduced in 1998, following the update of the UICC TNM classification of malignant tumours.\textsuperscript{24} In this classification, regional LNs, for the head of the pancreas and ampulla of Vater, are subdivided into: (1) superior to the head and body of the pancreas; (2) inferior to the head and body; (3) anterior, including anterior pancreaticoduodenal, pyloric, and proximal mesenteric; and (4) posterior, including posterior pancreaticoduodenal, common bile duct, and proximal mesenteric LNs (fig 1).

In 1999, the Japanese Pancreatic Society LN numbering system\textsuperscript{22} was introduced, at the request of the surgeons in the Royal Liverpool University Hospital. In this rather complex system, 18 different groups of LNs are identified (table 1), many of which have further subdivisions.

All the resection specimens studied included the head of the pancreas but not the body or tail of the pancreas. None of the patients had undergone previous abdominal surgery and there was no history of preoperative radiotherapy or chemotherapy. Lymph nodes had been dissected from the specimens after formalin fixation.

Table 1 The numbering of regional lymph nodes (LNs) of the pancreas according to the Japanese Pancreatic Society classification system\textsuperscript{22}

<table>
<thead>
<tr>
<th>No.</th>
<th>LN Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Right cardial LNs</td>
</tr>
<tr>
<td>2</td>
<td>Left cardial LNs</td>
</tr>
<tr>
<td>3</td>
<td>LNs along the lesser curvature of the stomach</td>
</tr>
<tr>
<td>4</td>
<td>LNs along the greater curvature of the stomach</td>
</tr>
<tr>
<td>5</td>
<td>Suprapyloric LNs</td>
</tr>
<tr>
<td>6</td>
<td>Infra- pyloric LNs</td>
</tr>
<tr>
<td>7</td>
<td>LNs along the left gastric artery</td>
</tr>
<tr>
<td>8</td>
<td>LNs around the common hepatic artery</td>
</tr>
<tr>
<td>9</td>
<td>LNs around the celiac trunk</td>
</tr>
<tr>
<td>10</td>
<td>LNs at the hilum of the spleen</td>
</tr>
<tr>
<td>11</td>
<td>LNs around the splenic artery</td>
</tr>
<tr>
<td>12</td>
<td>LNs of the hepatoduodenal ligament</td>
</tr>
<tr>
<td>13</td>
<td>Posterior pancreaticoduodenal LNs</td>
</tr>
<tr>
<td>14</td>
<td>LNs around the superior mesenteric artery</td>
</tr>
<tr>
<td>15</td>
<td>LNs along the middle colic artery</td>
</tr>
<tr>
<td>16</td>
<td>Para-aortic LNs</td>
</tr>
<tr>
<td>17</td>
<td>Anterior pancreaticoduodenal LNs</td>
</tr>
<tr>
<td>18</td>
<td>Inferior LNs</td>
</tr>
</tbody>
</table>

In the cases with grouped or numbered LNs, the sites of the most frequently found LNs were also determined. Statistical analyses were performed using the Mann-Whitney U test for non-parametric data.

Results

In total, 50 pathology reports were studied (45 resections for neoplasia, five resections for chronic pancreatitis), 11 with non-grouped LNs, 14 with grouped LNs, and 25 with numbered LNs. The LNs were numbered in all five cases of chronic pancreatitis.

The median lymph node count in the non-grouped cases was 7.0 LNs. There was a significant increase in the lymph node yield in both grouped cases (median, 12.0 LNs) and numbered cases (median, 17.0 LNs) compared with the non-grouped cases; \( p < 0.039 \) and \( p < 0.0001 \), respectively (table 2). Although the LN yield for numbered cases was higher than that for the grouped cases, this was not significant (\( p = 0.1066 \)). The LN yield in inflammatory cases (median, 15.0 LNs) was not significantly different from that found in the neoplastic resections with numbered LNs (median, 17.5; \( p = 0.5170 \)).

In the 39 resections in which the LNs were either grouped or numbered, LNs were found most commonly in the inferior, posterior pancreaticoduodenal, and infrapyloric regions (table 3).

Discussion

In this retrospective audit, we have shown that identifying peripancreatic LNs, either by anatomical groupings, proposed by the UICC TNM classification,\textsuperscript{23} or by the LN numbering system of the Japanese Pancreatic Society,\textsuperscript{22} significantly increases the LN yield from...
pylorus preserving Kausch–Whipple pancreaticoduodenectomy specimens (table 2). We have also shown that LNs are most frequently found in the inferior, infrapyloric, and posterior pancreaticoduodenal regions (fig 1; table 3).

The number of LNs detected in a resection specimen depends upon the anatomical differences between patients, the type of surgical excision, and the diligence of the pathologist in recovering LNs from the resection specimen. Different surgical procedures will produce specimens with different LN groups and subgroups and, therefore, different numbers of LNs.

In our study, all patients underwent the same surgical procedure, a pylorus preserving Kausch–Whipple pancreaticoduodenectomy (resection of head of pancreas, duodenum, distal bile duct, and gall bladder), with en bloc removal of anterior pancreaticoduodenal LNs, posterior pancreaticoduodenal LNs, hepaticoduodenal ligament ( bile duct) LNs, LNs around the superior mesenteric vessels, superior head/infrapyloric LNs, and small bowel mesentry LNs. Separately sent common hepatic artery and para-aortic LNs were not included in our analysis.

Although our overall average LN yield of 15.2 LNs in the 39 grouped and numbered cases is less than the average of 33 LNs found by Cubilla et al in eight Whipple resections, their resection specimens included a partial gastrectomy and pancreatic body resection with LNs from the lesser and greater curves of the stomach, and from the body of the pancreas, included in their average number. These differences highlight the need for standard definitions of surgical procedures, to allow objective comparisons of morbidity, mortality, and prognostic data between institutions.

Fat clearance techniques could have been used to increase LN yield. However, a detailed knowledge of the anatomical locations of peri-pancreatic LNs significantly improves the yield significantly. Before the introduction of LN grouping and subsequently numbering, the median LN yield (7.0 LNs) was less than the UICC TNM recommended minimum of 10 LNs, required for an adequate pathological assessment of LN status in carcinomas of the pancreas and ampulla of Vater. Although most of the LNs in our specimens were visible macroscopically, embedding the anterior and posterior pancreaticoduodenal groove fat and the inferior margin of the specimen resulted in microscopic and intrapancreatic LNs being found at these sites. Increasing dissection experience acquired by the surgeons and pathologist during the retrospectively analysed period of study will probably also have contributed to the increase in LN yields. However, the significant increase in LN yield with grouping compared with the initial non-grouping method, and the subsequent lack of a significant difference between grouping LNs and the most influential method of numbering LNs (the method with the highest number of cases studied) suggests that knowledge of the anatomical locations of LNs was more influential than increasing dissection experience.

The Japanese Pancreatic Society22 LN numbering system is complex but, in practice, only further subdivides the groupings of the UICC TNM system. It is more time consuming to identify the Japanese Pancreatic Society numbered LNs separately, but one would not expect to identify any more LNs with this method. Therefore, the lack of a significant difference between the numbers of LNs found in the numbered cases (median, 17.0) and the grouped cases (median, 12.0) suggests that the maximum number of LNs that can be found in a specimen has been achieved. Now that the Japanese numbering system is our standard protocol for LN sampling, it would be interesting to re-audit LN yields in the future to see if any further increase occurs. However, awareness that LN yield will be re-audited (one aspect of the Hawthorne effect) could influence the results.

In conclusion, we have shown that a detailed knowledge of the anatomical locations of peri-pancreatic LNs significantly increases the pathologist's LN yield in pancreaticoduodenectomy resection specimens. We suggest that illustrations of LN sites in resection specimens should be included in pathology guidelines/proformas to aid and improve LN detection and, therefore, improve pathological prognostic data.

We thank A Williams for assistance with the illustration.


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