The Aarhus County Vagotomy Trial: Trends in the Problem of Recurrent Ulcer After Parietal Cell Vagotomy and Selective Gastric Vagotomy with Drainage

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In a prospective, randomized study, 691 patients with duodenal (DU), pyloric (PU), or prepyloric (PPU) ulcers have been followed for 2-5 years after operation with parietal cell vagotomy (PCV) or selective gastric vagotomy with drainage (SGV + D). About half the patients have been followed for 5 years. Cumulative 5-year recurrence rates, calculated by a life table method, suggest a higher recurrence rate for patients with DU when operated with PCV (15%) than when operated with SGV + D (9%), but the difference was not statistically significant (p > 0.05). Patients with PU/PPU had higher recurrence rates following either procedure than patients with DU (PCV: 33%; SGV + D: 14%).

A study of the change in recurrence risk as a function of time after operation suggests that the recurrence rate following SGV + D when used for DU will continue to rise after 5 years, but probably very slowly. The recurrence rate after 5 years is unpredictable, however, for PCV when used for DU, and unpredictable for both methods when used for PU/PPU.

The recurrence rate was found to be independent of the level of preoperative gastric acid secretion, and this was true for both PCV and SGV + D. An increased recurrence rate was, on the other hand, found to be associated with < 50% postoperative reduction in pentagastrin-stimulated acid secretion.

After parietal cell vagotomy, there are very few functional sequelae. Recurrent ulcer, however, occurs with a substantial frequency, although with a wide range in results from different centers. Varying periods of observation make comparison difficult, and probably there is some interdepartmental variation in the threshold for acceptance that a recurrence has appeared. Even with extensive use of endoscopy, a definitive diagnosis may be evasive and a matter of judgment.

Little is known about the change in recurrence rate with time after operation, and whether the final level is beginning to emerge. Points of disagreement are the possible dependence of recurrence rate on the preoperative acid secretory capacity and on the site of the primary ulcer—in the duodenal cap or pyloric channel.

These are the topics to be discussed in this account of the Aarhus County Vagotomy Trial. A detailed description of the methods, the functional results after 2 years, and preliminary recurrence data have been presented previously [1, 2].

Methods

The Aarhus County Vagotomy Trial is a prospective, randomized trial comparing the results of parietal cell vagotomy without (PCV) and with drainage (PCV + D), selective gastric vagotomy with drainage (SGV + D), and selective vagotomy with antrectomy. These operations are applied to ulcers in the duodenal bulb (DU), in the pylorus (PU), and in the distal 2 cm of the prepyloric area (PPU). The final classification of the site of the ulcer...
was done during laparotomy, with only occasional disagreement with the preoperative endoscopic diagnosis.

The trial was started in 1972, and patients were entered until 1977. The operations were performed within the general regimen of the departments, most being done by residents at different stages in their training, but after thorough instruction. About half the patients have been followed for 5 years, and all have been followed for at least 2 years. The total material comprises 906 patients, but in this account only patients treated with PCV and SGV + D will be considered, a total of 691 patients. Patients with PU and PPU are grouped together, since they have been found to have similar characteristics with respect to results after operation and share a marked difference from DU. Combined ulcers are omitted in this report. The distribution of patients between types of operation and types of ulcer is seen in Table 1.

The diagnosis of recurrent ulcer was usually verified by endoscopy when patients presented with dyspeptic symptoms, or suspicion was raised at the annual routine check-up. Often repeated endoscopy was necessary before the diagnosis was reached. When in doubt, we relied more on the patient's symptoms than on x-ray and endoscopy. It must be remembered that most patients have many years of experience with periodic dyspepsia. When they tell us that the all too well-known symptoms have recurred in a recognizable form, we are prone to accept that their disease has recurred and they are treated accordingly with antrectomy or, in recent years, cimetidine. Only in cases of atypical symptoms has endoscopic proof of recurrence been a sine qua non. This way of handling the diagnostic problem results in a high proportion of accepted recurrences to cases of postoperative dyspepsia [2]. The time for appearance of a recurrence was defined as the time for debut of symptoms, and not as the time for establishment of the diagnosis.

All recurrences are grouped together. Most recurrences appear at the same site as the primary ulcer, but recurrent disease manifest as gastric ulcer is included also. Patients with insufficient vagotomy

<table>
<thead>
<tr>
<th>ULCER TYPE</th>
<th>SGV + D</th>
<th>PCV</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DU</td>
<td>281</td>
<td>235</td>
<td>516</td>
</tr>
<tr>
<td>PU/PPU</td>
<td>112</td>
<td>63</td>
<td>175</td>
</tr>
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Fig. 1. Three examples on curves of integrated recurrence intensity, $I(t)$. The recurrence intensity, $I(t)$, is an expression of the risk an operated patient, who has not already had a recurrence, runs for developing one within a small time interval, e.g., 1 month around time $t$ after operation. The integrated (cumulated) graphs are helpful in making it possible to see how recurrence intensity depends on time after operation. If $I(t)$ is constant after operation, the integrated (cumulated) curve of $I(t)$ will form a straight line with a slope equal to $I(t)$. If $I(t)$ is decreasing as time elapses after operation, the $I(t)$ curve will level out and be upwards convex. An increasing $I(t)$ will result in upwards concave curve.

Table 1. Number of patients observed for 2–5 years after parietal cell vagotomy (PCV) or selective gastric vagotomy with drainage (SGV + D). Patients with duodenal ulcer (DU) and pyloric or prepyloric ulcer (PU/PPU) are considered separately.

as indicated by results of pentagastrin and insulin tests are included, as well as patients with seemingly adequate vagotomy. Included also are patients whose ulcers recurred after ingestion of salicylates. It may be misleading to treat so heterogeneous a group of patients as belonging to one disease entity, but we will defer subdivision of the group, as well as an account of treatment and results, until we have followed all patients for at least 5 years.

The 5-year cumulative recurrence rate for groups of patients was estimated by a life table method [2, 3]. The graph gives information about the probable recurrence rate for a cohort of patients at different times after operation, but does not give direct information about a possible change in recurrence risk during the observation period. It could be expected that the risk of development of recurrent ulcer for patients who have not already had one, at time $t$, the so-called recurrence intensity, $I(t)$, would be higher during the first year or two after the operation. If recurrences continue to develop after that time, although at a decreasing intensity, the life table graph still will show a rise, and it may be difficult to realize whether a change in intensity has taken place. This can be made easier with a logarithmic transformation of data, resulting in the so-called integrated recurrence intensity. If the probability of developing a recurrence at a certain time, $(t)$, after operation is called $r(t)$, then $-\ln(1 - r(t))$ is equal to the integrated recurrence intensity $I(t)$. The graph of $I(t)$ will show the changes with time in recurrence intensity, $I(t)$. A straight line (Fig. 1)