There is general agreement that secondary effects on
the blood tend to follow surgery for peptic ulcer but
most of the available information relates to partial
or total gastrectomy. Vagotomy combined with
gastrojejunostomy has been widely used in the
surgical treatment of chronic duodenal ulcer but
few studies have been made of the haematological
effects of this procedure (Burge and Pick, 1958;
Feggetter and Pringle, 1963; Cox, Bond, Podmore,
and Rose, 1964; Hopkinson, 1966). An account is
therefore given of changes in the blood eight years
after vagotomy combined with gastrojejunostomy
and the results are compared with those obtained in
a similar series of patients treated by the Polya
gastrectomy.

CLINICAL MATERIAL

The basis of the study was a long-term, prospective
investigation started in 1954 in the Peptic Ulcer
Clinic at the Western Infirmary, Glasgow. In this
project, male patients coming to elective surgery
for chronic duodenal ulcer were treated either by the
Polya gastrectomy or by total vagotomy with
gastrojejunostomy. The choice was made randomly
only after the surgeon had completed his preliminary
laparotomy and satisfied himself that he could
carry out either operation with complete safety.

The present study includes only those patients who
had been operated on at least eight years previously.
Excluding patients who had died, emigrated, or
undergone further gastric surgery, 82% of the Polya
group and 84% of the vagotomy group were
investigated. The two groups of patients were similar
in several respects. The mean ages, heights, and
weights were almost identical. In the vagotomy
group, the mean interval between operation and the
present study was 103 months (SD 17-1) which
does not differ significantly from the corresponding
value in the Polya patients (105 months, SD 12-3).
Each group is compared with an unselected series of
men with unoperated chronic duodenal ulcer who
presented for investigation while the present study
was in progress.

METHODS

Haemoglobin, packed cell volume, and mean
corpuscular haemoglobin concentration were mea-
sured by the methods described by Dacie and Lewis
(1963). Serum vitamin B₁₂ was estimated by the
Euglena gracilis method (Ross, 1952), serum folate
by the Lactobacillus casei method (Girdwood, 1960),
and serum iron and total iron-binding capacity
by the methods of Ramsey (1953, 1957).

RESULTS

The results are presented in two parts. First, a
comparison is made between the findings in the
patients after the two different operations. Second,
the haematological measurements in patients after
gastric surgery are compared with those carried out
in patients with duodenal ulcer who had not been
subjected to operation.

COMPARISON OF THE EFFECTS OF THE TWO OPER-
ATIONS Table I shows mean values in the two groups
of patients after operation. Each measurement
reveals an advantage for vagotomy with gastrojeju-
nostomy. The differences are generally small but
many are statistically significant. The distribution of
haemoglobin concentrations is shown in the figure
which serves to indicate the actual incidence of
abnormal results and confirms the view that the
haematological findings after vagotomy with gas-
trojejunostomy are better.

Seventeen of the gastrectomy patients and four
of the vagotomy patients gave a history of oral iron therapy or blood loss during the 12 months preceding the study. Either factor might be expected to influence the state of the blood but exclusion of the findings in these patients does not alter the finding that haematological deficiencies are less after vagotomy than after the Polya gastrectomy. Fifteen of the 17 Polya patients excluded in this way had received prophylactic oral iron therapy and it is reasonable to suppose that some of these patients might otherwise have been significantly anaemic. It is therefore possible that the true extent of iron deficiency after Polya gastrectomy had been masked.

COMPARISON WITH UNOPERATED PATIENTS Table II shows the mean values for haemoglobin, serum iron, total iron-binding capacity (TIBC), and percentage saturation of the latter with iron in unoperated male duodenal ulcer patients and in the two postoperative groups. With the exception of the TIBC in the vagotomy patients, all values in the postoperative patients were significantly lower than in the unoperated patients.

DISCUSSION

The main purpose of the present study was to make a comparison between two gastric operations for chronic duodenal ulcer. For many years the Polya gastrectomy was used because of its effectiveness in preventing recurrent ulceration. Subsequently its

![Graph](Image)

**TABLE I**

MAIN RESULTS IN ALL PATIENTS AFTER OPERATION

<table>
<thead>
<tr>
<th></th>
<th>Vagotomy with Gastrojejunostomy</th>
<th>Polya Gastrectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Mean ± SD</td>
</tr>
<tr>
<td>Haemoglobin (g/100 ml)</td>
<td>50</td>
<td>14.7 ± 1.3</td>
</tr>
<tr>
<td>Packed cell volume (%)</td>
<td>50</td>
<td>43.9 ± 3.3</td>
</tr>
<tr>
<td>MCHC (%)</td>
<td>50</td>
<td>33.5 ± 1.5</td>
</tr>
<tr>
<td>Serum iron (µg/100 ml)</td>
<td>49</td>
<td>97 ± 44</td>
</tr>
<tr>
<td>TIBC (µg/100 ml)</td>
<td>45</td>
<td>352 ± 60</td>
</tr>
<tr>
<td>Ssaturation of TIBC (%)</td>
<td>45</td>
<td>28.5 ± 12.3</td>
</tr>
<tr>
<td>Serum vitamin B12 (µg/ml)</td>
<td>47</td>
<td>208 ± 74</td>
</tr>
<tr>
<td>Serum folate (mµg/ml)</td>
<td>47</td>
<td>8.3 ± 3.6</td>
</tr>
</tbody>
</table>

1Not statistically significant (P > 0.05)

**TABLE II**

COMPARISON OF UNOPERATED DUODENAL ULCER PATIENTS WITH THOSE AFTER SURGERY

<table>
<thead>
<tr>
<th></th>
<th>Duodenal Ulcer</th>
<th>Vagotomy with Gastrojejunostomy</th>
<th>Polya Gastrectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Mean ± SD</td>
<td>No.</td>
</tr>
<tr>
<td>Haemoglobin (g/100 ml)</td>
<td>63</td>
<td>16.1 ± 1.3</td>
<td>50</td>
</tr>
<tr>
<td>Serum iron (µg/100 ml)</td>
<td>61</td>
<td>116 ± 42</td>
<td>49</td>
</tr>
<tr>
<td>TIBC (µg/100 ml)</td>
<td>46</td>
<td>338 ± 39</td>
<td>45</td>
</tr>
<tr>
<td>Ssaturation of TIBC (%)</td>
<td>46</td>
<td>35.1 ± 12.1</td>
<td>45</td>
</tr>
</tbody>
</table>

1Significance of difference from mean value in duodenal ulcer patients

2N.S. = not statistically significant (P > 0.05)
Blood changes after vagotomy with gastrojejunostomy compared with Polya gastrectomy

A haematological study has been carried out in 107 men more than eight years after surgery for chronic duodenal ulcer. The operation was the Polya partial gastrectomy in approximately half the patients and vagotomy with gastrojejunostomy in the remainder. A true comparison of the effects of the two operations was possible because the choice of operation had been made randomly. All haematological measurements show an advantage for vagotomy with gastrojejunostomy but the differences are small.

We gratefully acknowledge the encouragement and advice of Professor A. W. Kay and the ready cooperation of Dr J. F. Adams who carried out the serum vitamin B₁₂ estimations.

REFERENCES


popularity waned, partly because of appreciation of
a rather high incidence of nutritional deficiencies.
The most common of these is anaemia which is
usually due to iron deficiency but which is occasion-
ally due to deficiency of either serum vitamin B₁₂ or
folic acid. Vagotomy is favoured because it obviates
the need to remove part of the stomach and this
might be expected to reduce the incidence of un-
desirable metabolic sequelae. Workers who have in-
vestedigate this problem agree that anaemia is un-
common after vagotomy with gastrojejunostomy
(Burge and Pick, 1958; Feggeter and Pringle, 1963;
Hopkinson, 1966). However, one previous study has
indicated that anaemia is more common after this
operation than in a group of normal subjects (Cox
*et al*, 1964).

The present study was possible because of the
existence of a unique group of patients who had
been randomly allocated to either the Polya gastrecto-
my or vagotomy with gastrojejunostomy in the
middle of the 1950s. It tends to confirm the belief
that vagotomy results in a lower incidence of haemato-
logical abnormalities than does the Polya partial
gastrectomy. This accords with the findings of
Burge and Pick (1958).

However, vagotomy is not entirely free from haem-
atological consequences as is shown by the lower
haemoglobin and serum iron values after vagotomy
compared with unoperated duodenal ulcer patients.
This confirms the finding of an earlier study (Cox
*et al*, 1964) in which some patients as early as four
years after vagotomy with gastrojejunostomy also
had low haemoglobin and serum iron values.

The most remarkable findings in the series is the
low incidence of overt anaemia (see Fig.). This
Can be attributed in part to the exclusion of women
who show a greater susceptibility to iron deficiency
after gastric surgery (Hobbs, 1961) and in part to the
history of recent oral iron therapy in many of the
gastrectomy patients.

**SUMMARY**

A haematological study has been carried out in 107
men more than eight years after surgery for chronic
duodenal ulcer. The operation was the Polya partial
gastrectomy in approximately half the patients and
vagotomy with gastrojejunostomy in the remainder.
A true comparison of the effects of the two opera-
tions was possible because the choice of operation
had been made randomly. All haematological
measurements show an advantage for vagotomy
with gastrojejunostomy but the differences are small.

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advice of Professor A. W. Kay and the ready cooperation
of Dr J. F. Adams who carried out the serum
vitamin B₁₂ estimations.

REFERENCES


Blood changes eight years after vagotomy with gastrojejunostomy compared with those after polya partial gastrectomy.

A G Ox, H E Hutchison and C A Wardrop

*Gut* 1968 9: 11-13
doi: 10.1136/gut.9.4.11

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