Hypochlorhydria and hypergastrinaemia in rheumatoid arthritis

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SUMMARY In order to evaluate the incidence and aetiology of hypergastrinaemia 53 patients with seropositive rheumatoid arthritis were examined for gastric acid secretion, fasting serum gastrin concentration, circulating parietal cell antibodies, and some parameters of the activity of inflammation of rheumatoid arthritis. The basal and maximum acid output was found to be subnormal in this group (P<0.01), and in 11 of these patients (23%) the fasting serum gastrin levels were raised (P<0.05). This hypergastrinaemia correlated strongly with maximum acid output. Only in cases of achlorhydria or hypochlorhydria (maximum acid output less than 2 mmol/l) was the serum gastrin level markedly raised. Two out of 5 patients with achlorhydria were found to have circulating parietal cell antibodies, and 1 had decreased absorption of vitamin B₁₂. No relationship was found between serum gastrin and duration or activity of rheumatoid arthritis; nor was there a relationship between basal serum gastrin and the various antirheumatic drugs administered.

Rooney et al. (1973a, 1973b) have demonstrated a high incidence of hypergastrinaemia in patients with rheumatoid arthritis (RA). But the cause of this phenomenon was not established. The inflammatory activity, the duration of the rheumatoid arthritis, and the gastric acid secretion were found to be unrelated to serum gastrin levels, nor did the presence of rheumatoid factor in serum influence the serum gastrin levels (Rooney et al., 1976a, 1976b). We have therefore investigated the incidence and the possible causes of the increased fasting serum gastrin levels in patients with rheumatoid arthritis.

Patients and methods

Fifty-three patients were included in this study. 28 females and 25 males with a mean age of 55 years (range 17–74 years). All patients met the criteria of the American Rheumatism Association for the diagnosis of classical or definite rheumatoid arthritis (Ropes et al., 1959). The age of males and females was not statistically different. Mean duration of the RA was 9 years (range 1–35 years). All patients had a positive haemagglutination reaction with sensitised sheep cells, according to the technique of Svartz-Schlossman, and none had undergone previous upper abdominal surgical operations.

Eight patients were not taking any antirheumatic medications; the others were receiving indomethacin, gold, or corticosteroids, or a combination of these drugs. The activity of joint inflammation was assessed by means of an articular index; tenderness, warmth, and swelling of all joints were measured by the same investigator.

A matched control group consisted of 28 persons, 14 males and 14 females, with a mean age of 52 years (range 36–75 years) without any sign of rheumatoid arthritis, or upper abdominal complaints.

Fasting serum gastrin was measured by a radioimmunoassay technique (Stadil and Rehfeld, 1973; Lamers and van Tongeren, 1977). The gastrin antisera was raised in a rabbit against synthetic human gastrin I containing residues 2 through 17 (SHG 2–17, Imperial Chemical Industries Ltd.) conjugated to bovine albumin. Gastrin components I, II (gastrin-34), III (gastrin-17), and IV (gastrin-13) could be demonstrated by using this antibody. The antibody reacted with sulphated and non-sulphated forms of gastrins I, II, and III with almost equimolar potency (Rehfeld et al., 1975). Gastric contents were collected according to the
method of Hector (1968); the correct position of
the orogastric tube in the stomach was checked by
the water recovery test (Hassan, and Hobson 1970).
Pentagastrin in a dose of 6 µg per kg body weight
was used for maximum stimulation of acid secretion.
The gastric acid concentration was determined by
titration of gastric juice with 0-1 N NaOH up to pH
of 7-0. The basal acid output (BAO) during 1 hour,
the maximum acid concentration (MAC) and the
maximum acid output (MAO) during 1 hour were
calculated.

The presence of circulating antibodies to parietal
cells and intrinsic factor was measured according to
the method of Taylor et al. (1962). Other immuno-
logical investigations performed on all patients were
the sheep cell agglutination test, latex fixation re-
ation, antinuclear antibody test, and antiperinuclear
antibody test (Nienhuis and Mandema, 1963). The
following parameters of inflammatory activity were
recorded: erythrocyte sedimentation rate (ESR),
haemoglobin, and protein electrophoresis.

Statistical analyses were carried out by the Wil-
coxon test for unpaired data. Regression analyses
were done by the method of least squares.

Results

In 11 out of the 53 patients investigated fasting
serum gastrin levels were raised, while none were
raised in the 28 matched controls. The serum gastrin
level of the whole group, 158 pg/ml (range 44–790
pg/ml), was significantly (P < 0.05) higher than in
the matched control group, 67 pg/ml (range 43–97
pg/ml). As shown in Table 1, the basal gastric acid
output, maximum acid output, and maximum acid
concentration were significantly (P < 0.01) lower
than in a group of 20 healthy persons. This popu-
lation was subdivided into 5 different groups in
accordance with the MAO, namely, total achlor-
hydria (group A); severe hypochlorhydria, MAO 0–2
mmol/h (group B); mild hypochlorhydria, MAO
2–6 mmol/h (group C); moderate hypochlorhydria,

MAO 6–10 mmol/h (group D); and MAO more than
10 mmol/h (group E) (Fig. 1).

Markedly increased serum gastrin concentrations
were found almost exclusively in patients with
achlorhydria (group A) or severe hypochlorhydria
(group B). These patients had significantly (P < 0.02)
higher serum gastrin levels than patients in groups
C, D, and E. Group A showed a weak tendency
for higher gastrin levels than group B (P = 0.1).
Two out of 5 patients with achlorhydria had parietal
cell antibodies, and none had demonstrable anti-
bodies against intrinsic factor. Only 1 patient showed
an impaired absorption of vitamin B12 (2.3% excre-
tion of labelled vitamin B12 in 48-hours urine;
normal more than 15% in 48-hours), but this patient
had no evidence of pernicious anaemia. None of
the other patients had demonstrable circulating
parietal cell or intrinsic factor antibodies.

In the RA patients with MAO more than 2
mmol/h there was no significant correlation between
BAO and serum gastrin (r = 0.22) and between
MAO and serum gastrin (r = 0.03). Furthermore,
we found no correlation between the serum gastrin
level and the age of the patients, duration of the
rheumatoid arthritis, articular joint index, sub-
cutaneous nodules, ESR, haemoglobin, anti-
perinuclear antibodies, and antinuclear antibodies.
As shown in Fig. 2, no relation was found between
serum gastrin levels and the various antirheumatic
drugs used.

Table 1 Gastric acid secretion in patients with
rheumatoid arthritis and in healthy controls

<table>
<thead>
<tr>
<th></th>
<th>Patients (n = 53)</th>
<th>Controls (n = 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>Basal output (mmol/h)</td>
<td>1-2</td>
<td>0-11-4</td>
</tr>
<tr>
<td>Maximum output (mmol/h)</td>
<td>10-4</td>
<td>0-29-4</td>
</tr>
<tr>
<td>Maximum acid concentration (mmol/l)</td>
<td>83</td>
<td>0-148</td>
</tr>
</tbody>
</table>

Fig. 1 Correlation between fasting serum gastrin
concentrations and maximum acid output in patients
with seropositive RA. The mean for each group is
shown as a solid line. Gastrin has been plotted on a
logarithmic scale.
various antirheumatic medication. Discussion taking gastric biopsies in our group of 53 patients with seropositive, definite for experimental reasons only.

This is in accordance with the findings of Rooney et al. (1976a, 1976b). Whereas these authors found normal gastric acid output in almost all of their 16 RA patients with hypergastrinaemia, according to our data this hypergastrinaemia in rheumatoid patients appears to be based on an absence or severe reduction of gastric acid secretion. There is no ready explanation for the discrepancy between the findings of Rooney et al. (1976b) and our own results, although in contrast to our study Rooney and coworkers did not include rheumatoid patients with normal serum gastrin levels in their study. Nor did they show whether there is any relationship between serum gastrin levels and gastric acid secretion in their hypergastrinaemic patients. Generally, serum gastrin levels are increased in patients with reduced gastric production (Walsh and Grossman, 1975). Moreover, in patients with hypochlorhydria there is an inverse correlation between stimulated acid secretion rate and fasting serum gastric concentration (Trudeau and McGuigan, 1971; Gedda-Dahl, 1974). The increased serum gastrin levels in these conditions are caused by the lack of inhibition of antral gastrin release due to the absence of gastric acid (Yalow and Berson, 1970; Fahrenkrug et al., 1976).

In addition to the hypergastrinaemia a very high incidence of decreased gastric acid secretion was seen in our patients; only 50% of the patients had a normal maximum acid output (that is, higher than 10 mmol/h). The mean fasting serum gastrin level was found to be increased only if the MAO was lower than 2 mmol/h. In a study of nonrheumatoid patients the mean gastrin level was found to be raise if the MAO was less than 10 mmol/h, but only if MAO was less than 2 mmol/h did the mean fasting gastrin reach very high levels (Gedda-Dahl, 1974). As in other studies (Trudeau and McGuigan, 1971; Gedda-Dahl, 1974) some of our patients with a MAO <2 mmol/h had a normal fasting serum level of gastrin. Stockbrügger et al. (1977) found that in normogastrinaemic patients with achlorhydria the number of antral G-cells had not increased, probably as a result of coexisting antral gastritis.

In general it has been assumed that achlorhydria and severe hypochlorhydria are an expression of chronic atrophic gastritis (Bock et al., 1963; Stockbrügger et al., 1977). Louyot et al., (1974) have established histological evidence of gastritis in 40% and hypochlorhydria or achlorhydria in 60% of a group of 50 rheumatoid patients. We abstained from taking gastric biopsies in our patients because it was considered unjustifiable to perform this procedure for experimental reasons only. Moreover, a small sample biopsy cannot conclusively exclude the presence of chronic atrophic gastritis. Atrophic gastritis, as demonstrated by others, resulting in a low gastric acid secretion can be accounted for either by the rheumatoid arthritis itself or by the long-term administration of anti-inflammatory drugs.

In the present study no relation was found between gastric acid secretion and the antirheumatic drugs given. Although in both studies no relation was found between the hyposecretion of gastric acid and the duration or activity of the rheumatic process, a possible role of the rheumatoid arthritis itself in the development of the hypochlorhydria cannot be excluded. Moreover, the increase of serum gastrin levels in untreated adjuvant arthritis in the rat also indicates a causative role of the inflammatory process itself (Rooney et al., 1973c).

In conclusion, the high incidence of hypergastrinaemia in patients with RA is, in our opinion due to achlorhydria or severe hypochlorhydria, and probably is the result of chronic atrophic gastritis.
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References


