EVALUATION OF CYTOLOGIC DIAGNOSIS FOR CHRONIC GASTRITIS

BY

Takashi Yamada,* Masahiko Kakihana,* Shunichi Matsumoto* and Hiroshi Sankawa*

There have been numerous investigations concerning the cellular picture in gastric juice exfoliated from the gastric mucous membrane in acute and chronic gastritis during the last century. Although detailed studies were reported by Boas in 1920, Westphal & Kuckuch in 1934, and Tomenius in 1947 etc., most of them dealt with the quantitative analysis of exfoliated cells in the gastric juice. They failed to find diagnostic value and showed merely the following findings.

1. That exfoliated gastric epithelial cells in the gastric juice decrease in number in atrophic gastritis and are sometimes accompanied by an appearance of signet-ring formed cells.
2. That they increase in hypertrophic gastritis.
3. That leucocyte and various kinds of emigration cells increase in acute gastritis.

Table 1. Cytologic Diagnosis of gastric disease by Trypsin or Chymotrypsin lavage. (230 cases)

<table>
<thead>
<tr>
<th>Name of Disease</th>
<th>No. of Case</th>
<th>Cytologic Diagnosis</th>
<th>Accuracy</th>
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<tr>
<td></td>
<td></td>
<td>malignant cell positive</td>
<td>malignant cell negative</td>
</tr>
<tr>
<td>Gastric carcinoma</td>
<td>49</td>
<td>42</td>
<td>7</td>
</tr>
<tr>
<td>Gastric sarcoma</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>43</td>
<td>7</td>
</tr>
<tr>
<td>Chronic gastritis</td>
<td>40</td>
<td>2</td>
<td>38</td>
</tr>
<tr>
<td>Gastric or gastroduodenal ulcer</td>
<td>34</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>Duodenal ulcer</td>
<td>17</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Gastric Folyt</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>3</td>
<td>89</td>
</tr>
<tr>
<td>The others†</td>
<td>88</td>
<td>0</td>
<td>88</td>
</tr>
</tbody>
</table>

† This group represents non-operative cases.

The abstract of this report has been read at the 45th Meeting of Gastroenterological Society of Japan (held at Matsumoto city, 1959)

* 山田泰，垣花昌彦，松本俊一，三川宏： The Second Surgical Dept., School of Medicine (Chief: Prof. E. Hamaguchi).

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Special attention was paid recently to the detection of cancer cells in the gastric juice. The cellular picture of benign epithelial cells and emigration cells seems to have been neglected as a diagnostic aid in gastric cancer. Although Panico \textsuperscript{39} and Henning \textsuperscript{29} discussed it, they elicited no definite diagnostic significance in exfoliated cells derived from benign pathological stomachs.

It is the author’s purpose to describe the quantitative and qualitative analysis of exfoliated cells in 40 operated cases of chronic gastritis, compared with the histological pictures of the corresponding gastric mucosa. Cytological examinations were carried out on 230 cases by chymotrypsin or trypsin lavage, shown in Table 1, using the same method as previously reported.\textsuperscript{28}

**Method**

Specimens of exfoliated cells were obtained by the following method.

A Levin tube was passed into the stomach via the mouth and fasting gastric juice was aspirated and discarded. A total of 200 cc. of enzyme solution was instilled, divided into 50 cc. at each instillation. During the instillation of the enzyme solution, a complete turn of the patient in a lying position was made, which ensures washing of the entire stomach. The sediment was smeared and immediately fixed in ether-alcohol and stained by hematoxylin-eosin. The enzyme lavage solution was prepared by adding 5 mg. of chymotrypsin or trypsin to 200 cc. of 1/10 acetate buffer (pH 5.6).

In order to ascertain whether there was any correlation between these cytologic findings and the inflammatory changes of gastric mucosa, the surgically removed tissues of the stomach were histologically examined. For the quantitative analysis, the frequency of appearance of exfoliated cells and changes of mucosa were determined, using marks $++\sim\pm$.

**Result**

A. Quantitative analysis of cytologic finding in chronic gastritis.

1) **Frequency of appearance of exfoliated cells and the acute inflammatory process of gastric mucosa.**

It was noted by early authors that exfoliated emigration cells increased in number in acute gastritis, and recently Richardson and Henning\textsuperscript{29} described that acute exacerbation of gastritis could be identified by the appearance of intracellular leucocyte (leucocyte including cells). We see histologically at times the exfoliated or emigration cells gush out from the mucosa in which acute inflammatory signs are markedly noted (Fig. 8).

In this connection we first investigated the exfoliative cellular picture...
in cases with acute exacerbation. The acute inflammatory process was evaluated, based upon these respects as, emigration of leucocyte into epithelial line and mucous layer, edema and “Knospenbildung”.

A close correlation was noted between frequency of appearance of leucocyte and acute inflammatory findings, especially in severe acute inflammatory cases (Table 3). But there is no definite relationship between the frequency of appearance of the gastric epithelial cells and acute inflammatory findings except in severe acute inflammatory cases (Table 2).

Furthermore the frequency of appearance of leucocyte including cells (Fig. 4) in the gastric sediment and the degree of emigration of leucocyte into epithelial line were indistinctly correlated (Table 4, Fig. 7).

They were not always found in the sediment of gastric mucosa with

| Table 2. Degree of acute inflammatory findings in gastric mucous membrane |
|-----------------------------|-----------------------------|-----------------------------|
| Frequency of appearance of epithelial cells in smears | -~± | + | ++ | # |
| 1~# | -~± | # | # | # |
| + | 1~# | # | # | # |
| ++ | + | # | # | # |
| # | ++ | # | # | # |

| Table 3. Degree of acute inflammatory findings in gastric mucous membrane |
|-----------------------------|-----------------------------|-----------------------------|
| Frequency of appearance of leucocyte and other emigration cells in smears | -~± | + | ++ | # |
| 1~# | -~± | # | # | # |
| + | 1~# | # | # | # |
| ++ | + | # | # | # |
| # | ++ | # | # | # |

| Table 4. Degree of emigration of leucocyte into epithelial cells in gastric mucous membrane |
|-----------------------------|-----------------------------|-----------------------------|
| Frequency of appearance of leucocytes | -~± | + | ++ | # |
| 1~# | -~± | # | # | # |
| + | 1~# | # | # | # |
| ++ | + | # | # | # |
| # | ++ | # | # | # |
a slight or moderate degree of acute inflammatory signs. They were noted only in 11 cases among 25 acute inflammatory cases in our series. Of course the leucocyte including cells are not only derived from the epithelial cells but also from histiocytes or macrophagocytes. Sometimes they may be derived from the epithelial layer of the respiratory tract (chiefly in sputum) or other parts of the alimentary tract.

No exact information could be obtained by leucocyte or leucocyte including cells in the gastric sediment in spite of the above comparative analysis. Erythrocyte including cells are seen sometimes in the sediment mixed with blood, but not frequently (Fig. 5).

Table 5. Degree of hyperplasia of surface epithelial cell in gastric mucus membrane

<table>
<thead>
<tr>
<th>Frequency of appearance of exfoliated gastric epithelial cell in smears</th>
<th>− ~ +</th>
<th>+</th>
<th>++</th>
<th>+++</th>
</tr>
</thead>
<tbody>
<tr>
<td>−~±</td>
<td>● ● ●</td>
<td></td>
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<td>● ● ● ●●●●●●</td>
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<tr>
<td>+</td>
<td>● ● ● ● ●● ● ● ● ●●●● ● ● ● ● ● ● ● ● ●</td>
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<td>+++</td>
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Table 6. Degree of atrophy of glandular cell in gastric mucus membrane

<table>
<thead>
<tr>
<th>Frequency of appearance of exfoliated gastric epithelial cell in smears</th>
<th>− ~ +</th>
<th>+</th>
<th>++</th>
<th>+++</th>
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<tbody>
<tr>
<td>−~±</td>
<td>● ● ●</td>
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<td>±</td>
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<td>● ● ● ● ●● ● ● ● ● ● ● ● ● ●● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●</td>
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Table 7. Degree of cystic dilatation of glands in gastric mucus membrane

<table>
<thead>
<tr>
<th>Frequency of appearance of exfoliated gastric epithelial cell in smears</th>
<th>− ~ +</th>
<th>+</th>
<th>++</th>
<th>+++</th>
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<tr>
<td>−~±</td>
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<td>+</td>
<td>● ● ● ● ●● ● ● ● ● ● ● ● ● ●● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●</td>
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<td>● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●</td>
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<td>+++</td>
<td>● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●</td>
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2. **Frequency of appearance of exfoliated cells and the chronic inflammatory process of gastric mucosa.**

The exfoliative cytologic picture was investigated in patients with chronic inflammatory process of the stomach. The frequency of appearance of epithelial cells was well correlated with the degree of chronic inflammatory process as shown in Tables 5-9. It was especially realized that exfoliated epithelial cells appeared in proportion to the hyperplastic tendency of surface epithelial cells and inversely in proportion to the atrophic tendency of gastric glands as shown in Table 5 and 6. The correlation, however, with cystic dilatation and intestinalization were not very clear, as shown in Tables 7 and 9.

Although it had been said that atrophic gastritis was diagnosed by an appearance of a signet-ring formed cell in gastric sediment, we could find it only in the sediment from gastric mucous membrane with remarkable intestinalization. The diagnostic significance of the signet-ring formed cell seems then to be obscure (Table 8). This is also conceivable for the following reason: Signet-ring formed cells are not always epithelial in origin, but rather frequently are derived from histiocytes or other emigration cells, if vacuolar degeneration may have developed. It may also happen that signet-ring formed cells are derived from the enucleation of the included cells from the leucocyte including cells by secondary change, after exfoliating into the gastric lumen.

Furthermore it is not easy to discriminate between a signet-ring formed cell derived from gastric mucous membrane and one from a respiratory organ, as Panico indicated in his report. As previously described, non-epithelial cells in gastric sediment cannot always indicate the changes of mucous membrane. We often find, however, follicle erosion or hyperplastic proliferations of lymphnodes of the mucous layer in the sections of chronic gastritis. Among the emigration cells, therefore, the frequency of appearance of lymphocyte in gastric sediment and the degree of hyperplasia of lymphatic follicle in corresponding gastric mucous membrane were compared. There are no correlations between both findings (Table 10).

Panico reported on the arrangement of exfoliated epithelial cells mixed with lymphocyte infiltration, but this was rarely observed in our cases. One reason seems to depend upon the fact that proteolytic enzymes not only accelerate the exfoliation of epithelial cells of mucous membrane, but also separate cellular binding of exfoliated cell clumps.

Although Panico, Henning, Streicher and others also noted that all kinds of gastric epithelial cells can be well distinguished in gastric sediment, we supposed that in using the lavage method they may not be easily distinguished in sediment, except when exfoliated cells are well preserved.
Table 8. Degree of intestinalization in gastric mucous membrane

<table>
<thead>
<tr>
<th>Frequency of appearance of signet ring formed cell in smear</th>
<th>-~±</th>
<th>+</th>
<th>#</th>
<th>##</th>
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<tbody>
<tr>
<td>1 ~ 4</td>
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Table 9. Degree of intestinalization in gastric mucous membrane

<table>
<thead>
<tr>
<th>Frequency of appearance of exfoliated gastric epithelial cell in smear</th>
<th>-~±</th>
<th>+</th>
<th>#</th>
<th>##</th>
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<tbody>
<tr>
<td>1 ~ 4</td>
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<td>+</td>
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Table 10. Degree of hyperplasia of lymphatic follicle in mucous membrane

<table>
<thead>
<tr>
<th>Frequency of appearance of signet ring formed cell in smear</th>
<th>-~±</th>
<th>+</th>
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<tr>
<td>1 ~ 4</td>
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B. Appearance of benign atypical cells in the gastric sediment of chronic gastritis cases.

When we make a diagnosis of gastric cancer, based upon the present knowledge of exfoliative cellular pictures, a benign epithelial atypical cell may be mistaken for a malignant one, since no distinct line of differentiation can be drawn morphologically between them. Even in gastritis-case such atypical cells may be seen.

Apart from these epithelial atypical cells we often found histiocytes, called “dust cells”. The cells originating from the respiratory tract are easily identified by the phagocytized particles in their cytoplasm. Sometimes exfoliated Russell's bodies (a kind of degenerated histiocyte) increases in size and contains a typical irregular form of nucleus and deep eosinophilic granular cytoplasm, as shown in Fig. 6. These cells can not be mistaken.
EVALUATION OF CYTOLOGIC DIAGNOSIS FOR CHRONIC GASTRITIS

In this series of chronic gastritis cases, we found many atypical cells and misdiagnosed in two cases. We present case reports only, since our experience is not sufficient yet to discuss and classify the cases in detail. Following cellular pictures should be necessary for detailed reading.

**Case 1. K.N. 38-year-old male**

For 4 months before admission to our clinic he had had nausea and dysphagia. In addition diarrhea had developed a month prior to admission and lasted for 10 days. Thereafter gastric trouble had become sometimes remarkable. No hematemesis was noted. On admission his general condition was fair and anemia was not evident.

On physical examination a tumor like mass was palpable in right upper quadrant of the abdomen. It was tender on pressure. Stool was normal and occult blood in feces was negative. Gastric analysis showed hypoacidity. X-ray examination revealed rough and irregular mucosal relief and rigid wall on the small curvature, although the latter was not unequivocal.

The **exfoliated cellular findings**;

A number of emigration cells (especially leucocyte and leucocyte including cells in Fig. 11) and gastric epithelial cells were seen. This seemed to be suggestive of the acute inflammatory process. Among these cells slight atypical cells were found, as shown in Fig. 10. There was slight enlargement or hyperchromasia of the nucleus which was stained rather basophilic. This atypism of cells was supposed to be benign.

However, large signet-ring formed cells were found in the course of further research, as shown in Fig. 12. The basophilic staining of cytoplasm was remarkable, and nucleus was compressed by the cytoplasmic vacuolization. The nucleolus was prominent and bizarre.

We could never find these atypical vacuolated cells in benign cases. This morphologic evidence was suggestive of the possibility of active growth in the gastric mucous membrane. This case was diagnosed as positive (Class 4).

The resected stomach had a thickened wall and large or giant fold of mucous membrane. Macroscopic diagnosis was giant hypertrophic gastritis (Fig. 13). Histological examination revealed profound acute inflammation, cystic dilatation of glandular duct, intestinal metaplasia and capillary dilatation, with increased mucous production (Fig. 14).

**Comment**;

In this case the wrong diagnosis was due to misjudgement of the signet-ring formed cells. When goblet cells are exfoliated into the gastric juice, they are round and smooth and contain a rather indistinct nucleus. We cannot be mislead by these morphologic characteristics (Fig. 9). Similar relations
are seen in the vacuolated histiocytes. Such atypical cells, as seen in this case, would be found only in cases in which the mucous production had increased remarkably in the mucosa.

The above findings may suggest that the cytologic diagnosis should not be made, based upon the vacuolated or signet-ring formed cells except when very typical malignant signet formed cells are found as shown in Fig. 15 and 16.

**Case 2. O.K. 61-year-old male**

About 5 months before admission to our hospital, he was treated conservatively for numbness of his left arm. Two months later he developed a hard mass in the left supra-clavicular region. No remarkable gastric trouble was noted. On admission his general condition was fair. Physical examination revealed a localized hard pigeon-egg-sized mass with smooth surface in the left supra-clavicular region which was scarcely movable. There was no anemia.

We suspected metastatic lesion from cancer of the stomach (Virchow's metastasis). Then examinations on stomach were performed. Gastric analysis showed hypoacidity. On X-ray examination mucosal relief was normal. There was neither filling defect, nor niche.

*The exfoliated cellular findings;*

In comparison with exfoliated leucocytes, a smaller number of gastric epithelial cells was found. Among the cells we could frequently find inclusion cells as shown in Fig. 17. These cells were remarkably acidophilic and were different from emigration cells. Except for these, we found no more atypical cells. This case was diagnosed as negative (Class 2, benign atypical) cytologically.

*Comment;*

We extirpated the tumor of the neck for exploration, because conclusive evidence against cancer could not be obtained in the clinical findings. The histological diagnosis was neurofibroma. Therefore we did not perform the laparotomy.

Comparative study between cytological and histopathological findings of the stomach was impossible. But similar morphological changes of the cells might be considered in the next case, because these atypical cells in this case resembled the atypical cells in the next case.

**Case 3. T.B. 38-year-old male**

He began to complain of occasional heart burn and epigastric pain not related to meals at the age of 23. In addition jaundice developed about 3
years ago. With the chief complaint of epigastric pain he was admitted to our clinic. No hematemesis developed previously. On physical examination he was well nourished but slightly anemic. In the right upper quadrant of the abdomen a finger tip sized, elastic and tender mass was palpated. Occult blood in feces was negative. Gastric analysis showed hyperacidity. On X-ray examination the stomach was slightly dilated and the mucosal relief was rough.

The exfoliated cellular findings:
Many naked epithelial cells of stomach were exfoliated with a moderate amount of emigration cells and a few leucocyte including cells and signet-ring formed cells. Among these cells several atypical cells were found. The staining was remarkably basophilic and the nucleus was not distinct while the nucleus-cytoplasmic ratio increased. Furthermore, as shown in Fig. 18, 19, there were inclusion cells and cell clumps resembling the cut surface of an onion. This case was diagnosed as negative (Class 2, benign atypical), because the atypism of each cell was relatively uniform.

Macroscopical and microscopical examinations of the resected stomach revealed many erosions and scars in the region of antrum (gastritis erosiva). As shown in Fig. 20, there were hyperplasia of surface epithelium of the mucosa and remarkable intestinalization, while gastric glands were rather atrophic.

Comment:
The atypical cells in this case might be exfoliated from regenerative mucosa with many erosions which were under repair. The morphologic evidence in this case suggested that inclusion cells might lead us to the wrong diagnosis, unless a comparative evaluation among various kinds of exfoliated cells is made.

Case 4. S.K. 68-year-old male
He was admitted to our clinic with complaints of gastric pain not related to food taking, anorexia and loss of body weight. On admission his general condition was excellent and no anemia was found. Gastric analysis showed achylia. X-ray examination revealed abnormal mucosal relief near the cardia and normal in the corpus and antrum. There was neither filling defect nor niche.

The exfoliated cellular findings:
A moderate number of emigration cells and epithelial cells were seen. Although the preservation was poor, the atypical cell clumps and a few signet-ring formed cells were evident (Fig. 22). The arrangement of the cell clumps was epithelial and the cellular size was obviously larger than normal
gastric ratio increased and the chromatin was distributed in small aggregated forms with scant nuclear substances. Nucleolus, as a rule, was not so prominent. The staining of these cells was slightly basophilic. In spite of this cellular atypism, the margin of the cytoplasm and the nucleus were smooth in boundaries and anisocytosis was not remarkable. The cellular findings might be atypical, but not conclusive. Therefore this case was diagnosed as negative (Class 2, benign atypical).

Comment:

This patient underwent no operative treatment since conclusive evidence was lacking. Rubin\(^{16}\) and Massey\(^{10}\) reported the change of the exfoliated cells from the gastric mucosa in pernicious anemia. He mentioned the morphological characteristic of it, and called the exfoliated large bland cells found in the sediment as pernicious anemia cells. Furthermore he designated the marked atypical one among the pernicious anemia cells as active form.

The cellular morphology of this case was supposed to be similar to the morphological criteria shown by Rubin. However in this case no anemia was found, although atrophic gastritis was indicated by X-ray examination. Then we thought that these cells might be one of morphological change due to metaplasia, not specific in pernicious anemia. Hennino\(^{8}\) suggested recently that these large bland cells appeared not only in pernicious anemia patients. Rubin supposed that these changes of gastric epithelial cells should be produced by metabolic disturbance. The same morphologic changes should be seen in megaloblast and macrocyte of bone marrow. A detailed comparative study of these atypical cells has not yet been completed.

Case 5. H.S. 61-year-old female

She began to experience heart burn and obscure gastric symptoms 20 years prior to admission and recently had pain in her upper abdomen after meals. During the past year she was placed under medical therapy at a hospital with the diagnosis of peptic ulcer. For 2 months before admission she had a dull feeling in epigastrium, accompanied with vomiting after meals and loss of appetite. Stool was normal. No hematemesis.

On admission her general condition was fair, except that her upper abdomen was slightly tender. Moderate anemia was present. Occult blood was positive in stool. Gastric analysis showed achylia. X-ray examination revealed that mucosa relief of larger curvature was rough and irregular. These findings suggested a malignant lesion, but no filling defect or niche was noted.

The exfoliated cellular findings;
A number of gastric epithelial cells and emigration cells were seen. The preservation of exfoliated cells was excellent. Among these cells, the atypical cells were scattered, as a single cell or cell clumps. Anisocytosis, prominent nucleus, binucleus, trinucleus, and inclusion cells were found. But such less atypical findings as relatively scant cytoplasm, less prominent chromatin distribution and smooth cellular margin were also found. These cellular morphologies are illustrated in Fig. 23.

The staining of the cells were remarkably basophilic. Besides these atypical cells, signet-ring formed cells and leucocyte including cells also were frequently noted. This case was diagnosed as positive (Class 4).

Macroscopic examination of the resected stomach revealed remarkable atrophy and many erosions with remarkable injection and polyplike proliferation as large as 1–3 mm in height. Microscopic examination revealed remarkably atrophic glands of irregular arrangement. The proliferation of atypical cells into inner lumen and the mitosis were very frequently evident in the glandular tissue. But the infiltrative picture of the atypical cell nest was not recognized. There was no picture of carcinoma in situ but atrophic hyperplastic gastritis with severe metaplasia (Figs. 24 and 25).

Comment:

We can hardly admit that these cells could be benign, if we make our cytological diagnosis based upon criteria which were introduced by various authors. But the smoothness in cellular boundaries, the common nuclear structures between exfoliated cells and the coexistence of less atypical cells should be more carefully estimated. From the present cytological point of view we can not draw, generally speaking, a line of distinction between these benign atypical cells and malignant cells. As shown in Figs. 27, 28, 29 and 30, the interpretation of the less atypical malignant cells in cancer and sarcoma cases was also difficult.

Studies on the morphology of these cells have to be advanced in the future. Whenever malignant changes are suspected operative intervention should be considered in such cases.

Summary and Conclusion

The cells obtained from the stomach with chronic inflammation by proteolytic enzyme lavage may reveal certain chronic inflammatory processes. But there was no close correlation between the cytologic findings and the histological pictures of a stomach except in the two points of hyperplastic tendency of surface epithelial cell and atrophic tendency of gastric glands. These results were compatible with the previous experimental reports. (In previous reports the exfoliative tendency of gastric epithelial cell was compared with corresponding histological findings experimentally). The cyto-
logic findings of the emigration cells especially give no accurate clue to
the diagnosis of acute gastritis, because gastric juices may be mixed with
spatium, or oropharyngeal elements or duodenal elements.

Benign atypical cells appearing in chronic gastritis were discussed pre-
viously by Panico, Henning, Ayabe and Oota. However a clear criterion
of the morphologic picture is not yet determined. It is still uncertain
whether the differences of the morphologic criteria between benign atypical
cells and malignant cells can be clearly recognized. Furthermore it is un-
known whether the benign atypical cells may turn out to be ma-
linant in the future, or whether these morphologic features are derived from degener-
ative or metaplastic changes in nucleus and cytoplasm.

The question, we suppose, may be answered by the accumulating com-
parative studies such as we have examined in this work. To our regret,
we have not encountered enough cases of chronic gastritis to classify such
a correlation.

In the future exfoliative cytology may become one of the new procedures
for the diagnosis of precancerous condition.

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Figs. 1. Exfoliated normal gastric epithelial cells. (×1500)
2. Ciliated epithelial cells in the gastric lavage fluid. (×1500)
3. Dust cells in the gastric lavage fluid. (×1500)
4. Exfoliated leucocyte including cells (histiocyte). (×1500)
5. Exfoliated erythrocyte including cells (histiocyte) (×1500)
6. Exfoliated Russell’s bodies (a kind of degenerated histiocytes). (×1500)
7. The leucocyte emigrating into epithelial line of gastric mucosa. (×90)
8. The leucocyte and other cells gushed out from the severe inflammatory mucosa (×60)
Figs. 9. Exfoliated signet-ring formed cell (goblet cells). ($\times 1500$)
10. Exfoliated cells in case 1. (exfoliated atypical cells). ($\times 1500$)
11. Exfoliated cells in case 1. (exfoliated leucocyte including cells). ($\times 1500$)
12. Exfoliated cells in case 1. (exfoliated atypical signet-ring formed cells). ($\times 1500$)
13. Histological section of case 1. (giant hypertrophic gastritis). ($\times 5$)
14. Histological section of case 1. (increased production of mucus). ($\times 50$)
15, 16. Exfoliated malignant signet-ring formed cells (carcinoma cases). ($\times 1500$)
Figs 17. Exfoliated inclusion cells in case 2. (×1500)
18. Exfoliated inclusion cells in case 3. (×1300)
19. Histological section of case 3. (×60)
20. Exfoliated malignant inclusion cells (Cancer case). (×1500)
21. Exfoliated large bland cells in case 4. (×1500)
22. Exfoliated benign atypical cells in case 5. (×1500)
23. Histological section of case 5. (×50)
Figs. 25. Histological section of case 5. (×700)
26. Exfoliated various kinds of atypical malignant gastric cells. (×1500)
27. 28. Exfoliated less atypical malignant cells and the corresponding histological section (carcinoma case) (×1500, ×450)
29. 30. Exfoliated malignant lymphoma cells and the corresponding histological section (malignant lymphoma case). (×1500, ×450)

(A length between two scales indicates 1,000 times enlargement of 10μ)