CYTOLOGICAL EXAMINATION OF THE DISCHARGE IN CASES OF SUPPURATION IN THE MAXILLARY SINUS AS A GUIDE TO TREATMENT.

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At the meeting of the British Medical Association held at Exeter in 1907, Dr. William Milligan called attention to the value of the cytological examination of aural discharges in assisting in the estimation of the extent of the pathological changes in the middle ear. His conclusions were, shortly, that if the discharge showed on examination large numbers of leucocytes associated with degenerated columnar epithelial cells, and with few lymphocytes, the inflammatory process had not passed deeply into the lining membrane of the middle ear. The presence, on the other hand, of large numbers of lymphocytes indicated, he found, granulomatous changes; while myelocytes suggested involvement of the bone, and giant cells the existence of tuberculous disease.

In the case of suppuration in the maxillary sinus, the question of radical or non-radical treatment is at present, as a rule, settled on the basis of the duration of the disease. This is practically the only guide available, and it has proved by no means satisfactory. If from cytological examination of the discharge one were able to derive some information as to the condition of the lining membrane of the cavity, such information would be of the greatest value in assisting us in the choice of operative procedure.

It should be borne in mind that, in contrast to the middle ear cleft, the size and shape of the maxillary antrum render it much more liable to exhibit varying degrees of inflammatory change in different parts of its lining membrane. Thus, for example, it not infrequently happens that in the same antrum one may find advanced changes in the mucous membrane of the alveolar region with little or no disease in the mucosa lining the roof. This fact must render less definite any information which might be derived from cytological examination of the discharge.

With a view to investigating the help to be obtained from cytology, the discharges in a number of cases of maxillary sinus suppuration occurring in the Ear, Nose and Throat Department, under the care of Dr. Logan Turner in the Royal Infirmary, Edinburgh, have been examined before treatment and the subsequent
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progress of the cases noted. The results of the investigation are detailed in this paper.

The specimens were, as a rule, obtained by puncture through the outer wall of the inferior meatus and by washing out the cavity after a thorough cleansing of the nasal chambers, so as to avoid contamination as far as possible. In a few cases the specimen was collected on a swab at the operation. Films of the discharge were made in the ordinary way and stained with Leishman's or Jenner's stain. Great difficulty was often experienced in recognising the different varieties of cells owing to the extreme degree of degeneration, but examination of a second specimen collected shortly after the first usually proved more satisfactory. Neither giant cells nor myelocytes were found in any of the films. Epithelium, polymorphonuclear pus cells and lymphocytes were practically the only types of cell recognised. Lymphocytes were regarded as being present in excess when the ratio of lymphocytes to polymorphonuclears was greater than one to six or eight.

Relation of Pathological Histology to Cytology.—In order to ascertain the structural changes in an inflammatory condition of the antral mucosa for purposes of comparison with the cells in the discharge, a microscopic examination was made of the mucosa in six cases where the discharge had been cytologically examined and the radical operation subsequently performed. Only two of the specimens will be described in detail.

1. D. B., a case of dental origin and of many years' standing, associated with atrophic rhinitis. Cytological examination of the discharge revealed the presence of large numbers of lymphocytes and epithelium of the columnar and squamous types. The streptococcus pyogenes was the pathogenic organism. The mucosa was found to be much thickened. In section, the epithelium was shown to be mostly ciliated but squamous in parts, with a slight, small-celled infiltration of the deeper layers.

2. R. D., a dental case of three years' duration. The discharge showed simply polymorphonuclear pus cells with very few lymphocytes. The streptococcus pyogenes was pathogenic. The mucosa was edematous, and showed on section the epithelium for the most part preserved and ciliated but squamous in a few places. There was dense, small-celled infiltration of the submucous connective tissue, especially the superficial layers. Numbers of cells could be seen making their way out between the epithelial cells. These were mainly lymphocytes, although in the secretion on the surface the cells were almost entirely polymorphonuclear.
The mucosa in the other four cases showed similar changes, and bore out conclusively the statement made above that different parts of the cavity often show different degrees of inflammatory change.

_Cytology in Relation to Duration of the Disease._—The duration of the disease was ascertained in sixty-nine of the eighty cases examined. These are grouped below under four periods of duration, viz. first, over five years; second, less than five years and more than one; third, less than one year and more than six months; fourth, less than six months.

1. Twenty-nine cases were of more than five years' duration. In ten of these (34 per cent.) lymphocytes were found in excess. Epithelium occurred in sixteen (55 per cent.)—ciliated in one, columnar in three, squamous in ten, and both columnar and squamous in two.

2. Twenty-two cases belonged to the next period—under five years and more than one year. Six of these (27 per cent.) showed excess of lymphocytes, and five (23 per cent.) epithelium, which was squamous in four cases and both columnar and squamous in one case.

3. In seven cases the discharge had lasted less than one year and more than six months. Excess of lymphocytes was found in three of these (43 per cent.). Squamous epithelium occurred in one (14 per cent.).

4. Eleven cases were cases of less than six months' duration. Excess of lymphocytes was shown in four (36 per cent.). Epithelium was recognised in none of the eleven.

It would seem, then, firstly, that the percentage of cases in which excess of lymphocytes occurs does not vary very greatly over these periods (34 per cent., 27 per cent., 43 per cent., 36 per cent.), and that the presence or absence of relatively large numbers of lymphocytes in the discharge from any case does not permit us to relegate the case to any particular period of duration. Secondly, the more chronic the case, the greater the likelihood of finding epithelium in the discharge.

_Cytology as Affecting Choice of Operative Procedure._—Sixty-five cases were treated by operative intervention. In some, measures short of radical were employed, consisting of lavage through a permanent opening, made either in the alveolus or in the nasal wall, or lavage by frequent puncture of the nasal wall with trocar and cannula without establishing a permanent opening. In others a radical operation was performed, the cavity being curetted
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through an opening in the canine fossa, and a permanent communication being made between the antrum and the inferior meatus of the nose.

The question of the choice of operative procedure will be dealt with as affected, firstly, by the presence of small or large numbers of lymphocytes; and, secondly, by the occurrence of epithelium in the discharge.

1. (a) In forty of the cases only small numbers of lymphocytes were found. In thirty-two non-radical measures were employed, and in sixteen (50 per cent.) a cure resulted. Four out of fourteen (28 per cent.) treated by lavage through an alveolar opening, and eight out of thirteen (61 per cent.) treated by lavage through a nasal opening, were cured. Repeated intra-nasal puncture and washing out was carried out in five cases, and was successful in four (80 per cent.).

In the remaining eight cases the radical operation was performed.

(b) Twenty-five of the cases showed large numbers of lymphocytes. Of the eighteen treated by non-radical measures, six (33 per cent.) were cured. Two were treated by alveolar lavage without success, though one of them was only of three weeks’ duration. Lavage through a permanent nasal opening was carried out in twelve cases, of which three (25 per cent.) were cured. Of three cases treated by repeated intra-nasal puncture, two (66 per cent.) were cured. One case cleared up after the removal of some carious teeth.

The radical operation was performed in seven of the twenty-five cases.

It is worthy of note that excess of lymphocytes was found in five out of six cases where the sinus trouble was associated with atrophic rhinitis.

2. In twenty of the cases which underwent operative treatment, epithelium was found in the discharge.

(a) One case which showed ciliated epithelium (a case of six years’ standing, in which were found only small numbers of lymphocytes) was cured by lavage through a nasal opening.

(b) One case in which columnar epithelium was found (a case of many years’ duration, in which large numbers of lymphocytes were present) was uncured by alveolar lavage.

(c) Of two cases which showed both columnar and squamous epithelium, one was treated by radical measures and the other was cured by the alveolar operation.
(d) Squamous epithelium only occurred in sixteen cases. In fourteen of these non-radical measures were employed, five (36 per cent.) being cured, one out of five (20 per cent.) by the alveolar route, three out of eight (37 per cent.) by permanent nasal opening, and one by repeated intra-nasal puncture.

The above results for ease of comparison are shown below in tabular form.

|                         | Non-radical Treatment | Alveolar Lavage | Nasal Lavage | Frequent Intra-nasal Puncture |
|-------------------------|-----------------------|-----------------|--------------|------------------------------|
|                         | Total. | Cured. | Total. | Cured. | Total. | Cured. | Total. | Cured. |
| 1. (a) Lymphocytes not in excess | 32 | 50 | 14 | 28 | 13 | 61 | 5 | 80 |
| (b) Lymphocytes in excess | 18 | 33 | 2 | ... | 12 | 25 | 3 | 66 |
| 2. (a) Epithelium ciliated | 1 | 100 | ... | ... | 1 | 100 | ... | ... |
| (b) Epithelium columnar | 1 | ... | 1 | ... | ... | ... | ... | ... |
| (c) Epithelium columnar and squamous | 1 | 100 | 1 | 100 | ... | ... | ... | ... |
| (d) Epithelium squamous | 14 | 36 | 5 | 20 | 8 | 37 | 1 | 100 |

With regard to groups 1 (a) and 1 (b) in the table, it will be remembered that the cases in the two groups were distributed in similar proportions over the different periods of duration, so that, in comparing these results in the two groups, the duration factor may probably be neglected. It would seem then that the prospect of cure by non-radical measures is greater in cases where only small numbers of lymphocytes are present than in cases where lymphocytes are present in large numbers.

With regard to group 2, the number of cases showing ciliated and columnar epithelium was too small to enable one to come to any conclusion as to the significance of the different varieties of epithelium. It will be noted that seventeen cases showing epithelium were treated by measures short of radical, and that seven of these (41 per cent.) were cured. It will also be noted that of the total sixty-five cases, fifty received non-radical treatment, with twenty-two cures (44 per cent.). Apparently, then, the presence of epithelium in the discharge has very little bearing on the prospect of cure by non-radical measures, despite the fact,
be it remembered, that the duration of cases showing epithelium is greater than the average.

Cytology in Relation to Bacteriology.—The bacteriology was noted in thirty-five cases where there was no excess of lymphocytes. The streptococcus pyogenes was present in sixteen of these. Of the sixteen, thirteen were treated by non-radical measures, with seven cures (53 per cent.).

Of the cases where excess of lymphocytes was found, the bacteriology was investigated in eighteen, thirteen of which were found to be associated with streptococcus pyogenes. In eight of these latter, non-radical measures were employed, and one was cured (12 per cent.).

It would seem, then, that the presence of streptococci in a case showing few lymphocytes does not appreciably affect the prospects of cure by non-radical measures (53 per cent. as compared with 50 per cent.; vide table). In the case, however, which shows large numbers of lymphocytes, the prospect of cure is considerably diminished by the presence of streptococci (12 per cent. as compared with 33 per cent.).

Conclusions.—1. The discharge from the maxillary sinus is a discharge from a mucous membrane which is showing different stages of the inflammatory process in different parts of its area. Cytology, therefore, can never be more than a partial aid in the estimation of its condition.

2. The presence or absence of relatively large numbers of lymphocytes in the discharge does not depend upon the chronicity of the disease. Epithelium is not, as a rule, to be recognised in the early stages of the disease. Epithelium found in the discharge is usually of the squamous variety.

3. Cases in which the discharge shows relatively small numbers of lymphocytes hold out a better prospect of cure by non-radical procedure than do those where relatively large numbers of lymphocytes occur.

4. Independent of the period of duration, cases which are associated with the streptococcus pyogenes and which also show excess of lymphocytes in the discharge are seldom cured by non-radical measures.

I have to acknowledge my indebtedness to Dr. Logan Turner for the clinical material which he has placed at my disposal for the purposes of this investigation, and for many valuable suggestions in carrying it out.