

A STUDY OF THE ENDOCERVICAL COLUMNAR CELLS I — MORPHOLOGY AND FREQUENCY*

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(With 4 plates)

The study of the columnar cells of the endocervical mucosa is of great opportunity. We know that the squamous cell carcinoma of the cervix originates in the columnar epithelium of the cervix through the squamous metaplasia (epidermidalization).¹

In this paper we describe the variegated morphological aspects which the columnar cells present during the microscopic examination of "topographic"² sections of the uterine cervix of adult and aged women.

A good description of the cells that constitute the endocervical epithelium was presented by Robert Schroeder⁴ in 1930. In his work different opinions of various authors about the morphology of the mucous cells and of ciliated cells are presented. Although the author states: "I have also seen the irregular picture of the mucous epithelium", only two types of glandular cells are shown.

Papanicolaou, Traut and Marchetti,³ in 1948, described a high columnar form of secretory cell found in the late follicular stage with elongated nuclei toward the center of the cell and a not very tall secretory cell with the nucleus toward the base of the cell during the early follicular stage. They have frequently seen ciliated cells scattered among the cuboidal cells of the surface epithelium of the endocervix and in the epithelium of the endocervical glands.

DESCRIPTION OF THE ENDOCERVICAL CELLS

Through the continuous observation of thousands of histological sections of the cervix uteri it becomes evident that the secretory columnar cells of the endocervical mucosa vary in size and present different staining affinity. Its nuclei also vary in size, in shape and situation within the body of the cells. It is possible that the epithelium of the endometrium and of other mucosas also present detectable similar variation and, perhaps, similar phenomenon occurs to all the cells of the organism.

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An artificial and arbitrary classification of the epithelial endocervical cells could be made taking into account:

1. The staining affinity. Basophilic cells are those stained by hematoxylin; eosinophilic cells those tinged by eosin and amphophilic cells those tinged by both dyes.

2. The intensity in the coloration of the cytoplasm. It permits to distinguish two main qualities of cells, the clear and the dark ones.

3. The presence or absence of cilia.

4. The shape of the nucleus. There are flattened, picnotic, ovoid and round nuclei.

5. The situation of the nucleus. We can find nuclei in the base of the cell (basal), near the base (parabasal) and in the middle of the cell (median) and apical ones.

The combination of these different categories made possible the characterization of 26 types of cells, indicated by the alphabetical symbols.

They are presented in Table I and Plate I, Fig. 1.

TABLE I
Distribution of the cellular varieties

STAINING AFFINITY	INTENSITY OF COLORATION OF CYTOPLASM	Shape of the nucleus and position	
Basophilic.....	Clear cells.....	1. Flattened and basal	A
		2. Picnotic and parabasal	B
		3. Ovoid and parabasal	C
	Dark cells.....	4. Flattened and basal	D
		5. Ovoid and parabasal	E
		6. Flattened and basal	F
		7. Ovoid and median	G
		8. Round and parabasal	H
Amphophilic.....	Clear cells.....	9. Flattened or ovoid basal	I
	Dark cells.....	10. Round and basal	J
		11. Ovoid and basal	K
		12. Ovoid and parabasal	L
		13. Ovoid and parabasal	M
		14. Round and parabasal	N
15. Round and basal	O		
Eosinophilic.....	Clear cells.....	16. Flattened and basal	P
		17. Picnotic and parabasal	Q
		18. Ovoid and parabasal	R
		19. Round and parabasal	S
		20. Ovoid and parabasal	T
	Dark cells.....	21. Flattened and basal	U
		22. Ovoid and parabasal	V
		23. Ovoid and parabasal	W
		24. Round and parabasal	X
	Ciliated cells.....	25. Round and parabasal	Y
26. Ovoid and apical		Z	

MATERIAL AND METHOD

The data for this study were derived from the observation of 250 histological sections of the whole uterine cervix (Plate II, Fig. 2). The cervixes were removed from uteri obtained by total hysterectomy or by cervical amputation (see Table II) and were fixed in 10% formalin solution. The sections were stained with Delafield's hematoxylin and eosin solutions.

TABLE II
Origin of the studied cervixes

ORIGIN	DIAGNOSIS	N.º of cases
Cervical amputation.....	Prolapse.....	76
Histerectomy.....	Myoma.....	89
	Prolapse.....	45
	Adenomyosis.....	7
	Microcarcinoma.....	6
	Carcinoma <i>in situ</i>	5
	Ovarian tumors.....	5
	Polyp.....	3
	Causes connected to pregnancy..	2
	Carcinoma of corpus uteri.....	2
Autopsy.....	Sudden death.....	10
TOTAL.....	—	250

In every histological section there were specifically counted two thousand glandular columnar cells which cover the surface of the cervical canal and two thousand glandular columnar cells which constitute the so-called endocervical glands (Table III).

Only the cells situated in areas distant from the external os of the cervical canal, at sites free from inflammation and not situated upon the so-called reserve cells were considered for computation. The counts of the superficial and of the glandular cells were made as indicated by the arrows in Plate II, Fig. 2.

Not included were the atypical columnar cells and those directly altered by inflammation.

The histological sections stained with hematoxylin and eosin after forty days or less were discarded because the cells became acidified, eosinophilic. The sections made in tissues ill-fixed by the 10% formalin solution and obtained from old paraffin blocks were also discarded.

TABLE III
Counts of the cellular varieties in 250 cervices

	N.º of superficial cells	N.º per thousand	N.º of glandular cells	N.º per thousand	Total	N.º per thousand	Measures in microns
A.....	640	1.28	5,060	10.12	5,700	5.700	21 x 7
B.....	480	0.96	2,590	5.18	3,070	3.070	26 x 5
C.....	0	0.00	350	0.70	350	0.350	27 x 6
D.....	58,060	116.12	135,850	271.70	193,910	193.910	20 x 6
E.....	98,995	197.99	102,710	205.42	201,705	201.705	25 x 5
F.....	600	1.20	2,200	4.40	2,800	2.800	22 x 6
G.....	38,890	77.78	45,460	90.92	84,350	84.350	30 x 6
H.....	550	1.10	1,520	3.04	2,070	2.070	22 x 8
I.....	5,380	10.76	20,310	40.62	25,690	25.690	24 x 6
J.....	6,230	12.46	5,000	10.00	11,230	11.230	23 x 7
K.....	67,310	134.62	55,060	110.12	122,370	122.370	24 x 6
L.....	40,670	81.34	18,890	37.78	59,560	59.560	28 x 6
M.....	61,545	123.09	15,135	30.27	76,680	76.680	24 x 6
N.....	16,485	32.97	5,560	11.12	22,045	22.045	22 x 10
O.....	15,850	31.70	3,900	7.80	19,750	19.750	13 x 7
P.....	1,250	2.50	9,325	18.65	10,575	10.575	20 x 6
Q.....	3,280	6.56	7,960	15.92	11,240	11.240	23 x 6
R.....	2,970	5.94	2,840	5.68	5,810	5.810	27 x 6
S.....	5,000	10.00	3,515	7.03	8,515	8.515	18 x 10
T.....	650	1.30	650	1.30	1,300	1.300	26 x 5
U.....	4,940	9.88	10,750	21.50	15,690	15.690	25 x 7
V.....	37,505	75.01	15,825	31.65	53,330	53.330	21 x 5
W.....	10,430	20.86	5,020	10.04	15,450	15.450	13 x 8
X.....	950	1.90	50	0.10	1,000	1.000	12 x 8
Y.....	11,265	22.53	17,060	34.12	28,325	28.325	22 x 8
Z.....	10,075	20.15	7,410	14.82	17,485	17.485	25 x 5
TOTAL	500,000	1,000.00	500,000	1,000.00	1,000,000	1,000.000	—

Tables were made in which were listed, in every case of histological section, in addition to the specific counts, the age of the patient, the size of the cells, the anatomical lesion of the uterus and other histological, anatomic and clinical data which will be the subject matter of a following paper.*

EPITHELIOGRAM

The specific cell counts made following the above procedure resulted at first in some confusion. We therefore tried to simplify the series of numbers into a practical and representative form. We solved the problem by placing in little squares the types of columnar cells, from the most frequent to the less frequent, beginning from left to right, both the superficial and the glandular cells. We designated this tabulation of the cells, EPITHELIOGRAM.

EPITHELIOGRAM is then the graphic representation of the frequency of the different epithelial columnar cells, superficial and glandular, in decreasing order.

This epitheliogram refers to the cells of the endocervical epithelium, i.e., CERVICO-EPITHELIOGRAM.

We use in the epitheliogram only the five most frequent types of superficial columnar cells, in the top row, and the five most frequent in the glands, in the lower row. When there are less than five varieties of cells we place a dash in the vacant square, varying the vacant square according to the proportional quantity of the cells. So, in the last square, on the right, there is placed the variety of cell that summed one hundred or less.

Here are, as example, only 8 epitheliograms of the 250 cases of cervixes studied.* Cases No.:

5.	L D K J Z	12.	M — — — —	18.	D — — — —
	D K E J M		L M J K E		D — E — —
56.	E G K D —	115.	G D E — Z	158.	E — — — —
	D E G Y —		G D E — Y		E — — V D
218.	E K D L —	233.	E M K L G		
	D E K G L		D E K I G		

* This part of the work was made with the able collaboration of Mrs. Neli Lowndes Vieira.

* In this representation the squares were not drawn, in order to facilitate the printing.

COMMENT

The superficial and the glandular cervical epithelia vary not only as to cellular types (see Plates II-IV, Figs. 3-7) but also to quantity of each cellular type found. These qualitative and quantitative variations are observed not only in relation to the age of the patient or dependent on associated anatomic uterine lesion but they can be observed in the same histological section. This occurs chiefly when we compare the counts of the most highly placed epithelial endocervical structures with those next to the external cervical os. Also qualitative and quantitative counts made in the right and the left halves of the very same uterine cervix differ greatly. Thus, the conclusions are valid only if obtained on the basis of a great number of cases.

After the counts we analysed also the varieties or types of cells that occur in each histological section to know how many different cells take part in the composition of the superficial epithelium, of the glandular epithelium and of both epithelia. Simultaneously we tried to determine if the same type of cell is found coincidentally in both the surface and in the glands.

The superficial epithelium of the endocervical mucosa is formed on an average by 5 cellular types, varying from a minimum of 1 up to 14 cellular types. The glandular epithelium is composed on an average of 6 different cellular types varying from 2 to 11 types. The two epithelia of the mucosa are formed on an average by 8 types of cells varying from 2 to 17 types. Not all the cellular types found in the superficial epithelium there exist in the glands. There is, on an average, a coincidence of 3 cellular types and a non-coincidence of 5 cellular types in the 250 cervixes studied.

The frequency of the various cellular types presented in table III should not be considered the norm. It is a sample of unselected material which constitutes the daily work of pathology laboratory. The age of the patients varied from 13 to 76 years, averaging 41 years. Considering the frequency of occurrence in the superficial epithelium of the cervical canal some cells seem to possess the capacity to adapt themselves to the task of lining (cells K — L — M — N — O — V). Others, on the contrary, by their greater frequency in the cervical glands, can be considered more specialized or adapted to secretion (cells D — E — G — I) (Table III).

The effects of clinical physiologic factors and of pathologic lesions of the uterus on the specific numerical composition of the endocervical epithelia will be the subject of the next report.

CONCLUSIONS

1. The columnar cells both those which line the cervical canal as well as those which form the glands, vary greatly in their morphology and staining affinity.

2. By their variations these cells can be classified into 26 different types, labelled here, in alphabetical letters.

3. Every sexually mature woman presents, in a certain period of her life, specific individual "composition" of the endocervical epithelium (epitheliogram) both superficial and glandular.

4. After a statistic study of one million columnar cervical cells we found that the basophilic cells (D — E — F — G — H) are predominant in the glands and the amphophilic and eosinophilic cells (K — L — M — N — O — V) are predominant on the surface.

5. The thick ciliated cells (Y) predominate in the glands and the thin cells (Z) on the superficial epithelium.

6. The cells most numerous are types E — D — K — G — M — L — V. The rarest types of cells are T — X and C.

7. The "secretory" cells presented a frequency of 954 per thousand and the ciliated cells 46 per thousand.

SUMMARY

After the observation of many thousands of histological sections of the endocervical mucosa it became evident that its columnar cells present a great variety of aspects not only those of the surface of the canal but also those of the glands.

A classification of these cells was made taking into account the staining affinity, the intensity staining of the cytoplasm, the presence or absence of cilia, the shape and location of the nucleus.

The various combinations of these different data made possible the characterization of 26 types of cells which we labelled by the alphabetical letters. Two hundred and fifty cervixes obtained by cervical amputation and by hysterectomy were studied. The uteri presented lesions observed in the course of routine laboratory examination.

In each of the 250 histological sections there were specifically counted 2,000 columnar cells which cover the cervical canal and 2,000 columnar cells which form the glands.

A graphic representation of the frequency of both the superficial and glandular columnar cells was presented; this was given the name EPITHELIOGRAM.

The variation of the cellular "composition" of each epithelium is discussed and the frequency of the various cellular types after the count of one million of cells is presented.

RESUMO

O estudo minucioso do epitélio da mucosa endocervical possibilitou o reconhecimento de vinte e seis tipos de células cilíndricas, tanto na superfície de revestimento do canal, como nas chamadas glândulas endocervicais.

Para a classificação destas 26 células, que tomaram, cada uma, uma letra do alfabeto, foram levados em consideração a intensidade de coloração, a presença ou não de cílios, a forma e dimensões dos núcleos e sua posição na célula.

Foram analisados inicialmente 250 cortes histológicos, sendo contadas, especificamente, em cada corte, 2 000 células cilíndricas de revestimento e 2 000 células cilíndricas das glândulas. Em cada caso foram anotados, nas tabelas, além dos dados clínicos como a idade da mulher, a presença e o dia do ciclo menstrual e o número de filhos, os dados observados nos cortes histológicos como a intensidade da inflamação, a presença e a extensão da metaplasia, o aspecto do epitélio actocervical, a presença e o número de cistos de Naboth, o número de glândulas endocervicais, a presença e o número de cistos endocervicais, o conteúdo do canal cervical e, finalmente, o tempo decorrido entre a coloração e a leitura da lâmina e o diagnóstico anátomo-clínico.

Como o número de células fosse muito grande em cada caso, procurou-se organizar, com auxílio das 26 letras, uma representação gráfica da frequência das diferentes células epiteliais (de revestimento e das glândulas) em ordem numérica decrescente. Esta representação gráfica recebeu o nome de EPITELIOGRAMA. O epiteliograma serviu para mostrar que cada mulher sexualmente madura apresenta "composição celular" própria, individual.

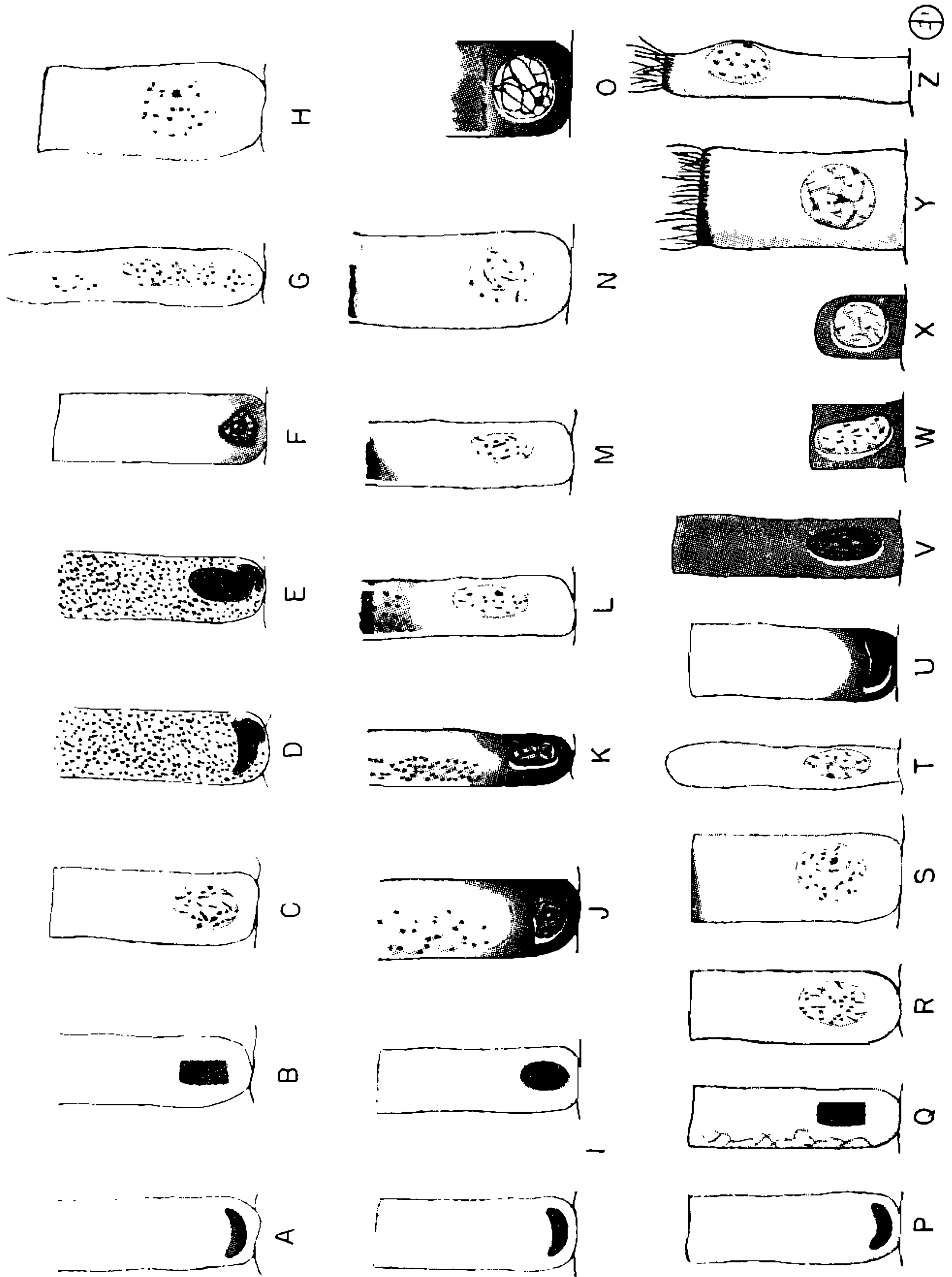
Após estudo estatístico de um milhão de células cilíndricas verificamos que as células basófilas (D — E — F — G — H) predominam nas glândulas e as células anfófilas e eosinófilas (K — L — M — N — O — V) predominam na superfície. As células ciliadas grossas (Y) predominam nas glândulas e as ciliadas delgadas (Z), na superfície. As células mais frequentemente encontradas são, em ordem decrescente, E — D — K — G — M — L — V. As células mais raras são T — X — C. As células "secretoras" apresentaram frequência de 95 por cento e as ciliadas 5 por cento.

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PLATE I

Diagram showing the 26 cellular types found in the normal human endocervical mucosa.



DUARTE: Endocervical columnar cells. I

PLATE II

Fig. 2 — Photograph of a histological section of the uterine cervix. "Topographic section". The arrows indicate the way of counting (Hematoxylin and eosin x 2.5) .

Fig. 3 — Photomicrograph of a cervical gland. The epithelium is constituted by the cellular types "I" and "Z" (Hematoxylin and eosin x 500) .

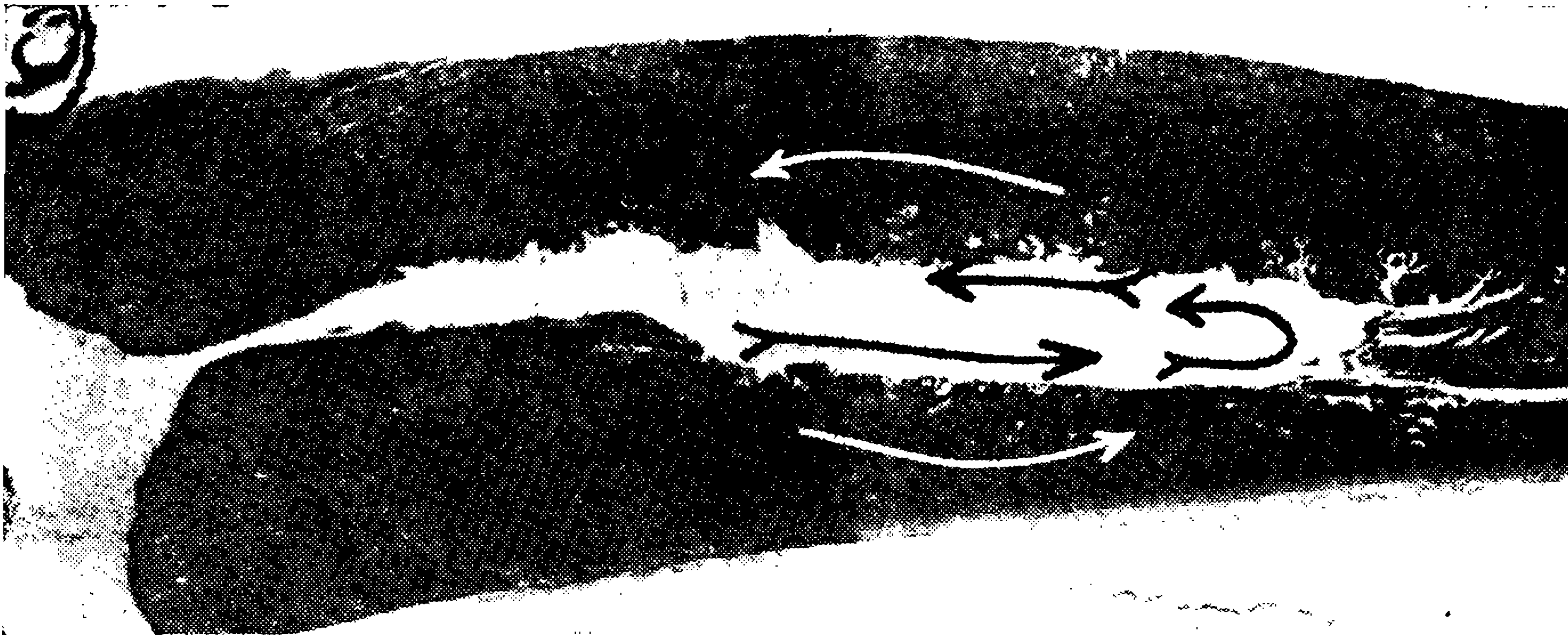


Fig. 2

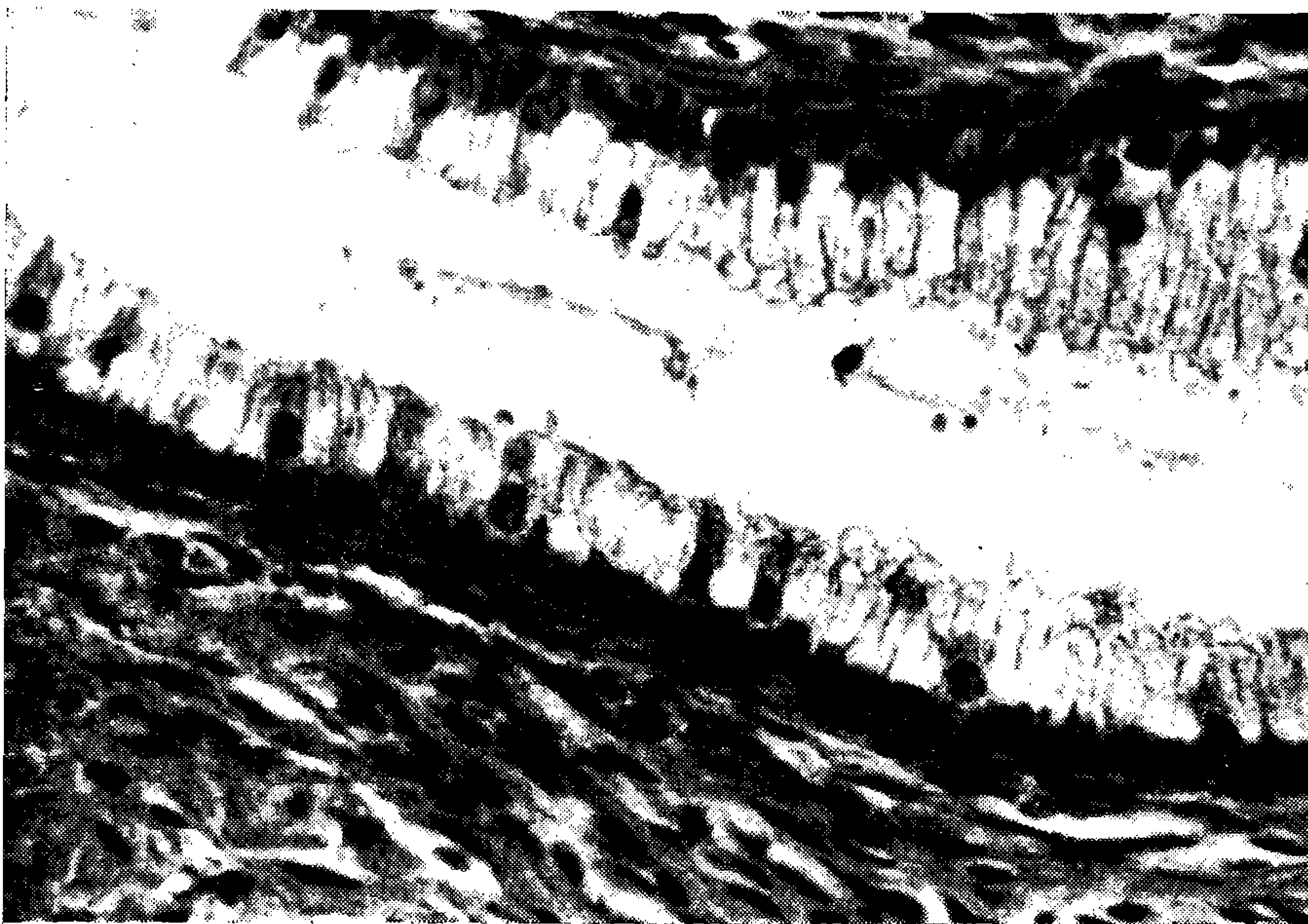


Fig. 3

DUARTE: Endocervical columnar cells. I

PLATE III

Fig. 4 — Lining cervical epithelium constituted by cellular types "N" and "E" (Hematoxylin and eosin x 1,060) .

Fig. 5 — Lining cervical epithelium constituted by the celular types "F", "K" and "Z" (Hematoxylin and eosin x 1,060) .



Fig. 4

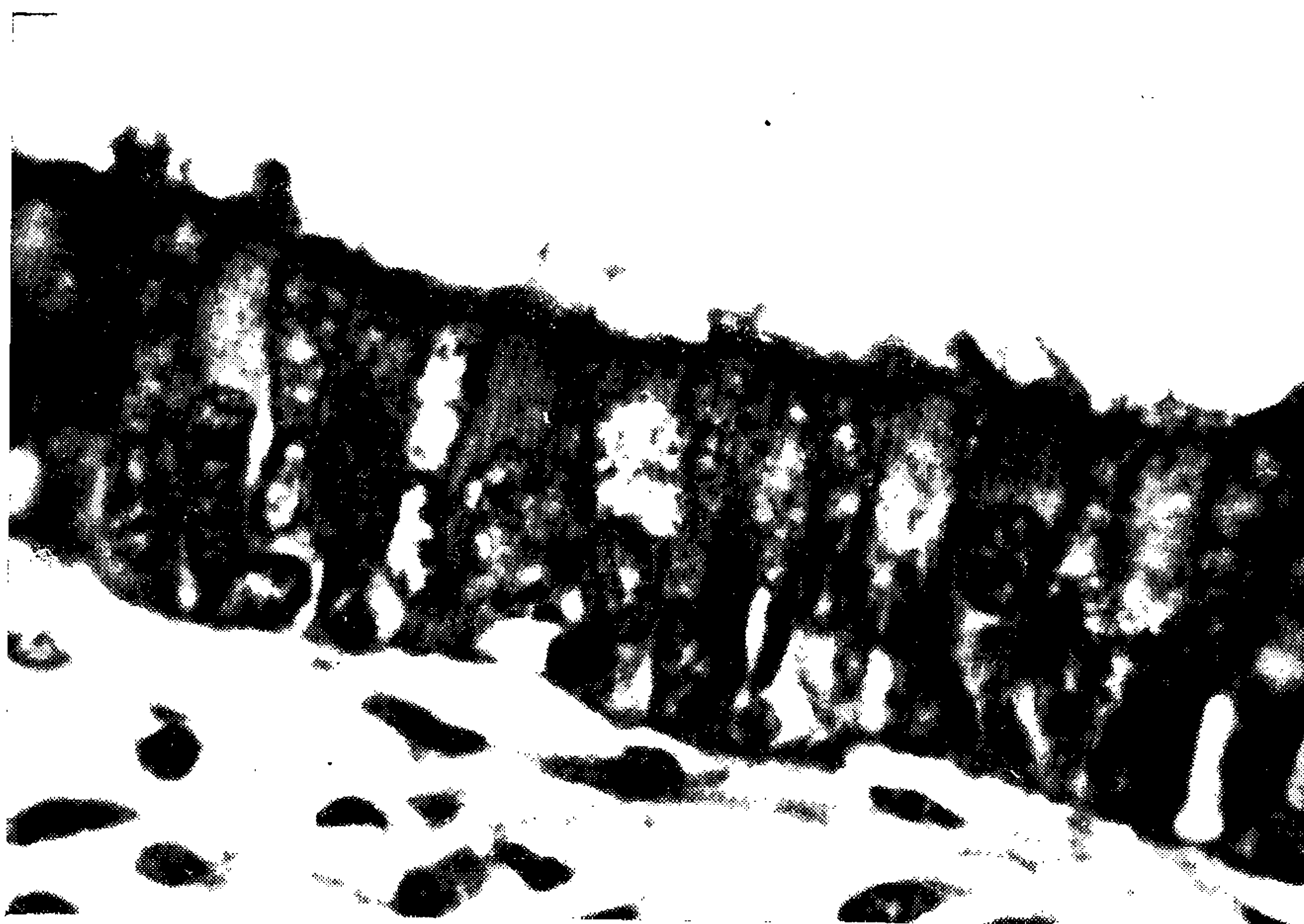


Fig. 5

DUARTE: Endocervical columnar cells. 1

PLATE IV

Fig. 6 — Cervical gland constituted by "G" cells (Hematoxylin and eosin x 150) .

Fig. 7 — Cervical gland constituted by the cellular types "Y" and "E" (Hematoxylin and eosin x 690) .

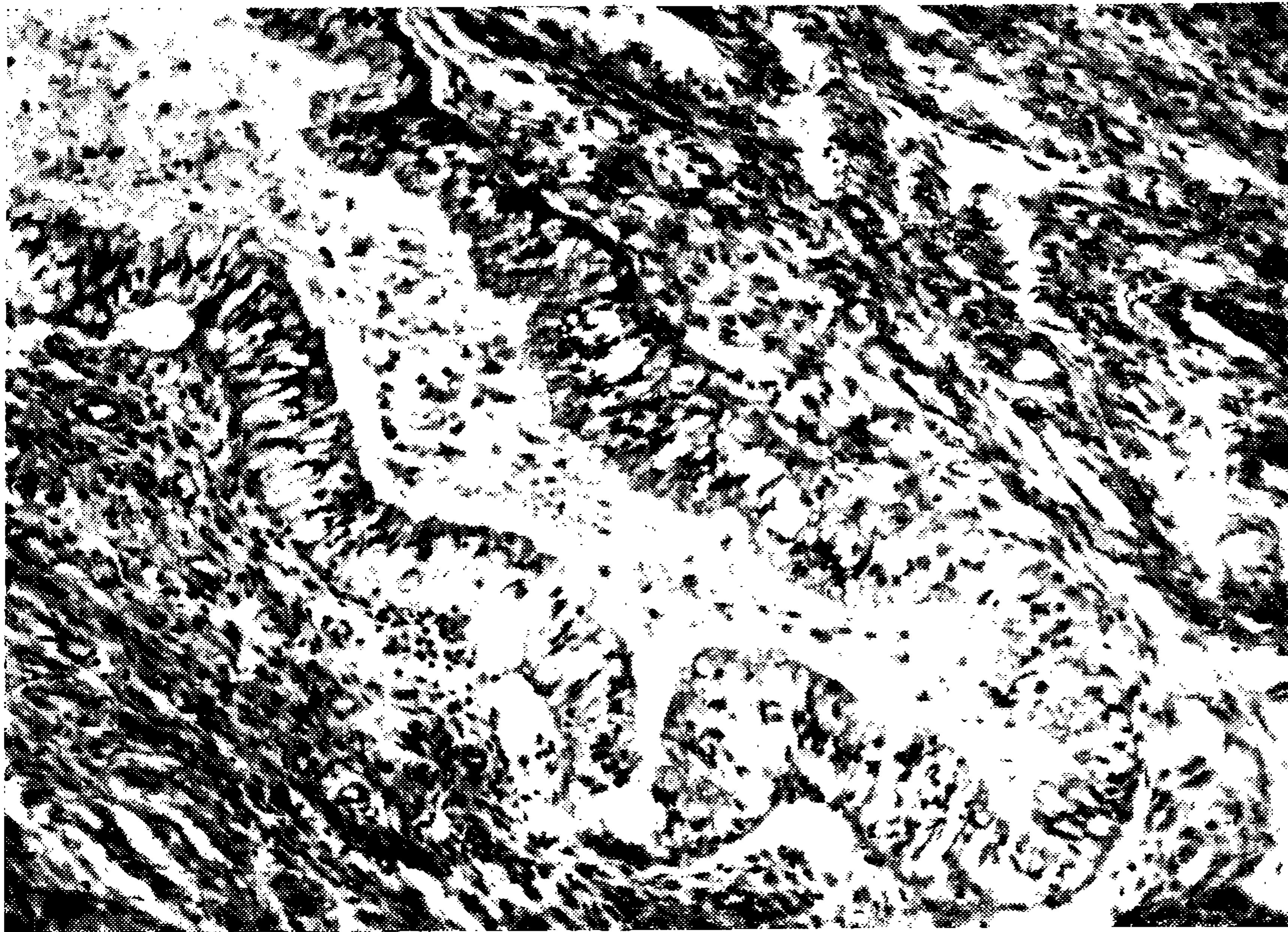


Fig. 6



Fig. 7

DUARTE: Endocervical columnar cells. I