

INVOLVEMENT OF THE LYMPH GLANDS IN CANCER OF THE CÆCUM

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IT is generally accepted that involvement of the lymph glands is a guide to the extensiveness of the operation as well as an aid in prognosis. The gastro-intestinal tract, except the cæcum and small intestine, from the stomach to the rectum has been studied in the Mayo Clinic from the standpoint of involvement of the lymph glands. In 1912, MacCarty and Blackford studied the lymph glands of the stomach, in 1920, McVay studied the rectum, and in 1921, Hayes continued the investigation in cases of cancer of the large bowel, except the small intestine and cæcum.

In considering the lymphatic drainage of the cæcum with regard to involvement in cancer, Clogg has shown that dissemination is along certain anatomic lines. He uses the classification of Jamieson and Dobson, which has also been used in this study (Fig. 1). The course of the lymphatic vessels of the cæcum is closely associated with that of the ileocolic blood-vessels. The ileocolic artery is surrounded from its origin to its division by a chain of lymphatic glands varying in number from ten to twenty and in size from about 1 mm. to 3 cm. The chain is often continuous without interspace with the gland around the superior mesenteric artery. At the point where the ileocolic artery gives off its terminal branches the chain of glands becomes broken into several groups which are associated with the branches of the artery. These groups are constant in number, though not in the number of their constituent members, and are sufficiently distinct from each other to be described in five groups. These groups form a basis for the study of the involvement of the lymph glands in cancer of the cæcum: Group 1, anterior ileocolic, Group 2, posterior ileocolic, Group 3, appendicular, Group 4, ileal, and Group 5, right colic.

The lymph vessels which drain the cæcum are simple in their arrangement, conforming to the plan of the glands (Fig. 2). However, there may be vessels which do not drain into the five groups of glands, but drain directly into those around the ileocolic artery above, and these must be kept in mind in exploring the abdomen for possible involvement.

Cancer of the cæcum originates in the glands of Lieberkühn. Around these glands are numerous lymphatics which form a thick network below. This is in combination with a second coarser network in the submucosa. The

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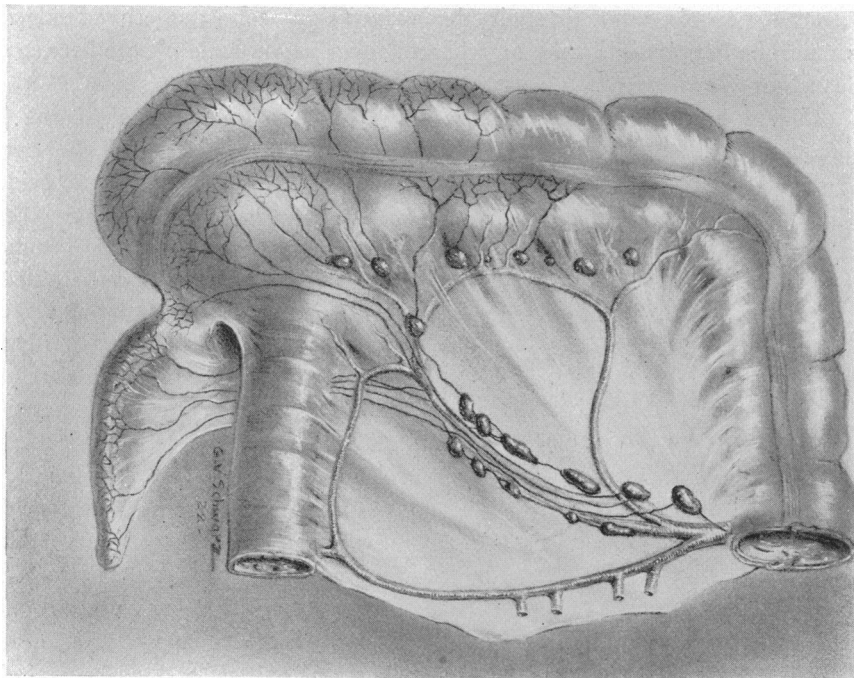


FIG. 1.—Anterior surface of cæcum. Anatomic distribution of normal lymph glands. (Jamieson and Dobson.)

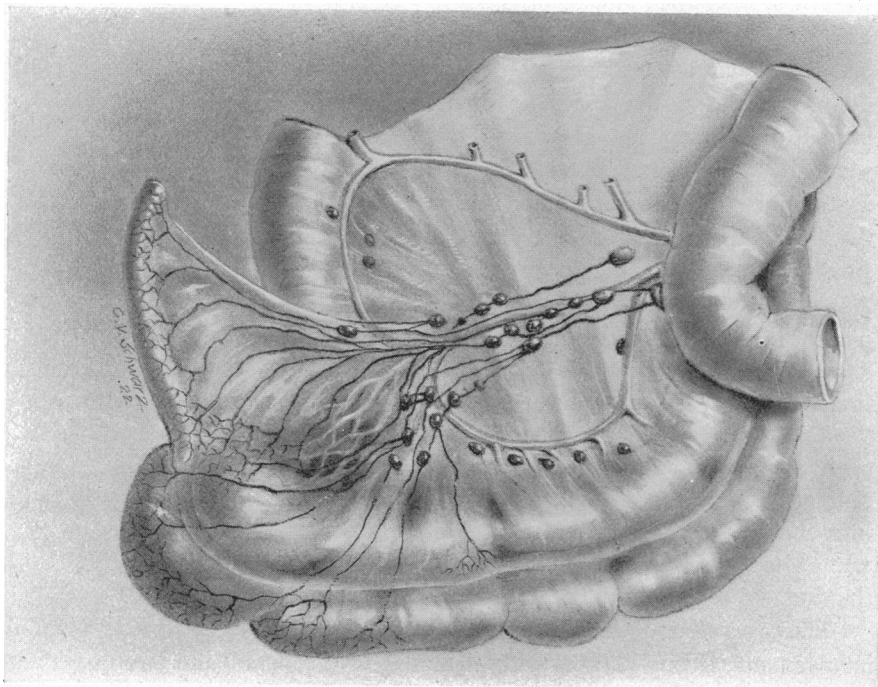


FIG. 2.—Posterior surface of cæcum. Anatomic distribution of normal lymph glands. (Jamieson and Dobson.)

efferent vessels pass through the muscularis, collecting the fluid from numerous lymphatics in the muscle and form a lymphatic plexus between the layers of the mesentery (Fig. 3).

There has been some dispute concerning the involvement of the ileocæcal valve in cancer of the cæcum.



FIG. 3.—(A263481). Arrangement of cells in carcinoma of the cæcum.

In the literature, however, the evidence seems to show that it is involved in the greater number of cases. Mummery says that "The commonest situation of growth in carcinoma of the ileocæcal angle is at the ileocæcal valve." Ewald, in his series of sixty-four cases, found 50 per cent. involving the valve. In our series 64 per cent. had involved the valve.

One hundred preserved specimens of cancer of the cæcum which had been removed at operation in the Mayo Clinic formed the basis of this study. The gross specimens, the size, form, location, extent, and character of the growth and the surrounding tissues

were first examined and records made. The lymph glands were then dissected out, particular attention being paid to the position and the anatomic distribution of the normal glands. They were all "teased out" by reducing the tissue into thin layers and transmitting the light through, in order to get the smallest as well as the largest units. As they were removed they were placed in phials, depending on their location, and their numbers and position were recorded on the charts.

The glands and sections from the original growth were studied microscopically, and the growths classified into the five groups mentioned (Fig. 4). The histories were reviewed for the purpose of checking the clinical and the pathologic diagnosis.

The cases were divided into three groups: Group 1, cases without glandular involvement; Group 2, cases with glandular involvement; and Groups 3a and b cases of colloid carcinoma, selected from Groups 1 and 2.

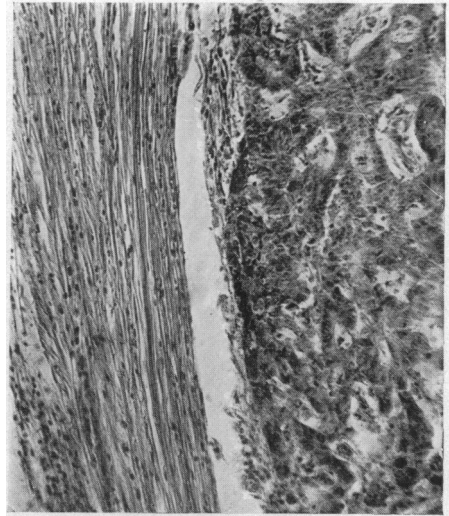


FIG. 4.—(A217584). Lymph glands showing thick capsule and carcinoma cells.

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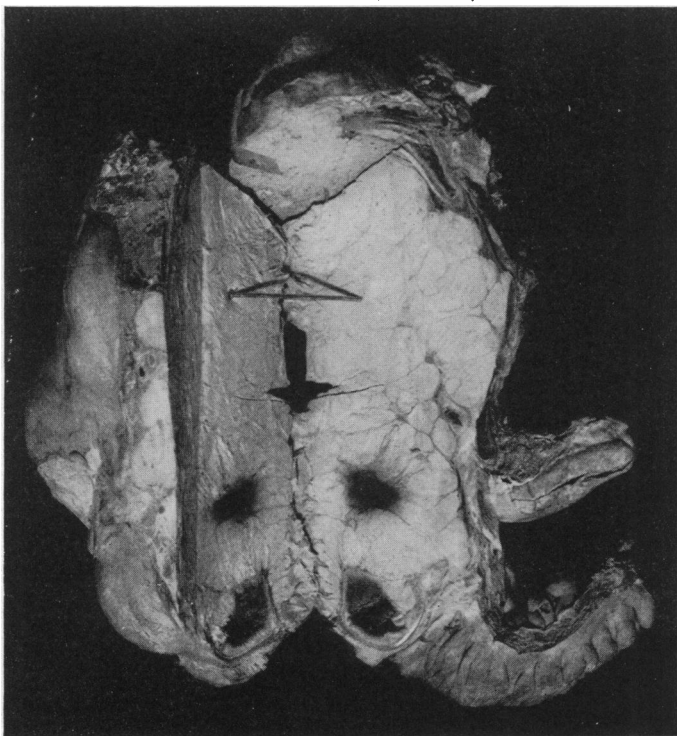


FIG. 5.—(A25392). Solid carcinoma filling lumen of the cæcum. Appendix not involved. No metastasis to regional lymph glands.

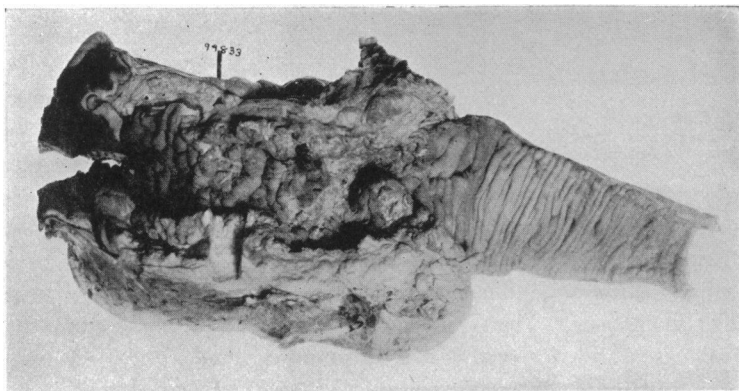


FIG. 6.—(A98833). Annular carcinoma of the cæcum which involved ileocecal valve but did not metastasize to regional lymph glands.

GROUP 1.—*Cancer without metastatic involvement of the regional lymph glands.*—There were sixty-eight patients (68 per cent.) in this group. Twenty-three were females and forty-five were males; the average age was forty-nine years. The average number of glands in each specimen was 8.84; the total number of glands was 629. Several specimens were found with few or no glands, but as a rule the glands were numerous and large, ranging from the almost microscopical 1 mm. to that of 3 cm. (Table I.) (Fig. 5). The outstanding feature of the “inflammatory” glands was the predominance

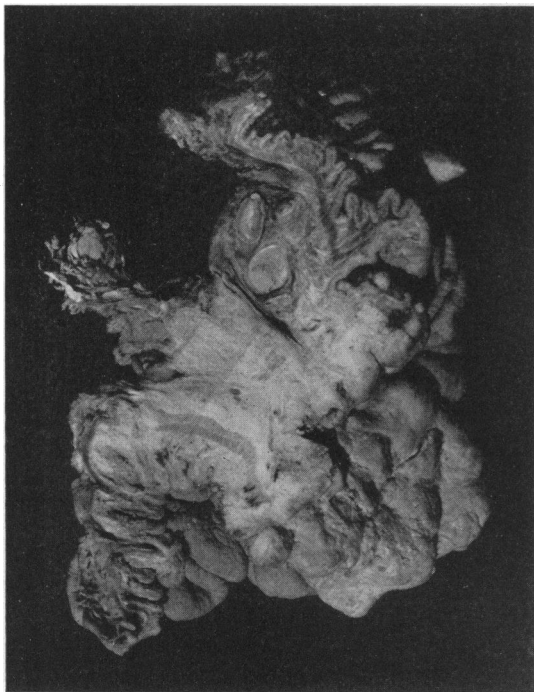


FIG. 7.—(A184960). Carcinoma of the posterior wall with involved glands. This specimen had thirteen glands, of which only six showed metastatic involvement.

of the posterior ileocolics, both in size and number. In only two cases were the appendicular glands enlarged, and this was probably due to appendicitis. The ileocæcal valve was involved in thirty-nine cases (50 per cent.) and in twenty cases (29 per cent.) the growth was annular or cylindrical, involving all the walls (Fig. 6).

GROUP 2.—*Cancer with metastatic involvement of the regional lymph glands.*—There were thirty-two patients in this group; eight were females and twenty-four males; the average age was 49.2 years. The average number of glands in each specimen was 12.3; the average number involved by metastasis in each specimen

was 3.59, and the total number

of glands was 396. (Table II) (Fig. 7). Again the predominance of the posterior ileocolic glands was manifested. And further, in the thirty-two cases of involvement of the lymph glands, the posterior ileocolics were involved in twenty-nine. Nine appendicular glands were found, but none of them were the seat of metastasis. The ileocæcal valve was involved in twenty-five of the thirty-two cases (78 per cent.) and in all cases the growth was annular or cylindrical, involving the entire wall.

Primarily, all cancers of the cæcum are of the adenocarcinomatous type and the colloid variety has been regarded as a degenerative process (Fig. 8). Parham, in a recent paper, has thrown new light on this phase of the subject. After an exhaustive study of colloid cancer he concluded that a functional

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TABLE I
Group I. Carcinoma of the Cæcum Without Glandular Involvement.

Case	Sex, Age	Location	Glands	Case	Sex, Age	Location	Glands
A208874	M-62	Anterior ileocolic	4	A203094	M-59	Anterior ileocolic	4
		Posterior ileocolic	5	A204856	F-63	Anterior ileocolic	2
A156932	M-62	Anterior ileocolic	6			Posterior ileocolic	9
		Posterior ileocolic	14	A182683	F-47	Anterior ileocolic	6
		Appendicular	9	A169495	M-48	Anterior ileocolic	3
A226072	F-42	Anterior ileocolic	5			Posterior ileocolic	8
A112389	F-63	Anterior ileocolic	5	A125209	M-31	Anterior ileocolic	5
A231897	M-59	Anterior ileocolic	6			Posterior ileocolic	9
A219508	M-70	Anterior ileocolic	6	A76186	F-58	Anterior ileocolic	2
A261071	M-65	Anterior ileocolic	7			Posterior ileocolic	9
		Posterior ileocolic	5	A273156	F-58	Anterior ileocolic	3
A254414	F-63	Anterior ileocolic	4			Posterior ileocolic	9
		Right colic	2	A261786	M-43	Anterior ileocolic	5
A263481	M-46	Anterior ileocolic	2			Posterior ileocolic	3
		Posterior ileocolic	16	A224716	M-59	Anterior ileocolic	2
		Right colic	3			Posterior ileocolic	12
A274871	M-58	Anterior ileocolic	2	A290336	M-31	Anterior ileocolic	4
		Posterior ileocolic	7	A307312	M-39	Anterior ileocolic	2
A336867	M-56	Anterior ileocolic	4			Posterior ileocolic	10
		Ileal	2			Ileal	2
A40635	M-40	Anterior ileocolic	5	A48660	M-54	Anterior ileocolic	4
		Posterior ileocolic	10			Posterior ileocolic	10
A22895	M-48	Anterior ileocolic	4	A18536	M-49	Anterior ileocolic	5
		Posterior ileocolic	9			Posterior ileocolic	9
A57231	F-28	None					
A295762	M-41	Posterior ileocolic	16	A184954	F-39	Posterior ileocolic	16
A190106	F-38	Posterior ileocolic	12	A183363	M-56	Posterior ileocolic	9
A114808	M-66	Posterior ileocolic	8	A203555	M-73	Posterior ileocolic	9
		Ileal	5	A107964	M-51	Posterior ileocolic	5
A134338	M-65	Posterior ileocolic	6	A127339	M-36	Posterior ileocolic	12
A99833	F-46	Posterior ileocolic	2	A68450	F-47	Posterior ileocolic	7
		Ileal	4	A70127	F-40	Posterior ileocolic	8
A64593	M-38	Posterior ileocolic	8	A63548	M-58	Posterior ileocolic	6
A221979	M-49	Posterior ileocolic	18	A364875	F-44	Posterior ileocolic	8
A257848	M-44	Posterior ileocolic	12	A254633	M-57	Posterior ileocolic	2
		Ileal	3	A282203	F-38	Posterior ileocolic	14
A351494	M-57	Posterior ileocolic	8	A304737	M-31	Posterior ileocolic	12
A339017	F-49	Posterior ileocolic	8	A335834	M-49	Posterior ileocolic	13
A307746	M-64	Posterior ileocolic	5	A338349	F-34	Posterior ileocolic	2
A324824	F-58	Posterior ileocolic	8	A347708	M-65	Posterior ileocolic	6
A313898	M-66	Posterior ileocolic	4	A86405	M-38	Posterior ileocolic	8
A92504	F-43	Posterior ileocolic	5	A58736	F-42	Posterior ileocolic	12
A68010	M-51	Posterior ileocolic	10	A62812	F-63	Posterior ileocolic	4
A57330	F-49	Posterior ileocolic	8	A76173	M-55	Posterior ileocolic	6
A48922	M-71	Posterior ileocolic	9	A25637	M-48	Posterior ileocolic	4
A4464	F-68	Posterior ileocolic	6	A35049	M-40	Posterior ileocolic	2
		Ileal	5	A11977	M-46	Posterior ileocolic	9
A25392	M-47	Posterior ileocolic	9				
A303742	M-37	Ileal	3				

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TABLE I.—Continued.
Summary of Group I

Patients.....	68 (68 per cent.)
Females	23
Males... ..	45
Average age.....	49 years
Posterior ileocolic glands	484
Anterior ileocolic glands.....	107
Appendicular glands.....	5
Ileal glands.....	24
Right colic glands	5
Total number of glands	629
Average number of glands in specimen.....	8.84

differentiation of the cancer cells is demonstrated by the production of mucus in quantities which show that the function is uncontrolled, and that colloid cancer usually grows slowly and metastasizes late. This statement he modified by the division of colloid cancer into two groups based on the microscopic

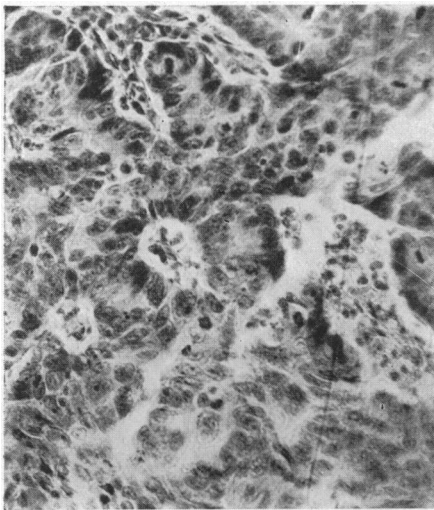


FIG. 8.—(A50540). Adenocarcinoma forming in a lymph gland. Mitotic figures present.

picture, those showing the “signet ring” types of cellular morphology being more malignant than the glandular type with columnar cells (Fig. 9.) In discussing the glandular involvement he says that local glands are commonly affected, but distant metastasis is slow. Recurrence is often localized to the site of origin, thus showing the difficulty of local eradication (Fig. 10). Twenty-two per cent. of Parham’s cases of cancer of the cæcum were of the colloid type; he says “As compared to carcinoma of the cæcum in general, colloid carcinoma of the cæcum has the greater longevity.”

GROUP 3A.—*Colloid cancer without metastatic involvement of the regional lymph glands.*—There were eight patients in this group, three females and five males; the average age was forty-eight years. The total number of glands was forty-eight, and the average number in each specimen was 7.2.

GROUP 3B.—*Colloid cancer with metastatic involvement of the regional lymph glands.*—There were twelve patients in this group, two females and ten males; the average age was 49.3 years. The total number of glands was 144. Fifty-one glands were involved; ninety-three were inflammatory. The average number of glands in each specimen was twelve (Figs. 11 and 12).

SUMMARY

One hundred pathologic specimens and 1,033 associated lymph glands were examined.

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TABLE II.

Group 2. Carcinoma of the Cæcum With and Without Glandular Involvement.

Case	Sex, Age	With	Glands	Without	Glands
A144469	M-50	Posterior ileocolic	1	Anterior ileocolic Posterior ileocolic	5 8
A217584	M-53	Posterior ileocolic	3	Anterior ileocolic Posterior ileocolic	6 11
A299507	M-60	Anterior ileocolic	1	Posterior ileocolic	10
A299107	F-66	Ileal	2	Ileal	2
A294841	M-38	Posterior ileocolic	3	Ileal	3
A338189	F-59	Posterior ileocolic	2	Posterior ileocolic	6
A321512	M-68	Posterior ileocolic	2	Posterior ileocolic	6
A8563	M-52	Posterior ileocolic	3	Posterior ileocolic	3
A28431	F-58	Posterior ileocolic	1	Posterior ileocolic	8
A11977	M-48	Posterior ileocolic	1	Posterior ileocolic Anterior ileocolic	7 10
A17527	M-52	Posterior ileocolic	2	Posterior ileocolic Anterior ileocolic Appendicular Ileal	8 5 9 4
A165146	M-33	Posterior ileocolic	2	Posterior ileocolic	9
A180796	M-42	Posterior ileocolic	2	Posterior ileocolic	8
A126319	M-54	Posterior ileocolic	2	Posterior ileocolic	4
A102581	M-49	Posterior ileocolic	1	Posterior ileocolic	9
A137095	M-47	Anterior ileocolic	2	Posterior ileocolic	6
A146060	M-68	Posterior ileocolic	6	Anterior ileocolic Posterior ileocolic	5 2
A250540	M-70	Posterior ileocolic Ileal	2 2	Anterior ileocolic	10
A31000	F-59	Anterior ileocolic Posterior ileocolic	5 1	Posterior ileocolic	5
A101909	F-60	Posterior ileocolic	6	Anterior ileocolic Posterior ileocolic	3 5
A213118	F-30	Ileal	4	Ileal	4
A207819	M-47	Posterior ileocolic	4	Posterior ileocolic	3
A207387	M-54	Posterior ileocolic Anterior ileocolic	4 3	Posterior ileocolic Anterior ileocolic	9 1
A178416	M-20	Posterior ileocolic Anterior ileocolic	2 6	Posterior ileocolic	7
A159065	M-67	Posterior ileocolic Anterior ileocolic	3 2	Posterior ileocolic Anterior ileocolic	2 12
A40635	M-40	Posterior ileocolic Anterior ileocolic	2 5	Posterior ileocolic	6
A86068	M-48	Posterior ileocolic	7	Posterior ileocolic Anterior ileocolic	3 4
A248256	M-53	Posterior ileocolic Anterior ileocolic	4 2	Posterior ileocolic Ileal	13 3
A210885	F-58	Anterior ileocolic	4	Posterior ileocolic	19
A217183	M-51	Posterior ileocolic Anterior ileocolic	2 4	Posterior ileocolic	2
A261154	M-40	Posterior ileocolic	3	Posterior ileocolic	9
A165023	F-53	Posterior ileocolic	1	Posterior ileocolic	4

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TABLE II.—Continued.
Summary of Group 2.

Patients.....	32 (32 per cent.)
Females.....	8
Males.....	24
Average age.....	49.2 years
Posterior ileocolic glands involved.....	74
Posterior ileocolic glands not involved.....	192
Anterior ileocolic glands involved.....	34
Anterior ileocolic glands not involved.....	61
Appendicular glands involved.....	0
Appendicular glands not involved.....	9
Ileal glands involved.....	8
Ileal glands not involved.....	16
Glands involved.....	115
Glands not involved.....	281
Total number of glands.....	396
Average number of glands in specimen.....	12.3

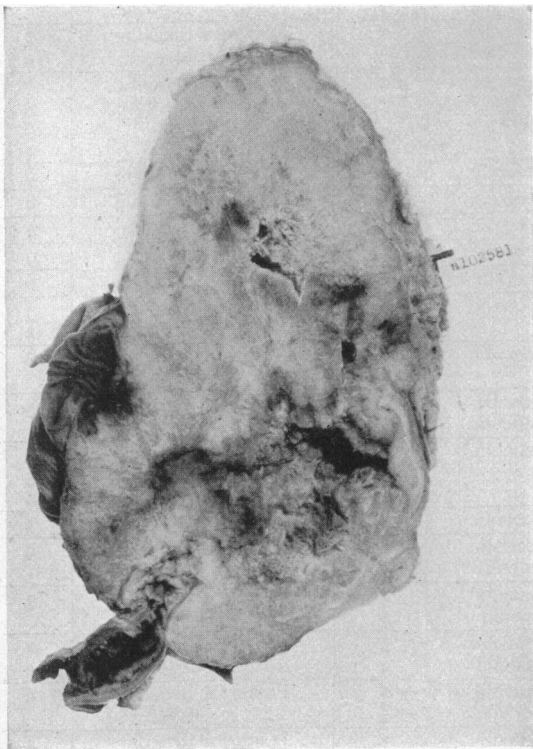


FIG. 9.—(102581). Massive colloid carcinoma which involved ileocæcal valve and metastasized to regional lymph glands.

Cancers without local metastasis usually protrude into the lumen of the cæcum rather than penetrate its wall, while those with metastasis usually involve the walls.

The most common site for cancer of the cæcum is the posterior wall. Cases of annular cancer, or those in which all the walls were involved, comprised nearly 43 per cent. of this series. In 35 per cent. the growth was confined to the posterior wall. This accounts for the fact that metastasis and inflammatory reaction are most often found in the posterior ileocolic lymph glands. The growth was confined to the anterior wall in 13 per cent. of the cases.

Colloid cancer occurred in 20 per cent. of the cases. It

metastasized in 12 per cent. and was often present in the most highly malignant cases.

The ileocæcal valve was involved in 64 per cent. of the cases.

Sixty-six per cent. of the cases were males, and 34 per cent. females.

In 32 per cent. of the cases there was metastatic involvement of the regional lymph glands.

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TABLE III.

Group 3a. Colloid Carcinoma of the Cæcum Without Glandular Involvement.

Case	Sex, Age	Location	Glands
A22895	M-48	Anterior ileocolic Posterior ileocolic	4 9
A274871	M-58	Anterior ileocolic Posterior ileocolic	2 7
A70127	F-40	Posterior ileocolic	8
A254414	F-63	Posterior ileocolic	11
A92504	M-43	Posterior ileocolic	5
A336867	M-56	Posterior ileocolic Anterior ileocolic	6 4
A339017	F-49	Posterior ileocolic	2
A303742	M-37	Ileal	3

Summary of Group 3a.

Total number of patients	8 (8 per cent.)
Females	3
Males	5
Average age	48 years
Posterior ileocolic glands	48
Anterior ileocolic glands	10
Ileal glands	3
Total number of glands	61
Average number of glands in specimen	7.6

Lymph glands were found which were normal in consistency, yet palpable and plainly visible to the naked eye.

The size of the intestinal lesion, and the size and number of the regional lymph glands proved to be no criterion of the presence or absence of metastasis.

Lymph glands, simulating cancerous glands in size, due to marked cellular infiltration and lymphœdema, were found to be inflammatory.

Glands, too small to be palpated at the time of operation, were found to be the seat of metastasis.

In cases of glandular involvement large and numerous inflammatory glands were also noted, which could

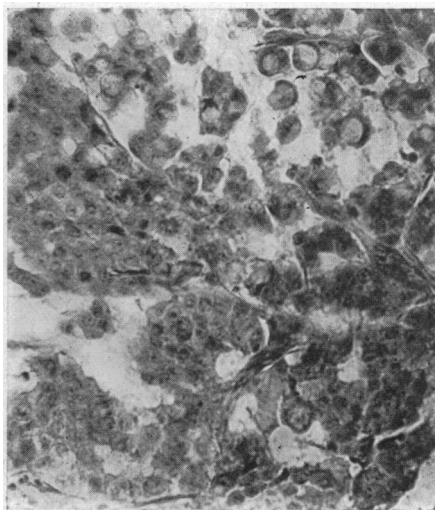


FIG. 10.—(A501909). Colloid carcinoma (signet-ring type). (X200.)

only be distinguished by the use of the microscope.

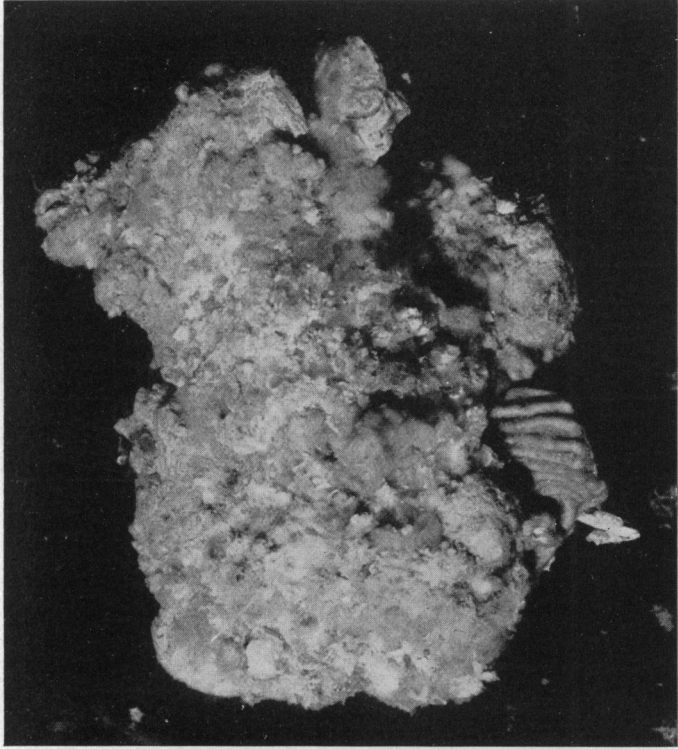


FIG. 11.—(A339017). Colloid carcinoma filling cæcum and involving ileocecal valve; the regional lymph glands were free from metastasis.

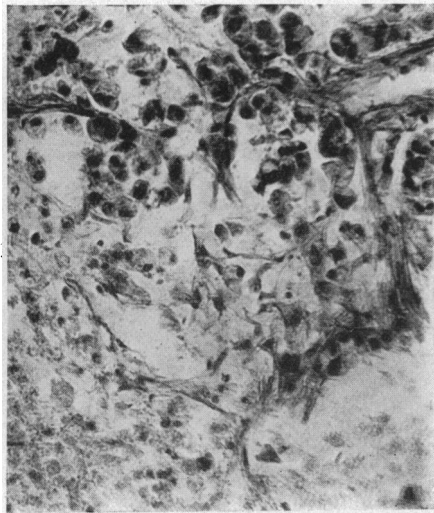


FIG. 12.—(294841). Metastasis in a lymph gland from colloid carcinoma. (X150.)

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In cases of low malignancy clinically, without metastasis, were local glands, larger and more numerous than in the more highly malignant cases showing metastatic involvement.

In cases with a large number of glands involved pathologically, a high degree of malignancy was usually proved clinically.

Predominance of the posterior ileocolic lymph glands is of significance, and should prove of value in the operating room, since 71 per cent. of all glands found were in this region, and 64 per cent. of the glands which showed metastatic involvement belonged to this group.

Systematic microscopic examination is the only method of determining the presence of local or regional metastasis.

TABLE IV.

Group 3b. Colloid Carcinoma of the Cæcum With and Without Glandular Involvement.

Case	Sex, Age	With	Glands	Without	Glands
A144469	M-50	Anterior ileocolic Posterior ileocolic	5 8	Posterior ileocolic	1
A165146	M-53	Posterior ileocolic	2	Posterior ileocolic	9
A102581	M-49	Posterior ileocolic	1	Posterior ileocolic	9
A264202	F-57	Posterior ileocolic	3	Posterior ileocolic	4
A321512	M-68	Posterior ileocolic	2	Posterior ileocolic	6
A178416	M-20	Posterior ileocolic Anterior ileocolic	2 6	Posterior ileocolic	7
A160796	M-42	Posterior ileocolic	2	Posterior ileocolic	8
A126319	M-54	Posterior ileocolic	2	Posterior ileocolic	4
A299507	M-60	Posterior ileocolic	1	Posterior ileocolic	10
A213118	F-30	Ileal	4	Posterior ileocolic Ileal	5 4
A146060	M-68	Posterior ileocolic	8	Anterior ileocolic Posterior ileocolic	5 8
A207819	M-47	Posterior ileocolic	4	Posterior ileocolic	3

Summary of Group 3b.

Total number of patients.....	12 (12 per cent.)
Females	2
Males	10
Average age.....	49.3 years
Posterior ileocolic glands involved	34
Posterior ileocolic glands not involved.....	74
Anterior ileocolic glands involved.....	11
Anterior ileocolic glands not involved.....	5
Ileal glands involved	4
Ileal glands not involved.....	4
Glands involved.....	51
Glands not involved	93
Total number of glands	144
Average number of glands in specimen.....	12

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