

## DISTRIBUTION OF AXILLARY LYMPH NODE METASTASES IN CARCINOMA OF THE BREAST\*

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AXILLARY NODE ANATOMY and invasion of these nodes from carcinoma of the breast was studied in 77 consecutive cases in which a radical mastectomy was performed from April, 1949 to June, 1951. Thirty-one were at the University Hospital and 46 were in the private practice of the senior author. Almost all of the operations were performed by the two authors. At the time of the radical axillary dissection, labels were applied to key anatomical points to help localize the lymph nodes when they were dissected out. As the work progressed, the number of axillary nodes removed in each case tended to increase as interest led to more extensive axillary dissection.

Following the removal of the specimen, it was extensively studied by the junior author. It was washed free of blood in a 1 per cent citrate solution, fixed in formalin, and then washed through increasing concentrates of alcohol up to absolute alcohol. Then the entire specimen was cleared in methyl salicylate. The lymph nodes then were more visible and were dissected from the specimen. Their locations were charted on an anatomical drawing. Two to five microscopic sections were made of each node.

In all, 2418 axillary lymph nodes, or an average of 31.4 per patient, were examined and 519, or 21.4 per cent, were found microscopically to contain neoplastic cells. The total number of nodes removed per specimen varied from ten to 73.

Of the 77 patients studied there were no axillary metastases in 29, which is 37.6 per cent. In view of the generally stated opinion that carcinoma grows and metastasizes more rapidly in young people, it is interesting that in this group the two youngest patients were 25 and 26 years of age, with known tumor before operation of six months and three months duration respectively. Neither had metastasis in the axillary lymph nodes. On the other hand, probably the most rapidly progressing growth was in a woman 80 years old. A lump in the breast was discovered only two months before operation. It grew very rapidly locally and carcinoma was found in 61 of the 67 axillary nodes.

The average age of the patients without node metastases was 57. In general, the ages of these patients were the usual for breast carcinoma, as was the grade of malignancy. In six of these patients the duration of tumor was one or more years. One had been noted for three years, one for 17 months, and four for one year. Excluding case 34, in which there was an indefinite duration of eight years, the aver-

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FIG. 1

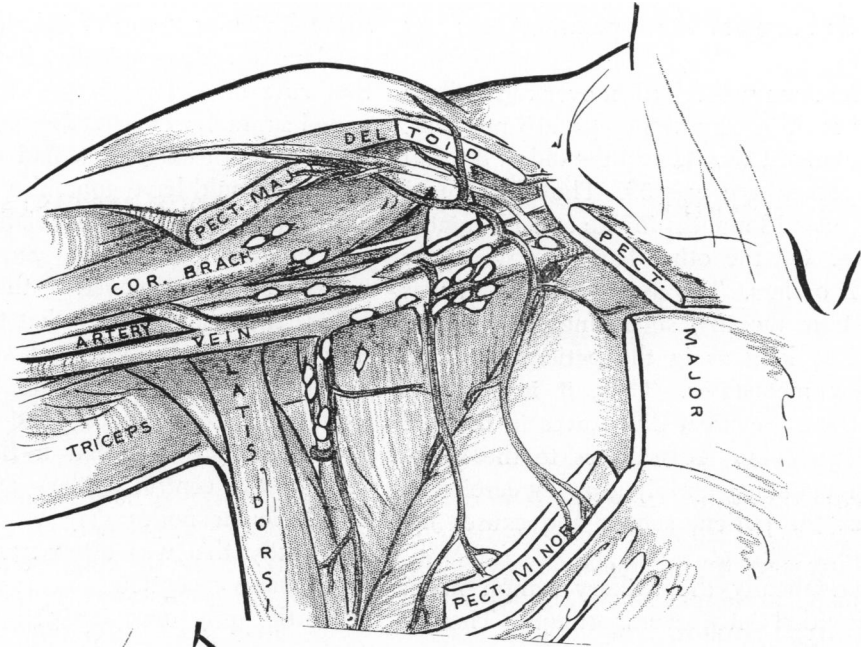


FIG. 2

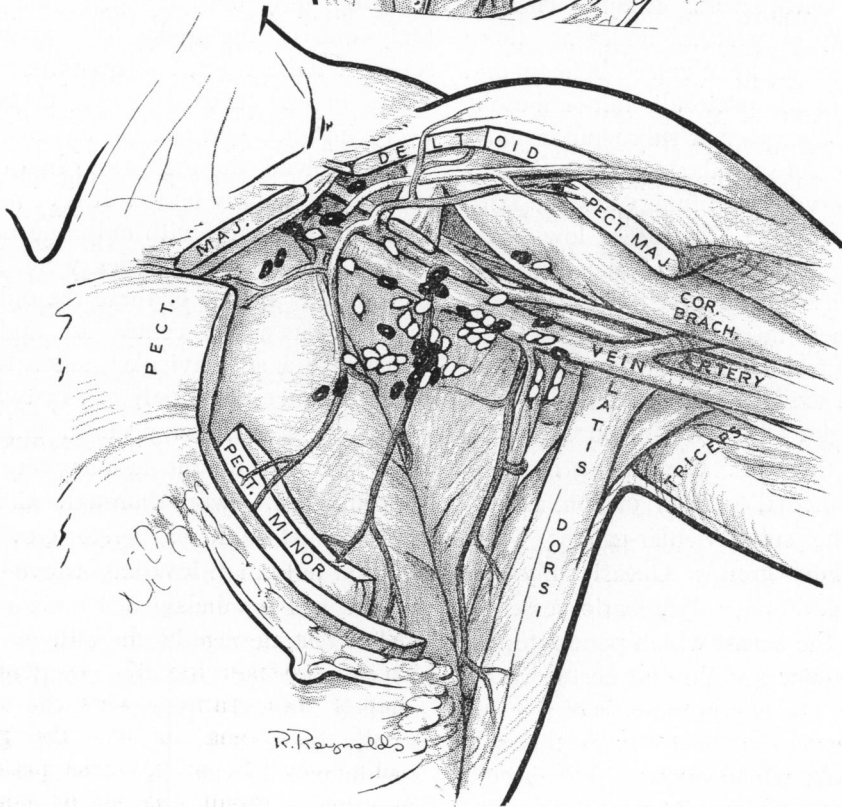


FIG. 1.—Carcinoma invaded only one node, which was in the subclavicular group. No lower axillary node is involved. Patient's age was 38. Two and a half months' duration; right. Breast lesion 3 x 5 cm.; 24 nodes found.

FIG. 2.—Carcinoma often skips nodes between those involved. Twenty-six nodes with carcinoma, out of 63 nodes, were found. The patient's age was 62; two weeks' duration. Left; intermediate zone, superior.

age duration before operation was six months.

Carcinoma was found in over ten axillary nodes each in 16 patients, or 20.8 per cent. The youngest was 42 and the oldest 80, and the average age was 59. The duration of tumor was 18 months in one and 12 months in two. On the other hand, six were one month or less. The average duration was only four months, surprisingly only two-thirds as long as in the patients with no axillary metastases. Thus, it is observed that there are great differences in the rate that carcinoma metastasizes to the axilla. This means that rapidly growing carcinoma alarms the patient sooner and causes her to seek treatment.

Anatomically the axillary lymph nodes are divided into several groups. The anterior axillary or pectoral nodes are those near the lateral thoracic vessels beneath and just lateral to the pectoralis minor muscle. The posterior axillary or subscapular nodes are near the subscapular vessels and thoracodorsal nerve which innervates the latissimus dorsi muscle. There are low nodes and high nodes in each of these groups. The lateral axillary or brachial nodes drain the arm. These three groups of nodes drain into the central axillary nodes which are high in the axilla along the axillary vein, mainly inferior to it but also posterior and anterior to the vein. Continuing medially about the medial portion of the axillary vein are the subclavicular nodes which drain the above groups. Occasionally they receive, in addition, a lymphatic vessel directly from the breast which penetrates the pectoralis major muscle and costocoracoid membrane. The efferent vessels of the subclavicular group unite to form the subclavian trunk, which opens either directly into the junction of the internal jugular and subclavian veins or into the jugular lymphatic trunk; on the left side it may end in the thoracic duct. A few efferents from the subclavicular nodes usually pass to the

supraclavicular group of inferior deep cervical nodes. Anatomically, it would seem that cure of carcinoma by excision of invaded supraclavicular nodes would be very rare, as when carcinoma had reached this group it would have gone also to a greater extent through the subclavian trunk into the general circulation. Supraclavicular nodes were not removed in this study.

It is thought generally that the first axillary lymph nodes involved secondary to carcinoma of the breast are the anterior axillary or pectoral nodes, first the low and then the high, and that if there is time enough the central axillary and then the subclavicular nodes may be invaded. In this study this was often true, but there were many exceptions. The pectoral nodes were the only ones invaded in 16 cases. Only one of the nodes was invaded in seven of these cases, two nodes in six, four nodes in one, and six nodes in two. In every instance when seven or more nodes were involved, the metastases had reached the central axillary nodes. It is of note that in two cases, each with only one node involved, the pectoral nodes were free of metastases. In one of these the only node invaded was a high central one and in the other case a subclavicular node. In three other instances with only one or two carcinomatous nodes, the pectoral group had been skipped and the lesions were in the central nodes. A very thorough axillary dissection must be done, therefore, even if no pectoral nodes are invaded, as even then a high central or subclavicular node may contain metastatic neoplastic cells.

It is expected that the group of nodes invaded after the pectoral group will be usually the central axillary nodes. This was true in nine of the cases. They each had from two to 15 nodes involved and included these two groups of nodes in rather uniform progression.

Even with only one or two nodes invaded there may be a skip in which there are

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FIG. 3

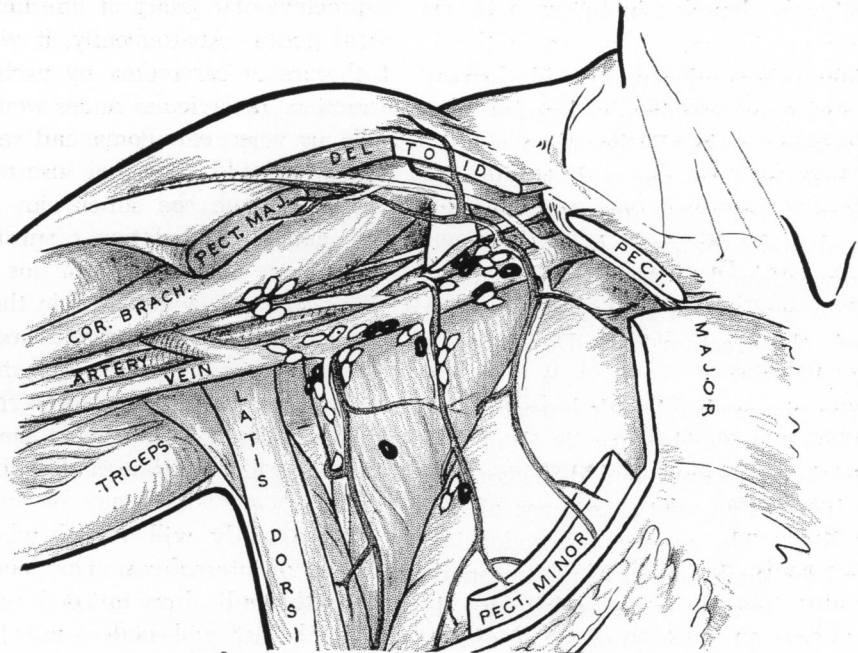


FIG. 4

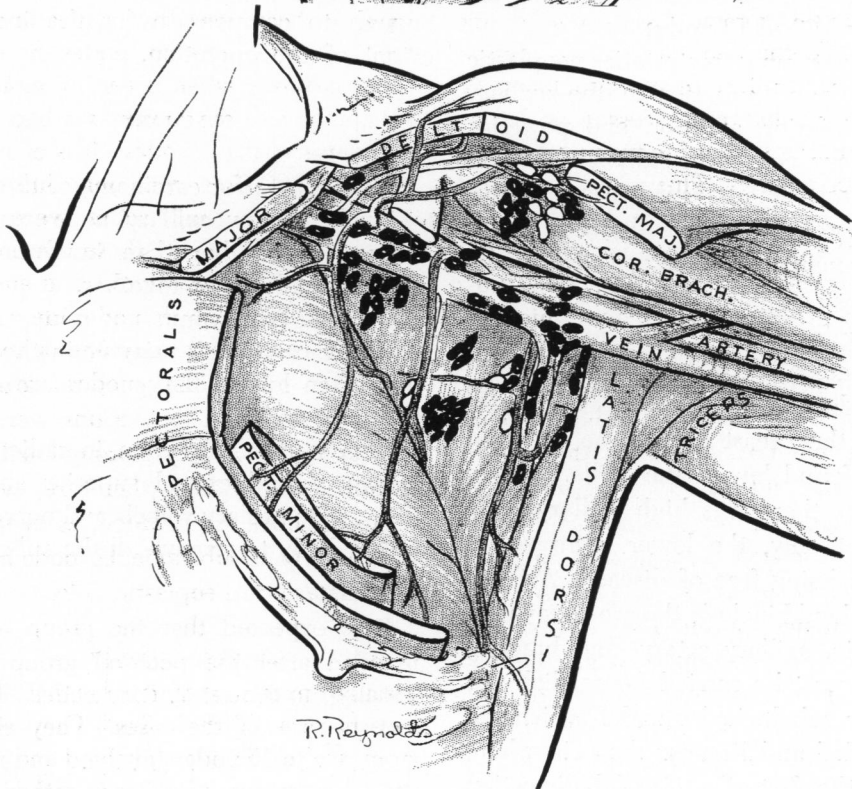


FIG. 3.—Carcinoma skips many nodes. Here it invaded 11 of 43 nodes. Patient's age was 59; two months' duration. Right, 3 cm. tumor, upper outer quadrant.  
FIG. 4.—Carcinoma involvement in 62 of 73 nodes. Patient's age was 59, one month duration. Two lesions in breast; 2x2 cm. and 1x1 cm. Upper outer quadrant.

many uninvolved nodes in between those containing carcinoma. In one case there was a low subscapular node and then a long skip past many uninvolved nodes to a central axillary node. Rather than a uniform progression from one node to the adjoining one it is very common to see many uninvolved nodes between involved ones. This also was found in the breast by Monroe<sup>3</sup> and in case of metastases from carcinoma of the rectum by David and Gilchrist.<sup>1</sup>

When carcinoma has invaded great numbers of the axillary nodes, usually all of the groups in the axilla are invaded. This massive involvement was noted in seven of the cases studied. The number of nodes invaded and the total number of nodes found in each of these cases were as follows: 21 of 24, 27 of 30, 29 of 34, 30 of 37, 46 of 53, 61 of 67, and 62 of 73 nodes.

Nodes containing metastatic neoplastic cells were found superior to the axillary vein; also inferior, anterior, and posterior to the axillary vein, especially high in the region between the lateral thoracic and subscapular vessels. Far medially, near where the axillary vein crosses the first rib, may be found nodes containing neoplastic cells.

From the facts brought out in this study it appears essential to do a very complete axillary node dissection in all cases of carcinoma of the breast even if no involved nodes are found low in the axilla. In five of the cases there was high axillary node involvement only, the lower more accessible nodes being free of disease. Axillary dissection should include the area above the axillary vein, axillary artery, and brachial plexus. It must be carried far medially to remove the subclavicular nodes which are often invaded and lie near the vein where it crosses the first rib. Careful dissection should extend high, posterior and superior to the axillary vessels, as involved nodes may be found there. We have not found

this extensive dissection to increase the incidence or degree of postoperative edema of the arm. With this extensive axillary dissection, recurrences of carcinoma in the axilla are very rare. Postoperative roentgen therapy to the axilla had been dispensed with in most cases, which also decreases the incidence and degree of postoperative arm edema.

This study does not include the internal mammary chain of nodes. Handley and Thackray<sup>2</sup> found this group invaded with carcinoma quite frequently. Very radical axillary node dissection must increase the cures when the invasion is of axillary nodes only.

Future study will reveal whether the addition of internal mammary node dissection to the radical operation for carcinoma of the breast will give results improved enough to compensate for the increased extent of the operation.

#### SUMMARY

It is common for carcinoma of the breast to involve a few axillary nodes and skip many others rather than involve only a group of nodes near together.

High axillary lymph nodes may be invaded by carcinoma primary in the breast even when low axillary nodes are free of malignant cells.

Axillary node dissection in radical mastectomy should extend superior and posterior to the axillary vessels and nerves, and also medially to remove all the subclavicular nodes.

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