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Lymphangiography in Staging Carcinoma of the Prostate. A Comparison with Operative Findings

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Pedal lymphangiography was performed in 30 patients who subsequently underwent radical retropubic prostatectomy, and radical pelvic lymphadenectomy. In 24 of 30 patients, lymphangiograms correctly predicted the presence or absence of nodal involvement. In spite of certain limitations of the technique, it is considered an essential diagnostic study in patients considered for possible radical prostatic surgery, or in patients who may be candidates for external megavoltage radiotherapy to the prostate gland and its lymphatic drainage.

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In a previous publication[1] we compared lymphangiography with operative findings in 18 patients undergoing radical retropubic prostatectomy and pelvic lymphadenectomy for carcinoma of the prostate. We concluded:

(a) in most patients, prostatic carcinoma extends via regional lymphatics prior to metastasizing to bone:

(b) pedal lymphangiography adequately visualized external iliac, common iliac and para-aortic nodal drainage, but failed to produce satisfactory opacification of the hypogastric, obturator and lateral sacral lymphatics, and

(c) operative findings and subsequent pathologic study of the lymph nodes confirmed the preoperative lymphangiographic diagnosis in 15 of the 18 patients (83%).

Since that initial report, pedal lymphangiography has been routinely employed in the staging and evaluation of patients with prostatic carcinoma prior to contemplated radical prostatectomy or radiation therapy. With information now on 30 patients we are able to evaluate further the accuracy of lymphangiography in predicting nodal involvement.

Materials and methods

Between July 1, 1972, and December 30, 1975, 30 patients with a diagnosis of carcinoma of the prostate gland underwent pedal lymphangiography, followed by radical retropubic prostatectomy and bilateral lymphadenectomy. Node dissection included complete excision of the sacral, obturator, hypogastric, external iliac, and common iliac lymph nodes. The patients ranged in age from 49 to 74 years.

In 16 patients, the diagnosis of carcinoma of the prostate was made by incidental finding of neoplasm in curettings from transurethral prostatectomy for presumed benign prostatic hyperplasia. In 14 patients the diagnosis was established by perineal needle biopsy of a suspicious nodule. In all patients, the clinical stage was initially described as A or B, based upon palpation of the gland.

Further evaluation of the patient included complete history and physical examination, routine laboratory studies, chest film, acid and alkaline phosphatase determination, metastatic bone survey, bone scan using 10 mCi ^{99m}Tc stannous polyphosphate, and pedal lymphangiography. In the latter 18 months of the study, we added bone marrow acid phosphatase determinations obtained by iliac crest aspiration.

Lymphangiography was performed by the technique previously described.[1] Films were taken 24 and 48 hours after injection for visualization of iliac and para-aortic nodes. (Figure 1) Magnification films were obtained as needed.

Lymphangiograms were interpreted as positive if there was demonstration of obstruction of lymphatic channels, filling defects of lymph nodes themselves, or failure of opacification of groups of nodes. (Figures 2—4)

Results

In 24 of the 30 patients (80%), the preoperative lymphangiogram correctly pre-

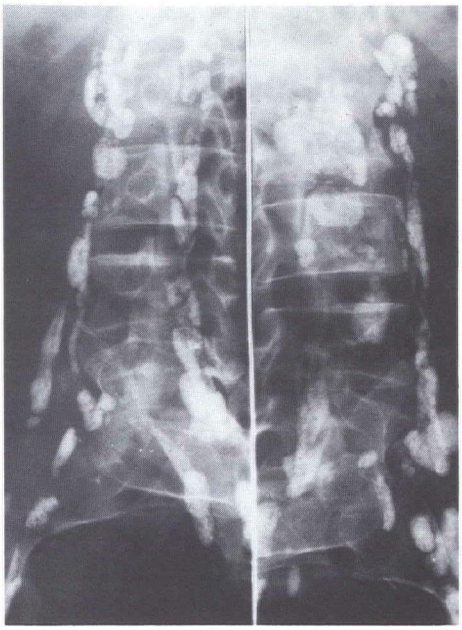

Figure 1
Right and left oblique lymphangiograms show external iliac, common iliac and para-aortic nodes, and channels of normal configuration.

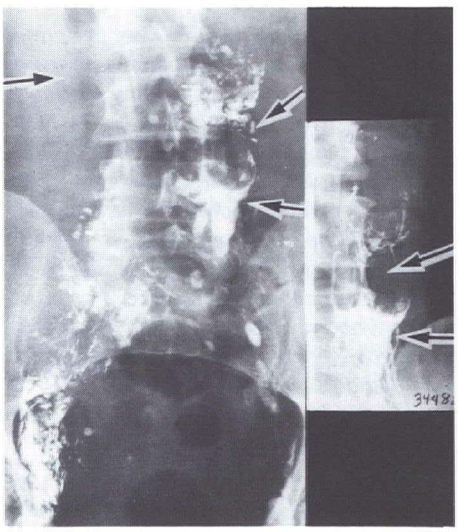

Figure 2
Absence of filling of right para-aortic nodes indicates replacement by tumor. Large left para-aortic nodal defect is seen with marked dilatation of proximal lymphatic ducts.

* All photos courtesty The Journal of Urology, March 1975.

dicted involvement or lack of involvement of the lymph nodes (Table I). In the other six patients the study was falsely positive in four instances, and falsely negative twice. In the four falsely positive cases, the filling defects seen on x-ray films were the result of fatty infiltration, or inflammatory processes in the nodes, and not the result of neoplastic involvement. In the two lymphangiogram findings incorrectly interpreted as negative, the tumor foci were microscopic and did not produce sufficient alteration in the lymph nodes to be evident radiologically.

In eight of ten patients having positive lymph nodes at the time of operation, external and common iliac nodal involvement was associated with concomitant involvement of the more proximal nodal drainage, eg, obturator and hypogastric. In two, however, the more proximal nodes were negative, in spite of the finding of documented distal node tumor involvement.

Morbidity related to the performance of the lymphangiogram was minimal. No lymphangiographic studies were done of patients who had radiologic evidence of pulmonary disease, or in whom pulmonary function studies were abnormal. Hence, there were no significant respiratory complications. Transient pyrexia was noted in four of the 30 patients undergoing lymphangiography. In six of 30, superficial skin infections developed at the point of dorsal pedal lymphatic cannulation.

There was no operative mortality. Significant operative morbidity included major wound infections in four patients, and documented pulmonary embolism in two. All patients who had normal sexual function prior to their operative procedure have been impotent since. Only one of the 30 patients has failed to regain complete urinary continence following the radical prostatectomy.

TABLE I.
ACCURACY OF LYMPHANGIOGRAMS IN 30 PATIENTS

	NO. CASES
Radiologic findings:	
Positive	14
Negative	16
Total	30
Pathologic findings:	
Positive	10
Negative	14
Total	24 (80%)

* Four falsely positive and 2 falsely negatives.

Discussion

The lymphatic drainage of the prostate gland has its origin within the gland, and extends peripherally to form a periprostatic network. The vessels then unite, to form several major lymph channels which surround the gland, and provide proximal drainage by several major pathways. One group of lymph vessels follow the inferior vesical artery to join the external iliac nodes, while another group drains posteriorly to the lateral sacral nodes, communicating freely with the lymphatics and the seminal vesicles and rectum and, eventually, with the common iliac nodal chain. Other lymphatic pathways involve the obturator nodes which in turn communicate with the hypogastric chain, hence to the external iliac-common iliac pathway. Yet another major pathway of lymphatic drainage from the prostate is via the perivesical nodes to the hypogastric chain. (Figure 5)

Pedal lymphangiography permits visualization of only the external iliac, common iliac, and para-aortic nodal drainage. The hypogastric, obturator, and sacral nodes are not visualized by this technique. In spite of the inability of lymphangiography to visualize the more proximal nodal drainage, this limitation of the technique was not significant in those patients who had positive nodes. Thus, in all ten patients in whom positive nodes were found, external and common iliac nodal involvement coexisted with involvement of obturator, sacral and

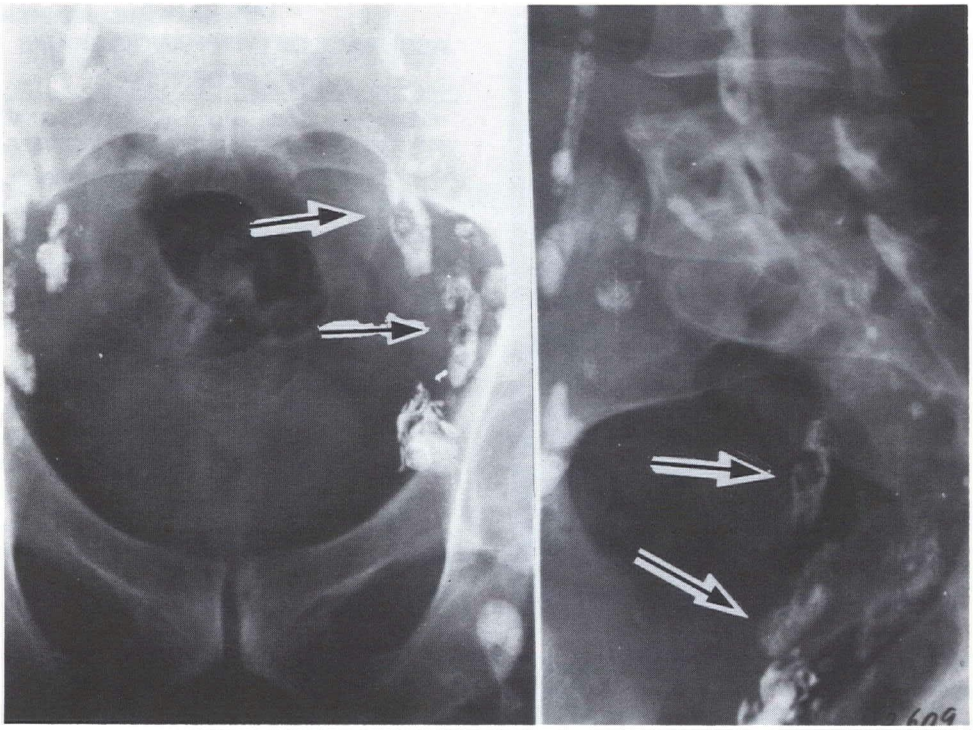

Figure 3.
Large, neoplastic filling defects in left external and common iliac nodes.

hypogastric nodes. Interestingly, in two other patients with iliac involvement, the more proximal nodal drainage was uninvolved. These finding suggest the ability of tumor cells to skip proximal lymphatic channels. Further, they show the apparent rapid movement of tumor into the external and common iliac chain after obturator, sacral or hypogastric dissemination has occurred. The frequency with which lymphatic spread of prostatic carcinoma occurs is underscored by the finding that 10 of 30 patients showed nodal involvement. These patients were presumed to have stage A or B carcinoma of the prostate, stages considered potentially correctable by radical surgery. This finding has been documented repeatedly.[2,3] Recently pedal lymphangiography has been considered essential prior to proposed radical external megavoltage radiotherapy.[4,5]

We are not yet prepared to conclude that the addition of radical lymphadenectomy to

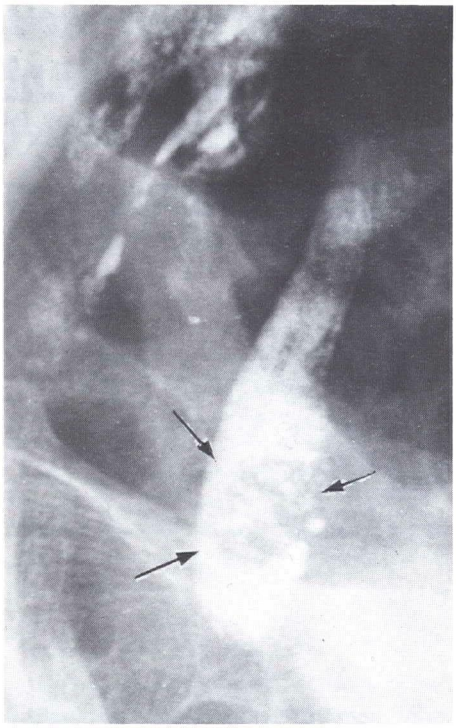

Figure 4.
Magnification film of right common iliac nodes clearly shows neoplastic filling defect.

radical retropubic prostatectomy enhances survival. However, nodal dissection, demonstration of the level of nodal involvement, and frozen section pathologic evaluation in the operating room allows the surgeon to make a more rational determination of candidates for radical prostatectomy, and its attendent significant morbidity. The preoperative lymphangiogram alerts the surgeon to the probability of nodal involvement, directs his attention to specific groups of nodes, and facilitates the dissection. Radiology films obtained on the operating table may reveal the adequacy of the node dissection.

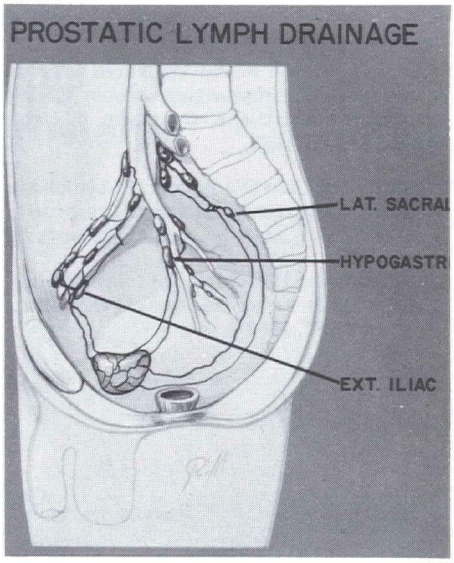

Figure 5

Despite the limitations of lymphangiography in opacifying the obturator, sacral and hypogastric lymph nodes, its 80% diagnostic accuracy establishes the technique as essential in determining the operability of a prostatic neoplasm, or in planning external megavoltage radiotherapy to the prostate and its lymphatic drainage.

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