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The utilization of a double gaseous contrast medium intra- and perivesically, combined with tomographic exposures of the pelvis, has disclosed such accurate images of bladder tumors that it should be used more often.

We believe that the ideal treatment for a well proven bladder carcinoma consists of radical excision of the bladder, followed by reconstruction of the bladder by means of an isolated segment of the sigmoid colon anastomosed to the urethra (Gil-Vernet), or a Bricker-type procedure. The importance of early diagnosis is still fundamental in the prognosis of patients with bladder tumors.

Sometimes the tumors are in such an advanced stage when first discovered that serious doubts arise as far as surgical indication is concerned. These doubts are not motivated by the feasibility of the surgical procedure in itself but by the prognosis. A good rule to follow in determining operability is the degree of infiltration that a tumor has reached; however, this is not easy to evaluate. We believe that our technique will help to better determine the degree of infiltration, as well as to give a volumetric estimation of the mass.

The tomography of a pelvis in which the perivesical space has been infiltrated by air, and in which the bladder itself contains air, will show a double gaseous medium between which the bladder wall will show neatly. Any intravesical growth, and of even more importance, any infiltration of the bladder wall or perivesical space, can be detected. In addition, the mental superimposition of tomographic films taken at different depth will give us a fairly accurate estimate of the volume (width, height and thickness) as well as infiltration of the tumor. The infiltration will be given because of the thickness of the bladder wall as well as the degree of peritoneal attachment at the level of the lesion. Of course, we cannot eliminate the possibility of inflammatory processes being responsible for it.

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TECHNIQUE

We have used air as a contrast medium. (Any other type of gas, O_2 or CO_2, can be used as well.) A long 7½ inch needle, connected to a 50 cc syringe through a rubber tubing, and a surgical clamp are the only instruments required. Previous local infiltration with an anesthetic is followed by introduction of the needle 2 cm. above the symphysis of the pubis in the midline. When the subcutaneous tissue is reached, the tip of the needle is further introduced beneath the symphysis, and as close to it as possible, into the perivesical space. After making sure that the lumen of a

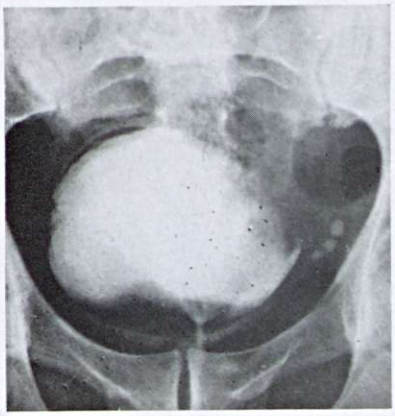

FIG. 1

vessel has not been entered, air (from 100 to 250 cc) is injected, gently, by means of intermittently clamping the connecting tubing while changing the syringe.

The procedure is painless. Upon withdrawal of the needle, the patient is catheterized and the bladder emptied of urine and gently filled with air, until the desire to void initiates. The catheter is then removed and the patient asked to retain the air.

All these procedures are done at the x-ray table and as many tomograms as necessary are taken. From our experience, it seems important to take them at least at three levels—9, 11 and 13 cm.

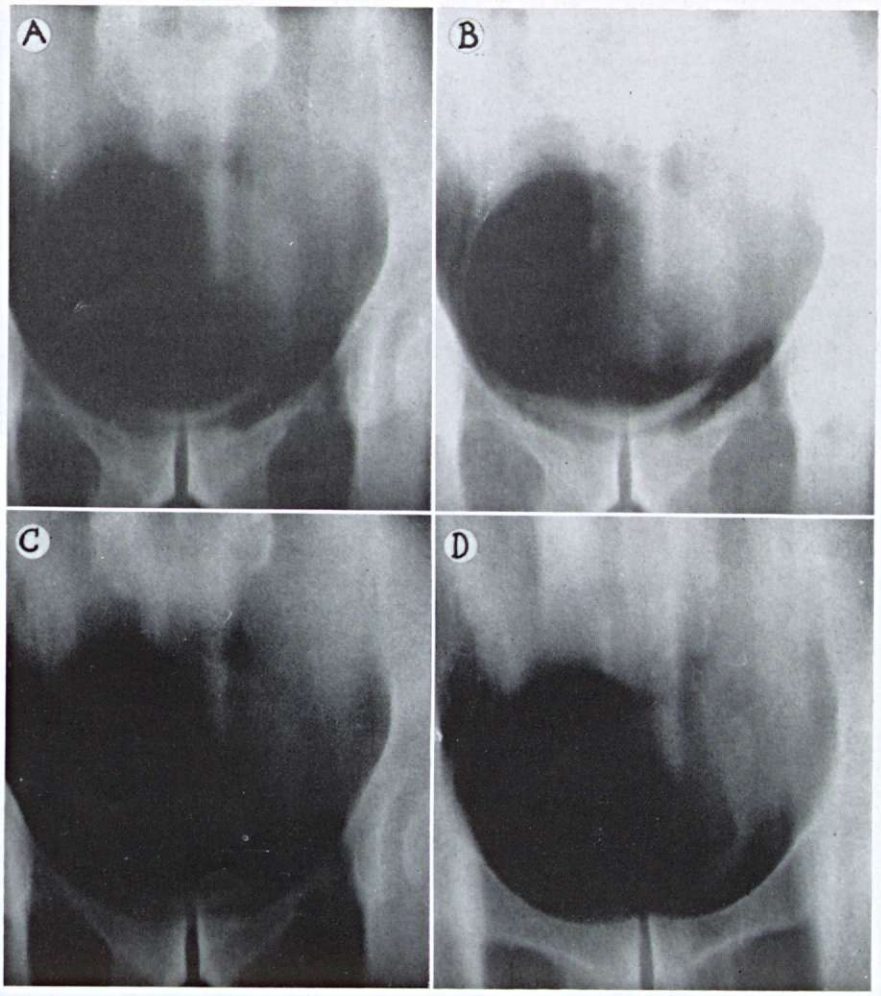

FIG. 2

COMPLICATIONS

We believe that the danger of using air as a contrast medium has been overemphasized. In only one patient was the perivesical infiltration with air followed by a right scrotal infiltration and this probably was due to lack of coalescence between the vaginal sheaths. It disappeared in a few hours.

OBSERVATIONS

There has been no selection of cases. All the patients who have been studied are presented here, except for one case done at Bellevue Hospital in New York City, of which films are not available at present.

Case 1. A cystogram (fig. 1) disclosed an irregular filling defect in the left side of the bladder. Tomograms taken at 8, 10 and 11 cm. (fig. 2, *A*, *B*, *C*) revealed a huge tumor filling the left half of the bladder and extending from the dome down to the trigone. The tumor also infiltrated the perivesical space. The peritoneum was attached to the bladder (the air displaced it on the right side but not on the left side). The tumor had a wide base; it was implanted in the left bladder wall and had an irregular surface.

In the tomogram taken at 13 cm. (fig. 2, *D*), the tumor began to diminish in size (situated dorsally in relation to this cut) and in spite of the fact that the peritrigonal space seemed to be free (infiltrated by air), the left half of the trigone

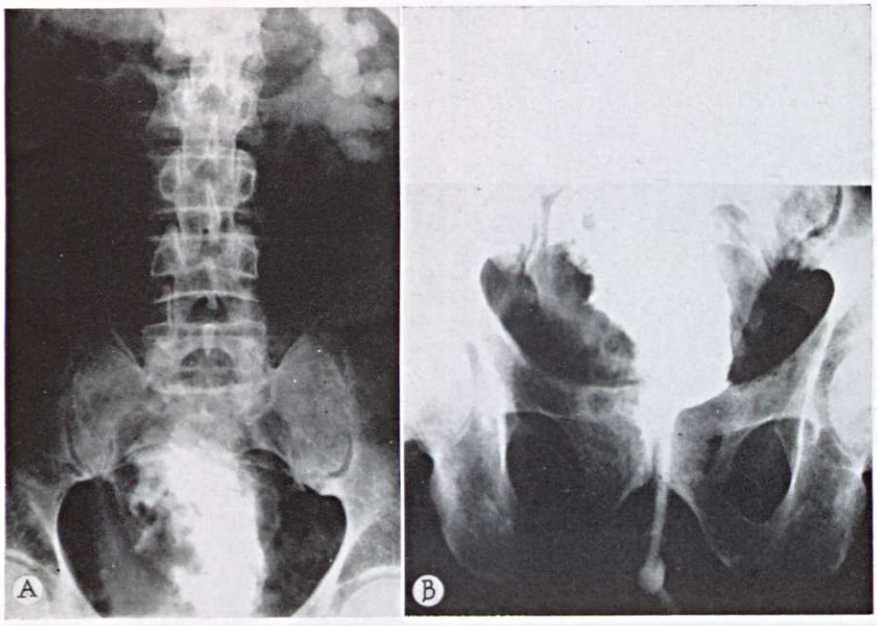

FIG. 3

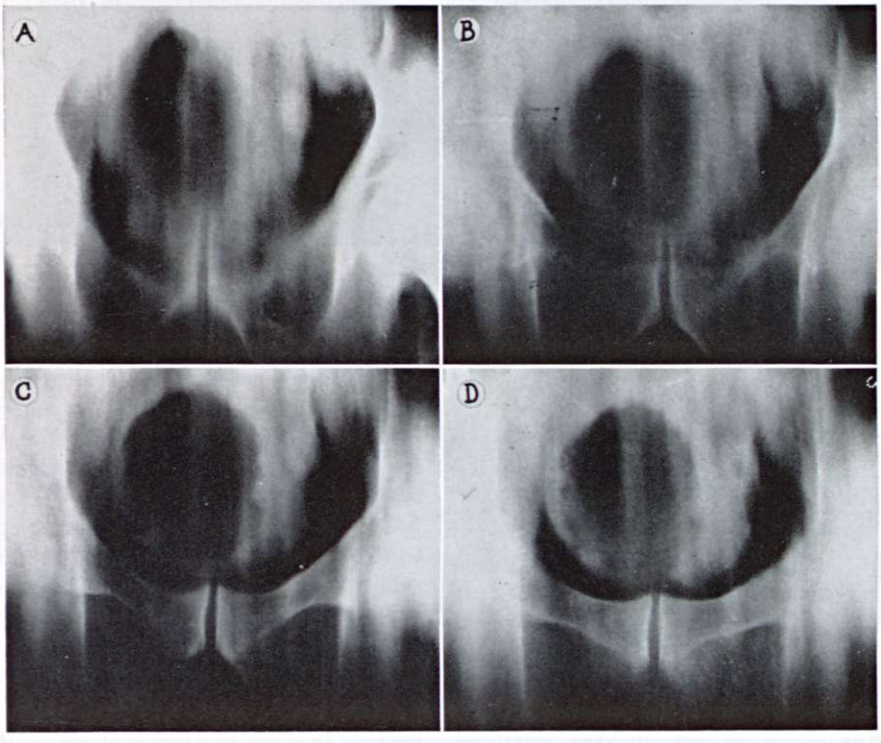

FIG. 4

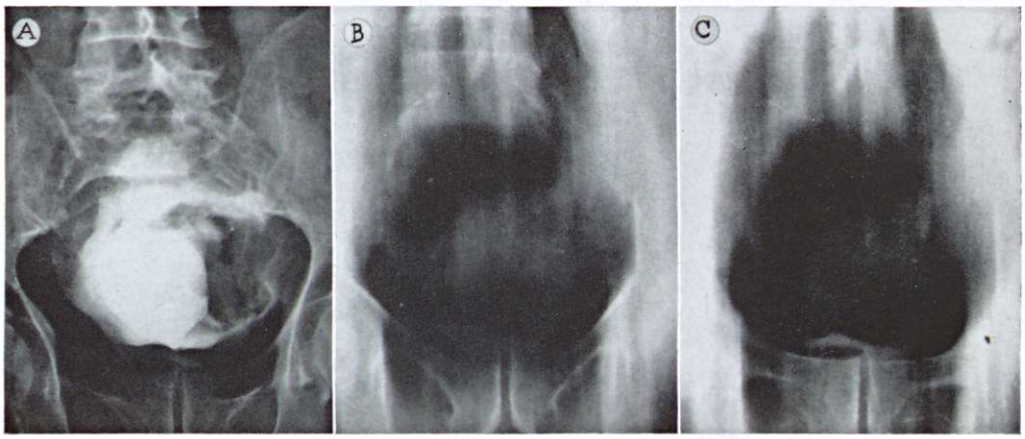

FIG. 5

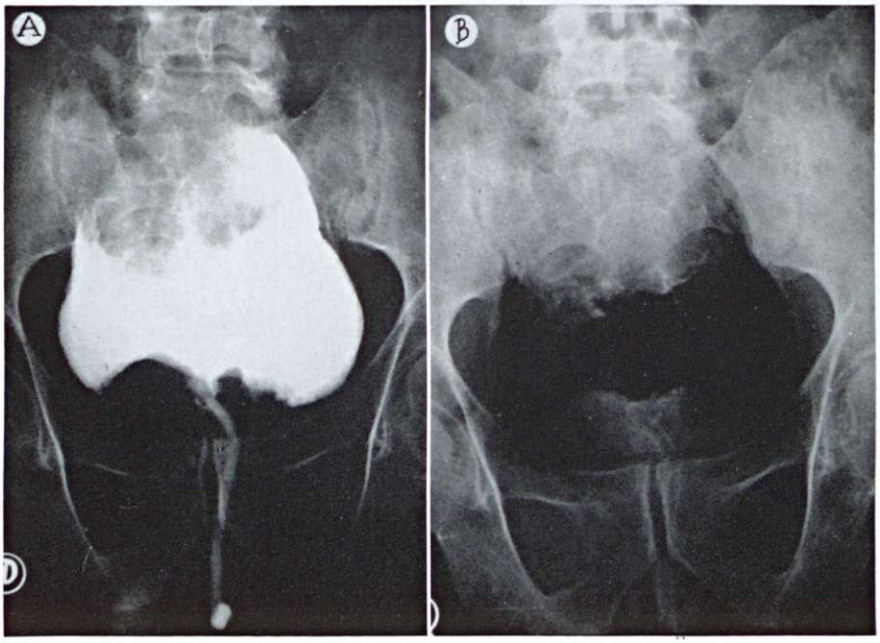

FIG. 6

was infiltrated and thicker than in previous tomograms.

Case 2. This is an advanced case. An excretory urogram (fig. 3, *A*) revealed non-function in the right kidney and a hydronephrotic left kidney. A cystogram (fig. 3, *B*) disclosed a large filling defect on the right side, as well as certain deformity and rigidity of the left side of the bladder wall.

Even in this advanced stage, tomograms revealed additional information. Those taken at 9, 10, 11 and 13 cm. (fig. 4, *A*, *B*, *C*, *D*) revealed the presence of peritrigonal infiltration (lack of air) at the 9 and 10 cm. level (fig. 4, *A* and *B*), but not at the 11 and 13 cm. level (fig. 4, *C* and *D*).

There is tumor arising from both bladder walls. In the left side the growth has a tendency to grow intravesically, while in the right side, the perito-

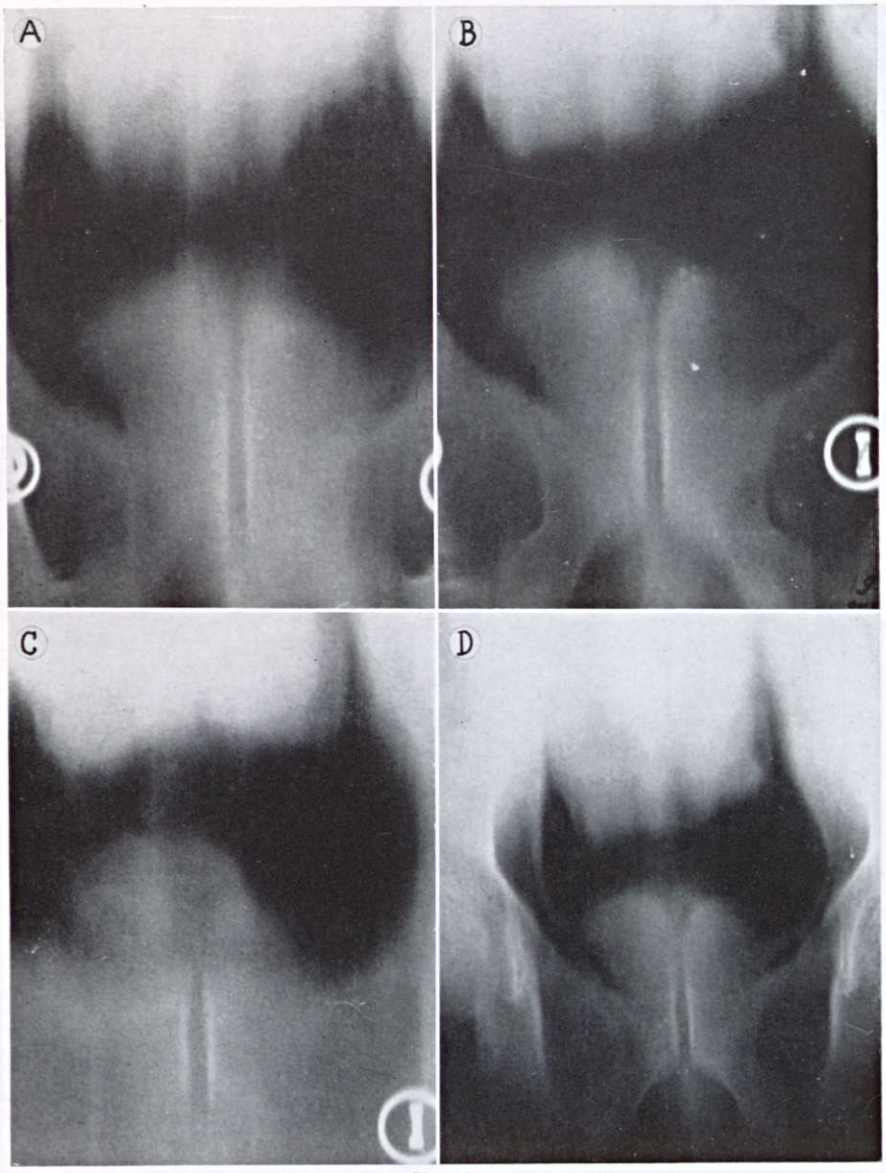

FIG. 7

neum is being infiltrated and attached to the bladder wall; the air cannot displace itself upwards.

Case 3. A cystogram (fig. 5, *A*), taken after the infiltration of air, revealed a filling defect on the left side of the bladder. The air can be seen extending much higher in the right side than in the left, where it stops at the lower third of the filling defect seemingly indicating the point where the tumor infiltrates the perivesical space. Tomograms taken at 10 and 12 cm. (fig. 5, *B* and *C*) confirmed this and revealed a huge intravesical tumor, probably pedunculated and arising from the upper part of the left wall.

Case 4. A cystogram (fig. 6, *A*), taken after perivesical infiltration, revealed two intravesical filling defects—a large one at the dome and a small one at the base (the latter resembling a prostatic adenoma).

A plain pneumocystogram (fig. 6, *B*) confirmed these findings.

Figure 7, *A*, *B*, *C* depicts tomographic close-up

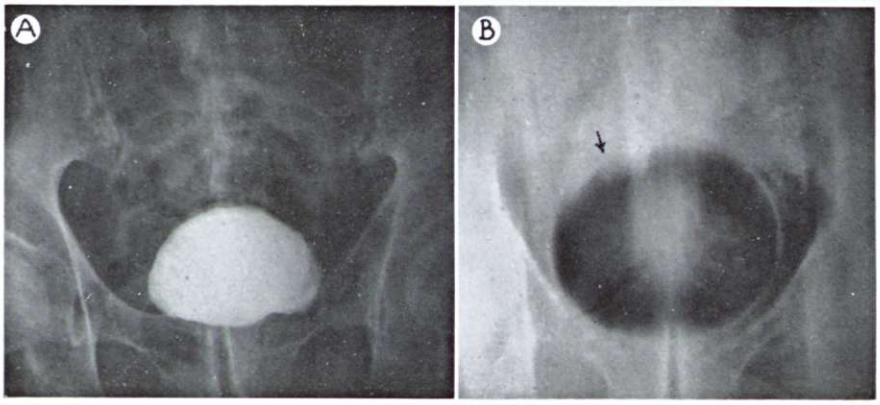

FIG. 8

views taken (at 8, 9 and 15 cm.) to study the tumor of the bladder neck. The tomograms revealed obvious infiltration of the peritrigonal space, caused by the "assumed" adenoma, and irregularity in the surface of this tumor.

Fig. 7, *D* is a tomogram (10 cm.) of the pelvis. It revealed the close relationship of both tumors (metastasis by contact on the dome of a primary tumor located at the bladder neck) and again, the infiltration of the peritrigonal space at the point where the tumor arises.

Case 5. A cystoscopic examination of this patient, who had complained of repeated episodes of hematuria, was negative. A cystogram (fig. 8, *A*) revealed a small bladder with smooth walls and no evidence of a filling defect. Figure 8, *B* is a tomogram, taken at 12 cm., in which the double gaseous contact discloses the presence of a small filling defect on the right side of the dome of the bladder, later proven to be carcinoma.

SUMMARY

Five cases of bladder tumors, studied by tomography, along with peri- and intravesical infiltration of air, have been reported. The importance of this method is based on the fact that the overlapping of dye in a spheric cavity (such as the bladder) hides many facts from the observer, while two-dimensional tomograms (using air as a contrast medium) are far more instructive—giving a volumetric appreciation of the tumor and an estimate of the degree of infiltration.

In one case a tumor, undetected by cystogram and cystoscopy, was revealed by this method.

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