
Radionuclide Venography in Pregnancy

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The role of radionuclide venography is demonstrated in the evaluation of inferior vena cava (IVC) and iliac vein obstruction during late pregnancy. Eight patients with a strong clinical suspicion of lower extremity venous disease underwent routine supine venogram during their third trimester of pregnancy. Because of abnormal image pattern, the study was repeated in either prone or lateral decubitus position. In two of the eight cases, the abnormal collateral veins were no longer visualized indicating functional obstruction of inferior vena cava by the gravid uterus. The remaining six cases continued to have similar image pattern suggesting true venous obstruction. Thus the modified radionuclide venogram is extremely useful in detecting major venous obstruction of IVC and iliac system during late pregnancy.

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Radionuclide venography (RNV) provides a non-traumatic and noninvasive way to investigate sites of thrombogenesis and occlusion in the venous system of the legs, pelvis, and the inferior vena cava (IVC). Understandably, because of radiation exposure, its use, as well as that of contrast venography in pregnant patients is not undertaken unless a high degree of suspicion of underlying pathology is present and the patient's condition warrants the study. The radiation dose to the fetus from RNV is ~50-60 mR and from contrast venography, it is about 20 to 30 times higher. This may, in part, account for the few references in the literature to radionuclide venography performed during pregnancy and the expected normal venographic variations which may be seen in this condition.

MATERIALS AND METHODS

This study is based on our experience in eight patients evaluated during their pregnancy. At the time of hospitalization all of them had a clinical diagnosis of venous occlusion involving the IVC or one or both common iliac veins. Prior to venogram, each patient was advised about possible risks from radiation exposure to herself and the fetus and they all agreed to undergo the procedure.

RNV was performed in supine position as described earlier (1). Because of abnormal venographic pattern in the abdomen and pelvis, this portion of the study was repeated in prone or lateral decubitus position. Sonographic examination was at-

tempted in two patients and it was successful in only one. One patient underwent contrast venogram. Five patients had concomitant pulmonary emboli; three of these were treated with anticoagulants while two underwent vena caval surgery.

CASE REPORTS

Table 1 gives a summary of clinical data and follow-up of all the cases. Two of these, one normal variant and one with true IVC obstruction, are presented here in detail.

Case 1

During her third month of pregnancy, a 24-yr-old woman had an episode of deep vein thrombosis of left femoral system diagnosed clinically and supported by radionuclide venography (Fig. 1). She was successfully treated with anticoagulant therapy. She returned, however, during the 26th week of pregnancy complaining of shortness of breath and chest pain. A RNV in the supine position, showed normalization of the left femoral venous system, but poor visualization of the IVC and the common iliac veins. In addition, the right common iliac vein was considered to be partially obstructed (Fig. 2A and B). When the study was repeated in prone position, the collateral veins in the pelvis and abdomen were no longer visualized. The IVC and iliac veins, nonetheless, continued to be poorly visualized and partial obstruction could not entirely be excluded (Fig. 2C and D). To rule out the possibility of a normal variation associated with pregnancy, sonographic examination was performed. With the patient supine, the superior half of the IVC was well visualized and found to be patent (Fig. 3A) but there was partial compression of its lower portion (Fig. 3B). The patient was then turned into a left lateral decubitus position, and a repeat examination was performed. It demonstrated relief of the previously noted compression of the IVC; the common iliac veins were also well visualized and did not contain thrombus (Fig. 3C and D).

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TABLE 1

Case no.	Age	Stage of pregnancy	Radionuclide venography		Sonogram	V/O	Follow-up
			Supine	Prone/lat dec*			
1 A	24 yr	10 wk	Abnormal Fig. 1	—	ND†	PE‡	Anticoagulant treatment with improvement
B	—	26 wk	Previous abnormal resolved. New abnormal. Fig. 2	Changing pattern	Normal Fig. 3	NI‡	No specific treatment
2	26 yr	34 wk	Abnormal. No iliac vein	Left lat dec normal Iliac vein well seen.	ND	ND	No specific therapy
3	37 yr	32 wk	Abnormal. Fig. 4	No change.	Inadequate	PE	Contrast venogram showing IVC obstruction; anticoagulant therapy
4	21 yr	30 wk	Abnormal	No change	ND	PE	IVC-ligation.
5	23 yr	24 wk	Iliofemoral obstruction	No change	ND	PE	IVC umbrella placement
6	22 yr	32 wk	Abnormal	No change	ND	PE	Anticoagulant treatment with improvement
7	24 yr	30 wk	Abnormal	No change	ND	PE	Anticoagulant treatment with improvement
8	20 yr	39 wk	Abnormal No IVC Abdominal and pelvic wall collateralization	Prone No IVC; paravertebral and pelvic collateralization	ND	ND	Anticoagulant treatment with improvement

* Lat dec: Lateral decubitus.
† ND: not done.
‡ NI: normal.
§ PE: Pulmonary embolism.

Case 2

A 37-yr-old obese female was admitted during 32nd week of pregnancy with bilateral pedal edema, more severe on the left side. Possibility of thrombophlebitis was entertained. The venogram of left lower extremity in supine and prone position

raised the possibility of IVC obstruction (Fig. 4). An ultrasound examination of abdomen and pelvis failed to visualize the IVC and iliac veins adequately due to her obesity. Because of patient's worsening condition, she was subjected to contrast venogram that confirmed partial obstruction of inferior vena cava.

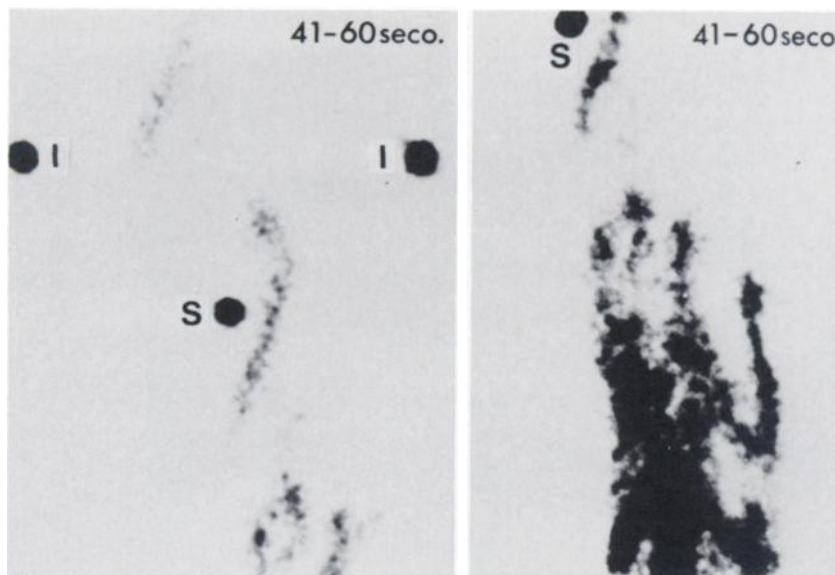


FIGURE 1
Case 1—10 wk pregnancy: Initial left lower extremity radionuclide venogram; obstruction to deep venous flow with marked collateral circulation in the left thigh (right) and pelvis (left). Markers are placed on iliac crests (I) and symphysis pubis (S).

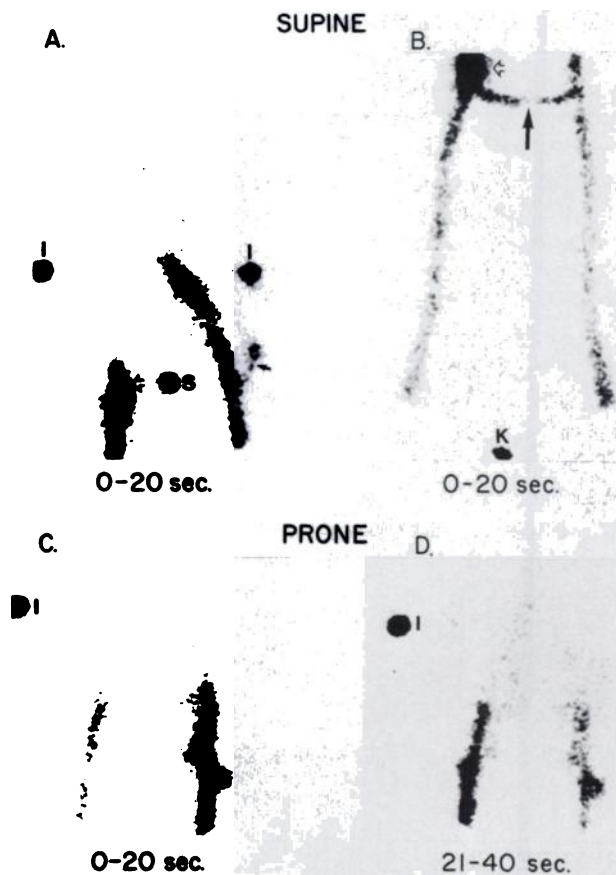


FIGURE 2
Case 1—26 wk pregnancy: Repeat supine venography of pelvis (A) and thighs (B); no tracer activity is seen in the IVC and there is faint visualization of paravertebral veins and left superficial abdominal vein (small solid arrow). Also left iliac vein appears to be partially occluded. Focal accumulation (open arrow) and delayed clearance of right common iliac venous activity suggests obstruction leading to filling of pelvic collateral veins (long solid arrow). This pattern does not persist when the study is repeated in prone position (C and D).

DISCUSSION

Dhekne et al. reported that in the absence of obstruction to the common iliac veins or IVC, ordinarily no significant tracer activity in collateral venous channels or reflux of flow into the internal iliac veins is noted on radionuclide venography (1). Earlier, Helander and Lindbom had also reported that during contrast venography, performed without Valsalva's maneuver, filling of the sacral and lumbar veins pointed to obstruction of the vena cava or the common iliac veins (2). It has long been known, however, that during pregnancy, pressure in the IVC increases secondary to the mechanical interference by the gravid uterus, and that this interference is greatest in the supine position. Indeed, Scott and Kerr reported that in the supine position, inferior vena caval pressure in advanced pregnancy is raised to a level comparable to that seen in nonpregnant women having complete caval occlusion (3). They found that even in the lateral position, the caval pressure is higher than normal. It is therefore, not surprising that alternate routes for venous return to the heart become more prominent during pregnancy and that collateral circulation would be noted in the abdomen and pelvis on venography without the presence of a true pathological process. Samuel also observed this phenomenon in a pregnant patient before Cesarean section who exhibited reflux of contrast material into the pelvic veins during intraoperative contrast venography—a finding which resolved when the uterus was held forward by traction and, therefore, clear of the IVC (4). Our first two cases showed that in the supine position, the pregnant uterus exerted sufficient extrinsic compression upon the ventral aspect of the IVC to cause significant narrowing, thus resulting in a greater blood flow through collateral veins and poor visualization of the IVC and common iliac veins. Also the

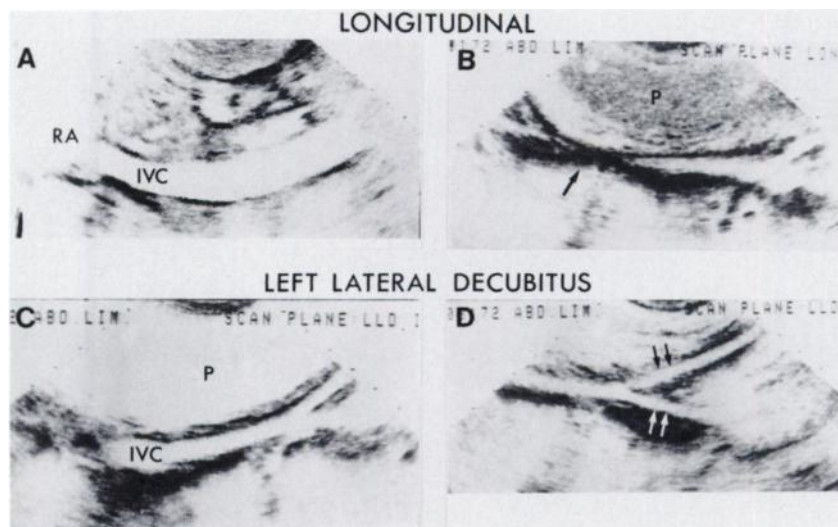


FIGURE 3
Case 1: Longitudinal scan with patient in supine position demonstrates patency of the upper portion of the IVC (A) and extrinsic compression of its lower portion by the gravid uterus (B). Repeat examination in left lateral decubitus position resolves the compression on IVC (C); common iliac veins (double arrows) are well visualized and free of thrombus (D). RA—right atrium; P—placenta.

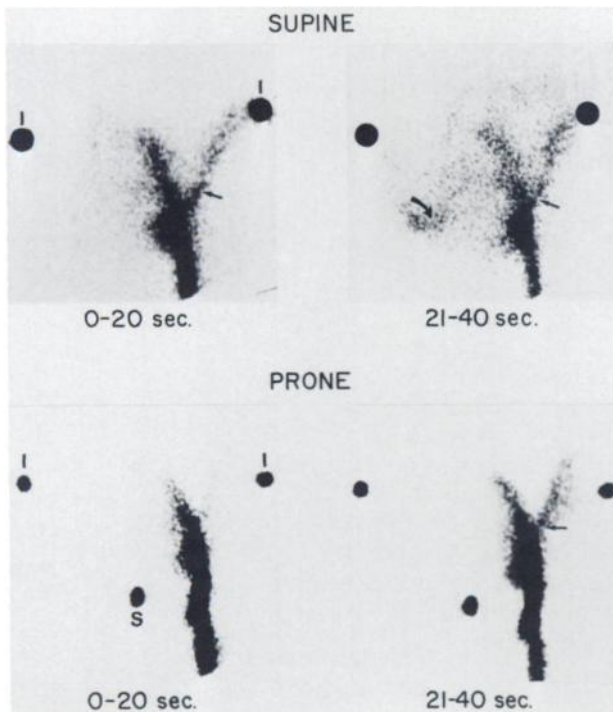


FIGURE 4

Case 2: Supine venogram of pelvic region following tracer injection in a left foot vein shows obstruction of common iliac vein and nonvisualization of IVC. There are collateral veins in the pelvis (curved arrow); in prone position, the pelvic collaterals are not identified but there is persistence of left iliofemoral venous activity (straight arrow).

appearance of these veins is shown to be dependent upon patient positioning. In the remaining six cases, however, the image pattern did not change with position. From our experience with these cases, it appears that the prone position in the pregnant patient may be better than routine supine position for imaging the

venous system of the abdomen and pelvis on radionuclide venography. Lateral or steep oblique positioning could also prove helpful in visualizing these venous structures especially when the patient can not assume prone position. The poor or nonvisualization of IVC per se is not a reliable feature since it may be related to attenuation of photons by overlying fetus. In the absence of true obstruction however, no collaterals should be visualized in the prone or lateral decubitus venogram.

The ultrasound examination plays a significant role in detection of thrombus in the IVC and common iliac veins. Unfortunately, the sonographic technique may not be adequate in visualizing these major veins because of the gravid uterus and other surrounding structures. When a pregnant patient's condition warrants investigation to rule out deep venous thrombosis of the lower extremities, the nuclear medicine radionuclide venogram is still the study of choice and it should include examination in prone or lateral decubitus position.

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