Inconsistent Venous Opacification: A Pitfall of Epidural Venography

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Inconsistent Venous Opacification: A Pitfall of Epidural Venography

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The lumbar epidural venograms of 45 consecutive patients with prior normal or equivocal myelographic examinations were reviewed. Each venographic injection was performed using transfemoral double-catheter technique, abdominal compression, Valsalva maneuver, and serial filming for 12 sec. There was a 30% incidence of false "occlusions" of epidural veins suggestive of compression by a herniated intervertebral disk. These false venous occlusions were demonstrated to be such by both subsequent opacification of previously nonopacified veins and lack of opacification of previously opacified veins during repeat venography. In view of the significant incidence of spurious venous occlusions in this series, it is recommended that epidural venography with single injection should be interpreted with caution except for normal studies.

Transfemoral lumbosacral epidural venography has been described as a simple angiographic procedure often requiring only a single injection and less than 30 min [1–2]. We completely agree with that description when a normal venous pattern is initially obtained after prompt catheterization of the appropriate veins.

It is generally agreed that the most reliable venographic sign of lumbar disk herniation is nonopacification of the anterior internal vertebral venous plexus secondary to compression by the adjacent herniated disk at a given level when the plexus is adequately opacified above and below that level. However, we have encountered numerous instances of inconstant nonopacification of segments of the lumbosacral epidural venous plexus that could be misinterpreted as clinically significant.

This report describes our experience with lumbosacral epidural venography, which has led us to believe that the simplistic view of epidural venography is unrealistic. This is because of unpredictable venographic hemodynamics and anatomical venous variations, which make catheterizations difficult even for very experienced angiographers. In addition, correct interpretation of venograms of satisfactory quality is often difficult when attempting to determine if the courses of opacified veins are abnormal.

Materials and Methods

The lumbosacral epidural venograms of 45 consecutive patients with prior normal or equivocal myelographic examinations were reviewed. Each venographic examination was performed using double-catheter technique, abdominal compression, Valsalva maneuver, 40 ml injections of Renografin-76 at 4–8 ml/sec, and serial filming during a 12 sec interval at 1 film/sec.

The initial contrast material was injected into one of four combinations of veins: (1) left ascending lumbar and right lateral sacral veins; (2) lateral sacral veins bilaterally; (3) left ascending lumbar and right internal iliac veins; or (4) left ascending lumbar and right common trunk of iliac and ascending lumbar veins. If a normal venous pattern was initially obtained, the examination was terminated at that point. However, if the anterior internal vertebral veins failed to opacify in the initial venographic series, repeat venography was

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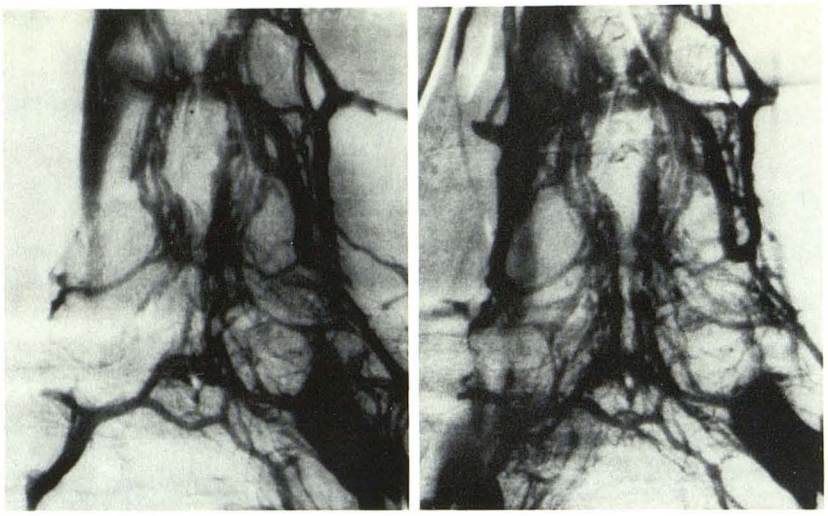

A B

Fig. 1.—**A**, Left ascending lumbar injection. Only partial opacification of right medial and lateral epidural veins at L5–S1 despite apparent satisfactory opacification above and below level. **B**, Left ascending lumbar–right lateral sacral injection. Much more extensive opacification of right medial and lateral epidural veins at L5–S1. Patient had left-sided symptoms. Case demonstrates comparison of single- and double-catheter techniques in same patient and was not included in statistics of this report.

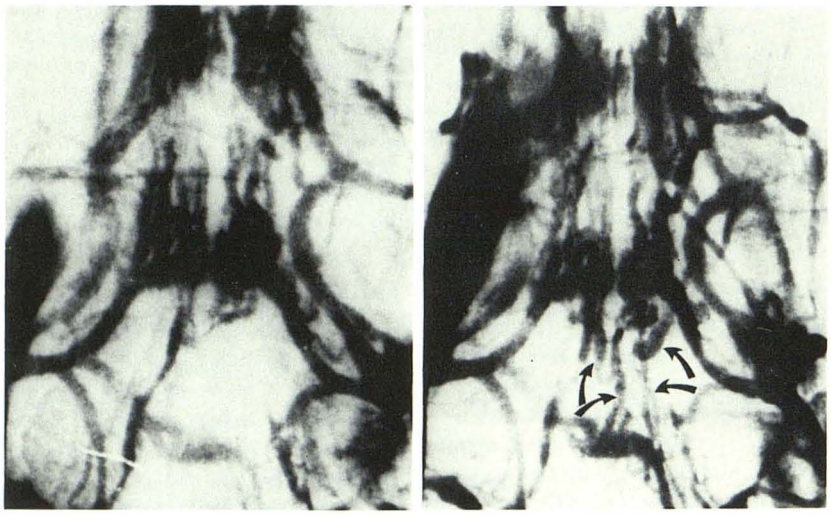

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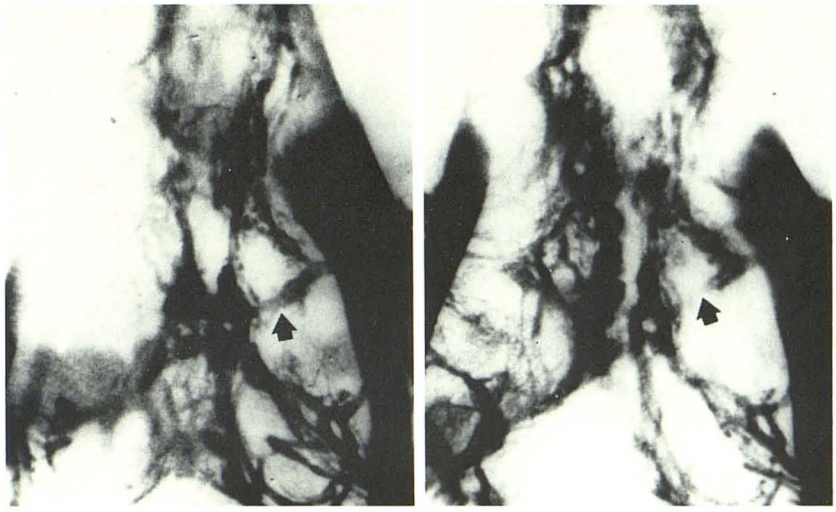
Fig. 2.—**A**, Left L5–S1 radicular–right internal iliac injection. Nonopacification of significant segments of medial epidural veins bilaterally at L5–S1. **B**, Second injection after moving catheter on right (but not on left) into right L5–S1 radicular vein. Extensive opacification of previously nonopacified veins (*arrows*). Patient had left-sided symptoms.

A B

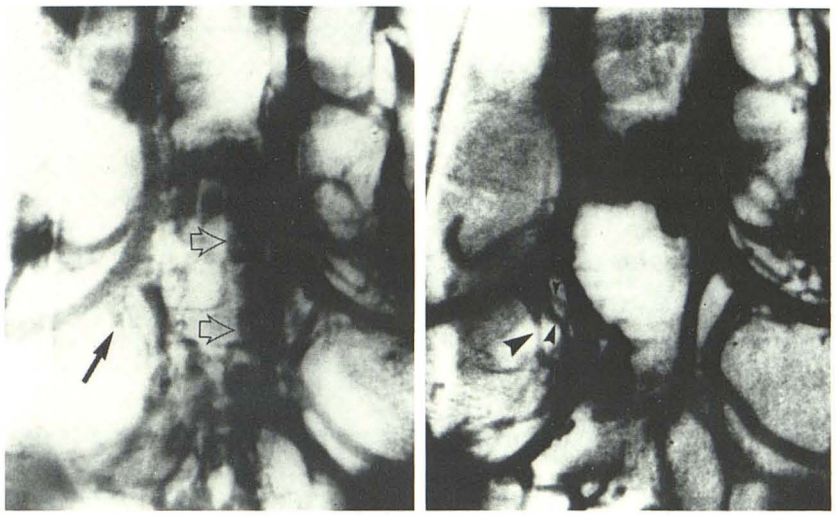
Fig. 3.—**A**, Bilateral lateral sacral vein injection. Nonopacification of inferior left lateral L5–S1 epidural veins and only partial opacification of right lateral L5–S1 epidural veins. **B**, Second injection after moving catheter on right (but not on left) into left ascending lumbar vein. Opacification of previously nonopacified inferior left lateral veins (*closed arrows*) and improved but incomplete opacification of inferior right lateral veins (*open arrows*). Surgery revealed right lateral disk herniation. Exploration of left side showed no significant abnormalities.

Fig. 4.—**A**, Left ascending lumbar–right internal iliac injection. Apparently complete opacification of left inferior lateral L5–S1 epidural vein (*arrow*). **B**, Second injection several minutes later after moving catheter on right (but not on left) into common trunk of right ascending lumbar and iliac veins. Apparent occlusion (*arrow*) of previously completely opacified left inferior lateral L5–S1 epidural vein. Patient had right-sided symptoms.



A B

Fig. 5.—**A**, Left ascending lumbar–right lateral sacral injection. Apparent occlusion of right lateral L4–L5 epidural veins (*closed arrow*) and excellent opacification of left medial L4–L5 epidural veins (*open arrows*). **B**, Second injection several minutes later after moving catheter on right (but not on left) into common trunk of right ascending lumbar and iliac veins. Opacification of right lateral L4–L5 epidural veins (*arrowheads*) not previously opacified, and nonopacification of previously opacified left medial L4–L5 epidural veins. Patient had left-sided symptoms.



A B

Fig. 6.—**A**, Anteroposterior left ascending lumbar–right internal iliac injection. Nonopacification of right medial and inferior lateral L5–S1 epidural veins. **B**, Right posterior oblique examination several minutes later without catheter manipulation. Opacification of previously nonopacified right medial (*curved arrows*) and inferior lateral (*straight arrow*) veins. Patient had left-sided symptoms.

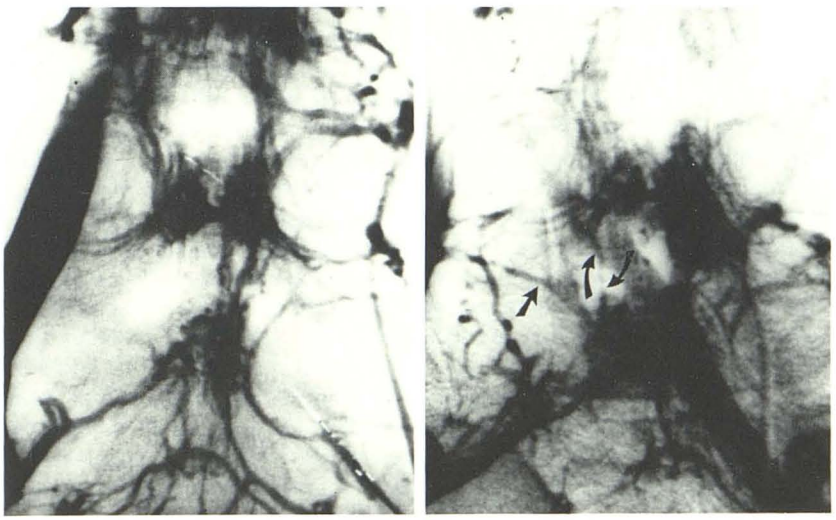


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TABLE 1: **Summary of Figures 1–6**

Figure	Left Catheter Position		Right Catheter Position		Nonopacified Epidural Veins	
	Initial Series	Later Series	Initial Series	Later Series	Initial Series	Later Series
1	ALV	Unchanged	None	LSV	R. L5–S1 medial and lateral	None
2	RV	Unchanged	IIV	RV	Medial L5–S1 bilaterally	None
3	R. LSV	L. ALV*	L. LSV	Unchanged	Lateral L5–S1 bilaterally	R. lateral L5–S1 (herniated R. disk at surgery)
4	ALV	Unchanged	IIV	I-ALV	R. L5–S1 lateral	L. L5–S1 inferolateral
5	ALV	Unchanged	LSV	I-ALV	R. L5–S1 lateral	L. L5–S1 medial
6	ALV	Unchanged†	IIV	Unchanged†	R. L5–S1 medial and lateral	None

Note.—R. = right; L. = left; ALV = ascending lumbar vein; I-ALV = common trunk of right iliac and ascending lumbar veins; IIV = internal iliac vein; LSV = lateral sacral vein; RV = radicular vein.

* Left catheter placed in left ascending lumbar vein for later series.

† Patient placed in right posterior oblique position without catheter manipulation.

TABLE 2: **False-Positive Rates of Epidural Venography in Surgical Series**

Year [Reference]	False-Positive Rate (%)	Catheter Technique
1968 [3]	7	Single
1971 [4]	11	Single
1974 [5]	3	Single
1976:		
[1]	1	Single
[6]	0	Single
[7]	6	Single
[8]	4	Single
[9]	2	Single
1977 [10]	0	Single
1978:		
[11]	4	Double
[12]	0*	Double
1979 [2]	0.3	Single

* See Discussion

performed usually after catheter manipulation or repositioning of the patient.

Results

Inconsistent opacification of anterior internal vertebral (epidural) veins was observed in 14 (31%) of 45 patients. Inconsistent opacification was confirmed both by subsequent opacification of previously nonopacified veins and lack of opacification of previously opacified veins on repeat injection. Repeat venography was usually performed by injection of one or more different veins, but occasionally by changing the position of one or both catheters in the same veins or by simply placing the patient in an oblique position without catheter manipulation. Several examples of inconsistent venous opacification are illustrated (figs. 1–6) and summarized in table 1.

Inconsistent opacification of epidural veins occurred least during simultaneous injections of lateral sacral veins bilaterally. However, bilateral catheterization of lateral sacral veins was often more difficult than other venous combinations.

Discussion

Various authors [1–12] have reported the accuracy of transfemoral lumbar epidural venography in the detection of herniated lumbar disks to be from 86%–99% with false-positive rates usually from 0–4% (table 2). However, with a few exceptions [8, 11, 12] critical analysis of their data cannot be made.

Houtteville [12], in comparing venographic and surgical findings in a group of 100 patients, claimed a 99% correlation although further analysis revealed an 83%–85% rate. In six patients with apparent venographic occlusions at more than one level, surgical exploration demonstrated normal disks at one of the venographically abnormal levels. In two other patients with similar venographic findings, surgical exploration was believed to be unnecessary because clinical findings made herniation at the additional levels unlikely. There were eight other patients with apparent venographic occlusions which at surgery were found to have soft, nonbulging, degenerated disks. However, unless one hypothesizes that soft, nonbulging disks lead to increased vasomotor tone of the overlying epidural veins with resultant apparent venographic occlusion, then these eight patients likewise had false-positive venograms. Therefore, 14% probably had false venous occlusions based on surgical findings alone and 16% based on surgical and clinical findings combined.

In a group of 45 consecutive patients with 38 normal and seven equivocal myelographic examinations, we have encountered an incidence of false occlusions or inconsistent opacification of epidural veins of about 30% using transfemoral double-catheter technique combined with abdominal compression and Valsalva maneuver. Admittedly, our false occlusion rate may be artificially high because our patients all had either normal or equivocal myelograms. Inclusion of patients with unequivocally abnormal myelograms may have lowered this rate, but this group of patients is not usually subjected to venography.

In view of the frequency of demonstrable false venous occlusions of anterior internal vertebral veins in the pres-

ence of apparent satisfactory opacification above and below the level of spurious occlusion, we recommend that "abnormal" examinations be interpreted with caution. This is particularly true because, disregarding radicular and segmental lumbar tributaries to the ascending lumbar veins, there are 28 combinations of pairs of veins to be selected from one ascending lumbar, one internal iliac, and two lateral sacral veins bilaterally. In view of the multiple potential sources from which nonopacified blood may enter the epidural venous plexus during venography, it is not surprising that inconsistent opacification occurs relatively often.

Lumbar epidural venography and myelography are complementary procedures; neither alone is an indisputable procedure of choice. However, we believe that due to the greater versatility of myelography, it probably should be the initial neuroradiologic procedure used in evaluating patients suspected of lumbar disk disease. Epidural venography is superior to myelography in the detection of laterally positioned (beyond the lateral margins of the subarachnoid space) herniated disks (fig. 3) at the usual sites of lumbar disk herniation (L4–L5, L5–S1) and of medial disk herniations at L5–S1. However, myelography is superior to venography in the detection of central herniations at L4–L5 and intradural lesions at all levels. Other factors favoring myelography over venography as an initial procedure are: (1) myelography is more cost-effective than venography [13]; and (2) myelography usually requires less skill and experience on the part of the examiner for satisfactory performance and interpretation than venography.

In summary, we believe that transfemoral lumbosacral epidural venography is a useful complement to myelography. However, due to the variable hemodynamics of epidural veins, similar to other veins (i.e., venographic nonopacification of veins does not necessarily indicate venous occlusion), we believe that interpretation of "abnormal" epidural venograms should be made with caution. The diagnosis of "occlusion" of lumbar epidural veins should be made only after at least two and probably three venographic series, using appropriate different combinations of double-catheter examinations, fail to demonstrate opacification. Even then the diagnosis should be made with reservations, especially when apparent occlusions are noted at asymptomatic levels.

Editor's Note

Computed tomography of the lumbar spine with and without coronal and sagittal reformatting is slowly becoming the initial procedure of choice to evaluate a patient suspected of having a herniated intervertebral disk.

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