PANTOPAQUE INTRAVASATION (EMBOLIZATION) DURING MYELOGRAPHY

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Hinkel⁴ first noted and described the phenomenon of intravasation of Pantopaque during myelography in 1945. His was the unique experience of fluoroscopically watching the contrast medium disappearing spontaneously from the spinal canal. “As the patient coughed, I saw a marked and bizarre change in the pantopaque column. It appeared to extend in all directions like a star-burst. The original subarachnoid oil column shrank rapidly, and branching, slender finger-like columns of oil were seen extending to the right, the left, caudad and cephalad from it. Within fifteen seconds no oil could be seen in the subarachnoid space and a broad oil column was seen forming to the right of the lumbar spine. It was at once realized that the oil had entered the venous system.”

Four years later in 1949 Fullenlove⁵ similarly witnessed the rapid disappearance of the contrast medium: “The pantopaque was seen to leave the spinal canal through the venous plexus in the area, and within three minutes the greater part was gone.”

Steinbach and Hill⁶ in 1951 reported a case in which 7.5 ml. of Pantopaque was left in the spinal canal when efforts to remove it were discontinued because of gross bleeding at the site of puncture. Subsequently intrathoracic distress developed and roentgenograms of the chest revealed the presence of “multiple small, fine, reticular densities . . . ” in both lungs, interpreted as Pantopaque emboli. In the subsequent discussion, it is inferred that all of the contrast medium had disappeared from the spinal canal. A similar case⁷ has been seen at the same institution since publication of the original paper; the details of the later experience are not as yet available.

More recently, Ginsburg and Skorneck⁸ reported another instance of embolization in the lung visualized roentgenographically, following intravasation.

We believe that intravasation of Pantopaque during myelography is more common than the paucity of reported cases would seem to indicate.

CASE REPORT

A 47-year-old white man was admitted to the hospital on July 6, 1955, complaining of low-back pain with radiation down the posterior aspect of the right leg, numbness about the rectum, and loss of sexual power. He gave a history of having had two low-back operations within 3 days in 1941 for pain in the back and leg. Following the operations, right foot-drop was present and the pain persisted essentially unchanged. In October, 1954, there was spontaneous development of numbness about the rectum, impotence, and difficulty in initiating micturition. The above symptoms persisted without progression or remission.

Examination. There was marked weakness of dorsiflexion and plantar flexion of the right foot with atrophy of the calf and anterior tibial muscle groups. The right Achilles reflex was absent. Slight saddle hypesthesia and hypesthesia were present and there was more pronounced sensory loss over the anterolateral aspect of the right leg below the knee, extending over the dorsum of the foot. Straight leg raising was not limited and the Naffziger test was negative.

A lumbar puncture done at the L5 interspace showed normal dynamics, and cerebrospinal
fluid studies revealed no cells, a very faint trace of globulin and a slightly elevated protein of 69 mg per 100 ml.

Roentgenograms of the lumbar spine revealed a transitional 1st sacral vertebra and evidence of a previous laminectomy with posterior fusion of L4 to S1.

Myelography. It was learned from the previous surgeon that a Thorotrast myelogram had preceded the operations in 1941. The contrast medium was reported to have been completely retrieved at the end of the procedure and none was demonstrable on the above-described films.

On July 7, 1955, lumbar myelography was performed. The introduction of the needle was atraumatic. A few milliliters of clear fluid were withdrawn and 9 ml of Pantopaque were injected with the patient on his left side. He was then turned to a prone position and tilted head-down to move the contrast medium into the upper lumbar region. This area appeared to be normal and an anteroposterior spot film was taken. The column of oil was then returned to the lower lumbar area where a defect appeared fluoroscopically at the 4th lumbar interspace on the left, below which a pronounced narrowing of the sac was noted. Anteroposterior and oblique spot films were made. At this point the patient complained of "a tickle in my chest," and an irritative cough developed, but otherwise he seemed to be tolerating the examination well. When the patient was tilted to the upright position, it was noted by fluoroscopy that the amount of contrast medium had greatly decreased and the remainder was progressively disappearing. Successive films were taken rapidly to record this phenomenon until only approximately 4 ml of Pantopaque remained. The spinal needle was withdrawn and a roentgenogram of the chest was made.

![Image](image_url)

**Fig. 1.** Column of Pantopaque as it appeared when loss of volume was first recognized under fluoroscopy.
Course. The fundi were inspected in the event that small emboli might have filtered through the lung barriers and have reached the retinal vessels, but these examinations were negative. The patient continued to complain of mild tickling in the chest for several hours thereafter, but during this period the coughing subsided and no abnormal auscultatory signs were found. His temperature rose to 100.6°F. in the afternoons of the next 2 days—aside from this there were no subsequent signs or symptoms referable to the unusual episode.

When the films were reviewed in chronological order, successively smaller amounts of Pantopaque were demonstrated until the meniscus reached the level of the tip of the spinal needle where the shrinkage of the column ceased. A lateral roentgenogram clearly incriminated the forwardly displaced needle as the *modus operandi* for the escape of the opaque medium into the anterior internal venous plexus, and in all films, multilinear rivulets of medium were visualized streaming away from the spinal canal along the distribution of the lateral sacral and pelvic veins.

Roentgenograms of the chest taken at the time of the myelogram, 3 hours later, and periodically thereafter, were negative for emboli. A general roentgenological survey of the body done the following day was unremarkable except for films of the skull, in which numerous faint linear streakings suggested an intracranial venous distribution of contrast medium.

A program of conservative management of the presenting symptoms was initiated but this proved ineffective.

Operation. On July 20 a lumbar laminectomy was performed. Dense arachnoid and dural thickening and adhesions were found involving the cauda equina and emerging nerve roots of

![Fig. 2. Film made seconds after that shown in Fig. 1, demonstrating venous pathways of evacuation.](image)
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Fig. 3. Intravasation almost completed at level of spinal needle, illustrating the escape of contrast medium into the anterior internal venous plexus.

the lower lumbar and sacral spine. No effort was made to decompress or dissect out these incarcerated structures.

Course. Recovery from operation was uneventful and the patient was discharged essentially unimproved 22 days after admission.

DISCUSSION

Previous authors have described and demonstrated the venous pathways of intravasated Pantopaque as it escaped along the intervertebral veins to enter the lumbar and lateral sacral veins, eventually to collect in the inferior vena cava in accordance with our present knowledge of normal venous drainage from the lower spinal canal. Ginsburg and Skorneck first presented roentgenological evidence revealing the actual passage of contrast medium into the venous channels, which in their case were the basivertebral veins. Fig. 3 is offered as evidence that in our case the Pantopaque passed from the subarachnoid space into the anterior epidural venous plexus along the forwardly displaced venipuncturing spinal needle.

Figs. 1 to 3 record the progressive dissemination of the opaque material which occurred in a matter of seconds.

Roentgenograms of the skull taken the day after myelography demonstrate numerous faint linear streakings suggesting that the material is in the veins rather
than in the subarachnoid spaces. It is postulated that this might represent a cephalad migration of the contrast medium along intraspinal venous pathways as advocated by Batson. Continuous coughing may have effected rapid changes in intrathecal and venous pressures resulting in a cephalad surge of the dye along the network of venous plexuses, with ultimate ascension into the intracranial venous system. It is not clear why residual contrast medium could be visualized roentgenographically 24 hours later. No intracranial symptoms were elicited and, unfortunately, no subsequent roentgenograms of the skull were taken, so this supposition remains unsubstantiated. We are unable to present roentgen confirmation of Pantopaque embolization in the lungs.

CONCLUSIONS

Although venous intravasation of contrast media from the subarachnoid space during myelography has been described on only 6 occasions, it is likely that the actual incidence may be greater. The epidural space is occupied by a rich network of intercommunicating venous plexuses, and it has been well established that pressure within these veins is considerably less than that within the spinal fluid sac under normal circumstances. The evacuation of the contents of the intrathecal space into the venous system has been remarkably demonstrated roentgenographically by several investigators. It is reasonable to suppose that this is a not infrequent occurrence during the routine postmyelographic removal of contrast medium, as these efforts are often associated with variable amounts of trauma and obvious distress to the patients. The experience may be attended by immediate symptomatology, a delayed reaction, or no clinical evidence of abnormality. The potential for serious sequelae is unknown as recorded experience is hardly sufficient for significant conclusions in this respect. Symptoms and clinical manifestations were transitory in all published cases.

In those instances in which there is an apparent discrepancy between amounts of medium injected and withdrawn, or when an irritative cough, mild distress of the chest, and associated febrile reaction attend or follow myelography, especially in the presence of a bloody tap, intravasation is suggested as a reasonable explanation.

REFERENCES

5. Steinbach, H. L. Personal communication.