

## CASE REPORTS

Anesthesiology  
83:632-635, 1995  
© 1995 American Society of Anesthesiologists, Inc.  
Lippincott-Raven Publishers

## Aortic Dissection as a Complication of Celiac Plexus Block

Ronald Kaplan, M.D.,\* Bereket Schiff-Keren, M.D.,† Elaine Alt, M.D.‡

CELIAC plexus block is a useful technique for control of pain from intraabdominal cancer.<sup>1,2</sup> We describe a patient who experienced a fatal complication while undergoing celiac plexus block *via* the transaortic approach.

### Case Report

A 52-yr-old man was evaluated for intractable abdominal pain secondary to unresectable gastric carcinoma involving the greater and lesser curvatures of the stomach. Two months before our evaluation, a gastroscopy revealed a bulky carcinoma. A computed tomography (CT) scan demonstrated the tumor to be locally invasive. His history was significant for allergy to contrast media, which produced an anaphylactic response.

The patient underwent a celiac plexus block while in the prone position. A 15-cm, 20-G block needle was directed from the patient's left side and positioned, with the aid of fluoroscopy, until the tip was anterior to the first lumbar vertebra. Transaortic needle placement was performed as described by Ischia *et al.*<sup>3</sup> with verification of passage through the anterior aortic wall as described by Feldstein *et al.*<sup>4</sup> Complete relief of his pain was attained after injecting 40 ml 0.5% lidocaine, using intermittent aspiration. Injection of an equal volume of absolute alcohol was planned with the same intermittent aspiration. After approximately 30 ml of alcohol was injected, blood was aspirated. The needle was advanced to reposition it anterior to the aorta. When pressure was exerted on the plunger of the syringe, the patient suddenly complained of generalized body pain, and aspiration again produced blood return. The procedure was aborted, and the patient

was turned supine and treated with morphine for his pain, which gradually subsided over about 15 min. There was no evidence of peripheral vascular insufficiency; the patient voided about 45 min later, and a bowel movement occurred about 2.5 h later. Vital signs remained normal, and his abdomen was soft, nontender, and pain-free until 4 h after the injection, when he complained of abdominal pain, which became severe and excruciating over the next 24 h. His temperature increased to 38.5°C, and his abdomen became distended.

A noncontrast CT scan revealed gastric tumor extending throughout the central abdomen, emphysematous cholecystitis, and pneumatosis intestinales and/or gangrenous bowel. An emergency exploratory laparotomy revealed emphysematous cholecystitis, infarct of the entire duodenum and 0.91 m of proximal jejunum, purulent ascites, and thrombosed mesenteric veins. Mesenteric and hepatic arterial pulsations were described as present and good. Surgical resection was not possible. Postoperatively, mechanical ventilation was maintained, along with a morphine infusion of 50 mg/h, until his death on the 4th postoperative day.

A postmortem examination confirmed the presence of an infiltrating adenocarcinoma of the stomach and multifocal intraabdominal ischemic injury. Examination of the anterior aortic intima between the origins of the superior mesenteric and celiac arteries revealed a puncture mark consistent with needle penetration. This lesion was continuous with intramural dissection of blood in a small portion of aorta and the proximal superior mesenteric and hepatic arteries. The hepatic artery dissection was associated with thrombosis (figs. 1 and 2). The presence of dissection and vascular thrombosis in these areas resulted in bowel and liver infarction.

### Discussion

The incidence of major complications from neurolytic celiac plexus block was determined by Davies.<sup>5</sup> In 2,730 neurolytic blocks performed from 1986 to 1990, the overall incidence of major complications (paraplegia, bladder and bowel dysfunction) was 1 per 683 procedures. The report did not indicate the block techniques.

Transcrural<sup>6,7</sup> and transaortic<sup>3</sup> techniques were developed to minimize the neurologic complications occasionally reported with the retrocrural approach. Singler<sup>6</sup> and Hilgier and Rykowski<sup>7</sup> reported using the transcrural approach in 41 patients, with transient diarrhea as a side effect in some patients. In 148 patients reported to have received the transaortic approach,<sup>3,4,8</sup> transient orthostatic hypotension and diarrhea were reported as the main side effects in some. If the incidence

\* Associate Professor of Anesthesiology, Albert Einstein College of Medicine; Attending Anesthesiologist, Montefiore Medical Center, Bronx, New York.

† Director, Macobi Pain Clinic; Senior Anesthesiologist, Tel-Aviv Medical Center, Tel-Aviv, Israel.

‡ Assistant Professor of Pathology, Albert Einstein College of Medicine; Attending Pathologist, Hospital of the Albert Einstein College of Medicine, Bronx, New York.

Received from the Albert Einstein College of Medicine and Montefiore Medical Center, Bronx, New York. Submitted for publication December 2, 1994. Accepted for publication May 2, 1995.

Address correspondence to Dr. Kaplan: Department of Anesthesiology, Montefiore Medical Center, 111 East 210th Street, Bronx, New York 10467-2490.

Key words: Anesthetic techniques: celiac plexus block. Complications: aortic dissection. Pain: chronic.

## CASE REPORTS

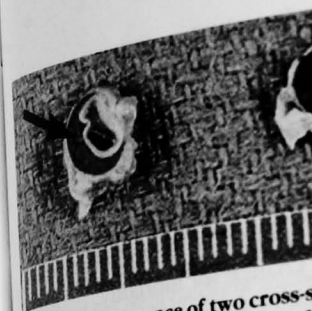


Fig. 1. Gross appearance of two cross-sections of the aorta showing intramural dissection of blood and a thrombus occluding approximately 50% of the lumen.

reported by Davies<sup>5</sup> is reproduced in these articles may be techniques are free from major complications. For example, Matson *et al.*<sup>9</sup> reported paraplegia after a transaortic neurolytic block. Only one other case of aortic plexus block has been reported. The procedure was not described. The patient died of pain from chronic pancreatitis. A pseudoaneurysm resulting from a thoracoabdominal aortic aneurysm was successfully repaired surgically through a thoracoabdominal approach.

The event leading to the dissection was movement of the needle tip from anterior to the aorta to within the lumen. The subsequent attempt to reposition the needle created the tear noted at the aortic intima. The injection of alcohol into the lumen may have contributed to local tissue damage. The blood, under pressure in the aorta, dissected. In addition, the total volume of alcohol injected by the patient may have been more than 1 ml of alcohol was aspirated, intraluminal alcohol was injected into the mesenteric and hepatic arteries. The dissection occurred but seems unlikely in view of the fact that the mesenteric and hepatic arteries were likely transmitted sensation. The reason for movement of the needle was secured in position anterior to the aorta to within the lumen. Forty milliliters of local anesthetic was injected to obtain relief, and anatomic dissection was well as this volume of injection. The position of the needle tip relative to the aorta was not known that the patient may have been

## CASE REPORTS

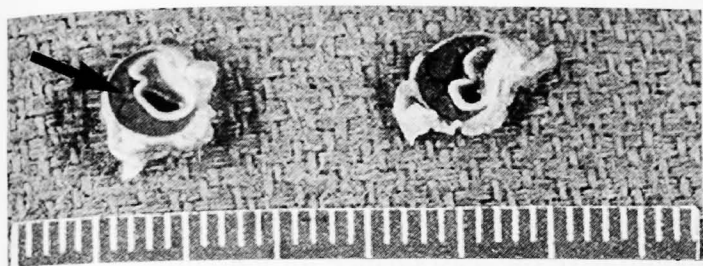


Fig. 1. Gross appearance of two cross-sections of hepatic artery showing intramedial dissection of blood (arrow) and a thrombus occluding approximately 50% of the lumen.

reported by Davies<sup>5</sup> is reproducible, the number of patients from these articles may be too low to say these techniques are free from major side effects. For example, Matson *et al.*<sup>9</sup> reported a potentially fatal dehydration from diarrhea, and Traycoff *et al.*<sup>10</sup> described paraplegia after a transaortic neurolytic block.

Only one other case of aortic injury from celiac plexus block has been reported.<sup>11</sup> The block technique was not described. The procedure was performed for pain from chronic pancreatitis. In this case, a traumatic pseudoaneurysm resulting from the procedure was successfully repaired surgically using a Dacron graft through a thoracoabdominal approach.

The event leading to the dissection in our case was movement of the needle tip from its original position anterior to the aorta to within the aorta and the subsequent attempt to reposition it. Either may have created the tear noted at the autopsy, permitting some injection of alcohol into the lumen. The alcohol may have contributed to local tissue damage/necrosis, and blood, under pressure in the aorta, completed the dissection. In addition, the total body pain experienced by the patient may have been secondary to some intraarterial injection of alcohol. As increments of no more than 1 ml of alcohol were injected before each aspiration, intraluminal alcohol injection leading to mesenteric and hepatic artery thrombosis was considered but seems unlikely in view of the autopsy findings. The mesenteric and hepatic pulses noted at surgery were likely transmitted sensations from the aorta.

The reason for movement of the needle tip from anterior to the aorta to within its lumen is uncertain, as the needle was secured in position during the injection. Forty milliliters of local anesthetic was required to obtain relief, and anatomic distortion from the tumor as well as this volume of injectate may have shifted the needle tip relative to the aorta. Another possibility is that the patient may have breathed more deeply. We

have noted movement of the needle tip associated with respiratory excursions during somatic paravertebral blocks under fluoroscopy, even when the needle shaft remained protruding the same distance from the skin. If this occurred in our case, the tip of the needle may have moved from its preaortic placement to within the aortic lumen or wall.

An argument might be raised that the use of CT imaging would have prevented this complication. This seems unlikely: radiographic contrast material could not be used because of the patient's allergy; the event occurred after successful completion of local anesthetic injection and near the end of the alcohol injection, when CT would not be in use; and fluoroscopy showed the needle to be in the appropriate location, which was verified by the location of the aortic tear found at

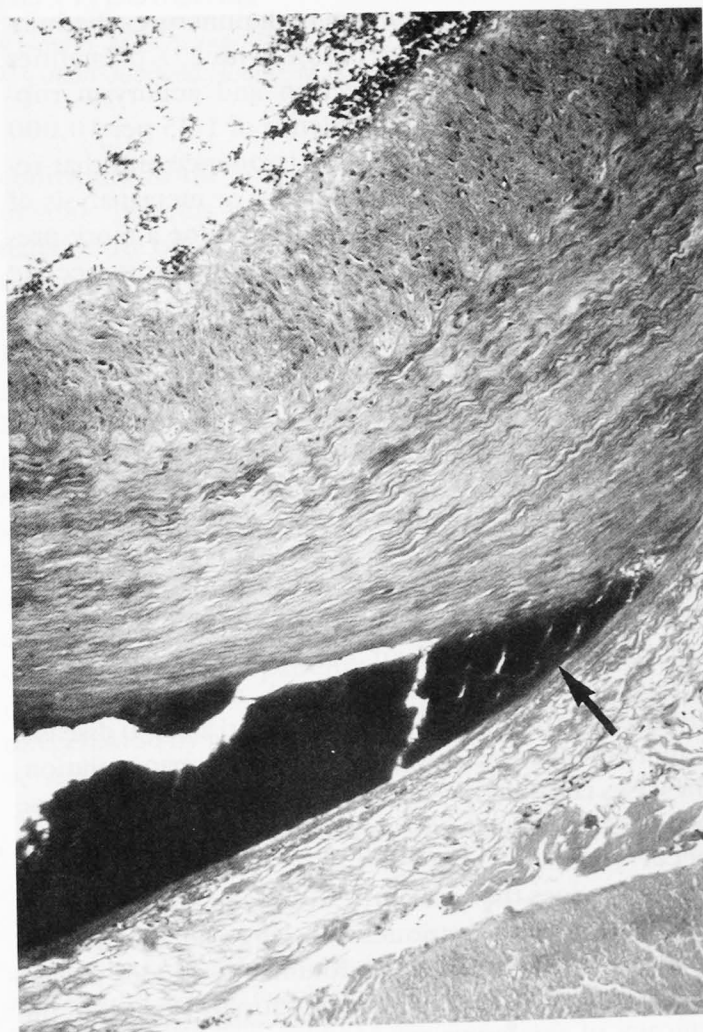


Fig. 2. Photomicrograph of the hepatic artery showing vessel lumen in upper left corner. Note the dissection of blood in the outer part of the media (arrow). Hematoxylin-eosin,  $\times 160$ .



## CASE REPORTS

autopsy. In addition, reliance on CT imaging was not believed to be necessary in Ischia's original description,<sup>3</sup> and two articles state x-ray guidance did not alter complications or outcomes.<sup>12,13</sup>

It is conceivable that a 22-G needle may not have caused this series of events. Celiac plexus blocks are described most often using no smaller than a 20-G needle.<sup>3,4,6,7,9,12</sup> The main reason is that the much greater resistance to injection through a 22-G needle makes it difficult to distinguish injecting in dense or restricting tissue compared to the loose periaortic tissue.<sup>14</sup> It would be more difficult to use a 22-G needle with the loss-of-resistance technique for identifying passage through the aortic wall.<sup>4</sup> In addition, a 20-G needle would minimize deflection from the intended path and bending when passing through dense or muscular tissue. A 22-G needle might also be more difficult to pass through a muscular aorta.

Translumbar aortography, which punctures the lumbar aorta, has a mortality of 0.05%, with 27% of fatalities resulting from aortic dissection and aneurysm rupture.<sup>15</sup> This would be an incidence of 1.35 per 10,000 procedures. Based on this low incidence and that reported by Davies,<sup>5</sup> only large series or metaanalysis of many reports would be able to determine a more precise incidence of aortic injury during transaortic celiac plexus block. In addition, dissection of the superior mesenteric artery, requiring emergency bypass surgery, has been reported with aortic puncture during translumbar aortography.<sup>16</sup>

Hepatic artery dissection is a rare occurrence. Larson *et al.*<sup>17</sup> tabulated and summarized their own and ten other reports from the literature. The available clinical data from these cases showed hypertension was not present in 3 of 10 cases, intramedial hepatic artery disease was absent in 3 of 10, intraabdominal manipulation did not occur in 7 of 11, and atherosclerotic arterial disease was absent in 7 of 11. Although our case did not have hypertension, intramedial arterial disease, tumor involvement, or intraabdominal manipulation, the cases tabulated by Larson *et al.*<sup>17</sup> indicate that these need not be present for hepatic arterial dissection to occur.

Finally, does the transaortic approach offer an advantage over other techniques? The high success rate of celiac block in relieving abdominal pain does permit analysis of a smaller number of patients regarding the efficacy of this approach. Ischia *et al.*<sup>8</sup> showed in a prospective randomized study that there was no significant difference in outcome between three different

approaches to neurolytic celiac plexus block. The transaortic approach therefore must be reevaluated in light of our case and that of Sett and Taylor,<sup>11</sup> its failure to prevent paraplegia,<sup>10</sup> and the known mortality and complications experienced from translumbar aortography. Although complications will potentially occur with neurolytic celiac blocks,<sup>5,18</sup> the technique chosen should have the least chance for mortality.

In summary, we present a case of transaortic neurolytic celiac plexus block that led to the patient's demise from aortic dissection associated with needle laceration of the anterior aorta. This is the second case reported of aortic injury associated with celiac neurolytic blocks and the first report of aortic injury using the transaortic approach.

The authors thank Dr. Michael Marin, Division of Vascular Surgery, Montefiore Medical Center, for his input regarding this manuscript.

## References

1. Cousins MJ, Dwyer B, Gibb D: Chronic pain and neurolytic blockade, Neural Blockade in Clinical Anesthesia and Management of Pain. Edited by Cousins MJ, Bridenbaugh PO. Philadelphia, JB Lippincott, 1988, pp 1069-1072
2. Bonica JJ, Buckley FP, Moricca G, Murphy TM: Neurolytic blockade and hypophysectomy, The Management of Pain. Edited by Bonica JJ, Loeser JD, Chapman CR, Fordyce WE. Malvern, Lea & Febiger, 1990, pp 2015-2020
3. Ischia S, Luzzani A, Ischia A, Faggion S: A new approach to the neurolytic block of the coeliac plexus: The transaortic technique. *Pain* 16:333-341, 1983
4. Feldstein GS, Waldman SD, Allen ML: Loss of resistance technique for transaortic celiac plexus block (letter). *Anesth Analg* 65:1092-1093, 1986
5. Davies DD: Incidence of major complications of neurolytic coeliac plexus block. *J Royal Soc Med* 86:264-266, 1993
6. Singler RC: An improved technique for alcohol neurolysis of the celiac plexus. *ANESTHESIOLOGY* 56:137-141, 1982
7. Hilgier M, Rykowski JJ: One needle transcrural celiac plexus block: Single shot or continuous technique, or both. *Reg Anesth* 19:277-283, 1994
8. Ischia S, Ischia A, Polati E, Finco G: Three posterior percutaneous celiac plexus block techniques: A prospective, randomized study in 61 patients with pancreatic cancer pain. *ANESTHESIOLOGY* 76:534-540, 1992
9. Matson JA, Ghia JN, Levy JH: A case report of a potentially fatal complication associated with Ischia's transaortic method of celiac plexus block. *Reg Anesth* 10:193-196, 1985
10. Traycoff RB, Khardori R, Zhong W: Comments on DeConno (Pain 55:383-385, 1993) and Brown (Pain 56:139-143, 1994) (letter). *Pain* 60:233-234, 1995
11. Sett SS, Taylor DC: Aortic pseudoaneurysm secondary to celiac plexus block. *Ann Vasc Surg* 5:88-91, 1991

## CASE REPORTS

12. Thompson GE, Moore DC, Bridenbaugh PO: Pain and alcohol celiac plexus nerve block. *Anesth Analg* 5:1977
13. Brown DL, Bulley CK, Quiel EL: Neurolytic blockade for pancreatic cancer pain. *Anesth Analg* 6:1977
14. Thompson GE, Moore DC: Celiac plexus block for peripheral blockade, Neural Blockade in Clinical Anesthesia and Management of Pain. Edited by Cousins MJ, Bridenbaugh PO. Philadelphia, JB Lippincott, 1988, pp 503-505
15. Hessel SJ: Complications of angiographic procedures. *Abrams Angiography: Vascular Imaging* 1990

Anesthesiology  
0883-6555-638, 1995  
© 1995 American Society of Anesthesiologists  
Lippincott-Raven Publishers

Inhaled Nitric Oxide  
in a Patient

Jean-Luc Fellahi, M.D.\* Eric  
Bruno Hou, M.D.

ACUTE respiratory distress syndrome is characterized by nonhemodynamic pulmonary shunting, arterial hypoxemia, pulmonary hypertension that may lead to right ventricular dysfunction.<sup>1</sup> Autorespiratory failure is a potential source of right-to-left shunt when the pressure gradient between alveolar and arterial pressure becomes positive as pulmonary edema develops. As a consequence, in

\* Interne in Anesthesiology.  
† Praticien Hospitalier in Anesthesiology.  
‡ Chef de Clinique in Anesthesiology.  
§ Professor and Chair, Department of Anesthesiology and Surgical Intensive Care Unit.

Received from the Surgical Intensive Care Unit, Hôpital de la Pitié-Salpêtrière, Paris, France. Submitted for publication May 8, 1995.

Address reprint requests to Dr. Roux, Département d'Anesthésiologie, Hôpital de la Pitié-Salpêtrière, Boulevard de l'Hôpital, 75651 Paris.

Key words: Anesthetics, gases; nitric oxide. Lungs; acute respiratory distress syndrome.

Anesthesiology, V 83, No 3, Sep 1995

## CASE REPORTS

12. Thompson GE, Moore DC, Bridenbaugh LD, Artin RY: Abdominal pain and alcohol celiac plexus nerve block. *Anesth Analg* 56:1-5, 1977
13. Brown DL, Bulley CK, Quiel EL: Neurolytic celiac plexus block for pancreatic cancer pain. *Anesth Analg* 66:869-873, 1987
14. Thompson GE, Moore DC: Celiac plexus, intercostal, and minor peripheral blockade, Neural Blockade in Clinical Anesthesia and Management of Pain. Edited by Cousins MJ, Bridenbaugh PO. Philadelphia, JB Lippincott, 1988, pp 503-530
15. Hessel SJ: Complications of angiography and other catheter procedures, *Abrams Angiography: Vascular and Interventional Radiology*. Edited by Abrams H. Boston, Little, Brown, 1983, pp 1041-1055

16. Bakal CW, Friedland RJ, Sprayregen S, Calligaro KD, Cynamon J, Veith FJ: Translumbar arch aortography: A retrospective controlled study of usefulness, technique and safety. *Radiology* 178:225-228, 1991
17. Larson CJ, Geier R, Edwards WD: Fatal acute dissection of the right hepatic artery after appendectomy. *Arch Pathol Lab Med* 111:300-302, 1987
18. Lebovits AH, Lefkowitz M: Pain management of pancreatic carcinoma: A review. *Pain* 36:1-11, 1989

Anesthesiology  
83:635-638, 1995  
© 1995 American Society of Anesthesiologists, Inc.  
Lippincott-Raven Publishers

## Inhaled Nitric Oxide-induced Closure of a Patent Foramen Ovale in a Patient with Acute Respiratory Distress Syndrome and Life-threatening Hypoxemia

Jean-Luc Fellahi, M.D.,\* Eric Mourgeon, M.D.,\* Jean-Pierre Goarin, M.D.,† Jean-Dominique Law-Koune, M.D.,‡ Bruno Riou, M.D., Ph.D.,† Pierre Coriat, M.D.,§ Jean-Jacques Rouby, M.D., Ph.D.||

ACUTE respiratory distress syndrome (ARDS) is characterized by nonhemodynamic pulmonary edema, intrapulmonary shunting, arterial hypoxemia, and acute pulmonary hypertension that may induce acute right ventricular dysfunction.<sup>1,2</sup> Autopsy studies indicate an incidence of patent foramen ovale (PFO) in the general population ranging from 25% to 35%.<sup>3</sup> These PFOs are a potential source of right-to-left intracardiac shunt when the pressure gradient between right and left atrial pressure becomes positive as pulmonary hypertension develops. As a consequence, intracardiac shunt might

contribute to the severe arterial hypoxemia observed in some patients with ARDS. In acute lung injury, inhaled nitric oxide selectively dilates pulmonary vessels in contact with gas-containing alveoli, thus diverting pulmonary blood flow from nonventilated to ventilated lung regions. As a consequence, arterial oxygenation improves *via* a reduction in intrapulmonary shunt.<sup>4-6</sup> By reducing pulmonary arterial hypertension, inhaled nitric oxide may decrease the right-to-left atrial pressure gradient and reverse the right-to-left intracardiac shunt observed in neonates with persistent pulmonary arterial hypertension and congenital intracardiac shunt.<sup>7,8</sup> A similar effect can be expected in adults with acute respiratory failure and PFO. We describe a case of severe ARDS in a patient with a PFO in which nitric oxide produced a dramatic improvement in arterial oxygenation by reducing intrapulmonary shunt and reversing right-to-left intracardiac shunt.

### Case Report

After a car accident, a 64-yr-old man with a history of dysrhythmia and chronic alcoholism was admitted to the emergency center of la Pitié Hospital in Paris. Initial lesions were a cervical fracture (C2) without neurologic injury treated by traction, a first rib fracture with a pulmonary contusion, and hemomediastinum secondary to a traumatic dissection of the right axillary artery, which required surgical repair. Postoperatively, he had rapidly worsening respiratory function

\* Interne in Anesthesiology.

† Praticien Hospitalier in Anesthesiology.

‡ Chef de Clinique in Anesthesiology.

§ Professor and Chair, Department of Anesthesiology.

|| Professor of Anesthesiology and Critical Care; Director of the Surgical Intensive Care Unit.

Received from the Surgical Intensive Care Unit, Department of Anesthesiology, Hôpital de la Pitié-Salpêtrière, Université Paris VI, Paris, France. Submitted for publication February 22, 1995. Accepted for publication May 8, 1995.

Address reprint requests to Dr. Rouby: Unité de Réanimation Chirurgicale, Département d'Anesthésie, CHU Pitié-Salpêtrière, 47-83 Boulevard de l'Hôpital, 75651 Paris cedex 13, France.

Key words: Anesthetics, gases: nitric oxide. Hypoxia: patent foramen ovale. Lungs: acute respiratory distress syndrome.