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Dale F. Webb
L. Tomatis
Rodman E. Taber
Joseph L. Ponka

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SUCCESSFUL SURGICAL MANAGEMENT OF SUPERIOR MESENTERIC AND FEMORAL ARTERY TUMOR EMBOLI RESULTING FROM PNEUMONECTOMY

A CASE REPORT

DALE F. WEBB, M.D.,* L. TOMATIS, M.D.,** RODMAN E. TABER, M.D.* AND J. L. PONKA, M.D.**

Macroscopic or microscopic tumor embolization may complicate pulmonary resection for bronchogenic neoplasms. A comprehensive study of arterial tumor dissemination during resections for bronchogenic carcinoma was presented by Aylwin who found a high incidence of pulmonary vein invasion in resected pulmonary specimens. Fatal coronary artery and cerebral tumor embolization have been previously reported following pulmonary surgery.2,3 Early ligation of the pulmonary veins during resection has been advocated as a means of preventing tumor emboli.4 The following case presentation is the first reported instance of successful tumor embolectomy following pulmonary resection for carcinoma.

CASE REPORT

J. P. A 57 year old machinist, was admitted to the Henry Ford Hospital on July 2, 1964 because of hemoptysis of one days duration. The patient enjoyed good health until two months prior to admission, at which time he developed a persistent cough and pain in his right hemithorax. He had smoked a pack of cigarettes a day for 30 years. On physical examination, there was evidence of recent weight loss. The blood pressure was 120/70 mm. Hg. Auscultation of the chest revealed decreased breath sounds on the right side. The hemoglobin was 11.8 grams and the urinalysis was normal. A chest roentgenogram demonstrated a tumor mass in the right lower lobe (Figure 1-A,B).

Bronchoscopy showed the right lower lobe bronchus to be filled with blood clots and a tumor mass. At operation on July 16, 1964, through a right posterolateral incision, a large bronchogenic carcinoma was found in the right lower lobe with enlargement of the regional lymph nodes due to metastatic tumor. The tumor mass surrounded the inferior pulmonary vein. The inferior pulmonary vein was ligated initially and intrapericardial division of the remaining pulmonary vessels was carried out. Pneumonectomy was completed by division and suture of the bronchus and removal of the enlarged subcarinal and paratracheal lymph nodes. The patient left the operating room in good condition but became pulseless shortly after arriving in the recovery room. External cardiac compression was begun immediately and an endotracheal tube reinserted. Resuscitation was effective and the patient awakened and moved about. At this time, the right leg below the knee was noted to be cold, pale and pulseless. The patient was returned to the operating room with a diagnosis of tumor
A. The preoperative chest roentgenogram shows a tumor mass in the right lower lobe with distal atelectasis.

B. A postoperative chest roentgenogram on the first day following pneumonectomy. A tumor embolus was removed from the right femoral artery six hours after pneumonectomy. A mesenteric artery embolectomy with small bowel resection for infarction was performed 24 hours after the pulmonary resection.

eMBOLIZATION TO THE RIGHT FEMORAL ARTERY. The diagnosis was confirmed when an embolus measuring 2 x 1 cm. was removed from the right common femoral artery under local anesthesia. Pulses returned immediately to the dorsalis pedis and posterior tibial arteries.

The patient was alert and responsive on the first postoperative day although bilateral positive Babinski reflexes and weakness of the right arm and facial muscles were present. The significance of this finding was not apparent as these localizing signs subsequently cleared. Twenty-four hours following pneumonectomy, the patient complained of increasing abdominal pain and examination revealed rebound tenderness with involuntary muscle guarding throughout the abdomen. Bowel sounds were absent. Abdominal roentgenograms showed dilated small bowel loops. The hemoglobin was 12.9 grams with a white blood cell count of 29,250. Because of tachycardia and hypotension 1,000 cc's of whole blood were administered. The patient was returned to the operating room with a diagnosis of superior mesenteric artery tumor embolization with small bowel infarction. The abdomen was opened through a midline incision revealing several loops of gangrenous small bowel. The viability of the intestine on each side of the infarcted area was impaired; however, weak arterial pulsations were visible in the distal ileal and proximal jejunal mesentery. The superior mesenteric artery was exposed by elevation of the mesocolon, and palpation distal to the origin of the middle colic artery revealed it to be pulseless. A vascular clamp was applied to the superior mesenteric artery proximal to the origin of the middle colic branch, and a transverse arteriotomy performed below the middle colic artery. A tumor embolus measuring 0.6 cm. by 1 cm. was removed (Figure 2-A,B) and a Fogarty catheter inserted proximally, permitting removal of several blood clots. The catheter was then passed into the right colic and the distal superior mesenteric artery with removal of approximately 4 cm. of blood clot from these branches. Back bleeding was then noted to occur from all branches except the right colic artery. The arteriotomy was repaired with a 6-0 Tefdek suture, and pulsations were palpable beyond this site of the repair after release of the clamps. Approx-
Figure 2

A. Photomicrograph of the tumor embolus removed from the superior mesenteric artery. It contains malignant cells similar to those seen in the resected lung. (X 1100)

B. Photomicrograph of the primary lung tumor. (X 1100)

imately 350 cm. of the jejunum and ileum were resected and intestinal continuity restored by an inverting, end-to-end anastomosis with one layer of chromic catgut and an inverting layer of interrupted silk. Drains were inserted in both lower quadrants and the abdomen closed with retention sutures. A tracheostomy was performed after conclusion of the abdominal operation because of excessive tracheobronchial secretions. The patient's condition was improved at the conclusion of the procedure. Respiration was assisted through the tracheostomy with a Bennett respirator for the first 5 days postoperatively. Chloromycetin and penicillin were administered intravenously for 10 days. Pulmonary insufficiency caused by retained tracheal secretions and bronchospasm required constant attention with administration of aminophylline, Isuprel and Dornavac inhalations. Bowel sounds returned on the fifth postoperative day and clear liquids were tolerated by mouth beginning on the seventh postoperative day. The tracheostomy tube was removed on the eighth postoperative day and the patient discharged in good condition 20 days following pneumonectomy.

**DISCUSSION**

Ten cases of successful superior mesenteric artery embolectomy were collected by Rutledge, but none were due to a tumor embolus. The patient reported here is the first instance of successful removal of a tumor embolus from a major vessel following pulmonary resection. The site of arterial occlusion in our patient was readily located by palpation of the intestinal mesentery. Exposure of the superior mesenteric artery where it overlies the third portion of the duodenum proved to be satisfactory for performance of the embolectomy and arterial repair. The embolectomy resulted in marked improvement of the circulatory status of the small intestine both proximal and distal to the areas of frank infarction. Undoubtedly, most, if not all,
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of the small bowel and the right colon would have been sacrificed because of the ischemic signs, had not successful embolectomy been possible. Small portions of the tumor embolized to the distal mesentery and were visible in multiple microscopic sections throughout the resected small bowel specimen.

An interesting approach which might be of help when an otherwise fatal amount of intestinal resection would be required was advocated by Meier. This procedure consisted of embolectomy without intestinal resection. A “second-look” operation is performed 24 to 48 hours later when the ischemic signs have either progressed or cleared. This program would merit consideration when applied to bowel of questionable viability; however, obviously necrotic intestine must be removed.

Because of previous experience with tumor embolization at the time of pneumonectomy, primary pulmonary vein ligation was carried out in the reported case. However, this did not prevent breaking off a portion of the tumor which had invaded the inferior pulmonary vein. When confronted by a similar situation in the future, a vascular clamp will be applied on the atrium proximal to the pulmonary vein in an attempt to prevent this complication.

**SUMMARY**

A complication of pneumonectomy for bronchogenic carcinoma with pulmonary vein invasion is described in which tumor embolized to the superior mesenteric and femoral arteries. Successful femoral and superior mesenteric artery embolectomies were performed with resection of 50 per cent of the small intestine. The incidence of arterial tumor embolization, either microscopic or macroscopic, should be reduced by early ligation of the pulmonary veins. Since it is not always possible to prevent tumor embolization at the time of pneumonectomy, an index of suspicion of this complication should be maintained which will allow early diagnosis and treatment.

**REFERENCES**


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