

Bronchial Atresia with Blood and Mucoïd Impaction: MR appearance

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<국문초록>

기관지 폐쇄증과 병발된 혈종 및 점액의 매복 : 자기공명영상 소견

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본 보고는 1예의 선천성 기관지 폐쇄증 환자의 자기공명영상소견 중에서 그 신호강도에 초점을 맞춘 증례보고이다. 폐쇄된 기관지 원위부로 확장된 기관지 내용물의 신호강도는 피하지방의 그것과 비교하여 T1 하중영상에서 비슷하였으며, T2 하중 영상에서는 상대적으로 낮았다. 기관지 내에 매복되어 있던 물질은 용혈된 혈액과 점액이 혼합된 것이 수술로서 확인되었다. T2 하중 영상에서 지금까지 발표된 예와 달리 낮은 신호강도로 나온 이유는 희석되지 않은 메트헤모글로빈의 T2 단축효과로 사료된다. 자기공명영상은 기관지폐쇄 원위부의 확장된 기관지를 다단면 영상을 포괄하였을 뿐 아니라, 기관지 내부의 내용물질에 관한 특유의 정보를 제공하였다.

— Abstract —

This report documents the MR appearance of bronchial atresia focused on its signal intensity. The signal intensity of the tubular dilated bronchi was isointense on T1 weighted image and hypointense on T2 weighted image as compared with the subcutaneous fat. Impacted materials in the bronchi were hemolysed blood clot mixed with mucus substance. Hypointensity on T2 weighted image which is contradictory to the signal intensity of previously reported cases with bronchial mucoïd impaction might be due to T2 shortening effect of the undiluted methemoglobin. MRI not only showed the distal dilated bronchi clearly in multidirectional planes but also provided unique information about the endobronchial contents.

Index Words: Branchi, abnormalities
Lung, MR studies

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이 논문은 1989년도 재단법인 한국방사선 연구재단 보조로 이루어졌음

이 논문은 1989년 10월 4일 접수하여 1989년 10월 19일에 채택되었음

Received October 23, accepted October 19, 1989

Introduction

Bronchial atresia is a rare congenital anomaly characterized by distal mucoid impaction and emphysema of the corresponding lung^{2,5}). MR appearance of the mucoid impacted bronchi has been reported in a case of bronchial atresia⁷) and in two cases of intralobar sequestration^{6,7}). We report a case of bronchial atresia with mixed hematoma and mucoid impaction and tried to correlate its MR signal intensity with its composition by chemical analysis.

Case Report

A 31-year-old female was evaluated for abnormal chest radiograph. Chest radiograph showed tubular mass shadow in left parahilar area. The mass was located anteriorly in lateral view. CT scan showed tubular mass shadow within the emphysematous left upper lobe. CT density of the tubular lesion was 65 H.U.

MR imaging was done on a 2.0 T superconducting system(Goldstar Spectro 20,000, Seoul). Conventional multiecho, spinecho images were obtained in transaxial and coronal planes gated to the cardiac cycle.

On T1-weighted image (TR 710 msec/TE 30 msec) tubular dilated structure showed very high signal that was isointense with subcutaneous fat. On T2-weighted image (TR 1450 msec/TE 120 msec) the signal intensity was slightly lower than that of the subcutaneous fat. T1 and T2 relaxation time of the tubular lesion were 770 msec and 43 msec, respectively. and 43 msec, respectively.

Bronchoscopy did not show any abnormality. Resected left upper lobe specimen showed dilated bronchi in anterior and lingular segment surrounded by emphysematous noncompressible lung which was devoid of anthracotic pigment. Endobronchial contents were thick, tenacious and mud-

dy in appearance with areas of greenish shiny area suggesting mucous material. Proximal portion of the dilated bronchi ended blindly at 1 cm distal to opening of the left upper lobe bronchus.

Microscopically, bronchial contents were consistent with old hemolysed blood mixed with mucinous material. There were minimal inflammatory and fresh red blood cells. Bronchial lumen was lined with ciliated cuboidal epithelium with plenty of Goblet cells. Submucosa was abnormally scant and was free of mucous gland.

Iron concentration of the impacted material within the bronchi was 120 ug/100 ml/g dry weight by acid digestion-flame atomic absorption technique which was within the range of whole blood(50-130 ug/100 ml).

Discussion

Bronchial atresia is a rare congenital anomaly usually producing an extrahilar mass and associated distal hyperinflation on chest radiograph^{2,5}). Mass shadow represents dilated bronchi with mucoid impaction and distal hyperinflation is due to unidirectional air drift through collateral channels²). The most common site of involvement is the left upper lobe as it is in the presenting case,

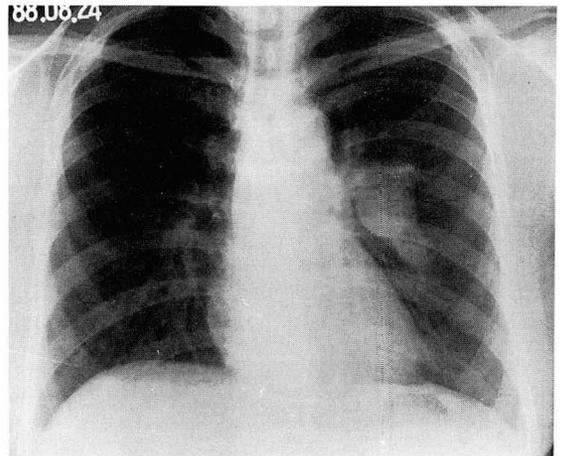


Fig. 1. Chest radiograph shows nodular and tubular mass shadow in left parahilar region.

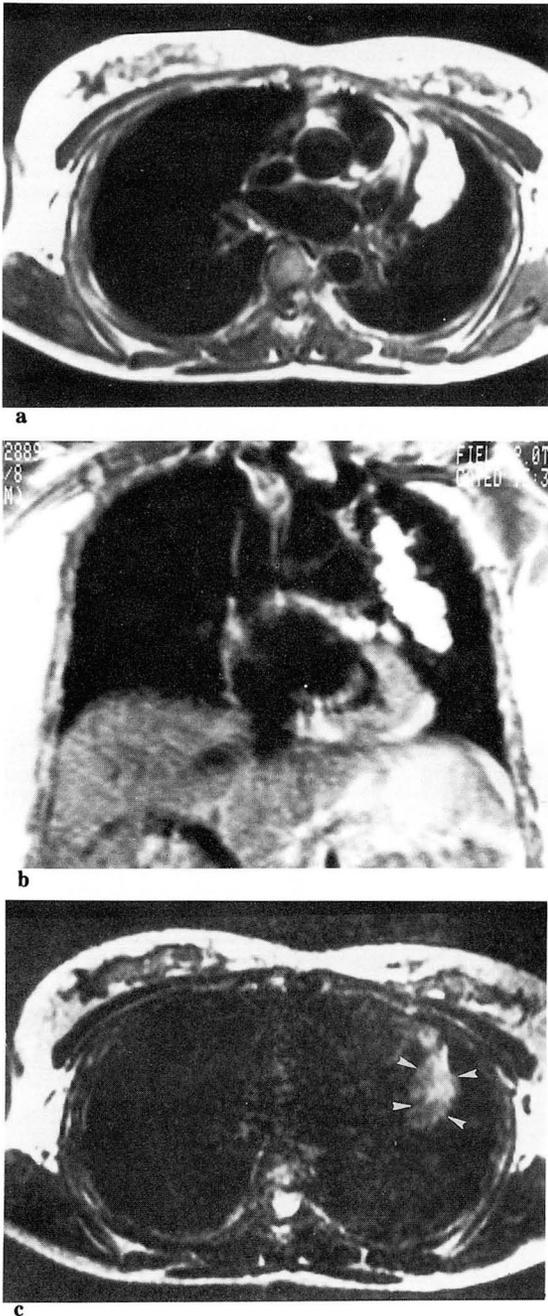


Fig. 2. T1-weighted MR images (TR every heart beat/TE 30 msec) in transaxial (a) and coronal (b) plane show very high signal intensity tubular branching lesion in the left upper lobe just lateral to the hilum. On T2-weighted image (c) (TR every other heart beat/TE 120 msec), signal intensity of the lesion (arrowheads) is lower than that of the subcutaneous fat.

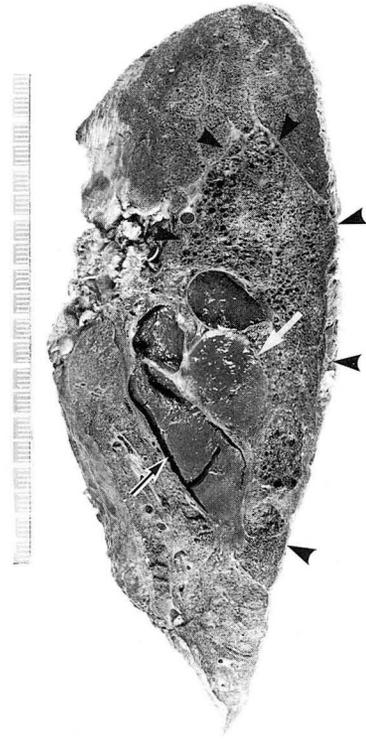


Fig. 3. Gross photograph of the resected left upper lobe cut in coronal plane shows dilated bronchi filled with muddy hematoma (lower arrow) with areas of shiny mucous material (upper white arrow). Surrounding lung is emphysematous (arrowheads).

as might be expected considering the embryonic instability observed in that lobe by Boyden¹⁾. The bronchial content distal to atresia has been described as “thick tenacious ivory colored mucus”⁵⁾ “clear mucus cast”⁹⁾ or “yellowish green mucoid material”²⁾. On the contrary, endobronchial content of our case is mostly muddy blood clots intermingled with areas of shiny mucus material.

MR signal intensity of the mucoïd impacted bronchi in cystic fibrosis⁴⁾, bronchial atresia⁷⁾ and in pulmonary sequestration^{6,7)} has been reported as bright signal both on T1 and T2 weighted images. The signal intensity in a case of bronchial atresia, reported by Naidich et al⁷⁾, was visually intermediate between muscle and fat on T1 weighted image, presumably due to high protein content of the

mucus. However, the signal intensity of the dilated bronchi in our case is isointense with fat on T1-weighted image and hypointense on T2-weighted image. We think T1 shortening effect of the extracellular methemoglobin is the main reason of the bright signal rather than the protein rich mucus. Recent report by Gomori et al³⁾. documented that undiluted free methemoglobin is isointense or slightly hypointense and diluted free methemoglobin is hyperintense on T2-weighted images of high field MRI. Iron concentration of the endobronchial impacted material of our case represents undiluted nature of the blood clot. T2 shortening effect of the undiluted free methemoglobin within the confined endobronchial space explains low signal on T2-weighted image in our particular case.

REFERENCES

1. Boyden EA: *Segmental anatomy of the lungs; A study of the patterns of the segmental bronchi and related pulmonary vessels.* McGraw-Hill, New York 1955
2. Cohen AM, Solomon EH, Alfidi RJ: *Computed tomography in bronchial atresia.* *AJR* 135:1097-1099, 1980
3. Gomori JM, Grossman RI, Hackney DB, Goldberg HI, Zimmerman RA, Bilaniuk LT: *Variable appearance of subacute intracranial hematomas on high-field spin-echo MR.* *AJR* 150:171-178, 1988
4. Gooding CA, Lallemand DP, Brasch RC, Wesby GE, Gavis B: *Magnetic resonance imaging in cystic fibrosis.* *J Pediatr* 105:384-388, 1984
5. Meng RL, Jensik RJ, Faber LP, Mettew GR, Kittle CF: *Bronchial atresia.* *Ann Thorac Surg* 25:184-192, 1978
6. Naidich DP, Rumancik WM, Lefleur RS, Estioko MR, Brown SM: *Intralobar pulmonary sequestration; MR evaluation.* *JCAT* 11(3):531-533, 1987
7. Naidich DP, Rumancik WM, Ettenger NA, Feiner HD, et al: *Congenital anomalies of the lungs in adults; MR diagnosis.* *AJR* 151:13-19, 1988
8. Pesce AJ, Kaplan LA: *Methods for copper and iron analysis in biological materials.* In *Methods in Clinical Chemistry*, p.527. Mosby, Saint Louis 1987
9. Williams LE, Murray GF, Wilcox BR: *Congenital atresia of the bronchus.* *J Thorac Cardiovasc Surg* 68:957-961, 1974