Pleuropulmonary Blastoma in a Child Presenting with Spontaneous Pneumothorax

JAMAREE TEERATAKULPISARN, MD*,
JIRAPORN SRINAKARIN, MD**,
DARUNEE JINTAKANON, DDS, MSc****
SURAPON WIANGNON, MD*,
CHUSAK KUPTARNOND, MD***,

Abstract

The authors described a 27-month-old boy with the diagnosis of pleuropulmonary blastoma who presented with spontaneous pneumothorax. The child was admitted to our hospital with the chief complaint of respiratory distress for 8 months. Initial chest X-ray revealed tension pneumothorax on the right side. After chest tube insertion to the right side, a repeated chest X-ray showed minimal pleural effusion and a mass-like lesion at the right lower lung field. Computed tomography (CT) of the chest showed a cavity with intramural mass confined in the right lower lung accompanied with hydro-pneumothorax. The surgery revealed a cystic and solid mass occupying the right pleural space medially displacing the right lower lung. Total removal of the mass was performed, the histopathologic findings revealed a mixed cystic and solid type of pleuropulmonary blastoma which was composed of primitive blastema with multidirectional differentiation. Combination chemotherapy consisting of vincristine, cyclophosphamide, doxorubicin and dactinomycin was administered two weeks after surgery. The child has been well for almost 6 months since the surgery, without any signs of metastasis or recurrence.

Key word : Pleuropulmonary Blastoma, Pneumothorax

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* Departments of Pediatrics,
** Departments of Radiology,
*** Departments of Surgery,
**** Departments of Pathology, Faculty of Medicine, Khon Kaen University, Khon Kaen 40002, Thailand.

Pleuropulmonary blastoma (PPB) or pulmonary blastoma (PB) is a rare primary intrathoracic and highly aggressive neoplasm in children. Barnett et al first mentioned pulmonary blastoma in 1945[1] but it was Manivel et al who described it in children[2]. This tumor is characterized by primitive blastema and a malignant mesenchymal stroma that often shows multidirectional differentiation without malignant epithelia. The term pulmonary blastoma has also been used to describe adult patients but the histopathology of classic adult PB differs from PPB in children because of the presence of carcinomatous components and the anatomic sites of tumor origin[2-4].

Respiratory distress is the most common clinical symptom and is often first misinterpreted as pneumonia[5], although few patients are reported as presenting with manifestations of pneumothorax[6-8].

The authors report a 27-month-old boy with a final diagnosis of pleuropulmonary blastoma who presented with spontaneous pneumothorax.

CASE REPORT

A 27-month-old boy was admitted to our hospital with spontaneous tension pneumothorax on the right side. He had an 8-month-long history of recurrent respiratory distress without fever and was treated at a private clinic for an acute asthmatic attack with a bronchodilator. This treatment brought no improvement but the child continued with normal activities and growth.

Two months before coming to the hospital, he began having a low-grade fever and progressive respiratory distress. He had no history of aspiration or trauma and the physical examination revealed mild respiratory distress, no cyanosis but the absence of breathing sounds in the right hemithorax.

Laboratory investigations revealed leukocytosis with normal differential counts and normal liver and kidney function test results. A chest X-ray revealed a tension pneumothorax on the right side that caused the mediastinum to shift to the left (Fig. 1). A chest tube was inserted into the right pleural space without expansion of the right lung. Bronchoscopic examination revealed no pathologic lesions. However, a chest X-ray showed minimal pleural effusion and a mass-like lesion at the right lower lung field.

Computed tomography (CT) of the chest showed a cavity with an intramural mass confined to the right lower lung accompanied with hydropneumothorax (Fig. 2). The first impression from the CT scan result was cystic disease of the right lung so the patient underwent a thoracotomy. The surgery revealed a cystic and solid mass size (8 x 7.5 x 2.5 cm) occupying the right pleural space medially displacing the right lower lung. Total removal of the mass was performed with a wedge resection of the right lung tissue at the site of the major fissure.

The histologic findings after scanning magnification revealed multicystic structures with areas of more solid tumor obliterating the normal lung (Fig. 3). A single layer of cuboidal epithelia lined the cystic spaces, and a focal area of stratified squamous epithelia was noted (Fig. 4A). A polypoid-like configuration of subepithelium proliferation of primitive, small, round- to oval-shaped cells resembling a cambium-layer-like appearance of botryoid rhabdomyosarcoma was observed in the cystic area (Fig. 3). Mixed blastematous and sarcomatous features of pulmonary blastoma were noted in the more solid area (Fig. 4A and 4B).

A predominant feature was the presence of cellular islands of small primitive blastematous cells with round to oval nuclei, granular chromatin, inconspicuous nucleoli and little cytoplasm. The stroma in the blastematous foci often blended into spindle cell sarcomatous areas. Variable numbers of large bizarre

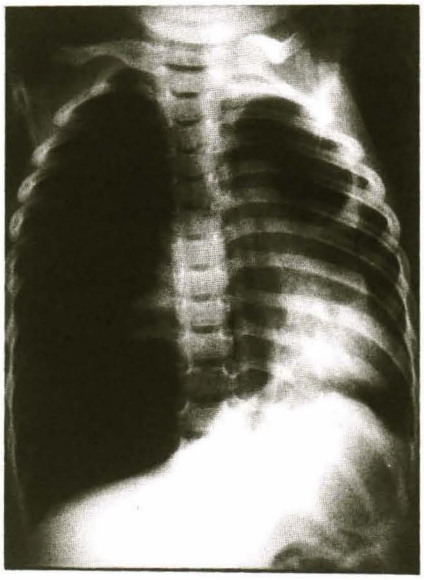

Fig. 1. Chest radiograph reveals right tension pneumothorax. The mediastinum is shifted to the left side.

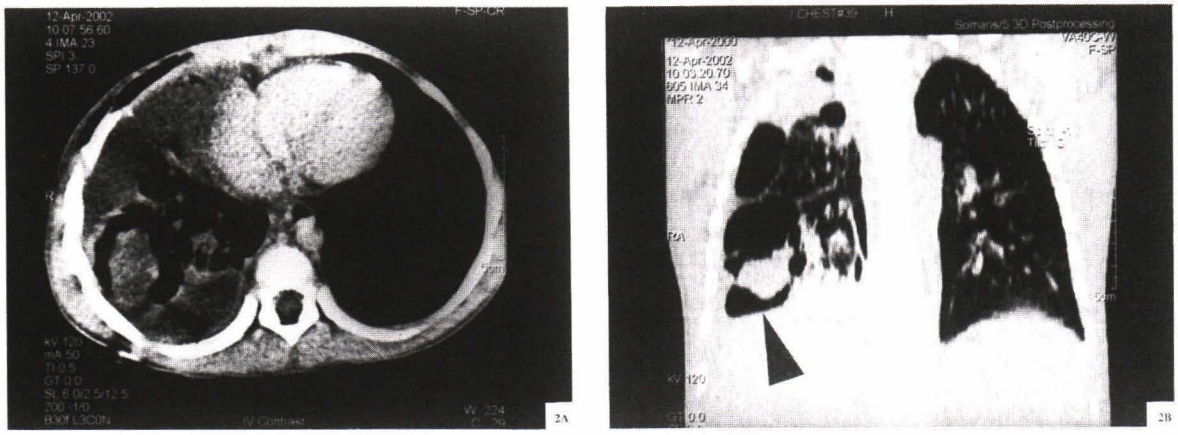

Fig. 2A and B. **Computed tomography of the chest reveals a cavity with an intramural mass confined in the right lower lobe accompanied with hydropneumothorax (A: axial, B: coronal multiplanar reconstruction).**

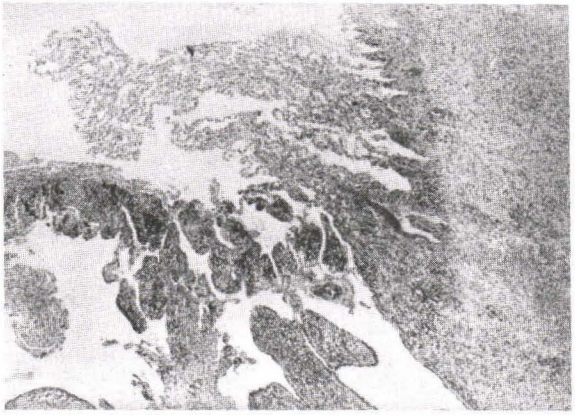

Fig. 3. **Pulmonary blastoma Type II comprises of cystic and solid area of proliferating undifferentiated small malignant cells obliterating normal lung tissue. The polypoid configuration of subepithelial condensation of small primitive malignant cells giving the feature of sarcoma botryoid-like presented in the cystic area. (H&E, X40)**

cells were scattered throughout the small primitive mesenchymal cells. At a higher magnification, foci exhibiting skeletal muscle differentiation, including polygonal larger tumor cells with eosinophillic cytoplasm and cross striation, were identified as isolated cells or as groups (Fig. 5). Cellular anaplasia in the form of giant, bizarre cells with irregular hyperchromatic nuclei in the mitotic stage were found accompanying other differentiated components in the form of immature hyaline cartilage (Fig. 6).

A combination chemotherapy consisting of vincristine, cyclophosphamide, doxorubicin and dactinomycin was administered two weeks after surgery. The child has been well since the surgery, without any signs of metastasis or recurrence.

DISCUSSION

This is the second report of a pleuropulmonary blastoma in a child from Thailand who presented with spontaneous tension pneumothorax. Pacharee et al reported the first case in a 2-month old boy diagnosed by autopsy[9]. Not more than 100 cases of pediatric pulmonary blastoma have been reported worldwide (PubMed). The largest series included 50 cases (Priest et al, 1997)[5]. Dehner et al (1995) classified this tumor as: Type I - cystic, Type II - mixed cystic and solid and Type III - solid[10].

The common presenting symptoms of PPB are respiratory distress, fever, chest or abdominal pain, cough, anorexia and malaise. These symptoms do not resolve with medical treatment[5]. The presented patient had tension pneumothorax at admission even though his chest X-ray did not show any lesion in the affected hemithorax, until a chest tube was inserted. After the surgical dissection, the tumor mass was found composed of both cystic and solid

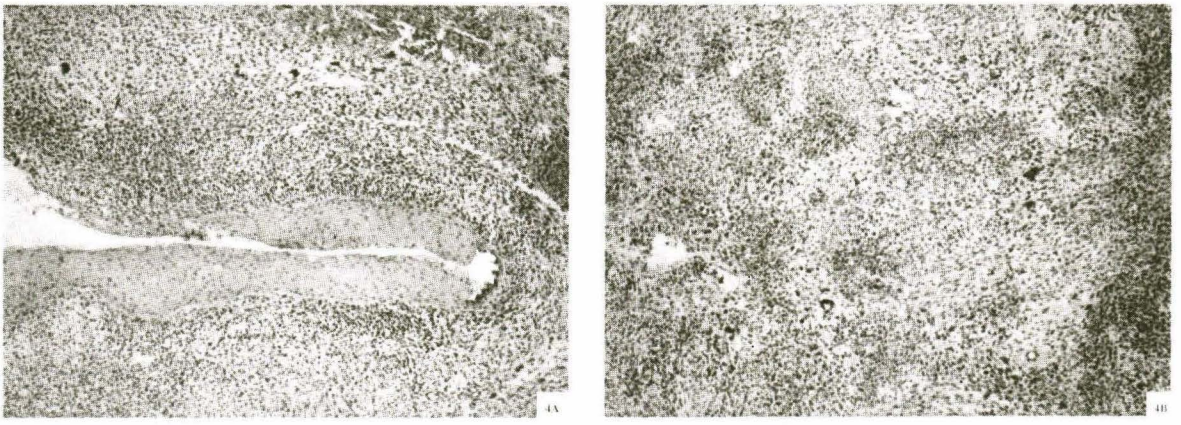

Fig. 4A and B. Mixed blastematous and sarcomatous feature of pulmonary blastoma, showing the stratified squamous epithelial lining of a cyst (A) with the subepithelial zone of the small, primitive blastematous cells with undifferentiated features surrounded by loose spindle cells (B). Contiguous foci contain large pleomorphic bizarre cells. (H&E, X100,100)

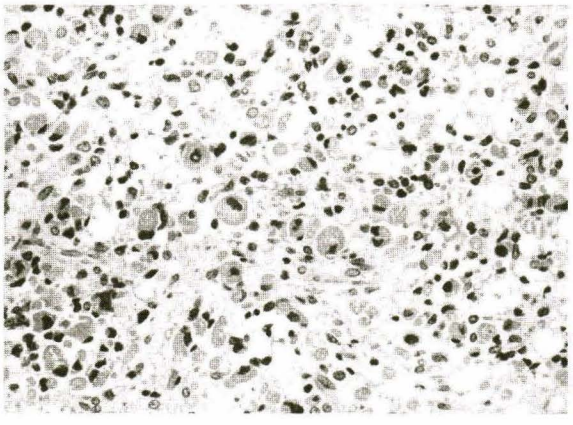

Fig. 5. Rhabdomyomatous differentiation showing groups of larger tumor cells with eosinophilic cytoplasm and cross striation. (H&E, X400)

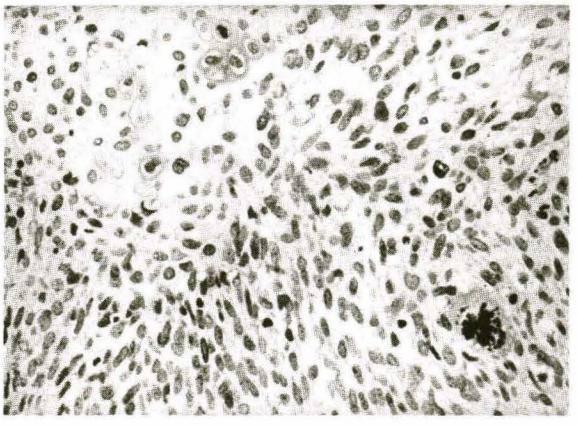

Fig. 6. Pulmonary blastoma, showing an area of cartilaginous differentiation and cellular anaplasia. (H&E, X400)

components (Type II), which was confirmed by pathologic examination.

Wright et al reported the progression of PPB from Types I to III over a 3-year period[11]. Priest et al noted that 38 per cent of their cases had cystic lesions prior to pathologic diagnosis followed, several months later, by the emergence of a solid area in the midst of the cyst[5]. Some have surmised that PPB superimposes on existing cystic lung lesions such as cystic adenomatoid malformation, extralobar sequestration or brochogenic cysts[12-19]. The presented patient suffered from respiratory distress for 8 months prior to diagnosis; perhaps because he had not had a chest radiograph examination before admission.

The prognosis of this tumor has been poor because of recurrence and metastasis[2,5,18]. The tumor commonly metastasizes along the CNS, though the inclusion of the brain and spinal cord has only

been observed in those with PPB Types II and III[5]. Most recurrences and metastases occur within 12 months of diagnosis[2,5]. Priest et al found the overall 2- and 5-year survival were 63 per cent and 45 per cent, respectively, with no significant difference by tumor type albeit their sample size was small[5]. They also showed that survival was not influenced by sex, the presence of pulmonary cysts, tumor size, any-side involvement , necrosis of the tumor or the extent of surgical resection; however, patients with pleural and/or mediastinal involvements had significantly poorer survival rates than those without them[2,5,18].

The standard treatment is radical surgery[6, 18-24], but both chemo- and radiotherapy should be considered following the surgery depending on the aggressiveness of the PPB and the type of tumor[2, 3,5,15,18-28]. Some authors suggested that patients with PPB Type I without extrapulmonary involvement could be treated with radical surgery alone[5, 18,19,29]. Patients with initially unresectable tumors should be treated with neoadjuvant chemotherapy or radiation to reduce the lesion to resectable proportions[18,29-31]. Previous studies confirmed the effectiveness of chemotherapy, although alone it is not able to offer a better prognosis[6,18,26,32-33]. Idolfi et al suggested that in the majority of the patients chemotherapy should be given with radiation therapy [18]. Surmont et al reported a radiosensitive PB in their patient[34] whereas Priest et al found survival among patients with Types II and III on radiation was not significantly improved over those not treated with radiation[5].

Although various chemotherapeutic agents have been used to treat PPB, a systematic clinical trial to identify the most appropriate agent, or combination of agents, has yet to be attempted. Notwithstanding, among the various combinations reported, cyclophosphamide, vincristine, doxorubicin, and dactinomycin showed an objective response[19] and the regimen is widely used for treatment of other solid tumors with acceptable toxicity. The authors, therefore, selected this combination to treat the completely resected tumor to prevent recurrence in the presented patient even though there was no evidence of metastasis.

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REFERENCES

1. Barnett N, Barnard WG. Some unusual thoracic tumors. Br J Surg 1945; 32: 447-57.
2. Manivel JC, Priest JR, Watterson J, et al. Pleuropulmonary blastoma, the so-called pulmonary blastoma of childhood. Cancer 1988; 62: 1516-26.
3. Koss MN, Hochholzer L, O'Leary T. Pulmonary blastoma. Cancer 1991; 67: 2368-81.
4. Francis D, Jacobsen M. Pulmonary blastoma. Curr Top Pathol 1983; 73: 265-94.
5. Priest JR, McDermott MB, Bhatia S, Watterson J, Manivel JC, Dehner LP. Pleuropulmonary blastoma, a clinicopathologic study of 50 cases. Cancer 1997; 80: 147-61.
6. Guler E, Kutluk MT, Yalcin B, Cilia A, Kale G, Buyukpamukcu M. Pleuropulmonary blastoma in a child presenting with pneumothorax. Tumori 2001; 87: 340-2.
7. Paupe A, Martelli H, Lenclen R, et al. Pneumothorax revealing pneumoblastoma in an infant. Arch Pediatr 1994; 1: 919-22.
8. Allan BT, Day DL, Dehner LP. Primary pulmonary rhabdomyosarcoma of the lung in children: Report of two cases presenting with spontaneous pneumothorax. Cancer 1987; 59: 1005-11.
9. Pacharee P, Parichatikanond P. Pulmonary blastoma, a case report in an infant and review of the literature. J Med Assoc Thai 1972; 55: 43-9.
10. Dehner LP, Watterson J, Priest JR. Pleuropulmonary blastoma. A unique intrathoracic pulmonary neoplasm of childhood. Perspect Pediatr Pathol 1995; 18: 214-26.
11. Wright JR. Pleuropulmonary blastoma. A case report documentign transition from type I (cystic) to type III (solid). Cancer 2000; 88: 2853-8.
12. Priest JR, Watterson J, Strong L, et al. Pleuropulmonary blastoma: a marker for familial disease. J Pediatr 1996; 128: 220-4.

13. Krous HF, Sexauer CL. Embryonal rhabdomyosarcoma arising within a congenital bronchogenic cyst in a child. J Pediatr Surg 1981; 16: 506-8.
14. Domizio P, Liesner RI, Dicks-Mireaux C, Risdon RA. Malignant mesenchymoma associated with a congenital lung cyst in a child: Case report and review of the literature. Pediatr Pathol 1990; 10: 785-97.
15. Senac MO Jr, Wood BP, Issaes H, Weller M. Pulmonary blastoma: A rare childhood malignancy. Radiology 1991; 179: 743-46.
16. Cohen M, Emms M, Kaschula ROC. Childhood pulmonary blastoma: A pleuropulmonary variant of the adult-type pulmonary blastoma. Pediatr Pathol 1991; 11: 737-49.
17. Murphy IJ, Blair GK, Fraser GC. Rhabdomyosarcoma arising within congenital pulmonary cysts: Report of three cases. J Pediatr Surg 1992; 27: 1364-7.
18. Indolfi P, Casale F, Carli M, et al. Pleuropulmonary blastoma, management and prognosis of 11 cases. Cancer 2000; 89: 1396-401.
19. Federici S, Domenichelli V, Tani G, et al. Pleuropulmonary blastoma in congenital cystic adenomatoid malformation: Report of a case. Eur J Pediatr Surg 2001; 11: 196-9.
20. Granata C, Gambini C, Carlini C, et al. Pleuropulmonary blastoma. Eur J Peidatr Surg 2001; 11: 271-3.
21. Ishikawa N, Sato H, Tsunezuka Y, Hiranuma C, Ueno Y, Kurumaya H. Pulmonary blastoma in a child: Report of a case. Surg Today 2001; 31: 705-7.
22. Karnak I, Ciftci AO, Senocak ME, Kale G, Buyukpamukcu N. Pulmonary blastoma: Diagnostic and therapeutic aspects. Pediatr Surg Int 1999; 15: 380-2.
23. Merriman TE, Beasley SW, Chow CW, Smith PJ, Robertson CF. A rare tumor masquerading as an empyema: Pleuropulmonary blastoma. Pediatr Pulmonol 1996; 22: 408-11.
24. Seballos RM, Klein RL. Pulmonary blastoma in children: Report of two cases and review of the literature. J Pediatr Surg 1994; 29: 1553-6.
25. Romeo C, Impellizzeri P, Grosso M, Vitarelli E, Gentile C. Pleuropulmonary blastoma: Long-term survival and literature review. Med Pediatr Oncol 1999; 33: 372-6.
26. Calabria R, Srikanth MS, Chamberlin K, Bloch J, Atkinson JB. Management of pulmonary blastoma in children. Am Surg 1993; 59: 192-6.
27. Medbery CA III, Bibro MC, Phares JC, Veach SR, Martin JE, Pasquale DN. Pulmonary blastoma. Case report and literature review of chemotherapy experience. Cancer 1984; 53: 2413-6.
28. Tagge EP, Mulvihill D, Chandler JC, Richardson M, Uflacker R, Othersen HB Jr. Childhood pleuropulmonary blastoma: Caution against non-operative management of congenital lung cysts. J Pediatr Surh 1996; 31: 187-9.
29. Lobo-Sanahuja F, Garcia I, Santamaria S, Barrantes JC. Case report: Pulmonary blastoma in children - response to chemotherapy. Med Pediatr Oncol 1996; 26: 196-200.
30. Ozkaynak MF, Ortega JA, Laug W, Isaacs H Jr. Role of chemotherapy in pediatric pulmonary blastoma. Med Pediatr Oncol 1990; 18: 53-6.
31. Parson SK, Fishman SJ, Hoorntje LE, et al. Aggressive multimodal treatment of pleuropulmonary blastoma. Ann Thorac Surg 2001; 72: 939-42.
32. Schmaltz C, Sauter S, Opitz O, et al. Pleuropulmonary blastoma: A case report and review of the literature. Med Pediatr Oncol 1995; 25: 479-84.
33. Perdikogianni C, Stiakaki E, Danilatou V, Delides G, Kalmanti M. Pleuropulmonary blastoma: An aggressive intrathoracic neoplasm of childhood. Pediatr Hematol Oncol 2001; 18: 259-66.
34. Surmont VF, van Klaveren RJ, Nowak PJ, Zondervan PE, Hoogsteden HC, van Meerbeeck JP. Unexpected response of a pulmonary blastoma on radiotherapy: A case report and review of the literature. Lung Cancer 2002; 36: 207-11.

พลูโรพุลโมนารี บลาสโตมาในเด็กที่แสดงอาการด้วยลมในช่องเยื่อหุ้มปอด

จามรี ธีรตกุลพิศาล, พบ, สุรพล เวียงนนท์, พบ*,*
*จิราภรณ์ ศรีนัครินทร์, พบ**, ชูศักดิ์ คุปตานนท์, พบ***, ดรุณี จินตกานนท์, ทบ, วทม*****

เด็กชายอายุ 2 ปี 3 เดือน รับไว้รักษาในโรงพยาบาลด้วยอาการสำคัญว่า หอบเหนื่อยเป็น ๆ หาย ๆ มาประมาณ 8 เดือน ภาพรังสีทรวงอกแรกรับพบว่ามีลมรั่วในช่องปอดด้านขวา หลังจากได้รับการรักษาด้วยการใส่ท่อเพื่อระบายลมออกแล้ว ถ่ายภาพรังสีทรวงอกซ้ำพบมีเงาก้อนเนื้อและน้ำเล็กน้อยในช่องปอดด้านขวา ภาพเอ็กซเรย์คอมพิวเตอร์ทรวงอกพบก้อนเนื้อขนาดใหญ่ในช่องปอดด้านขวา ภายในก้อนมีลักษณะผสมระหว่างถุงลมและก้อนเนื้อ ผู้ป่วยได้รับการผ่าตัดก้อนเนื้อออก ผลตรวจทางพยาธิวิทยาพบว่าก้อนเนื้อมีลักษณะเข้าได้กับโรคพลูโรพุลโมนารีบลาสโตมาชนิดผสมระหว่างถุงลมและก้อนเนื้อ เนื่องจากเนื้องอกชนิดนี้เป็นเนื้อร้ายที่มีโอกาสแพร่กระจายไปยังอวัยวะอื่น ๆ และมีโอกาสเป็นซ้ำสูง จึงได้รับการรักษาด้วยยาเคมีบำบัดด้วยยาสูตรผสมระหว่างวินคริสติน ไซโคลฟอสฟาไมด์ ด็อกโซรูบิซิน และแดกติโนไมซิน หลังจากให้ยาเคมีบำบัดครบ ขณะนี้ผู้ป่วยสบายดีหลังจากติดตามการรักษามา 6 เดือน

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จามรี ธีรตกุลพิศาล, สุรพล เวียงนนท์,
จิราภรณ์ ศรีนัครินทร์, ชูศักดิ์ คุปตานนท์, ดรุณี จินตกานนท์
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* ภาควิชากุมารเวชศาสตร์,
** ภาควิชารังสีวิทยา
*** ภาควิชาศัลยศาสตร์,
**** ภาควิชาพยาธิวิทยา, คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น, ขอนแก่น 40002