CT findings of Pulmonary Trichosporonosis

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Learning objectives

To recognize two major CT presentation of pulmonary Trichosporonosis: "summer-type hypersensitivity pneumonitis" in immunosusceptible patients and "invasive pulmonary trichosporonosis" in immunocompromised patients with severe neutropenia.

Background

Why Trichosporon spices emerge as clinically important organisms today?

Trichosporon spices are basidiomycetous yeast-like anamorphic organisms in the natural soil, universally distributed from temperate to tropical area. For the human body, the organisms are usually colonized in the normal flora of mouth, nail, skin and gastro-intestines. The yeast-like pathogen may cause superficial, mucosa-associated, or deep-seated infection, and possibly contribute pulmonary diseases.

In the lung, at least two distinct forms of disease expression have been known; "summer-type hypersensitivity pneumonitis (SHP)" as allergic pneumonia among outpatients, living in old sick houses with damp and decayed woods, and "invasive pulmonary tricosporonosis (IPT) " as deep-seated infection among hospitalized patients, especially hematological malignancy with severe neutropenia.

1. Summer-type hypersensitivity pneumonitis (SHP).

Trichosporon spices have been known as most significant cause for hypersensitivity pneumonitis in Japan. Inhalation of the organic dust of Trichosporon spices lead to type III and IV allergies in the susceptible cases. The clinical symptom such as cough, fever, chills, malaise, and dyspnea is related to the frequency and intensity of exposure to the organic antigen. The clinical presentation can be acute, subacute, or chronic, but it should be noted that there is considerable overlap among these three types, and many patients present with both subacute and chronic findings.

In Japan, radiological manifestations of SHP have been noted from1980s, then CT findings have been considered as relatively-specific. SHP should be considered as a house related disease, so that therapeutic strategies include avoidance of fungal exposure; cleaning up, leaving away, or building over the patients house. We believe that the endemic knowledge of typical CT findings of SHP are useful for diagnostic radiologists in the worldwide, because SHP may be present in the other countries with similar climate.
2. Invasive pulmonary trichosporonosis (IPT).

In 1965, Gemeinhardt H described lung pathogeneicity of the Tricosporon capitatum in man. To date, Trichosporon species have been recognized as emergent opportunistic agents causing invasive pulmonary infection, especially in hematologic malignancy, followed by smaller number of solid organ transplant recipients, and patients in intensive care units. Among hematological malignancy in Japan, trichosporon spices are known as the 4th most common organism for invasive fungal infection following Candidiasis, Mucormycosis, and Aspergillosis. The numbers of these patients has increased during the past quarter century because of greater number of hematopoietic stem cell transplantations. About 50 to 75% cases of invasive trichosporonosis show fungemia, and the lung is the most common site for solid organ involvement. Other site of disseminated infection include the brain, eyes, heart, liver, spleen, uterus, and soft tissue.

Treatment of IPT is not well established. The several cases are susceptible to azoles (fluconazole, voriconazole etc.) or high-dose amphotericin B, while echinocandine or low-dose amphotericin B are not effective against most IPT.

Imaging findings OR Procedure details

1. Summer-type hypersensitivity pneumonitis (SHP).

Chest radiography can be normal even in symptomatic patients and may shows non-specific findings with poorly defined, nodular, patchy, or diffuse opacities. Reticulo-nodular opacities may be observed in chronic SHP. The role of chest radiography is relatively limited in the diagnosis of SHP, comparing to CT.
Fig. 1: Subacute summer-type hypersensitivity pneumonitis (a typical case with dominant pattern of ground-glass opacities). A: Chest X-ray in a 56-year-old man, showed unclear ground-glass opacities in the bilateral upper lung field. B: Magnified image dealt with patchy ground-glass opacity in the right upper lung field. 

References: Radiology, Hamanomachi Hospital - Fukuoka/JP

Fig. 2: -continued. C, D, and E: High-resolution CT images of the same case. Patchy ground-glass opacities were seen at the bilateral upper lobe. Some individual opacities appeared ill-defined small nodular fashion in a characteristic centrilobular distribution.

References: Radiology, Hamanomachi Hospital - Fukuoka/JP
CT findings of subacute SHP are often characteristic enough to strongly suggest the diagnosis by combinations of bilateral ground-glass opacities, centrilobular nodules, lobular areas of air-trapping. In most cases, ground-glass opacities are more prominent than centri-lobular nodules, but several cases show dominancy of centrilobular nodules, occasionally lacking ground-glass opacities. For acute SHP patients, CT is seldom performed and add no further information to distinguish from subacute form.

**Fig. 3**: Subacute summer-type hypersensitivity pneumonitis (a typical case with mixed pattern of ground-glass opacities and small nodules). A: Chest X-ray in a 78-year-old woman, appeared diffuse interstitial opacities in the bilateral lung field. B: Magnified image showed with patchy ground-glass opacity and multiple nodular opacities in the right lower lung field.

**References**: Radiology, Hamanomachi Hospital - Fukuoka/JP
**Fig. 4**: -continued. C, D, and E: High-resolution CT images of the same case. C: Multiple centrilobular nodules were observed in the right upper lobe. D: Patchy ground-glass opacities superimposed centrilobular opacities at the right lower lobe. Some individual lobules appear low attenuation (*), suggesting air trapping and mosaic perfusion. E: Scattered centrilobular nodules were seen in the left upper lobe. A subpleural cystic change was present at the left lower lobe with a few adjoining small nodular opacities (arrow).

**References**: Radiology, Hamanomachi Hospital - Fukuoka/JP

CT findings of chronic SHP usually shows non-specific fibrosis with reticulation, architectural distortion, and traction bronchiectasis, superimposed to characteristic findings of sub-acute form. CT findings of chronic SHP considerably overlap to non-specific interstitial pneumonia (NSIP) and/or usual interstitial pneumonia (UIP), so that the diagnosis can be made by the combination of the detailed clinical history, including the living environment, presence of antibodies in serum, and compatible CT findings.
Fig. 5: Chronic summer-type hypersensitivity pneumonitis. A: Chest X-ray in a 82-year-old man, showed subpleural opacities, reticulation, bronchiectasis, and honeycombing in the bilateral lung field. Total volume loss of bilateral lungs were also seen, showing elevation of the bilateral diaphragm. B: Magnified image showed with wedge shaped subpleural opacity in the right upper lung field. Bronchiectasis of the B3b branch was also observed (arrow).

References: Radiology, Hamanomachi Hospital - Fukuoka/JP
Fig. 6: -continued. C, D, and E: High-resolution CT images of the same case. C: Wedge shaped subpleural opacity and interlobular interstitial thickening scattered in right upper lobe. D: Bronchiectasis (arrow), lobular atelectasis, and cystic change were seen in the S3b segment of the left upper lobe. E: Interlobular septal thickening was also observed in the S3b segment. Multiple centrilobular nodules (arrow head) distribute in the S6 segment of the left lower lobe.

References: Radiology, Hamanomachi Hospital - Fukuoka/JP

Fig. 7: Progression of chronic summer-type hypersensitivity pneumonitis. A: High-resolution CT at the level of the lower lobe shows patchy ground-glass opacity with scattered interlobular septal thickening and reticulation. B: On a High-resolution CT obtained 3 year later, there was extension of reticulation with irregular interlobular interstitial thickening in the right S8 segment. Patchy ground-glass opacities and ill-defined nodular opacities were also observed in the S9-10 segment. C: On a High-resolution CT obtained 6 year later, air trapping, cystic change, and honeycombing were evident in peripheral area of the right middle and lower lobe. Diffuse ground-glass opacity still remained in the right lower lobe.

References: Radiology, Hamanomachi Hospital - Fukuoka/JP

Table 1. CT findings in Summer-type hypersensitivity pneumonitis (SHP).

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<tr>
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<th>Acute</th>
<th>Subacute</th>
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<tr>
<td></td>
<td>CT is not applicable</td>
<td><strong>MAJOR FINDINGS</strong></td>
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<td>*typical clinical symptoms are diagnostic for acute SHP</td>
<td>Dominant pattern of patchy ground-glass opacities (most common pattern)</td>
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Dominant pattern of small centrilobular nodular opacities

Mixed pattern of above two findings

**MINOR FINDINGS**

Mosaic attenuation

Lubular area of air trapping

**Chronic**

FIBROTIC CHANGES, SUPERIMPOSED TO SUBACUTE SHP

*Reticulation

(Irregular interlobular interstitial/septal thickening)

*Architectural distortion

*Bronchiectasis/Traction bronchiectasis

*Cystic change/Honeycombing

*Acronym; R-ABC (reticulation, architectural distortion, bronchiectasis, and cystic change)

2. Invasive pulmonary trichosporonosis (IPT).

Radiographic findings of invasive pulmonary trichosporonosis (IPT) include diffuse infiltrate, multiple nodules, or patchy opacities in the lung fields. Several cases show cavitary opacities.

To our knowledge, there have been few case reports of CT findings of IPT. In 1989, Potente G described CT findings of IPT; showing nodules or mass-like infiltrates in the lung. Koyanagi T described CT findings of IPT; showing patchy consolidations and ground-glass opacities. CT manifestations of IPT are seemed to be non-specific, but patchy consolidation and ground-glass opacities may be more prominent than nodular opacities. Tashiro T et al described the pathological characteristics of IPT; including multiple fungal emboli in the smaller pulmonary vessels, transient fungal colonization in the vessels, subsequent fungal invasion from vessels to alveolar spaces, secondary vascular damages with pulmonary hemorrhage, and accumulations of alveolar exudates.
Patchy consolidations and ground glass opacities in the chest CT of IPT patients may reflect secondary pulmonary hemorrhage after fungal emboli.

**Fig. 8:** Chest CT images of invasive pulmonary trichosporonosis. A, B, and C: CT images on day +7 after unrelated cord blood transplantation showed ill-defined air-space consolidation and ground-glass opacity in the right upper lobe. Pleural effusion is also evident. The patient was a 63-year-old man with acute myeloid leukemia. The patient died on day +11 due to systemic trichosporonosis.

**References:** Radiology, Hamanomachi Hospital - Fukuoka/JP
**Fig. 9:** Progression of invasive pulmonary trichosporonosis. A: A chest CT was performed for a 53-year-old woman with acute lymphoid leukemia on day +15 after unrelated cord blood cell transplantation. CT showed no remarkable findings at the level of upper lobe. B: On a chest CT obtained on day +26, patchy ground-glass opacities were observed with scattered ill-defined nodules (arrows). Bilateral pleural effusion was also appeared. C: On a chest CT obtained on day +33, there was extension of patchy ground-glass opacity with multiple tiny nodules. D: On a CT obtained on day +46, massive consolidation was remarkable in the right upper lobe. Diffuse ground-glass opacity extended in both lung without reticulation. The patient died after low-dose amphotericin-B therapy on day +62 due to systemic trichosporonosis.

**References:** Radiology, Hamanomachi Hospital - Fukuoka/JP

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**Fig. 10:** Radiologic-pathologic correlation of invasive pulmonary trichosporonosis. A: A chest CT at the level of the tracheal bifurcation was obtained on day +46 after cord blood cell transplantation for a 53-year-old woman with acute lymphocytic leukemia. Dense consolidations with ground glass opacity were appeared in bilateral upper lobe. Marked pleural effusion was also seen. B. A chest CT at the level of left ventricle of the heart showed multiple ill-defined nodule in the right lower lobe. C. A gross pathological specimen of the resected right lung showed multiple hemorrhagic area in the RUL and the lung base. Numerous yellowish nodules are distributed in RUL, RML, and RLL. D. A resected HE stain showed broad area of hemorrhage in RUL, reflecting dense consolidations on CT. E. Multiple nodular colonizations of Trichosporon asahii was seen in the pulmonary vessels in RML, RLL, and RLL, corresponding to multiple ill-defined nodules on CT. [RUL; right upper lobe, RML; right middle lobe, RLL; right lower lobe, HE; hematoxylin-eosin]

**References:** Radiology, Hamanomachi Hospital - Fukuoka/JP
Differential diagnosis of IPT include bacterial pneumonia, fungal pneumonia, pneumocystis jiroveci pneumonia, viral pneumonia, septic emboli, pulmonary hemorrhage, drug-induced lung injury, and idiopathic pneumonia syndrome (IPS).

Table 2. CT findings in Invasive pulmonary trichosporonosis (IPT).

*Ground-glass opacities
*Nodules
*Patchy consolidation
*Massive consolidation

*These non-specific findings may be suggestive to enumerate IPT in the list of differential diagnosis, when non-effective antifungal drugs have been used empirically to the immunocompromised patients with hematologic malignancy, using echinocandines or low-dose amphotericin-B.

Patients were studied with Chest X-ray and MDCT (Aquillion 16 MDCT, TOSHIBA) in our hospital. Demonstrative cases were reviewed retrospectively, referencing to PACS data and clinical records from April 2006 to October 2012.

Conclusion

Pulmonary Trichosporonosis should be interpreted with attention to coexist CT findings with ground-glass opacities, based on the underlying immune reaction of patients.

References


**Personal Information**