Identification of Ambiguous Activities in Radionuclide Cisternography Using SPECT/CT: Aspirated and Ingested CSF Rhinorrhea

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A 2 year-old little girl underwent Tc-99m diethylenetriamine pentaacetic acid (DTPA) radionuclide cisternography to evaluate CSF rhinorrhea (Fig. 1). Cisternography clearly showed consecutive tracer activity in the nasal cavity and nasal tip, reflecting cerebrospinal fluid (CSF) leakage. However, several unexpected activities appeared on the bilateral mid- and unilateral lower thorax on delayed images, respectively. We performed additional SPECT/CT to delineate the CSF leakage tract and identify the unexpected activities. Through SPECT/CT, we could confirm that the mid-thoracic activity was in the lung parenchyma, while the lower thoracic activity was in the stomach. Thus, we speculated that these unexpected activities were the result of aspirated and ingested CSF rhinorrhea.

CSF rhinorrhea occurs when there is a fistula between the dura mater and the skull base and discharge of CSF from

the nose [1]. A spinal fluid leak from the intracranial space to the nasal respiratory tract is potentially very serious because of the risk of an ascending infection that could produce fulminant meningitis [2]. Therefore, identification of the fistulous tract is helpful for patient management. Radionuclide cisternography is an important imaging modality to detect the site of leakage in patients with CSF rhinorrhea [3–5]. The combination of radionuclide cisternography and SPECT/CT has led to a major improvement in the diagnostic accuracy for localization of CSF leakage [6–8]. This case also shows an important role for SPECT/CT fusion imaging in radionuclide cisternography not only for localizing the primary CSF fistula tract, but also for evaluating ambiguous radiotracer activities in planar imaging; these ultimately turned out to be aspirated and ingested CSF rhinorrhea.

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Fig. 1 A 2-year-old little girl, who had a history of pneumococcal meningitis 6 months previously, was hospitalized because of fever and vomiting. The pediatrician diagnosed recurrent meningitis and started empirical treatment with antimicrobial agents. However, during the hospitalization, she had several seizure events and an intermittent watery runny nose. CSF rhinorrhea was revealed by nasal discharge analysis, and she underwent radionuclide cisternography with 3 mCi (111 MBq) Tc-99 m DTPA for delineating the leakage focus and adjacent fistula tract. On delayed 120 minutes, it obviously depicted CSF leakage by showing the continuous linear tracer activity from nasal cavity to nasal tip (a, black arrow). Several unexpected and ambiguous tracer activities appeared in bilateral mid thorax level (a, arrowhead) and left side of lower thoracic level (a, open arrowhead). Then, we performed additional SPECT/CT on 180-

min delayed images to delineate the accurate CSF leakage route and to determine what those unexpected activities were. First, we analyzed the CSF leakage route. It passed through left mastoid antrum and Eustachian tube (b), and then it finally flew into nasal cavity and nostril (c). Second, we also characterized incidental activities of mid- & lower thorax area. Bilateral mid-thoracic activities were confirmed to be in the upper lung parenchyma (d). As serial chest radiography showed clear lung fields until that day and CT scan of SPECT/CT showed diffuse consolidations, we presumed that pneumonia occurred as a result of aspirated CSF rhinorrhea. SPECT/CT demonstrated that lower thoracic activity was in the fundus of stomach (e). We also speculated that this stomach activity might be due to ingestion of CSF rhinorrhea

Conflict of Interest The authors declare that they have no conflict of interest.

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