A case report of a 94-year-old, previously well male patient who presented with fever thought to be caused by community acquired pneumonia, new unilateral hearing loss and reduced consciousness. Despite antibiotic treatment he continued to deteriorate. Brain imaging with computer tomography and magnetic resonance imaging revealed a left otomastoiditis with osteomyelitis of the skull base, associated with an adjacent subdural empyema. He was also found to have a venous sinus thrombosis, most likely secondary to otitis media. He was managed with intravenous antibiotics, anticoagulation, grommet insertion and a hearing aid and he made a good recovery. This case reminds us to consider otitis media in older patients who present with hearing loss and fever. Otitis media can lead to serious complications including subdural empyema and osteomyelitis of the skull base [1)].

2015

A 55-year-old man was admitted complaining of headache, seizure, and urinary incontinence. He had a history of alcoholism and several hospitalizations for mild head trauma. Neuroimaging studies revealed a chronic hematic collection in the left frontal-parietal region. Laboratory tests showed increased C-reactive protein levels. In addition, surgical results revealed an infected subdural hematoma. A bacterial culture of the purulent specimen identified Escherichia coli. In view of the urinary complaint and leukocyturia, the etiology of the infected subdural hematoma was postulated as a urinary tract infection.

Infected subdural hematoma is an unusual disorder. We must keep in mind the possibility of this complication when seeing a patient who present with any of the three most common symptoms in this review. In these patients, craniotomy should be the method of surgical drainage, especially in adults. It ensures maximal drainage of the loculated pus and allows the total removal of the infected hematoma capsule [2)].

A case of delayed Escherichia coli subdural empyema following a head injury in an elderly patient without significant risk factors. Computed tomography imaging was equivocal for subdural empyema. The patient underwent surgery and was treated with intravenous antibiotic therapy. Although initial improvement in the patient's clinical condition was observed, he eventually succumbed to nosocomial pneumonia. In this article, the authors discuss the presentation, diagnostic tools, and treatment options for subdural empyema with an emphasis on the challenges [3)].

A 69-year-old man developed motor aphasia and right hemiparesis with severe headache, during the treatment of cellulitis and sepsis due to cat bites. Brain CT showed a low density, crescent-shaped lesion in the left subdural space, which was hypointense on brain diffusion-weighted imaging (DWI). One week later, when his neurological symptoms had worsened, the signal of the subdural lesion had changed to hyperintense on DWI. The lesion was capsule-shaped when enhanced by Gadolinium. The signal changes on DWI of the lesion indicated the existing hematoma had changed to an empyema, or so-called infected subdural hematoma, due to a hematogenous bacterial infection. Pasteurella multocida, a resident microbe in the oral cavity of cats, could be the responsible pathogen in this case. The patient recovered completely after treatment with intravenous high dose antibiotics. This is an important case report describing the transformation from a chronic subdural hematoma into a subdural empyema by DWI [4)].

A case of M. hominis subdural empyema in a woman occurring shortly after delivery. The patient presented with symptoms suggestive of bacterial meningitis. Spinal imaging revealed a subdural empyema that required neurosurgical intervention. Cultures from intraoperatively obtained biopsies identified M. hominis as the causative pathogen. The patient was treated with oral moxifloxacin for 4 weeks resulting in the resolution of the spinal lesion. The subdural empyema was presumably caused by a contaminated epidural blood patch performed with the patient's own blood during an episode of transient M. hominis bacteremia after delivery. The blood patch was indicated for the treatment of cerebrospinal fluid leakage, which had occurred after epidural anesthesia. Our findings highlight the significance of transient M. hominis bacteremia after delivery and implicate that M. hominis should be considered as a causative agent of extra-genitourinary tract infections particularly during the postpartum period or after genitourinary manipulation [5)].

2013

A 54-year-old male presented with 20 hour duration of headache, fever, and progressive deterioration of consciousness. He had undergone two burr-holes craniostomy and closed system drainages two times in a month for right fronto-parietal chronic subdural hematoma (CSDH). He presented to emergency department 10 days after the last surgery. There was history of closed head trauma 4 months ago and no skull fracture. Neurological examination revealed a Glasgow Coma Scale score of 10 (E3, V2, M5) and left side hemiparesis (3/5). Computed tomography (CT) and magnetic resonance imaging (MRI) demonstrated subdural collection in the same localization of the prior SDH.

With a possible diagnosis of SDE, he underwent emergent surgery under local anesthesia using the same burr holes to evacuate the subdural collection. At operation, a very thick capsule was seen around the lesion. A yellowish purulent material was drained with puncturing of the capsule. The empyema cavity was irrigated with sterile saline solution until the returning fluid was clear, and drains were placed in the subdural space for 2 days. Postoperatively he was alert and the hemiparesis resolved rapidly on postoperative day-1. Culture of the subdural fluid identified methicillin-resistant Staphylococcus epidermidis. He was treated with intravenous vancomycin and meropenem for 6 weeks. He was on prophylactic antiepileptic treatment since the first subdural hematoma drainage. He recovered fully and repeat MRI at 6 weeks follow-up did not show any recurrence of pus collection. He has been followed up in the outpatient clinic for 2 years [6)].

2010

A 42- year-old male presented with headache and purulent discharge from right parietal burr hole wound site. Patient gave a history of head injury two years ago. He underwent burr hole evacuation of chronic subdural haematoma, excision of outer membrane and right parietal craniectomy. The cultures grew S. paratyphi A. Recovery was uneventful following surgical intervention and antibiotic therapy [7)].

2009

A case of a bilateral chronic subdural hematoma which was contaminated with Klebsiella pneumoniae and resulted in a life-threatening central nervous system infection. After repeated of bilateral burr-hole drainage, the patient became hyperpyrexic and drowsy. Suppuration within the subdural space was suspected and then the patient underwent bilateral fronto-temporo-parietal craniotomies, and pus was evacuated. Its cultures revealed Klebsiella pneumoniae. Intravenous meropenem was given for 6 weeks. He recovered completely. Microorganisms like Klebsiella pneumoniae may directly infect the subdural space with iatrogenic contamination [8].

A 80-year-old man who had undergone total gastrectomy and splenectomy for gastric cancer 13 years ago presented with headache, drowsiness, and high fever 1 month after a traffic accident. Brain CT scans revealed bilateral subdural fluid collections. Diffusion-weighted imaging (DWI) showed mixed high and low signal intensities in the left subdural fluid, and contrast-enhanced MR imaging revealed capsule enhancement of the left subdural fluid collection. The patient was diagnosed with left subdural empyema, and 2 burr-holes were drilled for drainage and irrigation. Operative findings revealed a neomembrane underneath the dura mater. Old hematoma and yellowish-white purulent fluid were present within the neomembrane. This confirmed the diagnosis of infected subdural hematoma (ISH). Abscess culture results were positive for Escherichia coli. The patient's symptoms resolved postoperatively with subsequent antibiotic therapy. However, 4 months after the operation, he suddenly died of severe sepsis and disseminated intravascular coagulation following cholecystitis, which was possibly associated with splenectomy. The clinical presentation, diagnosis, and treatment of an unusual case of ISH have been discussed. We emphasize that DWI and enhanced MR imaging may be useful for diagnosing ISH, and serial DWI evaluations may help in monitoring the therapeutic response in ISH [9].

A 23-year-old male was admitted due to headache and fever. One month ago, he had mild head injury by his coworkers. Physical examination showed a macrocephaly and laboratory findings suggested purulent meningitis. Neuroimaging studies revealed a huge size of epidural space-occupying lesion. Under the impression of epidural abscess, operation was performed. Eventually, the lesion was located at subdural space and was proven to be subdural empyema. Later, histological examination of the specimen obtained by surgery demonstrated finings consistent with the capsule of the chronic subdural hematoma. Two weeks after operation, Propionibacterium acnes was isolated. The intravenous antibiotics were used for total of eight weeks under monitoring of the serum level of the C-reactive protein. Follow-up brain computed tomography (CT) scan showed the presence of significant amount of remaining subdural lesion. However, he has complained of minimal discomfort. It is suggested that the subdural empyema occurred with preexisting chronic subdural hematoma after head injury about one month prior to admission and it took a long time to treat Propionibacterium acnes subdural empyema with systemic antibiotics, at least over eight weeks [10].

2008

A 51-year-old man was found lying unconscious on a street and was brought to the hospital in an ambulance. He had no past history of any underlying disease but he had suffered head trauma approximately 1 month prior to this episode. On admission, he had high fever and developed a convulsion fit. Because the cerebrospinal fluid (CSF) findings showed mononuclear dominant pleocytosis and Gram staining revealed spiral-shaped gram negative bacilli, meningitis caused by C. fetus was suspected. Brain CT preformed on admission did not reveal any obvious abnormality. He

was immediately treated with antibiotics effective against C. fetus. His disease was complicated by bilateral subdural empyema; therefore, bilateral burr hole drainage was performed. Durling the operation, a hematoma with an outer membrane and containing yellowish pus was revealed. Infection of a chronic subdural hematoma and consequent formation of subdural empyema was deduced. Eventually, C. fetus was isolated from the CSF arterial blood and subdural empyema. The patient was discharged with no complication after the completion of the treatment [11].

2007

A 87-year old male was admitted due to generalized convulsion with loss of consiousness. He was afebrile and his blood sampling was not infectious. Computed tomography scan suspected left chronic subdural hematoma. Burr hole drainage was performed to remove the hematoma, but the abscess was aspirated in the subdural space [12].

1998

A 63-year-old male with a preexisting chronic subdural hematoma presented with progressive confusion and left hemiparesis as well as high fever. Subdural empyema was strongly suspected. At surgery, the empyema was encapsulated by definite inner and outer membranes. Cultures isolated from the subdural fluid and from an abscess of his left thigh yielded methicillin-resistant Staphylococcus aureus. A pulsed-field gel electrophoresis showed these two strains were genetically identical. Hematogenous infection of a preexisting subdural hematoma is an extremely rare cause of subdural empyema [13].

A 64-year-old man had been in a nearby hospital due to myelodysplastic syndrome with cerebral infarction for two months. His condition there had been almost uneventful. But spike fever occurred and the patient became drowsy two days before his transfer to our medical center. His consciousness level deteriorated progressively and CT scan showed a right chronic subdural hematoma. He had had no history of head trauma in the previous two months. On admission to our center, his consciousness level was semicoma with anisocoria. An emergency operation was performed via a single burr hole initially. From the burr hole, old bloody fluid accompanied by yellowish pus was obtained. Thus so-called ISH was diagnosed and the craniotomy was carried out. Gram stain of the specimen revealed gram negative rods. Although an epileptic state developed after the operation, it was controlled by barbiturate coma therapy for 3 days, followed by phenytoin administration. Fever subsided gradually with antibiotics sensitive to the bacteria and his anisocoria disappeared on the 4th postoperative day. In this case, Salmonella enteritidis was detected from bacterial culture both of the specimen and of the arterial blood. Salmonella enteritidis might have been implanted on the capsule of the chronic subdural hematoma by bacteremia derived from immunological dysfunction due to myelodysplastic syndrome. In conclusion, the possibility of ISH should be considered in chronic subdural hematoma patients with immunological dysfunction [14].

1997

A 70-year-old male presented with rapid neurological deterioration and fever 3 months after suffering a closed head trauma. He underwent craniotomy for possible subdural empyema based on computed tomography and clinical findings. Dural incision revealed an outer membrane typical of chronic subdural hematoma which covered a clear, yellowish fluid containing Campylobacter fetus. Histological examination confirmed the capsule of the hematoma, with a necrotic focus infiltrated by neutrophils. Administration of intravenous imipenem and topical tobramycin and cefalothin achieved total resolution of his neurological deficits. Development of the infected subdural effusion was probably secondary to bacterial infection in the pre-existing chronic subdural hematoma in the resolving stage. The presence of the hematoma capsule always carries the risk of development of an infectious focus [15].

1996

Two patients with postoperative subdural empyema following burr hole evacuation of chronic subdural haematoma are reported, both caused by Propionibacterium acnes. The need to consider this diagnosis in patients developing recurrent symptoms after surgical drainage of chronic subdural haematoma is emphasized [16].

A 71-year-old man developed a large multi-loculated subdural empyema following the evacuation of a chronic subdural haematoma. The pockets of pus were successfully evacuated endoscopically via the burr holes resulting in good recovery and no re-accumulation [17].

1995

Takamura et al. report the MR imaging of two patients with multiple subdural empyemas, including one in the interhemispheric fissure. MRI demonstrated convexity and interhemispheric collections which were mild hyperintense relative to CSF, hypointense relative to gray and white matter on T1W1, and marked hyperintense relative to CSF, and brain on T2W1. On the basis of signal intensity differences, MRI can distinguish subdural empyemas from most sterile effusions and chronic subdural hematomas with similar CT appearances. MRI was found to be clearly more sensitive to subdural empyemas than CT, though such lesions missed on CT were considered to be relevant. MR was superior to CT in demonstrating the nature, presence, and extent of these lesions. In both cases, the capsule of the lesions demonstrated enhancement, and connection between each lesion was obvious on contrast-enhanced MRI. It seems that contrast-enhanced MR image may detect encapsulation of an abscess which can not be detected from contrast-enhanced CT. We emphasized that the most significant factor in the successful surgical management of multiple subdural empyema, particularly including interhemispheric collections is the accurate location of pus. This can be reliably achieved with MR imaging [18].

1981

A case is presented in which computerized tomography (CT) demonstrated a supratentorial and parafalcial purulent collection. However, neither carotid angiography nor CT revealed the small scattered pockets of pus that were found over the convexity at operation. The entire subdural space was exposed by a wide craniectomy, permitting adequate subdural drainage and decompression of

the brain. It is thought that thorough drainage of the entire subdural space is crucial for the attainment of a successful result in a single-state operation [19].

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