

DIAGNOSIS OF LATERAL SINUS THROMBOSIS WITH COMPUTED TOMOGRAPHY, MAGNETIC RESONANCE IMAGING AND MR ANGIOGRAPHY

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- ✓ Three cases of lateral sinus thrombosis with chronic mastoiditis in children are presented. The findings of contrast enhanced computed tomography, T1 weighted axial magnetic resonance imaging, magnetic resonance angiography and neck ultrasonography were consisted with the diagnosis of lateral sinus thrombosis. Complete and modified radical mastoidectomies were underwent to the patients as connection with the extent of disease. The internal jugular vein was ligated in one case. Lateral sinus thrombosis is discussed.

Key word: *Lateral sinus thrombosis*

- ✓ **Lateral Sinus Tromboflebitinin Kompüterize Tomografi, Mağnetik Rezonans ve MR Angiografi ile Tanısı**

Lateral sinüs tromboflebiti olan kronik mastoiditli 3 çocuk sunuldu. Kontrastlı kompüterize tomografi, T1 ağırlıklı mağnetik rezonans, MR anjiografi ve boyun ultrasonografi bulguları ile tanı doğrulandı. Hastalara; hastalığın yaygınlık derecesine göre komple ve modifiye radikal mastoidektomi yapılarak bir vakada da internal juguler ven bağlandı. Lateral sinüs trombozu ayrıntıları ile tartışıldı.

Anahtar kelime: *Lateral sinüs trombozu*

INTRODUCTION

Lateral sinus thrombosis (LST) is almost exclusively a complication of otologic infection and usually established on clinical grounds of the disease in the presence of an otogenic infection. The altered clinical picture of this condition in the era of antibiotics may be misleading. Delay in the recognition of the LST results in serious morbidity and death. Therefore, additional tools and methods are required for the early diagnosis and treatment of this complication. We present 3 cases of LST secondary to chronic mastoiditis in the last 18 months diagnosed by contrast enhanced computed tomography (CECT),

magnetic resonance (MR) imaging, MR angiography and ultrasonography (US).

CASE REPORTS

Case 1. A 8 years old boy was admitted to a local hospital with left sided purulent otorrhea of 6 to 7 months duration, fever and chills of 3 weeks duration, headache and disequilibrium. The patient was treated with chloramphenicol, ampicillin and ceftriaxon. He was transferred to the Department of Pediatrics of Ondokuz Mayıs University Hospital for further evaluation, because the temperature was increasing. The temperature was 38°C, pulse 130/mn and blood pressure

110/80 mmHg. There was purulent drainage from the left ear and tenderness in the left postauricular area with no fluctuation. Hepatosplenomegaly, a 1/6 degrees systolic murmur was heard over the heart, rales and ronchi over the right and left chest were present. Neurologic examination was normal. The laboratory investigations revealed an elevated sedimentation rate of 150 mm/h, hemoglobin 5.4 gr/dl, white blood cell count 20000 mm³ with a shift to the left, total serum protein 6.8 gr/dl. Treatment with netilmisin (5 mg/kg/day) intravenously and sulbactam-ampicilin (200 mg/day) perorally was begun. Otolaryngology consultation was requested on the fifth hospital day. Otologic examination revealed purulent drainage from the left ear. There was no perforation but landmarks of the tympanic membrane could not be seen in detail. An inflamed fluctuant swelling (3x4 cm diameter) in the left postauricular region was present. Audiological examination revealed mixed hearing loss with 40 dB on the left ear. Radiographs of the ears showed poor aeration of the left mastoid but no evidence of bone destruction. Cranial CECT showed abscess formation over the antral cortex, destruction of the mastoid antrum and mastoid apex. There was a huge thrombosis in the left lateral sinus, transverse sinus and internal jugular vein (IJV) (Fig. 1.). US showed that the thrombus in the jugular vein extended up to the level of the carotid artery bifurcation. Axial T₁ weighted MR images showed that there was a huge thrombus in the enlarged lateral sinus and no flow in the left transverse sinus and lateral sinus. Coronal MR angiography images 3D PC/GR (33/8.8/20°) revealed that there was no flow in the left transverse sinus and lateral sinus nor in the jugular vein.

Fluctuant swelling was drained and pus evacuated. Cultures of pus yielded no growth.

Over the 4 days the patient's condition improved slightly. He underwent left cortical mastoidectomy after body temperature and the values of the blood chemistry were within normal limits. At operation, a defect of the cortical bone near inferior portion of the lateral sinus was found at the mastoid tip. Tympanic membrane was intact except a small retraction at the attic. Small cholesteatoma was found at the mastoid apex and digastric ridge. The lateral sinus was exposed to the mastoid tip. The lateral sinus and dura was covered by a granulation tissue. A longitudinal incision was placed in the transverse-sigmoid sinus complex. This allowed curettage of the infected thrombus and granulation tissue. IJV was ligated under the level of carotid bifurcation. Culture specimens taken from the granulation tissue and thrombus revealed no bacterial growth. Antibiotics were given intravenously for 3 to 4 days postoperatively and continued per orally for another 5 days. The patient did well postoperatively and remained afebrile. He was discharged from the hospital on postoperative day 15. He is symptom free 18 months later.

Case 2. A 14 years old boy with no previous otologic problems was admitted to Otolaryngology Department with left ear pain and fever. Physical examination revealed post auricular sensitivity only. Temperature was 38.7°C. The appearance of the tympanic membrane was normal. X-rays including Schuller and Towne showed mild sclerotic mastoid but no evidence of bone destruction. Water's and chest graphies were normal. There was a leukocytosis of 28500 mm³, hemoglobin was 13.1 gr/dl and sedimentation rate was 32 mm/h. Tympanogram showed negative middle ear pressure. Myringotomy was performed on the patient but no discharge from the middle

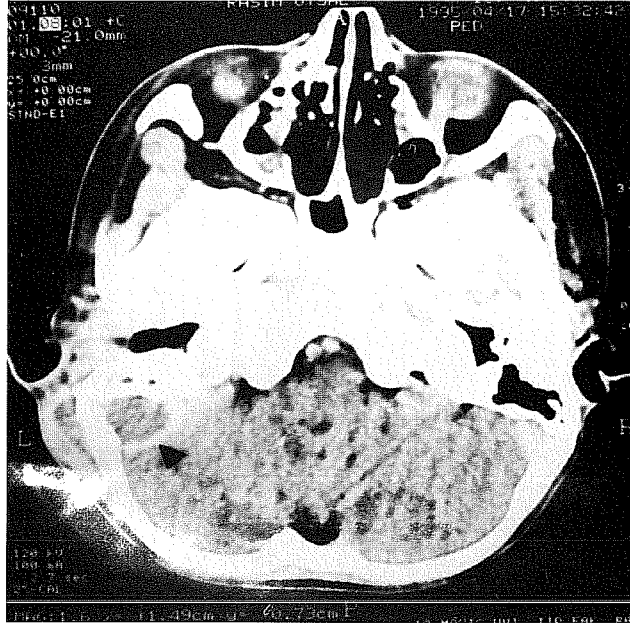


Fig. 1. CECT shows thrombus as a filling defect within the enlarged left lateral sinus. Note the extracranial abscess over the left antral cortex

ear was found. However, 2 days after myringotomy there was purulent drainage from the left ear. Culture of the pus grew no bacteria. Treatment was commenced with chloramphenicol (2 gr/day) and penicillin (24 mil.IU/day). Axial CECT and T₁ weighted MR images showed extradural abscess, mild opacification of the left mastoid and lateral sinus thrombosis (Fig. 2.). Coronal MR angiography showed that there was no flow in the left transverse and lateral sinuses (Fig.3.). Thrombosis was not found in the jugular vein by US.

A cortical mastoidectomy revealed an extradural abscess with purulent drainage. There was a small bone defect and granulation over lateral sinus and also granulation tissue around aditus ad antrum and tegmen antri. Lateral sinus was incised longitudinally and intraluminal thrombus was

evacuated. Free blood flow was revealed and then two lateral sinus lumens were packed with absorbable gelatin sponge. On postoperative day 1 and 2, the patient was febrile to 39°C, but no fever on postoperative day 3. Abscess drainage during operation grew *Staphylococcus aureus*. He was discharged from the hospital on postoperative day 8 and received sulbactam-ampicillin (750 mg/day) perorally for a total duration of 10 days. He is symptom free 5 months later.

Case 3. A 9 years old boy was admitted to Pediatrics Department with fever, nausea, vomiting and mental confusion. Physical examination revealed neck stiffness and positive Kernig's and Brudzinski's signs. Temperature was 39° C. There was a leukocytosis of 30700 mm³, hemoglobin was 11.3 gr/dl and sedimentation rate was 107

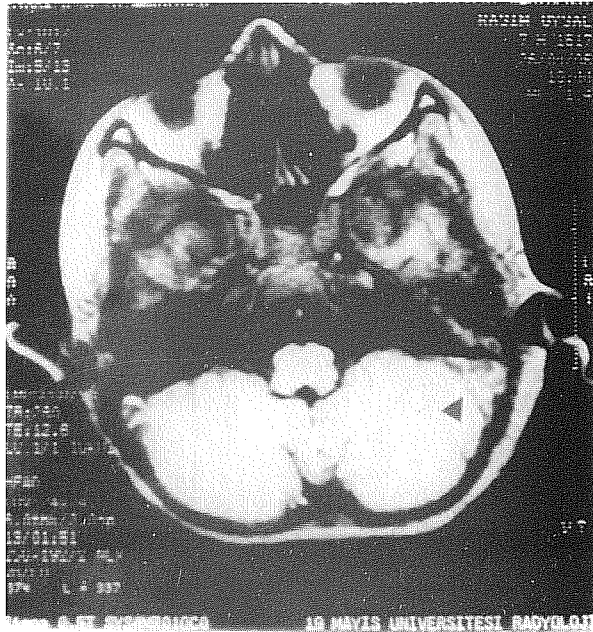


Fig. 2. T₁ weighted MR shows high signal from the left lateral sinus.

mm/h. Streptococcal meningitis was diagnosed by lumbar puncture. He was treated with ceftriaxone (100 mg/kg/day) and dexamethasone (0.6 mg/kg/day). On post admission day 4, the patient was afebrile but it has been noticed by pediatricians that he had a right sided purulent ear drainage. He was examined by us and purulent drainage from the right ear and minimal attic perforation with granulation tissue were seen. Culture of the pus grew *Streptococcus* sp. Axial CECT and T₁ weighted MR images showed extradural abscess, severe opacification of the right mastoid and lateral sinus thrombosis. Coronal MR angiography showed minimal flow in the right lateral and transverse sinuses. After treatment of meningitis was completed, patient transferred to the Otolaryngology Department. A cortical mastoidectomy revealed small bone defect

near mastoid apex. Dural granulation tissue with a bony dehiscence adjacent to the lateral sinus was discovered. The sinus itself was compressible. There was an extensive granulation in the antrum and minimal cholesteatoma around aditus ad antrum and absence of the long crus of incus. There was a blood flow from the lateral sinus with needle aspiration. Modified radical mastoidectomy was performed on the patient. The patient was kept on antibiotics of ampicilline + sulbactam (200 mg/day) perorally for a total duration of 10 days, did well, and is symptom free 3 months later.

DISCUSSION

LST is rare, but still a life threatening disease with a mortality rate of approximately 10 percent⁽¹⁾. It almost always arises from an inflammatory lesion in the nearby mastoid or

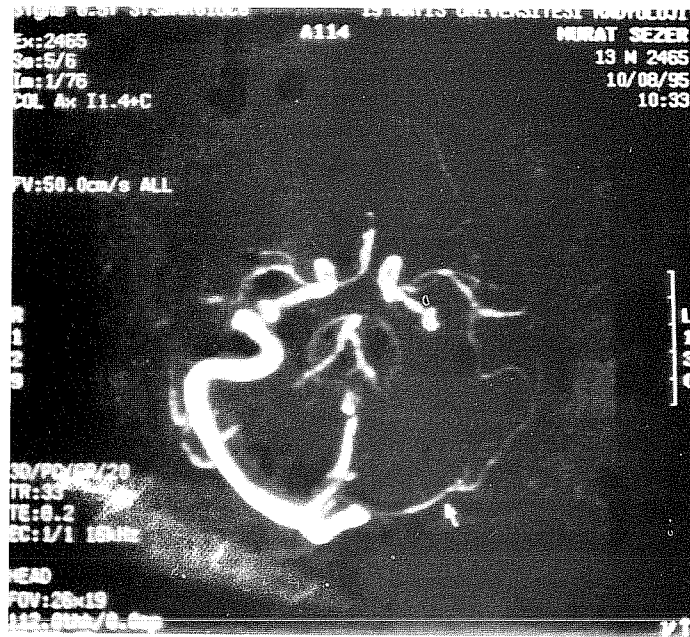


Fig. 3. MR angiogram shows absence of signal from the left lateral sinus and transverse sinus.

middle ear⁽²⁾. It has been reported by Mathews⁽³⁾ that the LST was associated with chronic suppurative otitis media and all of the cases associated with acute otitis media in his series occurred in children. In another series, 82 percent of patients with LST were under 15⁽⁴⁾. In two recent reports LST accounted for approximately 20 percent of intracranial complications of suppurative otitis media⁽⁵⁾. However, since the introduction of antibiotics the incidence of complications after otitis media has fallen from 3 to 0,15 percent⁽⁶⁾. The widespread use of systemic antibiotic therapy has changed the clinical presentation of the LST^(3,4). Samuel and Fernandes⁽⁷⁾ reported 21 cases of otogenic complications with an intact tympanic membrane, and Holt and Gates⁽⁸⁾ reported 9 cases of masked mastoiditis. Besides its rarity, nonspecificity of the signs and symptoms and the masking effect of

antibiotic therapy make diagnosis of LST difficult⁽²⁾. Investigations such as neutrophil leukocytosis of greater than 20000 mm³, and progressive anemia are of limited help. A lumbar puncture can be dangerous because of the risk of brain herniation, and the Tobey Ayer test is unreliable⁽⁹⁾. Routine radiographs of the mastoids can only show an inflammatory temporal bone disorder. Although carotid angiography and jugular venography are highly specific in the recognition of LST, they are invasive procedures carrying the risk of dislodging the thrombus⁽²⁾. However, digital subtraction angiography has gained importance as a relatively low risk procedure in the recognition of the LST. US provides diagnostic information of diagnosing jugular vein thrombosis⁽¹⁰⁾. When the diagnosis is delayed, the thrombus would be organization with demonstrate the full extent of the thrombus and surrounding

soft tissue. CT with contrast media infusion is often regarded as the radiologic study of choice for such diagnostic purposes. CT alone can often identify extradural, subdural, and cerebral abscess, and further provides supportive evidence of sigmoid sinus thrombosis and cerebritis^(1,11). Filling defect or "delta sign" on CECT gives more definitive evidence of the diagnosis⁽⁹⁾. However, the detection of dural sinus thrombosis requires strong clinical suspicion, precise orientation of thin cuts, concentrated contrast medium, multiplanar reconstruction, and special window settings⁽²⁾. MR may show abnormal signal from the sinus and high signal intensity on T₁ and T₂ weighted images indicates venous thrombosis. Gadolinium enhancement of MR images may also show a "delta sign" comparable to that seen on CT scanning⁽⁹⁾. MR angiography is quite sensitive to blood flow and distinguishes thrombosis from slow flow. It has several advantages; it is a non-invasive technique and does not require the use of intravenous contrast agent, it can be performed rapidly and does not use ionizing radiation. MR angiography can help to detect thrombosis of the superior sagittal and cavernous sinus^(12,13).

The treatment of chronic mastoiditis with LST is surgical removal of the ear infection concomitant with intravenous antibiotic therapy. Chronic mastoiditis necessitates mastoidectomy procedures. Intraoperative needle aspiration of the sinus provides evidence of patency or obstruction of blood flow. Absence of free blood indicates thrombus and needs longitudinal incision of the sinus and removal of the thrombus. The importance of ligating the IJV remains controversial. It has been reported that the jugular vein should be ligated in the course of the surgery if thrombosis is covered at operation⁽¹⁴⁾. Teichgraber et al⁽¹⁾ have agreed that this is

unnecessary in all cases as it considerably increases the mortality and morbidity of the procedure and ligation should be reserved for those cases in which thrombophlebitic or embolic spread beyond the sinus is inspected.

CECT scanning, MR angiography, T₁ weighted axial MR imaging and neck US have been performed on the patients to diagnose the suspected LST in our case under 15. The findings of MR imaging and angiography and CECT scanning were consistent with the diagnosis of LST. The extent of thrombus in the jugular vein was investigated by US. After the patients' conditions were improved with the antibiotics surgery was undertaken. In our cases; ligation of IJV under the level of carotid bifurcation was necessary because of extensive septic thrombus in the first case. In third case there was no need to open the lateral sinus because of free blood aspiration by needle. They were treated with antibiotics for 10 days postoperatively.

CONCLUSIONS

LST is an uncommon complication of mastoiditis and may be more difficult to diagnose accurately because of the nonspecific signs and symptoms of the disease and also the masking effect of antibiotics. Delay in its diagnosis and treatment results in high morbidity and mortality rates. CT scanning is sensitive in the detection of LST. MR angiography can distinguish thrombosis from slow flow and does not require ionizing radiation. Therefore it can be more preferable than other techniques. US can be used to detect the extent of the thrombus in the IJV. Mastoidectomy procedures with removal of the thrombus and together with intravenous antibiotics are recommended for treatment. When the clots extends beyond the mastoid area the ligation of the IJV should be done.

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