Symptomatic hydrocephalus and reversible spinal cord compression in *Listeria monocytogenes* meningitis

Case report

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Central nervous system infections with *Listeria monocytogenes* result in varied clinical syndromes ranging from meningitis to rhomboencephalitis. A case of *Listeria* meningitis complicated by symptomatic communicating hydrocephalus and hydrostatic cervical cord compression is presented which clinically and radiographically improved with aggressive ventricular drainage.

**KEY WORDS**  
*Listeria* meningitis  
hydrocephalus  
spinal cord deformity

The neurotropic nature of *Listeria monocytogenes* has been well described with a wide clinical spectrum including brain abscess, meningitis, nonmeningitic parenchymal cerebritis, and rhomboencephalitis (pontomedullary listeriosis). While *Listeria* can infect healthy individuals, central nervous system (CNS) infection is most common in the elderly and immunocompromised. Numerous reviews have emphasized the neurological manifestations of *Listeria* infection, but few have documented the nature and extent of secondary (postinflammatory) hydrocephalus occurring in this setting. In most reported cases of CNS listeriosis, computerized tomography (CT) scans are normal. A case of *Listeria monocytogenes* meningitis complicated by severe symptomatic hydrocephalus and hydrostatic compression of the cervical spinal cord is presented. Serial magnetic resonance (MR) imaging prior to and following the insertion of an indwelling ventriculoperitoneal (VP) shunt correlated well with the clinical improvement.

**Case Report**

This 47-year-old woman presented with fever and myalgias. She had a history of adenocarcinoma of the right breast treated with a modified radical mastectomy and four courses of chemotherapy (Cytoscan [cyclophosphamide], methotrexate, and 5-fluorouracil). Several weeks after completion of chemotherapy, she developed progressive nausea, malaise, lethargy, headache, and fever over 24 hours without an associated neutropenia. A lumbar puncture yielded cerebrospinal fluid (CSF) with 500 white blood cells (60% neutrophils and 40% lymphocytes), 150 mg/dl protein, and 7 mg/dl glucose. A bacterial culture was positive for *Listeria monocytogenes*, and a 21-day course of intravenous ampicillin was initiated.

The clinical course was both complicated and prolonged despite aggressive medical therapy. The patient developed a left seventh and bilateral sixth nerve palsies, generalized intermittent myoclonus, opsonolus, periodic alternating nystagmus, and a progressive decline in consciousness requiring intubation and mechanically assisted ventilation. She manifested a flaccid quadriparesis and, with time, wasting of the intrinsic hand and leg muscles. Several CT scans showed marked enlargement of the lateral, third, and fourth ventricles. A metrizamide ventriculogram demonstrated no obstruction to CSF flow. Multiple ventriculostomies with hourly drainage were required over a 10-week period to accomplish adequate CSF drainage. Magnetic resonance imaging performed while the patient was comatose and intubated revealed persistent hydrocephalus despite a patent ventriculostomy; it also showed a large fluid collection anterior to the upper cervical cord with an elongated cisterna magna (Fig. 1A). The upper segments of the cervical cord appeared compressed to less

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Reversal of \textit{Listeria} meningitis sequelae by CSF shunting

\textbf{FIG. 1.} Magnetic resonance $T_1$-weighted sagittal images of the brain (spin echo: TE 20 msec, TR 600 msec). 

\begin{itemize}
\item A: The image obtained before ventriculoperitoneal (VP) shunting demonstrates ventricular dilatation and anterior hydrostatic cervical cord compression. An extra-axial fluid collection is seen over the frontal lobe and a gas-fluid level is visible within the lateral ventricle.
\item B: The image obtained 4 weeks after insertion of a permanent VP shunt shows improvement in the ventricular and cervical cord anatomy. The fluid collection and intraventricular gas-fluid level have resolved.
\end{itemize}

than 50\% normal diameter. Four days after this MR image was obtained, a VP shunt with a low-pressure valve was placed.

Subsequently, the patient's condition showed steady dramatic improvement. Within 3 days, she began to awaken and had normal mental status, conversing in both Spanish and English. The multiple cranial nerve palsies and quadriparesis also showed marked improvement within 2 weeks and she was walking with assistance less than 8 weeks after shunt placement. Serial MR studies obtained 2 and 4 weeks after shunt placement documented virtual normalization of the cervical cord anatomy and ventricular size, with no evidence of residual cord compression (Fig. 1B). Two months later, the patient was walking without assistance and, 6 months later, was without significant deficit.

\textbf{Discussion}

The incidence of \textit{Listeria monocytogenes} meningitis has been steadily increasing recently as the population of relatively or completely immunocompromised patients has expanded. This subgroup includes transplant recipients, patients receiving chemotherapy, and those at the extremes of age (particularly the elderly). A review of 186 cases of culture-proven listeriosis by Nieman and Lorber emphasized the high frequency of disturbed consciousness as well as the high incidence of associated mortality.

While the present patient's course was complicated, the surprising reversal of the structural abnormalities following placement of a VP shunt deserves analysis.

Despite multiple ventriculostomies, the hydrocephalus and cervical cord compression remained refractory to hourly siphoning of CSF. Although on rare occasions the intraventricular pressure prior to CSF drainage was noted to be elevated (> 200 mm H$_2$O), the frequency of siphoning generally kept pressures at or close to 0 mm H$_2$O. Insertion of a permanent VP shunt resulted in dramatic resolution of both hydrocephalus and cervical cord compression in less than 4 weeks, as documented by serial MR studies. The reasons for the failure of aggressive ventriculostomy drainage and the subsequent success of VP shunting are not clear. Presumably, continuous drainage facilitated by internal shunting to a relatively low-pressure "sink" was critical in producing not only a contraction in the size of the ventricles but also a reexpansion of previously compressed spinal cord tissue.

The need for aggressive surgical treatment of hydrocephalus complicating tuberculous meningitis is well documented. In a study of 132 pediatric cases, hydrocephalus was found in over 33\% of cases and proved to be the single most important factor influencing prognosis.\textsuperscript{3} Similar findings have also been demonstrated in adults.\textsuperscript{2,8} A case of normotensive hydrocephalus occurring as a result of chronic \textit{Listeria} infection was reported in a patient in whom subacute dementia developed secondary to communicating hydrocephalus.\textsuperscript{4} All symptoms reversed following the insertion of a VP shunt.

The case presented here is unique in its documentation of reversal by VP shunting of the hydrocephalus...
and cervical cord compression caused by Listeria meningitis.

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References

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