Neurosurgical forum
Letters to the editor

Cerebrospinal fluid puncture in myelomeningocele patients

To The Editor: We read with great interest the recent article by Albright et al. (Albright AL, Ferson SS, Okechi H: Cerebrospinal fluid white blood cell counts in infants with myelomeningocele. Clinical article. J Neurosurg Pediatr 13:189–191, February 2014) regarding white blood cell (WBC) counts in CSF obtained from lateral ventricles and myelomeningocele (MMC) sacs in 100 consecutive infants in a developing country (Kenya) at the time of their initial presentation for medical evaluation. More than 50% of the CSF samples taken from MMC sacs had a high WBC count, although the culture results were positive in only 5 samples. The authors concluded that most ventricular CSF is normal and there is no need for routine evaluation, but CSF in MMC sacs often has a high WBC count, which can indicate bacterial infection, even with negative CSF culture results. So due to unreliable culture media and results in their setting, the authors prescribe intravenous antibiotics before MMC repair for infants with high MMC sac WBC counts to decrease the risk of postsurgical meningitis or ventriculitis.

In spite of profound improvement in perinatal care in Iran during recent decades, MMC is still one of the most common congenital abnormalities in this country. Most often, this anomaly is detected during the late second or third trimester, which is too late for termination of pregnancy. (Pregnancy termination is illegal in Iran after 18 weeks’ gestation.) Therefore, MMC is still a big problem in pediatric neurosurgery. Most of the social and economic burden of this complex disease is shouldered by the patients’ families, people who are primarily from low socioeconomic levels and tend to seek treatment after a very long delay, especially when the children have obvious motor deficits and hydrocephalus. So, when the families are referred to us the children can be in different age groups. We have done MMC surgery in patients with a wide range of ages (ranging from 1 hour to 8 years). The greater the delay to surgery, the greater the risk of infection or contamination of the sac, especially when wound care is poor.

Obtaining CSF from either the ventricle or the MMC sac is a painful and invasive procedure, so we do not routinely perform preoperative CSF sampling from the ventricle, and we routinely obtain CSF from the MMC sac only immediately before incision, when the patient is already in the operating room under anesthesia. Starting broad-spectrum antibiotic therapy only based on the WBC count of CSF obtained from the MMC sac is not justified in patients without any clinical signs or symptoms related to infection due to the side effects and the cost. Due to multiple adhesions inside the MMC sac, CSF may be trapped inside the sac, and fluid obtained from this site may not accurately represent the cell count and glucose level of CSF within the spinal canal. Fluid from the spinal canal enters the sac, but there is no free bidirectional exchange between the canal and the sac. Analysis of MMC sac fluid is similar to analysis of subdural fluid or postoperative subgaleal fluid collections in that it can show a high WBC count or low sugar level as a result of fluid retention. Therefore, analysis is useless. Fluid culture, especially if antibiotics were not given beforehand, is also not very helpful. We perform intraoperative MMC sac puncture routinely in all patients before incising the skin. The fluid culture is the only guide for us to stop or continue antibiotics in patients without sepsis or meningitis, and antibiotic therapy is adjusted according to the results of microbial culture and susceptibility analysis.

We have a defined protocol for approaching infection in children with MMC: 1) If the dystrophic skin on the sac is clean and the child does not have any clinical signs or symptoms of infection, we do not obtain a CSF sample from a ventricle or the MMC sac preoperatively. We routinely obtain CSF from the intact sac before performing the surgical incision, and if the results of culture of this specimen are positive, we continue perioperative antibiotic therapy. 2) If the sac is ruptured and CSF leakage is found, this is considered an emergency in our department. A ventricular puncture is performed and a ventricular CSF sample is obtained to rule out any associated infection. CSF is obtained from the MMC sac before skin incision, and the child is treated with antibiotics until the results of the sac CSF culture are available. 3) If the child is septic, a CSF sample from the ventricle is necessary. If the culture results are normal, the sepsis is treated and then the child undergoes MMC repair surgery. If culture of ventricular CSF shows infection, ventriculitis treatment is undertaken at the same time as surgery. CSF from the sac is sent as usual before skin incision, and antibiotic therapy is adjusted on the basis of the results of the culture and susceptibility analysis.

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Disclosure

The authors report no conflict of interest.

References

1. Albright AL, Ferson SS, Okechi H: Cerebrospinal fluid white


**Response:** The authors of the letter state that obtaining CSF from either the ventricle or the MMC sac is a painful and invasive procedure. We obtain CSF from MMC sacs through insensate skin at the caudal end of the MMC, which is painless. The pain of a single puncture of a 22-gauge spinal needle through the anterior fontanel in an infant appears to be minimal.

The authors believe that giving antibiotics based on WBC counts from the MMC sac is not justified in patients without clinical signs or symptoms related to infection due to the side effects and the cost. That opinion appears to be based on a belief that infants with high WBC counts in their MMC sacs have no significant risk of developing meningitis/ventriculitis if antibiotics are not administered. We believe that the risk is unknown and that it may be safer to give the antibiotics. We struggle with cost versus benefit arguments related to the use of antibiotics, but the cost of infection and possible brain damage also needs to be considered.

We operate on large numbers of children with MMCs (249 in 2013) and almost never find that adhesions have separated the MMC sac into multiple compartments. In some patients, adhesions (secondary to infection) have isolated the MMC sac from CSF within the spinal canal, but in most cases, there is communication between the two.

The statement that analysis of WBC counts in MMC sacs is “useless” seems to assume that the average WBC count of 141 cells/mm$^3$ has no relationship to infection. It seems to us that the safest thing to assume is that the high counts, which at times are greater than 500 WBCs/mm$^3$, represent localized infection that could spread cephalad in CSF.

The authors’ practice is to sample CSF from the MMC sac before the surgical incision and to give antibiotics depending on the culture results and sensitivities. That practice usually requires 2 days postoperatively for the culture results to become known and an additional day for the sensitivity results. Thus, if the MMC sac is infected, antibiotics would not be given during the time when the risk of cephalic spread of infection through the spinal CSF would be greatest. In their practice, a leaking sac is considered to be a neurosurgical emergency. In Kijabe, an appreciable proportion of MMC sacs have ruptured 2 or more days before the infant is admitted. We begin antibiotics immediately and continue them until the operation can be done, usually 1–2 days later. The ventricular CSF we have obtained in those children has almost always been culture negative. We do not sample MMC CSF or give preoperative antibiotics in those children whose sacs have never leaked, are not raw, or, in older infants, who have had no recent leak and appear well.

Our publication concluded with a statement that “analysis of CSF from MMC sacs should be done in developing countries when possible if the results will alter treatment” which they would not for the authors. We concluded that high WBC counts in CSF sacs were suggestive of infection and know of no good reason to think otherwise. We ended the abstract with the statement: “In developing countries where culture reliability is questionable [as it is in Kenya and many other developing countries], intravenous administration of antibiotics before MMC closure for infants with high MMC WBC counts may diminish postoperative meningitis/ventriculitis.” That statement is probably true but only a randomized control trial would answer the question definitively, and it is unlikely to be done.

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