

PEERING INTO BABIES' BRAINS

Recent improvements in brain imaging have brought this technology to the forefront in neonatal intensive care units (NICUs), where infants who were born prematurely or who endured difficult deliveries may be at very high risk for brain damage causing permanent disability. Dr. Steven P. Miller from the University of British Columbia is among the researchers at the forefront of this new frontier.

"Over the last decade or so, our ability to look into the infant brain has been revolutionized by new imaging tools, especially MRI [magnetic resonance imaging]," says Dr. Miller. "That's allowed us to appreciate the importance of connectivity in the brain."

Dr. Miller reviewed the latest research in the area of newborn brain imaging with Dr. Donna Ferriero from the University of California at San Francisco for the September 2009 issue of *Trends in Neurosciences*.

"We hope that understanding new mechanisms of brain injury will ultimately allow us to identify new opportunities for intervention," he says.

Dr. Michael Shevell, a pediatric neurologist at the Montreal Children's Hospital-McGill University Health Centre, agrees. "The two areas that have had the greatest impact on our understanding of the brain are imaging and genetics," he says. "Tremendous advances have occurred as a result of both of these areas, and one can expect similar advances in the future."

IMPROVEMENTS IN CARE

Already, imaging research has improved patient care. "The big questions parents have when they have a premature infant or when they've had a baby who's been asphyxiated at birth are, 'What will the future bring? Will my child walk? Will my child talk?'" says Dr. Shevell. "Imaging technology, together with the clinical progress of the child, will help us answer those questions more definitively. It will also identify subgroups of children at risk for particular problems for whom we can target early interventions, most typically rehabilitation interventions."

In NICUs, imaging has provided the opportunity to better determine which interventions are most helpful and which might actually

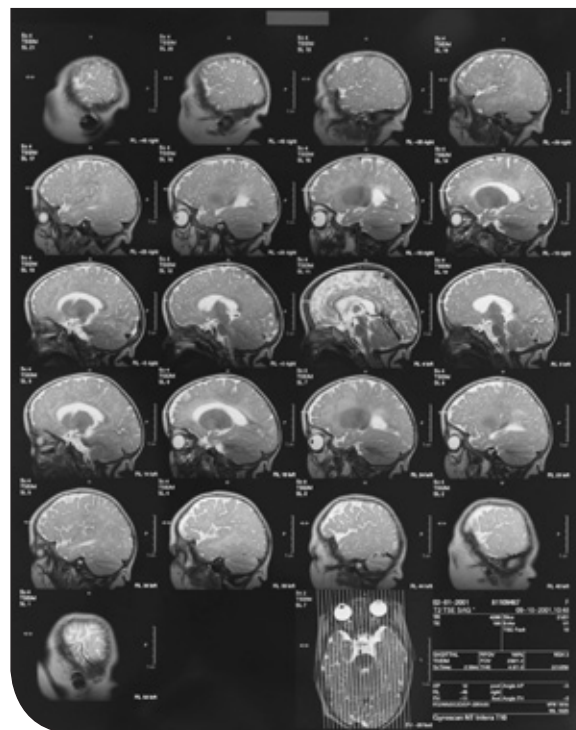
be doing harm. For instance, it was once routine to put preemies on intensive mechanical ventilation, until imaging studies revealed that this can actually contribute to brain damage. So, ventilation was toned down, and outcomes improved. Brain imaging studies have also demonstrated that babies born at term with congenital heart disease are at surprisingly high risk for developing white matter injury in the brain. Making sure these babies receive the treatment they need to support their blood pressure and the flow of blood to their brains may help prevent this

injury. Brain imaging has also helped reveal how important it is to reduce and treat infections in newborns.

"In an ICU, everything is monitored, the heart rate, the respiratory rate," says Dr. Miller. "But the brain is the black box that isn't really looked at. Now that we have noninvasive ways to look at the brain, both with imaging and intensive care monitoring, with things like infrared spectroscopy and amplitude-integrated EEG [electroencephalography], the brain is now becoming a focus of critical care medicine." Monitoring the brain with these technologies is becoming the standard of care in modern hospitals.

"The message that needs to go out to neonatologists is that there are better ways than cranial ultrasound of imaging the brain, and that there may be subtle injuries they're not picking up on," says Dr. Shevell. As technology advances, the ability to peer into babies' brains and detect injury in both structure and function will continue to improve. 🦋

BY ALISON PALKHIVALA



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