Newborn brains grow vision and movement regions first

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The regions of the brain that control vision and other sensory information grow dramatically in the first few months following birth, while the area that controls abstract thought experiences very little growth during the same period, University of North Carolina at Chapel Hill researchers have found.

The researchers discovered that the back regions of the brain, which control vision and sensory integration, grew significantly faster than the prefrontal region, which controls abstract reasoning. In addition, the type of brain tissue called gray matter, which contains most of the neurons or nerve cells, grew much more robustly than another type of tissue called white matter, which contains the connecting fibers between neurons in different brain regions. Gray matter size grew by roughly 40 percent in the first months after birth, while white matter grew very little.

"This pattern of brain growth in newborns has not been described before," said Dr. John Gilmore, a professor of psychiatry in the UNC School of Medicine and lead author of the study. "An enormous amount of brain development takes place between birth and late childhood that we know very little about. This study gives us the first glimpse into understanding that," he said.

The study is the first to systematically obtain very high resolution magnetic resonance imaging (MRI) scans on a large group of newborns. The results appear in the Feb. 7 issue of the *Journal of Neuroscience*.

Another key finding by the UNC team is that boys, on average, are born with brains about 10 percent larger than the brains of girls. This is consistent with the pattern seen in adults, Gilmore said -- men typically have a brain about 10 percent larger than that seen in women.

"What's interesting about this is it shows that the gender difference in brain size arises during prenatal brain development. It's present at birth. That gender difference is set in stone very, very early in brain development," Gilmore said.

However, the scans revealed that brain asymmetry -- or which side of the brain is larger -- was opposite in newborns and adults. In adults, the right side of the brain is usually slightly larger than the left side. Gilmore and his collaborators found the left side was slightly larger in the newborns who were included in the study. "What that tells us is that the overall asymmetries in the adult brain occur because of developmental events that happen after birth," Gilmore said. "So unlike the gender differences, the asymmetry differences arise after a baby is born."

For the study, 74 newborns at the University of North Carolina Hospitals were given high-resolution magnetic resonance imaging (MRI) scans in the first few weeks after birth.

In terms of brain volume, the researchers found newborn male brains were 7.8 percent larger than females. In addition, males had 10.2 percent more gray matter and 6.4 percent more white matter than females. No significant difference in brain asymmetry was observed between males and females; the left side of the brain was on average 4.3 percent larger than the right side.

While these findings are intriguing, Gilmore said, they just scratch the surface of an area that has been little studied so far and in which much more research needs to be done.

"This study gives us the first glimpse that there are regional differences in how quickly the brain is growing, and these regional differences are probably related to functional development," he said.

The dramatic growth in gray matter, the part of the brain that contains most of the neurons, or nerve cells, may have implications for autism research, Gilmore said. Children with autism have larger brains and more gray matter than average. The study suggests that in autistic children, something may go awry during gray matter growth in the first year of life, he said. "Too much gray matter may be just as bad as too little gray matter," Gilmore said.

Source: University of North Carolina School of Medicine