Agenesis of the Corpus Callosum:

Assessment and Remediation of School-Related Problems

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The effects of brain damage occurring during early developmental periods often tend to be less specific than damage occuring during adulthood due to the growth and differentiation of the developing brain. In contrast to the "typical" developmental brain disorder, this presentation focuses on three children who have unique, specific brain damage.

The three children, ages 2, 5, and 12, were born with agenesis (or lack) of the corpus callosum. Of the three commissural connections between cerebral hemispheres, the largest number of fibers pass in the corpus callosum. As can be seen in this slide, the centrally-located fiber system is found rostral to diencephalic structures. Although the anatomical interconnections of the callosal fibers are not well understood, a growing interest in the behavioral functions of this structure has occurred in large measure due to Roger W. Sperry's "split-brain" research. Nevertheless, many of the initial "split-brain" findings hae not been observed in individuals with agenesis of the corpus callosum (possibly because these persons have intact anterior commissures.) Pirozzolo, among others, has postulated that individuals with agenesis of this commissure present with distinct anatomical and behavioral abnormalities different than that seen in "split-brain" patients. Besides hydrocephalic and asymmetrical appearances, individuals with agenesis of the corpus callosum also display deficits in movement, language, and general cognitive abilities. Realizing

that by 1965 only 210 cases of this disorder had been reported in the literature and that the majority of these reports were one-time case studies of adults, the opportunity to follow not one but three children with this condition seemed unique.

Each of the children had been diagnosed as having agenesis of the corpus callosum within the six months of birth using neuroradiological techniques. All apparently experienced complications during delivery and were delivered through ceaserean section. At birth, each child was quickly identified as having hydrocephalus.

Case 1. Case #1 is a black female, now 12 years of age, who has been attending "normal" school since the age of about four. She has been followed on a yearly basis since that time by numerous professionals, including the county School Psychology Program. The earliest psychometric results available indicate that at 4 years and 3 months of age this child achieved a mental age of 3.5 and an IQ of 77 using the Stanford-Binet. Together with additional evidence, it was concluded at that time that her major difficulties involved attention-span and general abstracting abilities. For all practical purposes, this pattern of behaving has remained unchanged. Now that she is enrolled in junior high school, her attentional difficulties have become more pronounced. As a consequence, numerous behavioral reinforcement programs have been initiated by school psychologists. Despite these efforts, she continues lagging both scholastically and

emotionally. The limited success of these programs probably stems from the inability of ~~these programs~~ to address specifically her needs at school as well as at home.

Case 2. The second child is a white male who recently completed Kindergarten. Since he was born with hydrocephalus, clubbed feet, and a dislocated hip he has undergone numerous painful but relatively unsuccessful surgeries to ameliorate these problems. He has been followed both by medical and behavioral specialists since the age of 3 months. Although no overt neurological, social,, or language deficits were noted during the first evaluation at 3 months of age, by the time he was two and one half, difficulties were noticed in general social and visuo-motor skills. Most recently, these problems have exacerbated due to increased medical complications, peer pressure at school and growing parental difficulties at home. Informally planned exercises developed by psychologists to increase attention span, visuo-motor skills, and problem -solving abilities were casually pursued at home. Although a successful in-class modification program was established by his teacher, inadequate reinforcement consistency during lunch, recess, and after school disrupted the overall efficacy of this effort.

Case 3. The third case is that of a black female initially seen at the Medical College of Georgia. By the first year of testing, this child exhibited lethargy, limited motivation, poor attention span, retarded speech development, and poor fine motor

and gross motor skills. The most recent evaluation, at 3 years and 3 months of age, revealed a continued lag in these areas although not as much as initially expected. However, in addition to these complications the following deficits were also observed at the pre-school she was attending; head-stacking, ataxia, cognitive limitations, and emotional lability. Intervention was initiated within the first year of life with the assistance of several local agencies and an enthuthiastic mother. The child was exposed to non-handicapped peers, general physical and sensory stimulation, and speech and physical therapy. The child is now enrolled both at the local Cerebral Palsy School as well as a commercial pre-school where her mother is currently employed. Of the three cases, this one should prove most important since we have been able to test her thoroughly twice yearly,to establish well-chronicled intervention programs, and to stimulate participation by both family and local mental-health and developmental agencies.

While each of these children present unique limitations and each experienced different interventions, these preliminary findings still provide us with a glimpse to the developing brain. Attentional, cognitive, visuo-motor, and motor deficits were commonly seen in all of the children. While these problems could be considered a direct function of the agenesis, secondary emotional involvement may play a role in these behavioral manifestations. From a treatment standpoint, specific deficits-

even in developing brains- appear to require specific interventions. Consistency, adequate contingency, and specificity of treatment programs are critical to the efficacy of these efforts. What is most interesting is that, despite the efforts of both behavioral and medical professionals, these children have still been able to develop limited alternative or compensatory mechanisms in the face of relatively drastic limitations. Furthermore, the behavioral patterns typically observed in adults with agenesis of the corpus callosum were also observed in these children. Nevertheless, a more complete understanding of this disorder in these children awaits long-term follow-up.

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