

Review

Birth brain injury: etiology and prevention— Part III: Concealed and clandestine trauma

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Abstract

Hypoxia and hypovolemia produced by experimental birth asphyxia in primates can affect memory ability and development of the adult brain; in humans, hypovolemia produced by ICC and the resultant infant anemia is strongly correlated with behavioral and learning disorders in children, the degree of anemia being proportional to the degree of mental deficiency.

Autism comprises a major portion of these disabilities and is epidemic. Autism occurs more frequently after complicated or difficult births that indicate the use of ICC. The clinical features of autism indicate lesions of the auditory, speech and language areas of the brain to be fundamental. Hypoxic-ischemic birth injury to the inferior colliculi (part of the auditory circuit) could account for the later development of autism.

Mercury toxicity from vaccines as a cause of autism is controversial and is still under investigation; mercury accumulation in brain nuclei already damaged by hypoxia-ischemia (in the same manner that bilirubin accumulates in dead tissue but does not stain living tissue) may have led researchers to attribute the damage to an incidental finding and miss the real cause.

There is considerable evidence that the autism epidemic will end when the current custom of clamping functioning umbilical cords ends.

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1. Introduction

In Parts One and Two of this series, immediate cord clamping at birth (ICC) with loss of placenta transfusion (PT) and consequent hypovolemia is identified as the primary pathogen responsible for overt neonatal brain damage. However, many ICC neonates, premature and term, survive their neonatal course without any symptoms or signs of neurological dysfunction and may progress into childhood as apparently normal children. Only when the higher mental faculties are needed for progress does brain dysfunction become apparent. A very large proportion of low birth-weight babies never achieve independent living status, [1] and a significant number of apparently normal term neonates are diagnosed in or before grade school with behavioral and learning disabilities—autism, ASD, ADHD, aggression, hyperactivity and mild to moderate mental deficiency.

1. Experimental Asphyxia at Birth

Ranck and Windle (1959) attempted to produce an experimental model of cerebral palsy in monkeys [2]. In early experiments they delivered the infant head at birth into a saline filled sac and clamped the umbilical cord [3]. The monkeys initially displayed signs of hypotonic cerebral palsy, with delayed development of motor control. Monkeys subjected to this kind of total suffocation at birth appeared to “catch up” and make a complete recovery [4]. However, they showed a persistent defect in memory ability. When offered food placed in one of two containers, these primates could not remember the correct container when access was denied for one minute – they

were correct 50% of the time and they did not recover the memory faculty. Normal monkeys that had not been asphyxiated at birth chose the correct container 90+% of the time [5, 6]. These asphyxiated monkeys, in effect, had learning disabilities—attention deficit—without any apparent neurological defects.

Poor manual dexterity remained as the most prominent defect. Faro and Windle (1969) examined the brains of monkeys allowed to survive for several months or years following asphyxia at birth, and found that growth of the cerebral cortex had not progressed normally [7]; they described this growth failure as “transneuronal degeneration.” Windle (1969) stated emphatically that while monkeys subjected to asphyxia at birth appeared to recover, their brains were not normal [4]—the idea of “neural plasticity” is a euphemism with no basis in reality.

2. Infant Anemia and Intelligence

Behavioral and learning disabilities in children compose a wide variety of defects defined by varied subjective clinical diagnoses; they fill special education classes. However, two objective clinical factors have been correlated with these disorders:

1. Infant anemia
2. Standard intelligence testing.

For over 20 years, Lozoff and others [8-16] have published numerous studies correlating infant iron-deficiency anemia with childhood and grade school learning and behavioral disorders to the point of mental deficiency. In 1999, Hurtado [17] published objective correlation of the degree of infant anemia with the

degree of mental deficiency measured by a standard intelligence test:

“The effects of hemoglobin concentration, birth weight, maternal education, sex, race-ethnicity, age of mother, and age of child at entry into the WIC program on mild or moderate mental retardation are reported in Table 2. The effect of [infant] hemoglobin was significant after all covariates were entered into the equation [odds ratio (OR): 1.28; 95% CI: 1.05, 1.60]. Therefore, for each decrement in hemoglobin, risk of mild or moderate mental retardation increased by 1.28, even after we controlled for all other variables in the equation.”

Maternal iron deficiency anemia during pregnancy does not lead to neonatal anemia; the fetus apparently “parasitizes” the mother’s iron store to provide itself with adequate hemoglobin at birth. Cord blood hemoglobin levels are routinely above 14 gms%. Breast milk and most bottle-fed formulas contain no iron, thus the ICC infant, depending on the amount of blood volume lost in the placenta, may become progressively more anemic during the first year of life unless iron is supplemented. Once normal foods are introduced in the diet, the iron deficiency should disappear.

The normal neonate that receives a normal placental transfusion (physiological cord closure) is also not anemic at birth, but it tends to become polycythemic due to hemoconcentration immediately after birth. Excess red cells may be broken down resulting in mild (physiological) jaundice; the excess iron is stored, not excreted. The end result is that physiological placental transfusion (PT) provides the neonate with enough iron at birth to prevent iron deficiency anemia during infancy until iron is present in the diet. ICC (loss of PT, hypovolemia) is thus the major cause of infant anemia [18].

However, there is little evidence that correction of infant anemia, either by iron supplements or by red cell transfusion, improves or corrects the ominous prognosis of future mental deficiency. It thus becomes much more plausible to attribute the mental deficiency that correlates with infant anemia to hypovolemia and deficient brain perfusion at the time of birth. Infant anemia and brain damage BOTH can result from hypovolemia; both should be preventable by not clamping the umbilical cord at birth. The American Academy of Pediatrics and the Canadian Society of Pediatricians both recommend delayed umbilical cord clamping (PT) to prevent infant anemia and reduce the need for red cell transfusion. Hurtado’s results [17] indicate that the more severe the hypovolemia (blood loss due to ICC) the more severe the brain damage.

“A child with a slight brain defect often appears no different from a normal child. His intelligence quotient may lie in the range considered normal, but one never knows how much higher it would have been if his brain had escaped damage in the uterus or during birth [4].”

The fetal brain grows very rapidly from 28 weeks gestation to term. Assuming a brain radius of 2.5 cms for the preemie and 5.0 cms for the term child, brain volume increases from about 65 ccms to over 500 ccms—800% in 12 weeks. The germinal matrix (GM) is a significant “engine” for this enormous growth. As described in Part 2, the GM generates neurons that populate the cerebral cortex and it is very susceptible to ischemic infarction during and after birth; in other words, it is extremely dependent on very copious perfusion, a massive nutrient supply,

to function at its normal potential. It performs this function on a blood supply that is not fully saturated with oxygen. After premature birth with ICC and hypovolemia/hypoperfusion, oxygenation alone will not provide the germinal matrix with a massive nutrient supply. Even if infarction of the GM does not occur after ICC, one would expect a significant fall in production of neurons for the cerebral cortex from hypo-perfusion, a loss that probably would never be recovered.

A normal neonatal hemoglobin reading (term cord blood) is about 16 – 18 gms%; the criterion for neonatal red cell transfusion is a hemoglobin of 10 gms%. [19] This degree of hemodilution (that corrects hypovolemia) may not be reached for several weeks – a time period of germinal matrix under-production that would severely compromise growth of the cortex. In the anemic preemie, even without IVH, there is ample rationale for mental deficiency correlating with the degree of infant anemia.

The GM ceases to function by 37 weeks gestation, but the brain continues to grow at a considerable rate during the first year of life; correlation of infant anemia and mental deficiency also occurs in term births, indicating a correlation with ICC and hypovolemia. No specific neurological anatomical abnormality has been found that correlates with learning and behavioral disorders; however, any “minor” impediments to brain growth and development such as ischemia and hypo-perfusion would be difficult to demonstrate anatomically. Autism is a major component of these disabilities and is currently at epidemic levels. Autism cases in California increased 13% from 2003 to 2004. The number receiving services increased from 5,000 in 1993 to more than 26,000 in 2004 [20]. Many states report similar figures.

3. The Autism Epidemic

Autism is defined as a mental disorder originating in infancy characterized by self-absorption, inability to interact socially, repetitive behavior and language dysfunction (as echolalia–parrot speech.)

Autism is widely believed to be genetic in origin, however genes are not a plausible explanation for an epidemic. Several studies have correlated autism with “difficult” or complicated births, most of which (using current obstetrical methods) implicate correlation with ICC – cesarean section, low birthweight, abnormal presentations, and low Apgar scores [21-39]. The autism epidemic coincides with the ICC epidemic. If autism can be the result of birth brain injury, what part of the brain is injured or dysfunctional?

4. Locating the Brain Lesion

In the experiments in which monkeys were subjected to asphyxia at birth, the most prominent damage was found in the midbrain auditory system (the inferior colliculi). Gilles (1963) proposed that such damage might underlie some childhood language disorders [40]. Simon (1975) described how impairment of function within this small area of the midbrain might prevent a child from hearing stressed syllables or other acoustic features of word boundaries, and lead to the characteristic “echolalic speech” of children with autism – speaking in phrase fragments often employed badly out of context [41]. Rapin (1997) noted

that “verbal auditory agnosia” is associated with language disability in at least some children with autism [42].

With the advent of magnetic resonance imaging in the early 1990s, injury of the inferior colliculi has been reported in people who developed auditory agnosia and/or lost the ability to understand speech [43–52]. How much more serious would ischemic damage of this same auditory nucleus be in a newborn infant? Autism and its related syndromes are multi-faceted, but developmental language disorder is the most serious impediment for social and cognitive growth [39].

5. Mercury and Bilirubin

There has been much controversy regarding childhood vaccinations containing mercury as a cause of autism; discussions of how the brain might be affected have been vague at best. Minamata disease, caused by long-term exposure to environmental mercury, is associated with damage to the same auditory system structures damaged by asphyxia in newborn monkeys [53]. Further, verbal auditory agnosia has been reported in one case of dimethylmercury poisoning [54].

Ranck and Windle (1959) commented that the neuropathology they observed following asphyxia at birth most closely resembled that of kernicterus [2]. Kernicterus is associated most often with second and subsequent infants born to Rh-negative mothers, because antibodies to Rh-factor form following cross-placental leakage of blood from her first-born Rh-positive infant [55]. The placenta throughout gestation provides a barrier that prevents any mixing of maternal and fetal blood; this barrier only breaks down during birth, and this may be another iatrogenic effect of umbilical cord clamping [56].

Lucey et al. (1964) investigated the effects of bilirubin in newborn monkeys subjected to asphyxia [57]. Bilirubin staining of the brain was found only in monkeys subjected to asphyxia; and, only the brainstem nuclei affected by asphyxia took on the bright yellow color of bilirubin. Asphyxia appears to break down the blood-brain-barrier in the vulnerable nuclei of the brainstem. Zimmerman and Yannet (1933) summarized many earlier German language papers on kernicterus, and in concurrence with the earlier authors concluded that kernicterus was caused by bilirubin staining of subcortical nuclei already injured by sepsis or oxygen deprivation. They further commented, “This differs in no way from the well known fact that any intravital dye will localize in zones of injury and will leave unstained tissues which are not damaged [58:757].”

Mercury preservative in vaccines could, like bilirubin, cross the damaged blood-brain barrier in infants who suffered anoxia during birth. Infants who breathe immediately at birth, before the cord is clamped, may not appear to suffer any ill effects of cord clamping; and infants with an intact blood-brain barrier will not suffer any ill effects of vaccinations given in the newborn nursery.

6. Vaccine injury

In addition to preservatives, with any injection of an antigen, there is a possibility of anaphylactic shock developing; an occasional death following vaccination has been reported and ana-

phylactic shock is the probable cause. There are testimonials from parents saying, “My baby was knocked out for three days after the vaccination, and has never really recovered.” The hypotension of anaphylactic shock could have the same effect on mid-brain nuclei and the auditory circuit as the hypotension of ICC has after birth. Continuous recording of infant blood pressure following vaccination might elucidate this possible etiology of autism.

A related train of thought arises in line with this antigen / antibody reaction. With ICC and the loss of blood volume, loss of iron and loss of red cells, there is also a parallel loss of cord blood stem cells. Researchers and others seeking to “harvest” stem cells for many esoteric projects avidly seek them with ICC. Stem cells, lost by ICC, may normally provide the newborn with a competent immune system if PT is permitted – no cord clamp. They may thus prevent anaphylactic shock following vaccination; they may also prevent childhood asthma (also epidemic). The benefits of physiological cord closure have yet to be explored. Any single benefit of clamping a pulsating, intact cord has yet to be defined or proven.

7. Autism’s Multiple Etiologies:

Despite the popularly held opinion that autism is a genetic disorder, autistic behaviors have been observed in children with fetal alcohol syndrome, prenatal exposure to the anti-seizure medication valproic acid (depakote), prenatal infections, lead poisoning, as well as a host of non-related specific genetic conditions such as phenylketonuria (PKU), adenylo-succinase deficiency, fragile-X syndrome, and even children with Down syndrome [59–77]. These are not disorders that share common genes, but that all affect the same vulnerable system (or systems) within the brain, specific systems that support language and social development.

As discussed above, there is compelling evidence that traumatic anoxic birth is involved in the etiology of many, and maybe a majority of autism cases, with specific injury to auditory brain structures that might interfere with normal language development. Experimental asphyxia that damaged the auditory system in monkeys was inflicted by clamping the umbilical cord and preventing pulmonary respiration. Recently adopted delivery-room protocols state that the cord should be clamped immediately [78]. This protocol has found its way into several recent textbooks, and if followed too literally is equivalent to the experimental procedure used to inflict asphyxia in newborn monkeys.

Most infants do breathe within seconds of birth, so whether and when the umbilical cord is clamped may not make any difference in most cases, but as Dunn (1966) pointed out, “There is often a delay after delivery before breathing commences” [79]. Are these the infants who now will later be diagnosed with autism or ADHD? Autism does not become evident until the second or third year of life. Outcome studies should not stop with evaluation of postnatal bilirubin levels, but follow development at least up to the age when children are normally expected to begin speaking.

8. Placental blood is respiratory blood

Circulation and an adequate volume blood are essential for respiration. The fetal heart is the earliest organ to become functional, and between the fourth and fifth weeks of development begins circulating erythrocytes produced in the embryonic yolk sac [80]. The placenta becomes a major component of the cardiovascular system between the eighth and tenth weeks [81]. Blood is pumped by the fetal heart through the umbilical arteries to the placenta, where replenished with oxygen and nutrients it returns via the umbilical vein [82]. Placental blood is part of the fetal circulatory system, as much as pulmonary blood is after birth.

Erasmus Darwin in 1801 noted, “The placenta is an organ for the purpose of giving due oxygenation to the blood of the fetus; which is more necessary, or at least more frequently necessary, than even the supply of food [83:192].” Oxygen is the most urgently essential ongoing need of all species dependent for survival upon aerobic metabolism. Continuity of respiration via an intact volume of blood must be maintained during transition from fetal to neonatal life.

Research by Redmond et al. in 1965 provided dramatic evidence that the infant's first breath redirects blood from the placenta to the lungs [84]. This so-called “placental transfusion” fills the capillaries surrounding the alveoli, causing them to open [85]. Placental blood is respiratory blood, and appears by nature's design intended for perfusion of the lungs at birth [86].

Shunts in the heart supply sufficient circulation to the lungs for growth during gestation but divert the greatest volume to the placenta to receive oxygen. Once pulmonary circulation and breathing are established, these shunts close, but for a period of time they may remain open with the newborn infant's heart continuing to pump blood through the umbilical arteries for several minutes after birth [79]. Placental respiration usually does not cease immediately after birth, unless the cord is clamped. Should not the cardiovascular system of the infant be allowed to determine when placental circulation is no longer needed?

9. Discussion

Physiological birth – normal reproductive form and function —has produced normal brains and bodies for humanity over thousands, if not millions of years. Natural birth, while composed mostly of physiological births, also includes pathology – maternal and perinatal infant deaths, injuries and disease – but, through natural selection, birth malformations and malfunctions tend to be bred out quickly, not inherited. Thus birth pathology is usually environmental or accidental in origin, rarely genetic, and normal form and function often insures against accidents. Physiology routinely produces a physiological newborn.

Modern obstetrics has eliminated a large portion of birth pathology with surgical and medical technology. This has been done essentially by adjusting and managing those techniques towards maintaining or restoring the **physiological norm** whenever possible. Simultaneously, and unfortunately, there has been complete misunderstanding and misconception of the physiological role of the placenta and umbilical cord during labor and delivery, and after birth. Today, in delivery rooms, the normal anatomy and physiology of the placenta and cord

during the third stage of labor is routinely disrupted; healthful form and function is destroyed leaving iatrogenic injury.

Prior to 1950, midwives and/or “general practitioners” attended most deliveries. In rural areas especially, general surgeons or any doctor with some surgical expertise did cesarean sections. Cord clamping after pulsations ceased was taught in my medical school in 1956, and the literature prior to that time seems to show that this practice was a norm. The advent of exchange transfusion for Rh. hemolytic jaundice elevated bilirubin to pathogen status and entailed fast cord clamping in the delivery room. Early clamping on all neonates came into vogue to try to control “physiological” jaundice produced by “too much blood.” A bilirubin level exceeding twenty milligrams % was easy money for lawyers; many general practitioners and pediatricians abandoned newborn care. Fetal monitoring in the ‘70s introduced the concept of “fetal asphyxia / fetal distress” and the concept of preventing brain injury by rapid delivery and rapid resuscitation of the “distressed” child by oxygenation. Lawyers continued to prosper; two birthing specialties evolved.

1. The neonatal profession was formed to treat and manage the compromised neonate, primarily the preemie and the “depressed” newborn. “Asphyxia” was regarded as the prime pathogen during birth, and instant cord clamping followed by removal to the resuscitation table and immediate oxygenation / ventilation was used on all “at risk” babies in order to avoid hypoxia.
2. The perinatology profession soon followed and by the early 1990s, ICC (that was used routinely to rush the “at risk” child to resuscitation) was advocated in all “at risk” deliveries in order to document, through cord blood analysis, the medico-legal acid / base / asphyxia state of the neonate. [87] This ostensibly proves to the legal profession that the child was not asphyxiated at the time of birth.

The neonatology, perinatology and legal professions are all thriving; the incidence of cerebral palsy has remained constant for thirty years and autism is epidemic.

The perinatal/neonatal professions are indoctrinated with the fallacy that cord physiology produces pathology, that placental transfusion (PT) is over-transfusion, that cord clamping is absolutely needed for a neonate to have a normal blood volume and to avoid jaundice, plethora, polycythemia and hyperviscosity, and that brain hemorrhage results from too much blood. Consequently, in nearly every hospital in the western world, every cord is clamped as soon as is convenient, usually while it is still pulsating. Very, very few neonates begin life in the atmosphere with a physiological blood volume following physiological cord closure.

For approximately twenty-five years, the western world has produced increasing numbers of neonates that have routinely been denied placental transfusion (PT) by ICC or premature cord closure. When one accepts the premise that PT is a physiological event, the following consequences of current cord clamping are hardly surprises:

1. “Sick neonates are one of the most heavily transfused groups of patients in modern medicine [19].”
2. Immediate cord clamping (ICC) in the term child results in infant anemia [18].
3. Increasing degrees of infant anemia correlate directly with increasing degrees of mental deficiency in grade school children [17].
4. Abnormal births that usually entail ICC show a marked increase in autism outcome [33-39].
5. Delayed cord clamping (PT) decreases or eliminates the need for blood transfusion (infant anemia) in the preterm neonate and decreases the incidence of intra-ventricular bleeding (brain damage) [88, 89].

Failure to recognize and define fetal/neonatal cord physiology has led to compound errors. The (educational) *Neoreviews* article [90] entitled *When Should We Clamp the Umbilical Cord?* prevaricates in conclusion: “For most term and near term infants, the time of cord clamping may not matter.” Peltonen, [91] in one of *Neoreviews*’ references, states that clamping before the first breath may prove to be fatal—the time of cord clamping may be a life and death matter. After pages of similar contradictory answers to the title’s question, the authors cannot provide a rational conclusion, admit to an enigma, and fail to recognize the cause of their predicament.

The authors accept and proceed on the premise that: “we should clamp the cord.” They consider stripping the cord (iatrogenic placental transfusion) to be “unphysiologic,” and should not be done, but they pursue the fallacy that the cord clamp (iatrogenic cord closure) is physiological, and therefore should be done. Once this fallacy is recognized, (the cord clamp is not a part of human anatomy or physiology, surgical cord closure is not physiology) the title question becomes “When Should We Disrupt Cord Anatomy and Physiology With a Clamp?” The enigmatic plethora of contradictions and iatrogenic pathology in *Neoreviews* thus results from an absurd question based on a false premise.

The umbilical cord routinely closes itself physiologically, perfectly; therefore, we should not botch the process. Significantly, Mavis Gunther’s article [92] on placental transfusion and physiological cord closure is not included in the extensive reference list for *Neoreviews*’ educational article. [90]

Once the obstetrician or midwife understands **how** physiology closes the cord vessels, the rational timing of cord clamping, ***if it is done at all***, becomes obvious:

1. The umbilical arteries close first in response to high oxygen saturation [93] (this means that the lungs are functioning and fetal circulation has been converted to adult circulation.)
2. The umbilical vein closes in response to high central venous pressure [92, 94] (this means that all vital organs have enough blood volume to function well.)

Thus the cord vessels clamp themselves after all neonatal life support systems are functioning optimally, and the placental life support system is no longer needed. Placing a clamp on the cord after all these conversions have occurred is harmless in-

surance for umbilical vessel hemostasis that is already in place - physiologically.

Clamping a pulsating cord thus entails a period of asphyxia without either placental or pulmonary respiration, and guarantees hypovolemia of some degree. In the cord-compressed neonate, the preemie and the cesarean section child, (see Parts 1 and 2) hypovolemia, asphyxia, and disruption of normal circulation changes during birth may be extreme, resulting in overt brain damage, multi-organ dysfunction and persistent fetal circulation [95]. Besides overt neurological injuries, there is increasing evidence that a broad spectrum of apparently normal neonates may be compromised permanently by hypoxia / hypovolemia / hypotension caused by the current practice of immediate cord clamping, with dysfunction appearing long after birth.

Proof of this relationship is difficult to come by as the time of cord clamping is never recorded on the birth chart, and must be deduced from factors that are recorded:

1. If a cord pH is recorded, the cord should have been clamped immediately [87].
2. If a NICU team is present at birth, ICC is a routine procedure [90].
3. If a neonatologist records the One-minute Apgar, ICC has occurred.
4. If the delivery is a c-section, ICC is highly probable
5. If the child is a preemie, ICC is highly probable.
6. If the child had retraction respiration/RDS, ICC is highly probable.
7. If the child received a NICU blood transfusion, ICC is highly probable.
8. If a neonate is anemic, ICC is highly probable.

A recent review on delayed cord clamping, [89] (despite having a mass of “relevant” data, randomized double blind “controls” with multiple logistic regression models and extensive outcome analysis of the statistical possibilities and probabilities extracted from all that data,) concluded that delayed clamping *may* decrease the need for blood transfusion. Is there any evidence that it may not?

The most pertinent data was not recorded—the amount of placental transfusion (PT) that occurred during the delay in clamping is obviously crucial. The amount of PT is *not* directly proportional to time of delayed clamping. A child born by c-section and held high with cord clamping delayed for one minute may become exsanguinated by gravity blood loss into the placenta—delayed clamping may increase need for blood transfusion!

Placental transfusion depends on gravity drainage, uterine contraction and the neonate’s reflexes - physiology. Is statistical analysis needed to prove that placental transfusion prevents the need for blood transfusion? Comparing times of cord clamping with neonatal outcome and ignoring physiology is junk science.

In all studies that record the time cord clamping, all are fatally flawed by omission of randomized, “no clamp,” physiological controls. Without a valid, normal base or valid, physiological controls, “scientific” medicine cannot begin to establish any valid opinion regarding neonatal wellbeing and the time of

cord clamping. The following analogies illustrate this dilemma:

1. To ensure adequate ventilation, should the outcome of routine tracheal intubation at the moment of birth be compared to routine tracheal intubation at five minutes after birth without any comparison to outcome in the non-intubated, physiological child?
2. To avoid second-stage fetal distress, 1,000 random routine forceps deliveries are done immediately after complete dilatation of the cervix; 1,000 random routine forceps deliveries are done ten minutes after complete dilatation of the cervix. Immediate forceps produces ten fractured skulls; ten-minute forceps produces five fractured skulls. Conclusion: ten-minute forceps are 100% safer than immediate forceps [odds ratio (OR): 1.24; 97%]. However, 500 randomly selected patients just happened to deliver spontaneously before forceps could be applied and were removed from the study; they produced no skull fractures and no conclusion—forceps may not be safe at all..
3. Do the neonatal outcomes of immediate cord clamping, one minute clamping and five minute clamping have any relevance when the investigator has no data on, and no concept of what happens when a cord clamp is not used at all? Available data indicate that the cord clamp, when used on a timely basis without common sense, fractures blood volumes and injures brains and brain development.

10. Conclusion

Experimental asphyxia in primates using ICC has produced behavioral and memory dysfunction without overt neurological impairment. There is compelling evidence that loss of placental transfusion by ICC has deleterious effects on human mental growth and development. Infant iron deficiency anemia strongly correlates with later behavioral and learning disabilities – autism, ASD, ADHD, aggression, hyperactivity and mild to moderate mental deficiency. The degree of anemia is proportional to the degree of mental deficiency [17]. Full placental transfusion prevents infant iron deficiency anemia. The degree of mental deficiency thus varies directly with the amount of blood volume lost by ICC.

Autism and ASD constitute a major and increasing portion of these childhood mental disorders to an epidemic degree, and without current explanation. However, many studies have linked autism to difficult or complicated births, most of which would entail ICC in birth management.

The clinical features of autism point to dysfunction or derangement of the auditory / speech circuits of the brain and multiple diseases can affect these circuits. Lesions of the mid-brain auditory nuclei (inferior colliculi) in primates have resulted from birth asphyxia induced in part by ICC. The current autism epidemic coincides with current widespread use of ICC. Despite the time of cord clamping never being recorded, in many cases it can be inferred from the clinical record. ICC is a very probable cause of autism.

Convincing proof that premature cord clamping causes multiple brain dysfunctions will not be available until a large series

of neonates are allowed to deliver physiologically and are sent to the nursery with cord and placenta intact. These neonates will provide the professions with rational, normal (physiological) values for blood pressure, central venous pressure, urine output, blood volume, hemoglobin, hematocrit, newborn brain blood flow (MRI) etc. (It is doubtful that an MRI study has ever been done on a physiological neonate; many ICC MRIs [96] have been “deemed to be normal.”) Proof that mental deficiency and behavioral/learning disabilities originate from ischemic birth brain injuries may have to wait until these children are in grade school and undergo I.Q. testing. They may set a new standard for the “average” I.Q.

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