NEONATOLOGY TODAY

News and Information for BC/BE Neonatologists and Perinatologists

Volume 9 / Issue 10
October 2014

IN THIS ISSUE

Upcoming Medical Meetings

(See www.Neonate.biz for additional meetings)

Miami Neonatology - 38th Annual International Conference
Nov. 12-15, 2015; Miami, FL USA
http://pediatrics.med.miami.edu/neonatology/international-neonatal-conference

The Fetus & Newborn
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http://contemporaryforums.com/continuing-education-conferences/2014/fetus-newborn-november-las-vegas.html

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Nov. 20-22, 2014; San Diego, CA USA
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NEONATOLOGY TODAY

ISSN: 1932-7129 (print); 1932-7137 (online).
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Company Offices:
8100 Leaward Way; PO Box 444
Manzanita, OR 97130 USA

Editorial and Subscription Offices
16 Cove Rd, Ste. 200
Westerly, RI 02891 USA
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Perinatal/Neonatal Case Presentation: Neonatal Tracheal Rupture

By Ricardo Castillo-Gavan, MD

Abstract

Tracheal injuries in neonates are extremely rare entities that cause high morbidity and mortality. These injuries are associated mostly with two different scenarios: (1) birth trauma due to a big product (i.e. Shoulder Dystocia), and (2) in preterm infants with extremely low birth weight due to direct tracheal injury during intubation attempts.

A 2-hour-old newborn male was referred to our unit from a rural primary care-level center after a complicated vaginal delivery due to shoulders dystocia. Immediately after birth, physicians noticed increased difficulty breathing, and they also described the development of an apparent neck mass, so they decided to perform tracheal intubation and transport him to a tertiary center. When the patient arrived at our unit, he had normal vitals, and an evident left-anterior neck mass with palpable crepitation due to subcutaneous emphysema. We performed a chest X-ray and neck and thorax CT scan, which confirmed airway rupture, left clavicle fracture and pneumomediastinum. We provided support therapy with conventional and high frequency ventilation. Associated complications were present (right lung atelectasis, pneumothorax, sepsis and later shock). This case describes the clinical presentation, radiological features and outcome.

Case Presentation

A healthy 30-year-old mother, with normal and uncomplicated prenatal visits; obstetric history (Gravida 4, Para 3, Abortion 1). She started labor with spontaneous rupture of membranes. After a delayed and complicated vaginal delivery, she gave birth to a full-term (39 weeks of post menstrual age) baby boy. Obstetricians at the clinical center noted shoulders dystocia; they performed multiple maneuvers to facilitate birth. After delivery, the newborn had Apgar score of 5 in the first minute characterized by diminished muscle tone, irregular breathing, tachypnea, pale skin, and heart rate above 100 bpm. The attending pediatrician noticed the formation of an anterior neck mass, with the infant presenting an increasing work of breathing with a Silverman Andersen score of 6 characterized by chest, xiphoid and lower intercostal muscles retraction adding to his tachypnea status; therefore, his providers decided to intubate and transport him. His birth weight was 3,000 g (p30), length of 49 cm. (p35) and head circumference 35 cm. (p25). The first contact physician did not provide oxygen saturation status or arterial blood gases (ABGs) at birth.

When the patient arrived at the Neonatal Care Unit (Hospital Metropolitano, Monterrey, Mexico), his vitals were stable, arterial blood pressure 88/58 mmHg with mean Arterial Pressure 68mmHg measured in the right arm, heart rate was 148 bpm, and controlled respiratory rate of 40 per minute. The patient had an evident anterior-left neck mass with subcutaneous crepitation due to subcutaneous emphysema (Figure. 1); asymmetry of the upper limbs with diminished, upper left limb movements suggesting brachial plexus injury. We performed ABGs that showed compensated respiratory acidosis, pCO_2: 76 mmHg.

We also performed a portable thorax X-ray that showed left clavicle fracture, significant subcu-

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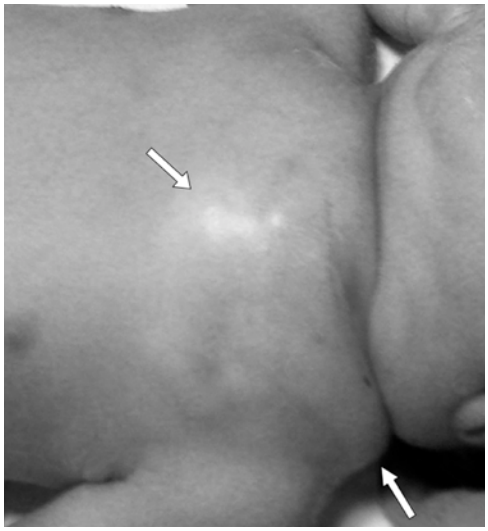

Figure 1.

taneous emphysema, pneumomediastinum, upper right lobe atelectasis, and pneumothorax (Figure 2). An air-leak was noted, so the patient was carefully re-intubated and a chest tube was placed, without complications. Afterward, neck and chest CT scans were performed which revealed the partial left-sided anterior tracheal rupture, gross righted pneumomediastinum, left clavicle fracture and subcutaneous emphysema (Figures 3 and 4).

The newborn was placed on conventional ventilation for the first 36 hours, where he had adequate ABGs and hemodynamics. Pediatric Surgery service was consulted, and it was decided to continue conservative therapy.

We gave instructions to all the clinical team to assure minimum movement of the patient and care of the endotracheal tube to avoid re-intubation, since there is a risk with blind intubation, that below the vocal cords the airway injury let the tube pass through it or extend the lesion.[1]

After 48hrs. a rise in the pCO_2 was noticed, reaching values of 110 mmHg in arterial blood samples. We put the patient on high frequency oscillatory ventilation (HFVO) on the third day of life. After 12hrs. on HFOV, fever was present, and the patient developed a toxic appearance; for this reason, we changed the antibiotics from Ampicillin and Cefotaxime, to Vancomicyn and Meropenem. Afterwards he developed hypotension, which subsided with Dopamine infusion (10-20 µg/Kg/min); this action improved his hemodynamic status for the next 48hrs. This gave us the opportunity to lower the vasopressor support. Unfortunately, the next night (Day 4), the patient's blood pressure dropped and his arterial pO_2 decreased, leading him to a shock condition. Cardiopulmonary resuscitation was performed, unsuccessfully.

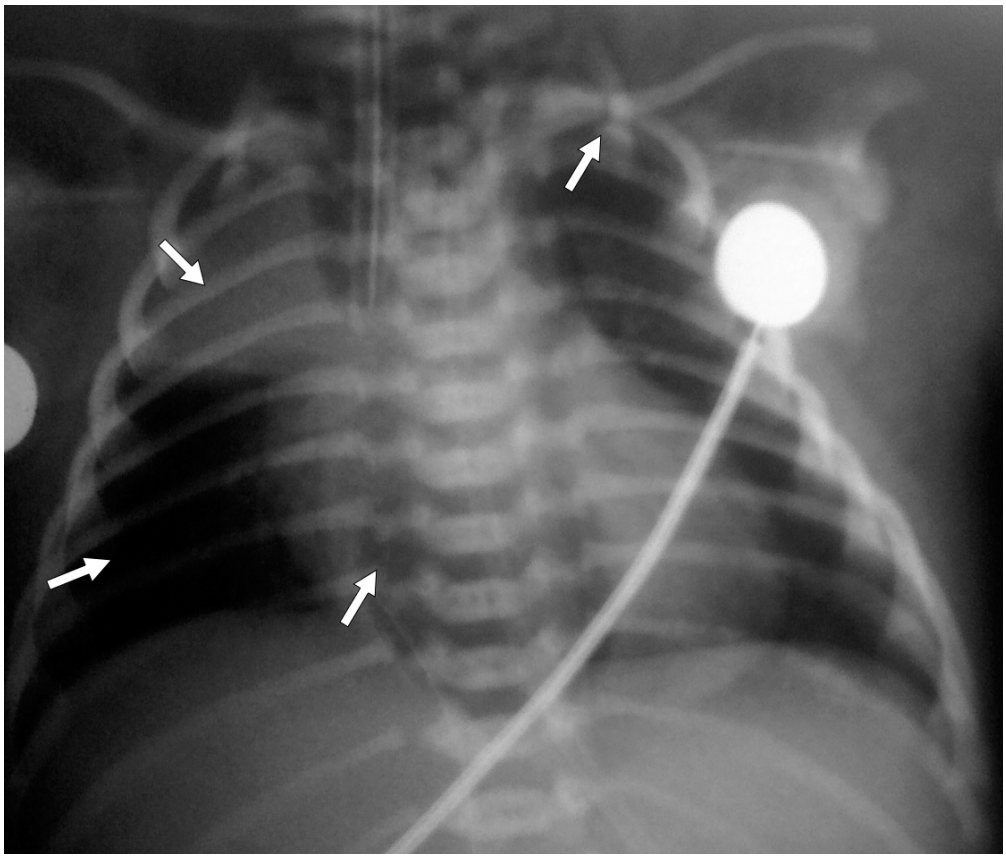

Figure 2.

Discussion

Neonatal tracheal rupture is an extremely rare entity associated with birth trauma (i.e., maneuvers during shoulders dystocia) or direct injury to the trachea at the time of intubation.

In newborn population, previous reports associate tracheal fracture and dystocia due to shoulders dystocia, mostly in infants weighting above 4000 g; prolonged second and third stages of labor (e.g., cephalopelvic disproportion); when assisted delivery devices are used, like forceps, ventouse, or excessive traction maneuvers leading to injury.[2-6] Mahieu et al. presented a summary of various literature reports with laryngeal and tracheal rupture in the neonatal period, some of them with similar clinical characteristics as our patient; nine reports were associated with shoulder dystocia, and four of these with brachial plexus injury. Those where the location of the tracheal injuries was partial anterior subglottic, represented the most complicated cases, with high mortality rate.[5] Pneumothorax and pneumomediastinum are common complications of tracheal injury as air dissects the mediastinum and ruptures into the pleural cavity.[2]

The airway rupture is possibly related to pre-existing tracheal congenital anomalies (congenital tracheal stenosis or ring agenesis),[5] traumatic injury from multiple attempts at intubating or a damaged trachea following a traumatic delivery. [7]

These injuries could result in complications associated with a high mortality rate such as respiratory depression, hypoxic ischemic encephalopathy (HIE), pneumomediastinum and pneumothorax.[2]

Subcutaneous emphysema in a newborn after a difficult delivery could be a key feature for an early diagnosis of tracheal injury. The presence of clinical and radiological signs of pneumothorax and/or pneumomediastinum will be related to the severity of the respiratory distress, and the extension of the injury in the tracheobronchial tree.

Other signs present with the respiratory distress, such as clavicle fracture, or Brachial plexus injury in the context of a difficult or instrumental delivery, should alert the physician to the possibility of a perforated or injured trachea.

The rapid occurrence of subcutaneous emphysema, with or without pneumothorax and pneumomediastinum, and the delayed occurrence of mediastinitis have been associated with high rates of morbidity and mortality, although these particular complications are related to neck and chest trauma most commonly seen in adults.[1,8]

As Ammari et al. described in their case report, the management of tracheal injury/perforation includes leaving the endotracheal tube in place for 8 to 10 days to ensure adequate healing of

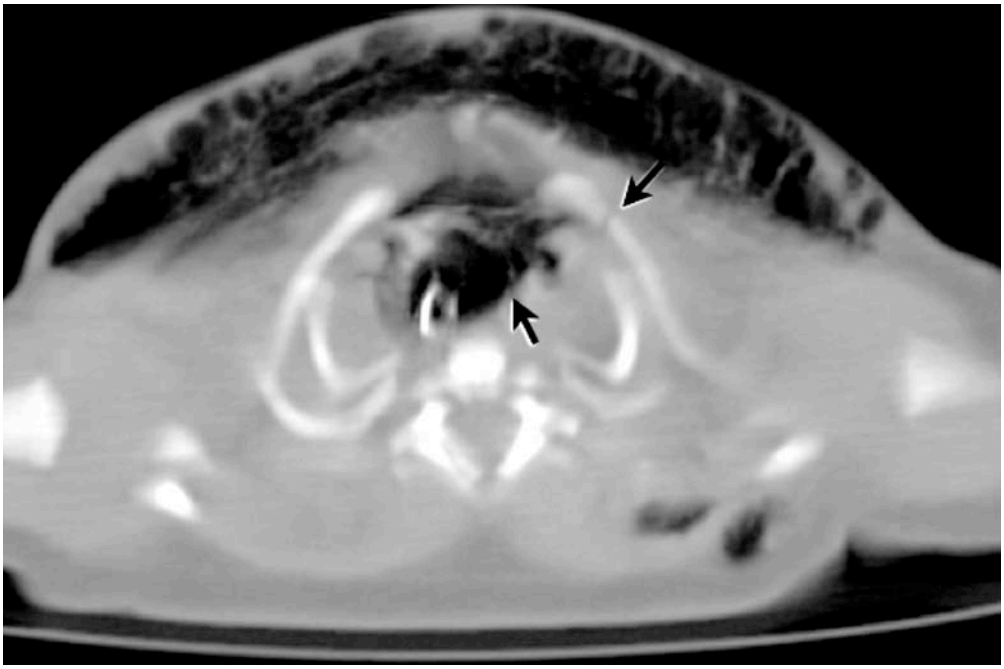

Figure 3.

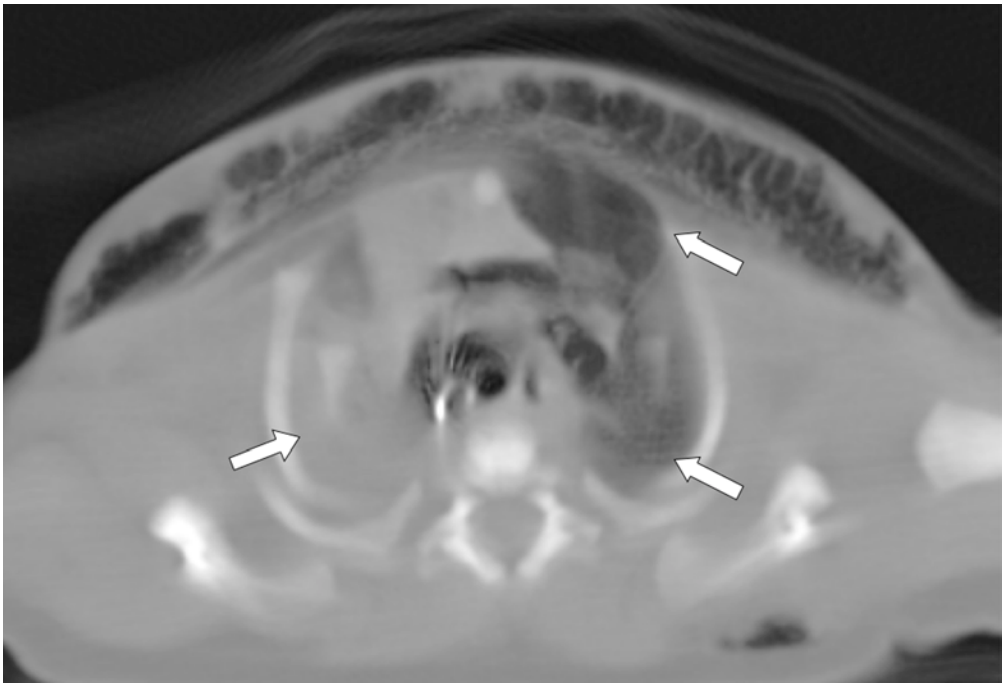

Figure 4.

the injured area, otherwise a tracheotomy would be necessary for the same period of time. Fiberoptic re-intubation could help minimize the risk of intubation trauma and bronchoscopy evaluation trauma to the injured area.[9,10]

There is no consensus about adequate therapy; both, surgical and conservative management have been proposed. The outcome may be fatal if rapid treatment is not given. Optimal treatment includes: close monitoring in an intensive care setting, endotracheal intubation passing the injured area, immediate drainage of pneumothorax (if this likely complication occurs), maintenance of ventilator and hemodynamic status and antibiotic prophylaxis.

Surgical invasive therapy still has high mobimortality outcomes, and should be evaluated on an individual basis.

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Hepatic Calcification as Complication of Umbilical Venous Catheterization in Singapore General Hospital

By Mary Grace S. Tan, MD; Shah Varsha Atul, MD

Background

Umbilical vein catheterization is a relatively easy procedure performed in the Neonatal Intensive Care Units (NICU). It provides fast central vein access; however, complications are also described in the literature.

Case Report

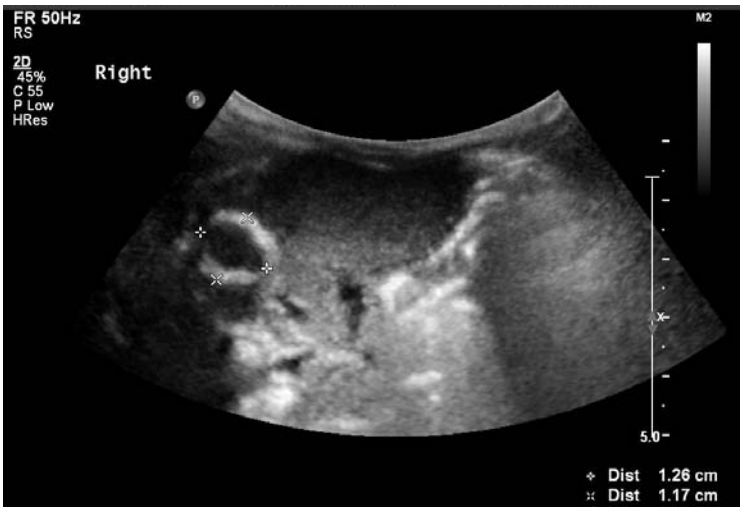
A case report of a premature infant (25 weeks) with hepatic calcification that was noted incidentally on the chest and abdomen X-ray on Day 48 of Life. Retrospective review of previous X-rays showed circular opacities that are not markedly obvious until Day 48 of Life when the patient had an acute life threatening event requiring intubation and X-ray. Chest X-ray that included the abdomen showed well-circumscribed opacity suggestive of a calcification. Patient was asymptomatic. There were no biochemical changes except for a rising alkaline phosphatase. Ultrasound of the abdomen revealed hepatic calcification.

Results

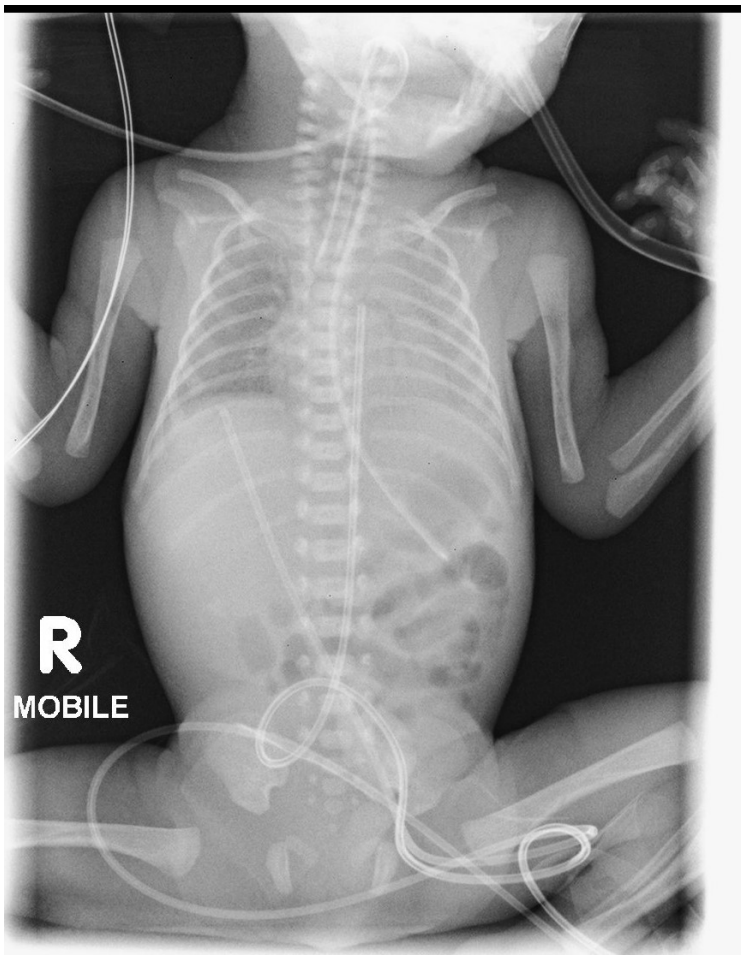
This case reminds us of the necessity for confirming the proper location of the central catheter right after its insertion, and adjustment of the position as needed during hospitalization.

Introduction

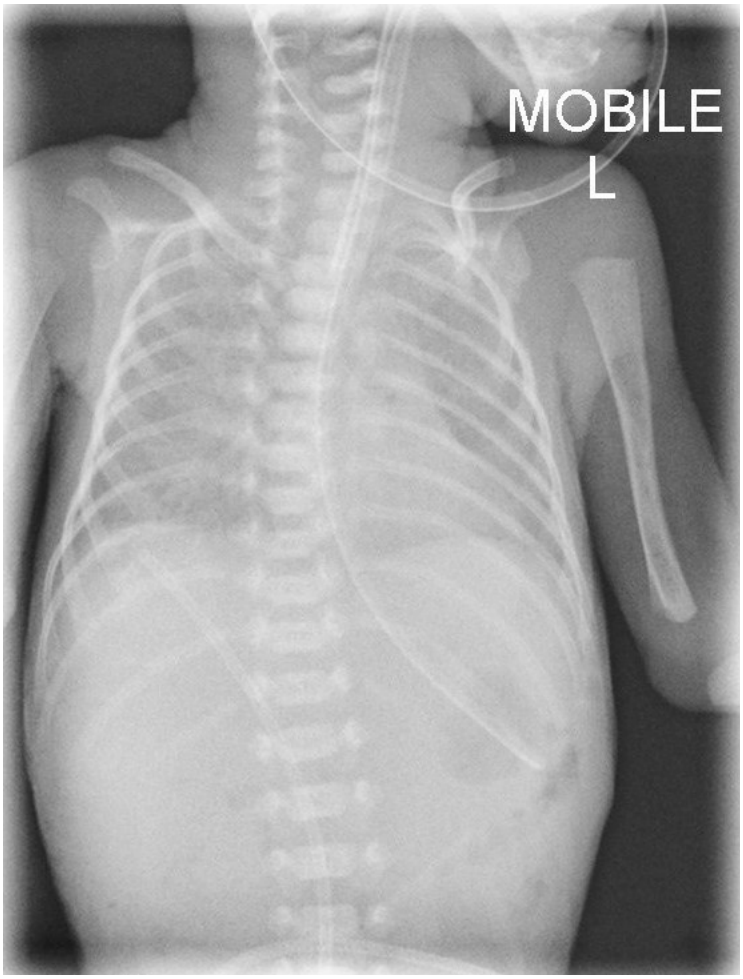
Catheterization of the umbilical vein is one of the fastest and easiest methods of gaining access to a central vein. The advantages of central vein catheters in comparison to peripheral vein cannulas in neonates are commonly known and include: a possibility of total parenteral nutrition, safe administration of many drugs, and elimination of stress and pain connected with repeated puncture of peripheral veins. Unfortunately, central vein catheterizations are also connected with the risk of multiple complications, the number of which increases with an incorrect placement of the tip of the cannula. Some of the complications are not connected with the type of cannula or vascular access. However, some of them, due to a specific anatomy (as in case of umbilical veins) are typical only for a given vessel or type of cannula. The complications of umbilical vein catheterization may include: blood-borne catheter-related general infection, air embolism, a substantial blood loss during catheterization or due to detachment of the cannula, thromboembolic complications, heart tamponade, disorders of the heart rhythm, pericardial or pleural effusion. In the case of improper insertion of the catheter to the portal vein, thrombosis of hepatic vessels, necrotizing enterocolitis, perforation of the intestines, portal hypertension, or a liver cyst may appear.



Ultrasound image.



Abdomen X-Ray on Day 1 of Life



Day 9 of Life

Infusion of hypertonic fluids into the liver tissue may lead to substantial damage of the liver parenchyma or its necrosis.

Case Report

T.Y.H., male, premature (25+4/52) infant was delivered by crash LSCS due to cord prolapse with birthweight of 690gms and APGAR Score of 4 at 1 min. and 6 at 5 min. Baby was born flat and required active resuscitation. He was intubated and ventilated. He required two doses of Survanta, and chest X-ray showed moderate Hyaline Membrane Disease. Septic screen and antiobiotic coverage were initiated.

A central catheter was introduced through the umbilical vein. Abdominal X-ray showed that the placement of the catheter was in the liver. Umbilical catheter was subsequently withdrawn. There was no repeat Xray post adjustment of the tip of the umbilical vein catheter. Parenteral nutrition was given through the catheter. Patient remained asymptomatic.

Minimal enteral feeding with breast milk was started on Day 2 of Life and was well-tolerated. Full feeds were achieved on Day 21 of Life.

Total parenteral nutrition and lipids through the umbilical vein catheter was used until Day 8 of Life, and replaced with a peripherally inserted central catheter.

Patient remained clinically stable and was subsequently extubated on Day 18 of Life.

On Day 48 of Life, baby had an acute life threatening event that required endotracheal intubation. There was an airway obstruction due to nasal trauma secondary to suction. Chest X-ray that included an abdominal X-ray incidentally showed a well-circumscribed opacification in the hepatic area. A Pediatric Radiologist was consulted, and his impression was that hepatic calcification was present. He recommended an abdominal ultrasound, and confirmed the diagnosis of hepatic calcification.

Retrospective review of previous X-rays revealed that the position of the umbilical vein catheter was not in the proper position. Despite withdrawal of the catheter after the first X-ray that was taken, post insertion,the catheter remained in the hepatic area until it was removed. In relation to the biochemical markers, there was a rise in the alkaline phosphatase on Day 22 of Life. Further investigation was not made as it was attributed to the osteopenia of prematurity.

Clinical and radiological picture was suggestive of an iatrogenic complication of parenteral nutrition through catheter in the umbilical vein, in the form of hepatic calcification.

In the course of hospitalization, patient remained clinically stable and levels of alkaline phosphatase spontaneously decreased.

Discussion

Umbilical vein catherterization is a very common procedure in the Neonate Intensive Care Units. One of the most frequently used routes for vascular access, especially on the first day of life, is the umbilical vein. Catheterization of the umbilical vein is considered to be relatively simple. The procedure is short and does not require general anesthesia. The tip of the catheter should be placed in the inferior vena cava, over the diaphragm. After catheterization, the position of the cannula should be assessed with radiological examinations of the abdomen and chest. Depending on the type of the catheter used, it may be necessary to administer a contrast agent to the catheter.

A disadvantage of this method is the possibility of an incorrect placement of the catheter, which may lead to a much higher number of complications, including pericardial tamponade, hydrothorax, and thromboembolic complications. When being introduced, the catheter frequently moves towards the liver, through the portal vein. This is when it should be removed immediately. Leaving it in a hepatic vessel (usually due to ignorance of its incorrect location) results in many serious complications that may put the newborn's life at risk. The most common are the thromboembolic complications which may lead to portal hypertension. A direct administration of concentrated infusion fluids, drugs or parenteral nutrition to liver parenchyma may in turn result in damage to the liver parenchyma due to a direct chemical irritation of the parenchyma and, to a lower extent, to the compression of normal tissues by extravasated fluid.

Differential diagnosis included liver abscesses in the course of a generalized infection, hamartoma of the liver, and, the least possible, hepatoblastoma. It should be remembered that nonspecific diseases of the

"The presented case shows how dangerous the incorrect placement of the central catheter tip may be. There was no information on whether the catheter was displaced in the course of nursing care after withdrawal, due to its poor fixation as there was no repeat X-ray done immediately post withdrawal of the catheter."

liver, accompanied by the damage of the hepatic tissue, may lead to an increase in ALP levels. Hamartomas of the liver are more common than hepatoblastomas. These are non-neoplastic tumors, being most probably a developmental abnormality of unknown etiology, connected with proliferation of the mesenchymal tissue. Their diagnosis is usually based on imaging examinations (CT and US). The tumors are of mixed solid and cystic type. In the case of the presented patient, the radiologist, after performing CT, took this diagnosis into consideration. However, it was excluded after biopsy of the lesion.

Liver abscesses are a very rare complication of a generalized infection in the neonatal period. They were diagnosed in children with generalized infection and an incorrectly placed catheter in the umbilical vein. In a patient with fever, rapidly increasing markers of infection, and abdominal manifestations, such a diagnosis was possible. Abdominal CT allowed an exclusion of liver abscesses.

The presented case shows how dangerous the incorrect placement of the central catheter tip may be. There was no information on whether the catheter was displaced in the course of nursing care after withdrawal, due to its poor fixation as there was no repeat X-ray done immediately post withdrawal of the catheter.

Conclusions

1. For a safe administration of parenteral nutrition, it is necessary to check on the location of the catheter tip after its insertion.
2. The catheter should be carefully secured, in order to avoid coming out or displacement.
3. In the case of any concerning symptoms, especially after a thromboembolic incident or abdominal manifestations, the catheter should be removed as fast as possible.
4. Immediate removal of the catheter is necessary if the tip is in the portal vein.
5. Alkaline phosphatase is elevated in bone and liver problems.

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The 2015 Workshop on Perinatal Practice

By Howard W. Kilbride, MD

The American Academy of Pediatrics (AAP) will hold *The Workshop on Perinatal Practice* at the DoubleTree Paradise Valley Resort in beautiful Scottsdale, AZ, March 27-29, 2015. As in years past, this unique meeting will focus on the "how to do" neonatology as much as the "what to do." The Workshop offers skills training in leadership, quality improvement methodology, teaching, and administration, as well as providing the latest evidence addressing clinically relevant questions.

The meeting will begin with a unique, optional coding session on Friday morning, led by Stephen Pearlman, Gil Martin, Richard Molteni and the AAP district coding experts. The 2014 meeting started 30 minutes earlier than in the past to allow time for all of the coding scenarios to be discussed, which was accomplished for the first time. These scenarios provided guidance to physicians for how to bill, using the latest codes with input from the coding committee. Each year, new codes become available, and it is important that clinicians appreciate these changes to complete billing accurately and efficiently. This coding training, which is uniquely focused on neonatal cases, is also useful for non-physician coders.

The opening plenary session at the 2014 meeting began with the Butterfield lecture, given by Eduardo Bancalari. Dr. Bancalari provided a great historical review of "Respiratory Support in the Premature Infant: Where We Have Been and Where We Are Going." He noted the evolution in chronic lung disease and the change in respiratory care using less invasive techniques. Annie Janvier, neonatologist and ethicist, emphasized the importance for clinicians to be sensitive to the value of life as perceived by families when counseling and leading difficult clinical decision-making discussions. Keith Barrington shared his experience of how to use published evidence to change practice, using probiotics as an example. Richard Martin and Steve Donn used current therapies for gastroesophageal reflux and bronchopulmonary dysplasia to illustrate how evidence may be used (or not used) to guide clinical management. Brian Smith described another type of evidence, which is available from electronic medical record data from our clinical practice, to help inform decision-making.

"The meeting will begin with a unique, optional coding session on Friday morning, led by Stephen Pearlman, Gil Martin, Richard Molteni and the AAP district coding experts."

Mark Del Monte, Director of the AAP Department of Federal Affairs, again provided an update of what is happening in Washington, DC. He emphasized the importance in understanding the political environment impacting pediatric health policies in order to be an advocate for newborns and their families. We also had the opportunity to meet the AAP president-elect, Sandy Hassink, in a "town hall meeting format."

On Saturday, smaller breakout sessions were designed to meet the unique needs of attendees. Members of TeCAN (Trainees and Early Career Neonatologists group) were offered sessions on grant writing, practice job interviews, career planning including

alternative practice styles ("hybrid academics"). Clinicians could choose sessions on topics such as ethics, mechanical ventilation, and how to perform high fidelity simulation of resuscitation techniques. Management topics included: budgets, leadership skills, social media in practice, and quality improvement.

The Scottsdale meeting also offered an opportunity to interact with and provide suggestions to our AAP leadership. David Burchfield, Chair of the Executive Committee of the Section on Perinatal Pediatrics, summarized the work of the committee, and encouraged attendees to meet with their district representatives to learn how the Section can help in their practice. Kristi Watterburg, Chair of the Committee on Fetus and Newborn, reviewed recently published statements and those currently in the works. Topics under consideration included: Kangaroo care, newborn screening for biliary atresia, non-invasive ventilation, PDA treatment, and apnea of prematurity. More detailed presentations on disaster preparedness and probiotics gave attendees an opportunity to provide input to the committee on these subjects prior to publication of the clinical statements.

If you missed an opportunity to attend the Workshop last spring, you can still put next year's "Scottsdale meeting" on your calendar. We are planning an updated coding session on Friday morning, and will again offer unique training in quality improvement and leadership skills. The Butterfield lecture will be provided by Apgar Awardee, Jon Tyson. Mark Del Monte will give another Washington, DC update and will also offer an advocacy workshop on Saturday morning. We will follow-up last year's discussion on probiotics with a provocative "pro/con" debate, and experts will challenge attendees to better understand how to use published data to make practice more "evidence-based." We will still provide unique educational opportunities for trainees and young faculty regarding career planning, grant writing, and leadership. The popular training for resuscitation simulation will return again as well. New in 2015, we will be offering opportunity for MOC (Maintenance of Certification) Part II credit for didactic components of this meeting.

This is a great conference, and the location at that time of year is also ideal for families or attendees who want some relaxation time around the meeting. The weather is idyllic for outdoor activities, and "Old Town," with great restaurants and shops, is just a short walk away. Register on line at: www.pedialink.org/cmefinder or call toll free 800-433-9016, option 3.

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Who Should Attend: neonatal-perinatal providers, including neonatologists, advanced practitioners and staff nurses

Conference Planning Committee:
- Alan Spitzer, MD, Course Director; David Auerbach, MD; David Burchfield, MD; Reese Clark, MD; Willa Drummond, MD; Melanie Pepper, MS, NNP-BC; Jose Perez, MD; Janet Samuel Thompson, Meeting Planner; Pediatrix Medical Group, Inc.; David Weisoly, DO

Guest Faculty:
- Steven Abman, MD; Daniel K. Benjamin, MD, MPH, PhD; Wally Carlo, MD; E. Michael Cotton, MD; Jeff Gould, MD; David Hackam, MD; Sue Hall, MD; Sudarshan Jadcherla, MD; John Kattwinkle, MD; Marty McCaffrey, MD; Jonathan Palma, MD; Mario Rojas, MD; Thomas Shaffer, MD; Seetha Shankaran, MD;Brian Smith, MD; Alan Spitzer, MD; Howard Stein, MD; Robin Steinhorn, MD; Philip Sunshine, MD; Robert Ursprung, MD; Michael Weiss, MD; Lianne Woodward, MD; Bradley Yoder, MD

Topics include:
- Non-invasive Ventilatory Management
- The Effects of Mechanical Ventilation on Other Organ Systems
- Contemporary Care of the Infant with PPHN
- Practical Applications of the SUPPORT Trial – Managing Oxygen in the NICU
- Surviving the NICU, Parents' Perspectives - Preemie-Parent Alliance Members
- Using the EHR in the NICU – Making it Better for Neonates
- Local Collaboratives in Improving Outcomes in the NICU
- CPQCC – The Challenges Moving Forward
- The North Carolina Perinatal Collaborative
- Outliers in the Data Warehouse – What Do You Do?
- The Neonatal Drug Pipeline
- Inhalation Drug Therapy in the NICU
- Pharmacological Considerations in the NICU
- Legends of Neonatology Award Dinner: Philip Sunshine, MD and John Kattwinkle, MD
- The Role of Biomarkers in the Diagnosis and Management of HIE
- Cooling in HIE – Where are We Now, What is the Future?
- The Use of Cord Blood in the Treatment of HIE Injury
- Imaging and Outcomes in the VLBW Infant – Evolving the Care
- Optimizing Growth of the Maternal and Donor Human Milk-Fed, Extremely Preterm Infant
- Breathing and Swallowing Mishaps in the Neonate: Aero-Digestive Regulation
- The Role of Probiotics in the Care of the ELBW Infant
- New Thinking About NEC

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Medical News, Products & Information

By Tony Carlson, Senior Editor, CCT

PTSD Symptoms Common After an ICU Stay

Newswise - Patients who have survived a stay in the Intensive Care Unit (ICU) have a greatly increased risk of developing symptoms of post-traumatic stress disorder (PTSD), according to a new study presented at the *2014 American Thoracic Society International Conference*.

"An ICU stay can be traumatic for both patients and their families," said Ann M. Parker, MD, a Pulmonary and Critical Care Medicine fellow at Johns Hopkins University in Baltimore, Maryland. "In our analysis of more than 3,400 ICU patients, we found that one quarter of ICU survivors exhibited symptoms of PTSD." The systematic review of 28 studies involved a total of 3,428 adult ICU survivors. Evaluation included testing with validated PTSD instruments, most commonly the Impact of Events Scale (IES, score range 0-75), administered one month or more after the ICU stay.

In a subset of 429 patients assessed 1-6 months after their stay in the ICU, meta-analysis demonstrated the pooled prevalence of PTSD symptoms was 23% at an IES threshold of ≥35 and 42% at a threshold of ≥20. In 698 patients assessed at 7-12 months, corresponding pooled PTSD prevalence rates were 17% and 34%. Rates in other studies included in the analysis ranged from 5% to 62%.

Risk factors for the occurrence of PTSD symptoms included younger age, use of benzodiazepines and/or mechanical ventilation during the ICU stay, and post-ICU memories of frightening ICU experiences. In some studies of European ICU patients, keeping an ICU diary significantly reduced the occurrence of PTSD symptoms.

Importantly, 3 of 3 studies demonstrated that more PTSD symptoms were associated with worse health-related quality of life.

A potential limitation of this systematic review is the variability of patient populations and PTSD survey instruments studied, which makes direct comparison between studies difficult.

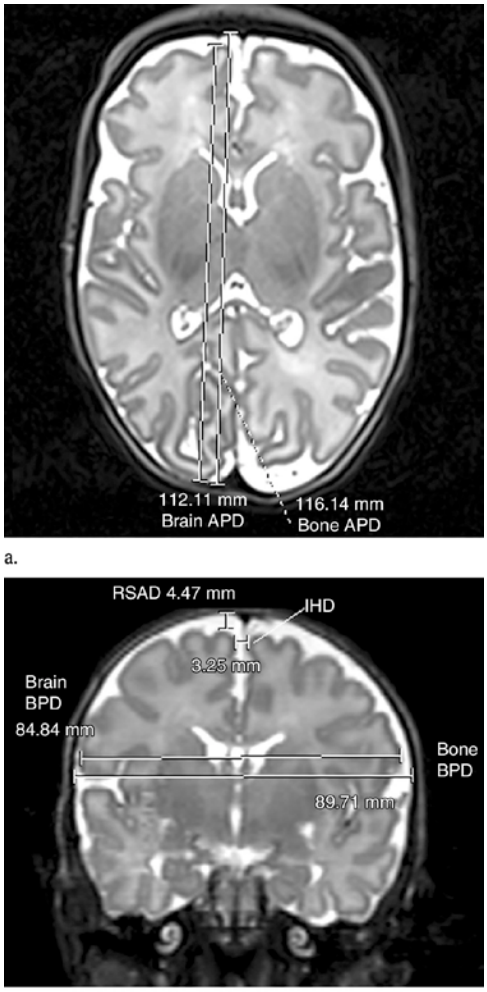
"Our meta-analysis confirms that a large proportion of patients who survive an ICU stay will suffer PTSD symptoms, which are associated with worse health-related quality of life," said Thiti Sricharoenchai, MD, Instructor in the Division of Pulmonary and Critical Care Medicine at Thammasat University, Thailand who conducted this study as a post-doctoral research fellow at Johns Hopkins University. "Further research should focus on PTSD screening, prevention, and treatment in this vulnerable patient population."

Dr. Parker and her mentor, Dr. Dale Needham, Associate Professor of Pulmonary and Critical Care Medicine at Johns Hopkins University, are currently planning a study to evaluate an out-patient intervention to address PTSD symptoms in ICU survivors.

Many of these investigations are ongoing; this news release represents the most up-to-date data available at press time.

MRI Shows Brain Abnormalities in Late Preterm Infants

Babies born 32 to 36 weeks into gestation may have smaller brains and other brain abnormalities that could lead to long-term developmental problems, according to a new study published online in the journal *Radiology.*

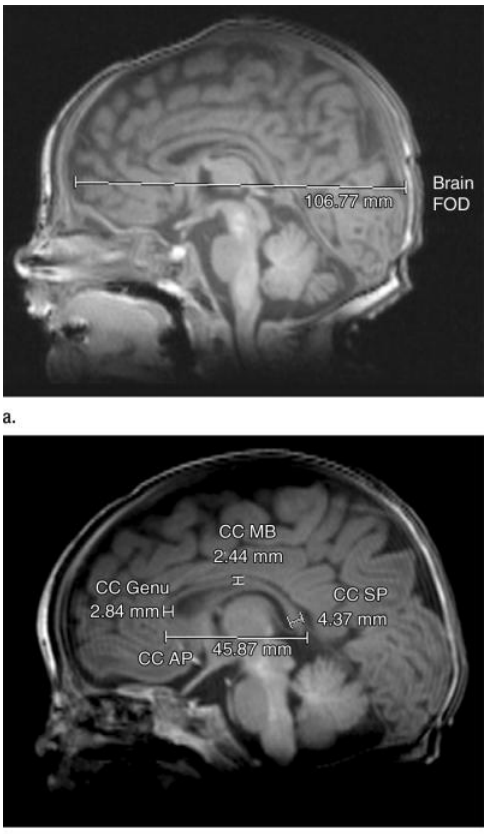


(a) Axial T2-weighted image shows brain and bone antero¬posterior distance (APD). (b) Coronal T2-weighted image shows brain and bone biparietal diameter (BPD), interhemispheric distance (IHD), right superior extra-axial distance (RSAD).
Credit: Radiological Society of North America

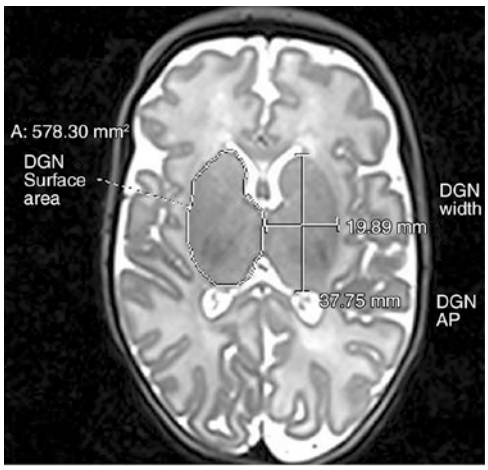
Much of the existing knowledge on preterm birth and brain development has been drawn from studies of individuals born very preterm, or less than 32 weeks into gestation at birth.

For the new study, researchers in Australia focused on moderate and late preterm (MLPT) babies —those born between 32 weeks, zero days, and 36 weeks, six days, into gestation. MLPT babies account for approximately 80% of all preterm births and are responsible for much of the rise in the rates of preterm birth over the last 20 years. Despite this, to date there have been no large-scale studies published on brain alterations associated with MLPT birth that may provide insight into brain-behavior relationships in this group of children.

"In those very preterm babies, brain injury from bleeding into the brain or a lack of blood flow, oxygen or nutrition to the brain may explain some of the abnormal brain develop-



(a) Sagittal T1-weighted image shows brain fronto-occipital distance (FOD). (b) corpus callosum (CC), anteroposterior distance (AP), genu, midbody (MB), splenium (SP) measurements.
Credit: Radiological Society of North America



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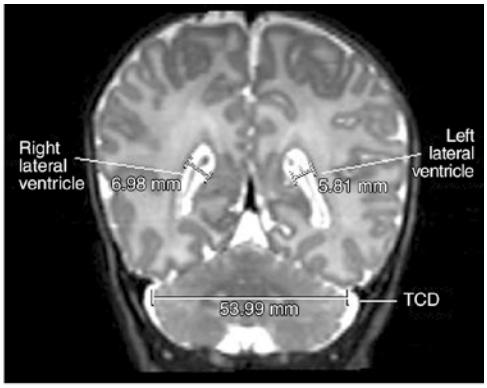

b.

(a) Axial T2-weighted image shows deep gray nuclei (DGN) width, anteroposterior (AP) distance, and surface area. (b) Coronal T2-weighted image shows lateral ventricle atrial measures and transverse cerebellar diameter (TCD).
Credit: Radiological Society of North America

ment that occurs," said the study's lead author, Jennifer M. Walsh, MBBCh, BAO, MRCPI, from the Royal Women's Hospital in Melbourne, Australia. "However, in some preterm babies, there may be no obvious explanation for why their brain development appears slow compared with babies born on time."

To learn more, the researchers performed magnetic resonance imaging (MRI) exams on 199 MLPT and 50 term-born infants (greater than 37 weeks gestation) between 38 to 44 weeks of gestation. They looked for signs of brain injury and compared the size and maturation of multiple brain structures in the two groups.

While injury rates were similar between the two groups, MLPT birth was associated with smaller brain size at term-equivalent age. In addition, MLPT infants had less developed myelination in one part of the brain and more immature gyral folding compared with term-born controls. Myelination—the formation of a fatty insulating sheath around some nerve fibers—and gyral folding—the folding of the cerebral cortex to increase the brain's surface area—are important processes in early brain development.

The findings suggest that MLPT birth may disrupt the expected trajectory of brain growth that would normally occur in the last two or so months in utero, according to Dr. Walsh.

"Given that brain growth is very rapid in the last one-third of pregnancy, it is perhaps not surprising that being born during this potentially vulnerable period may disrupt brain development," she said. "Brain growth is very complex, involving not only the neurons with which we think and do things, but also the other brain cells that support the neurons and are vital for normal brain function."

The researchers are hoping to learn in greater depth the impact that moderate to late preterm birth has on the brain, so that they can then begin to try different treatments designed to improve brain function and long-term outcome in these infants.

"Medications, along with early intervention to help parents understand their baby's needs, have been effective in helping very preterm babies catch up to their term-born peers," Dr. Walsh said. "However, whether any of the existing treatments will help babies born between 32 and 36 weeks is unknown, as they have not been studied very much at all."

The researchers plan to follow the infants in the study group through childhood to learn more about the relationship between brain abnormalities and later outcomes. They also are assessing additional MRI information about brain structure and function in these children.

"Understanding what problems they have and what might be causing them is the first step in trying to improve their long-term outcome," Dr. Walsh said.

Letters to the Editor

Neonatology Today welcomes and encourages Letters to the Editor. If you have comments or topics you would like to address, please send an email to: LTE@Neonate.biz and let us know if you would like your comment published or not.

NEONATOLOGY TODAY

ISSN: 1932-7129 (print); 1932-7137 (online).
Published monthly. All rights reserved.

Publication Headquarters
8100 Leaward Way
PO Box 444
Manzanita, OR 97130 USA
www.NeonatologyToday.net

Editorial and Subscription Offices
16 Cove Rd, Ste. 200
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ESPGHAN = European Society of Paediatric Gastroenterology, Hepatology and Nutrition; HMF = human milk fortifier

References: 1. Agostoni C et al. *J Pediatr Gastroenterol Nutr.* 2010;50:85-91. **2.** Clandinin MT et al. *J Pediatr.* 2005;146:461-468. **3.** Moya F et al. *Pediatrics.* 2012;130:e928-e935.

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