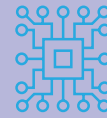




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Cook Children's Medical Center Makes Surgical History: The Role of Anesthesia in Separating Conjoined Twins

Kim Sumrak

On January 23, 2023, Cook Children's Medical Center in Fort Worth, Texas, performed groundbreaking surgery for the first time in the hospital's 105-year history. With a team comprising 25 medical professionals, including three anesthesiologists, four pediatric surgeons, two plastic surgeons, and 18 other clinical professionals, conjoined twins JamieLynn and AmieLynn were successfully separated after 11 hours of surgery. Anesthesiologist Chandra Reynolds,

MD, Medical Director of Perioperative Services at Cook Children's Medical Center, shared in an interview the extensive planning and challenges faced for this rare surgical event.

Pregnancy complications

James Finley and Amanda Archiniega, from Saginaw, Texas, were thrilled to learn they were pregnant, after desiring to add one more child to their family of five. The couple was surprised to discover Amanda was carrying twins, however, dur-

ing their 10-week ultrasound, they learned the twins had little to no separation. A follow-up appointment confirmed they were carrying conjoined twins. JamieLynn and AmieLynn were diagnosed as omphalopagus twins, meaning the point of connection was at the abdomen. Specifically, they were joined from the lower part of the breastbone to the belly button and shared a liver. Conjoined twins are extremely rare, representing one in every 200,000 live births, with only five to eight

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Conjoined twins JamieLynn and AmieLynn were born at 34 weeks at Texas Health Harris. Photo courtesy of Cook Children's Medical Center.



Biologics 101 for Anesthesiologists

Manar Mohamad Sharif Abdalgani, MBBS Richard Simoneaux
Kumar G. Belani, MBBS, MS, FACA, FAAP, SAMBA-F

Over the past two decades, treatment strategies for various inflammatory and autoimmune conditions have evolved from the use of small molecule broad-spectrum immunomodulators to that of highly targeted

antibody-based immunotherapies (*Nat Rev Immunol* 2021;21:680-6). Previously, glucocorticoids served as a key therapy for most of these conditions. However, this strategy demonstrated diminished

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Celebrating Diversity, Strengthening Inclusion, and Advancing Professional Development at ASA

Donald E. Arnold, MD, FASA

Bernard Banks, MBA, PhD, a noted expert on leadership and organizational change, provided two compelling lectures during ASA[®] ADVANCE 2023: The Anesthesiology Business Event. From his perspectives as a retired Army Brigadier General, Associate Dean for

Leadership Development and Inclusion and Clinical Professor of Management at Northwestern University's Kellogg School of Management, and an active consultant, Banks provided four key observations on organizational culture and success:

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SPECIAL SECTION

The Value of Global Engagement

Guest Editors: Ana Maria Crawford, MD, MSc, FASA, Elizabeth T. Drum, MD, FAAP, FCPP, FASA, and Kumar G. Belani, MBBS, MS, FACA, FAAP, SAMBA-F

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From the Front Lines: Conjoined Twins*Continued from page 1*

worldwide surviving the first few days after birth. Many conjoined twins die in utero or shortly after birth, however, each girl had her own heart and heart sac, which increased the chances for survival and made separation a possibility.

Delivery and surgical planning

As the pregnancy progressed, care was led by maternal-fetal specialist, Dr. Bannie Tabor, Texas Health Harris Methodist Hospital, a hospital with close ties to Cook Children's. Joined by a skywalk, local neonatologists practice at both hospitals' NICUs and many doctors from Texas Health Harris consult with Cook Children's pediatric specialists. Once Dr. Tabor reached out to Dr. Jose Iglesias, Medical Director of Pediatric Surgery at Cook Children's, and scans confirmed the girls were candidates for separation, Dr. Iglesias assembled a large team for the rare and risky medical undertaking, one of whom was Dr. Chandra Reynolds.

“During the five hours spent on surgery preparations before the first incision, the procedure of putting the twins to sleep was the most critical for Dr. Reynolds and her team.”

Dr. Reynolds described the extent of pre-surgery planning. The team discussed if Cook Children's would be the right venue, along with what kind of equipment would be needed to successfully separate the twins. Due to contacts with other institutions, Dr. Iglesias was able to consult with surgeons who had experience with similar separation anatomy and gather solid advice from the pediatric community. One pediatric cardiac anesthesiologist at Cook Children's had even been part of a similar surgery in the past, so could lend his expertise. Dr. Eugene Chung, she explained, had participated in the separation of a complex set of conjoined twins

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Two full medical teams, one for each girl, worked on the separation and were differentiated by the color of their scrub caps. Photo courtesy of Cook Children's Medical Center.

while working as a pediatric cardiac anesthesiologist at Texas Children's Hospital in Houston. He met with the physician members of the anesthesia team to offer advice and emphasized the importance of making an exhaustive list of required items and recording the list for reference. Dr. Chung also recommended scheduling as many run-throughs prior to the separation to identify any previously unanticipated needs or obstacles.

The surgical mapping and planning process for separation consisted of CT scans, ultrasounds, 3D modeling, and echocardiograms to obtain the anatomy of the girls, given the challenge presented with their face-to-face positioning. Additionally, surgical run-throughs were conducted to chart solutions and possible complications. Medical teams met individually, along with the larger team, to cover every possibility the day of surgery. Doctors at both facilities worked closely together for a delivery and postnatal plan.

The twins were born at 34 weeks at Texas Health Harris, on October 3, 2022, with both weighing 4 lbs., 7.8 oz. Neonatologists took over the babies' care after delivery and a month later the girls transferred to Cook Children's, where they remained until the pre-determined optimal time for separation. To keep their identities straight, a favored color was chosen for each girl, purple for JamieLynn and green for AmieLynn. In the NICU, the girls were monitored closely while doctors prepared for the immense task of separation, which was planned at four months of age due to anatomy, growth, and shared blood supply. The team even had to unexpectedly prepare for a potential earlier surgery date, Dr. Reynolds added, as one of the twins developed complications at two

months. However, the NICU resolved it in a planned and controlled fashion without the need for surgery, so thankfully, the operating room set-up could wait a little longer.

Anesthesia on surgery day

Following months of planning, preparation, and collaboration, surgery day arrived. Two full medical teams were in place, one for each girl, with purple and green scrub hats assigned to each group. The anesthesia team comprised two leads, Dr. Reynolds and a CRNA, along with two anesthesiologists, two CRNAs, two anesthesia technicians, and a runner. One logistical challenge the team faced, Dr. Reynolds noted, was the set-up of the operating room for the anesthesiologists. A bigger operating room typically dedicated to neurosurgery was utilized for the separation surgery to accommodate two medical teams. This way the machines, monitors, and medicine carts usually aligned on the shorter wall of the operating room were shifted to a longer wall to help house

double equipment. During the five hours spent on surgery preparations before the first incision, the procedure of putting the twins to sleep was the most critical for Dr. Reynolds and her team. Because of this, the team had spent several earlier sessions brainstorming and mapping out the plan for the anesthetic. At each step of the way, possible pitfalls were considered, and solutions were devised in case the team encountered those challenges on the day of surgery.

“When we're talking about taking care of conjoined twins compared to taking care of just a single baby, one of the biggest questions is what is shared, and there does seem to be some shared circulation between the girls,” said Dr. Reynolds. “What is the response going to be for baby B when we give baby A certain medication? It's a very slow and stepwise approach until we better understand what happens to one when the other receives medication. The key thing is to give one baby a certain amount of medication, watch and wait for a while to see how things are going and based on that response, we can give her sister a certain amount as well” (asamonitor.pub/3Xkz7Y1).

Although Dr. Reynolds had gathered information on how the girls responded to medication during prior CT scans, it was still unclear how much one baby would affect the other given their shared blood supply. As the girls were wheeled in from the NICU, JamieLynn and AmieLynn had IVs in place, however, AmieLynn's fell out, so the first task was to establish IV access for both girls. Because the girls were conjoined, their limbs were not as easily accessible compared with the average baby, so that factor added more time. Dr. Reynolds detailed how gas and drugs were administered slowly, as it was unknown just how much the twins shared. While the airway was unsecured, it was critical that the medications, including the anesthetic gas, be delivered slowly so spontaneous breathing could be maintained. Therefore, small doses of medications that would not diminish



Dr. Chandra Reynolds, Medical Director of Perioperative Services at Cook Children's Medical Center, called the 11-hour surgery “a well-choreographed dance.” Photo courtesy of Cook Children's Medical Center.

the respiratory drive were given, until the babies were sedated. JamieLynn had a higher requirement for medication, something that proved true to her during the induction phase, so AmieLynn fell asleep faster. When it came to intubation, JamieLynn proved to be more of a challenge, so the team took a break and focused on AmieLynn, securing her airway with traditional laryngoscopy first. Once AmieLynn's airway was managed, the doctors then shifted to secure JamieLynn's breathing tube via fiberoptic intubation. Following controlled ventilation, the next step consisted of surgeons placing arterial and central lines. After prep was complete, another hurdle the anesthesiologists faced was keeping the babies warm during the long surgery, all in a sterile surgical field. Dr. Reynolds first utilized specialized OR pads for positioning. Second, a water mattress was placed below the girls that continually sent warm water and third, the temperature in the room was dialed up. The latter proved uncomfortable at times given the multitude of bodies working in the room at once.

Once the girls were safely asleep, separation began and surgeons opened the abdominal wall, dividing the liver – the primary area of focus given the potential for significant blood loss. As the tissues of the chest were being dissected, Dr. Reynolds and her team closely monitored for any arrhythmia, as JamieLynn and AmieLynn would need a minute to recover. Hours later, after working through layer by layer, the babies were lying on their backs for the first time as two individuals. The final obstacle of the surgery was closure of their chests and abdomens, as it was a major defect after separation. The anesthesiology team watched pressure in the girls' chests meticulously to ensure their respiratory systems were not challenged during this step. Following an 11-hour surgery, JamieLynn and AmieLynn returned to the NICU for monitoring and recovery, with slow steps being taken each day until their hopeful release from Cook Children's.

True success story

Despite the slow, methodical process of anesthesia under what can only be described as extremely unusual and complex circumstances, Dr. Reynolds was happy to report that the entire surgical process went easier than expected. She was privileged to be part of such an experienced team participating in such a rare surgical opportunity. The level of teamwork and extreme preparation was seamless and worked like a “well-choreographed dance.” This truly is a success story for JamieLynn, AmieLynn, and every medical professional at Cook Children's. ■

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