

Alcor A-2361
Case Report



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1. Overview

Chihiro Asami, A-2361, became a member of Alcor in 2008. Born in Kushiro, Japan, August 2nd, 1948, she was now age 61. Chihiro, whose nickname was “Yumi”, had been a nurse during her working career. Now retired, she lived with her husband, Don Johnson, also an Alcor member.

Yumi was diagnosed with metastatic breast cancer that eventually extended to her brain. Her clinical death occurred at 10:23 AM on April 14th, 2010 at a hospice facility in Scottsdale, AZ. In addition to hospice staff, witnesses included Yumi’s husband as well as standby team personnel.

2. Personnel

Alcor’s Transport Coordinator, Aaron Drake, directed local Arizona response team members Steve Graber, Andrei Sobolev, and paramedic Eric Vogt, at the patient’s care facility. They were supported by Jennifer Chapman, Executive Director; and Steve Harris, M.D., Chief Medical Advisor.

Personnel at Alcor’s surgery suite included Nancy McEachern, DVM, Surgeon; Aaron Drake, Surgical Assistant; Hugh Hixon, Cryoprotectant Perfusionist; Steve Graber, Assistant Cryoprotectant Perfusionist; Andrei Sobolev, Surgical Scribe; Bonnie Magee, Surgical Support; Bruce Cohen; Surgical Support; and Richard Cremeens, Surgical Support.

3. Pre-Deployment

“Yumi” had first been diagnosed in February 2007, following a biopsy on one of her breasts which turned out to be positive. A mastectomy was performed a few days later and the removed lymph nodes confirmed stage three cancer. She was given a course of chemotherapy and radiation treatments to further treat the cancer. Her quality of life was fairly normal until March 2008 when she had symptoms suggestive of a stroke. A subsequent brain scan showed two large tumors in the cerebrum and cerebellum which prompted Yumi’s husband Don to notify Alcor of the problem. Surgery and Gamma Knife radiation therapy followed in July 2008 with minimal success as the tumors continued to grow, one of which was encroaching on her spinal area.

Aaron Drake and Todd Huffman decided to visit Yumi at her home to meet her and become familiar with the location to determine any logistical challenges in the event a response was needed. Items identified include the quickest driving route, where to park, the location of the apartment and how to move the patient down the stairs.

In April 2009, Yumi’s surgeon decided it was time to perform surgery again. Due to the location of the tumors, the surgeon expressed a high degree of risk for Yumi’s procedure. This report prompted Jennifer Chapman - Alcor’s Executive Director, to deploy a

standby for the surgery. As Alcor was in the process of rebuilding the Arizona team with new members that had minimal cryonics experience, Jennifer decided to deploy Suspended Animation's (SA) team for the standby. This included team members from SA in Florida, along with Dr. Steve Harris and staff from Critical Care Research in California, and Aaron Drake of Alcor.

The standby was directed by Catherine Baldwin, General Manager of SA. The location was a local hospital in Phoenix, AZ. Catherine interfaced with the hospital administration and staff to facilitate access to the patient in the event the patient did not survive the procedure. Although the surgery lasted the better part of the day, the report from the medical staff was it had been successful and Yumi was now resting comfortably. With this news, the standby ended and the teams returned home the following day.

Alcor continued to keep contact with Yumi's husband, Don, to monitor her progress. Some functional loss of use in one hand occurred after initiating a chemo pill designed to penetrate the blood brain barrier. However, over the course of the year, Don and Yumi attended Alcor Board meetings and cryonic meet-ups. It was encouraging to see her active after the procedure.

As the months passed, Yumi became increasingly fatigued from the medications that she took to keep her cancer at bay. A decision was made by her oncologist in February 2010 to discontinue her medications as they were possibly doing more harm than good. With this action, the cancer would either return or she might remain cancer free.

In the few weeks following the decision, Yumi mostly lost the ability to ambulate along with continued loss of use of her right hand and arm. This, along with severe headaches, prompted the oncologist to request another MRI scan to determine if the cancer had returned. The test revealed multiple masses had reformed in the brain, and after consultation with the neuro surgeon, it was determined that any additional surgical intervention would be futile. The cancer had become so aggressive that nothing more than keeping Yumi comfortable could be achieved at this point.

Don, Yumi's husband, contacted Alcor to inform us of the news. He relayed that Yumi's oncologist said she would probably only survive a few more weeks. Contact was made with a local hospice organization to enroll Yumi. This would be beneficial as having Yumi enrolled in a hospice program close to Alcor would increase her chances for an optimal cryopreservation.

Don called the hospice and upon completing all of the enrollment requirements, Yumi was accepted as a patient under their hospice-at-home program. Alcor pre-positioned coolers of ice at Don and Yumi's home as her health continued to decline, and the ice was replenished as needed, approximately every other day. An oxygen saturation monitor was supplied so it would sound an alarm if her vital signs fell to a critical level. This would alert Don to contact Alcor if her health failed suddenly, even if he was asleep in the middle of the night.

Don also discussed with Alcor the possibility of changing Yumi's cryopreservation status from "Neuro" to "Whole body". After discussions with people in the cryonics industry, he decided that "Whole body" was his preference. Alcor prepared the documents for Yumi to sign that allowed for the change and Don provided the necessary funding to make it official.

Over the next couple of weeks, the hospice organization sent a nurse to check on Yumi frequently. The purpose was to determine when her condition warranted having her changed to in-patient status. These visits also allowed Alcor to communicate regularly with the hospice organization's nurses regarding Yumi's condition. As her disease process progressed and her level of consciousness decreased, the hospice nurses determined it was time for Yumi to be transferred to the facility's in-patient unit. Yumi had not had any food for close to a week and she had not had any fluid to drink in the past few days. The decision by the hospice organization was the triggering mechanism for Alcor to launch a full standby.

4. Deployment

Since the transfer itself can be traumatic to a person in a fragile medical state, Alcor wanted to have a team in place before, during and after the move. Steve Graber and Aaron Drake started the standby on Sunday evening, April 11th. Alcor's recently remodeled rescue vehicle was loaded with fresh ice and driven to a hotel that was very close to Yumi's apartment. This would allow for a quick response in the event that something happened to Yumi prematurely.

On Monday morning, April 12th, Lifestar Ambulette arrived to move Yumi. Steve and Aaron met them at Yumi's apartment to observe the transfer. The ambulette personnel placed Yumi on a stretcher and moved her from the second story apartment, down a flight of stairs and into the waiting ambulance. The stretcher was secured inside the vehicle and Aaron rode in back with one of the transfer personnel to monitor her health during the transport. Steve followed behind in Alcor's rescue vehicle during the short ride to the hospice unit. The transfer was uneventful and Yumi was delivered to the waiting hospice organization's medical staff.

Steve positioned the rescue vehicle in the parking lot and Aaron spoke with the hospice staff to ensure they understood both Yumi's directives and Alcor's requests in order to help honor those directives. While Yumi was being admitted, the team began to prepare the stabilization equipment and move it into her room. A request was made to the hospice organization to establish an intravenous line on Yumi. This would allow the hospice organization to have a venous route to better manage pain and provide Alcor with quick venous access with which to administer post-mortem medications when needed. The hospice granted this request and they placed a heparin-locked IV catheter shortly thereafter.

Eric Vogt, a Southern California paramedic who had assisted Alcor during regional team training sessions, was contacted and asked if he would be willing to participate on the

standby. He agreed and flew out Monday afternoon. Andrei Sobolev, a local team member who lives in Phoenix, also came by to help cover staffing while other team members rested.

By Tuesday, April 13th, Yumi's oxygen saturation had dropped below 70% for the first time; her pulse was tachycardic; and her breathing had become very erratic. Her vital signs continued to decline throughout the day. These combinations of changes were significant enough to warrant preparing the medications. With the exception of those meds that had a limited window of efficacy once drawn-up, everything else was prepared.

The Arizona team now had a rotation of at least three team members on site at all times. They maintained this throughout the night as Yumi's condition had become more critical. As her oxygen saturation dropped to lower levels, the pulse oximeter became unreliable and the subtle rise and fall of her chest, indicating her breathing rate, had to be visually watched at all times. While this can become very tedious for team members, it is the only way to prevent an unwitnessed respiratory arrest from occurring. It is vitally important not to lose those first few precious minutes after clinical death occurs.

Tuesday night slowly turned into Wednesday morning. Yumi's vital signs were all becoming very erratic - a sign that typically indicates death is quite near. Team members present were Aaron, Steve and Andrei. Yumi was now experiencing long periods of apnea where she would not take a breath for sometimes up to 30 seconds. The nurses were now checking more frequently, expecting that something would happen yet the very same morning.

By 10:15 am, Yumi's breathing was extremely shallow and team members requested that the hospice staff stay in her room through the duration. At 10:22 am, Yumi's breathing had stopped completely. The nurse waited one minute to check for a pulse and stated she could no longer detect one. Yumi was pronounced by the hospice nurse at 10:23 am.

5. Field Stabilization and Cooling

Once the hospice nurse acknowledged that the Alcor team could begin their procedures, Aaron immediately turned on his voice recorder and administered the first five medications within a minute. This was followed by a saline bolus to flush the meds through the bloodstream and towards the heart. Meanwhile, Steve and Andrei put down a base layer of ice in the portable ice bath. The team grabbed the four corners of the bed sheet and lifted the patient off of the bed and moved her to the ice bath. Alcor's chest compression system, the Lucas, was placed over Yumi's sternum and mechanical compressions were initiated to provide cardio pulmonary support (CPS). This action would restore circulation of the blood, along with the medications, throughout the vascular system. Steve and Andrei worked quickly to completely cover the entire body with the remainder of the ice.

Aaron established an advanced airway with a single-lumen King airway. The tube was secured and attached to an oxygen tank to oxygenate the lung fields. A temperature probe was placed in the nasopharynx and the DuaLogR was activated to record the drop

in the patient's temperature. A second vascular access point was established through the use of the intraosseous Bone Injection Gun. One of the medications, Epinephrine, was administered via the recently acquired Baxa infusion pump to ensure that the desired effect of vasoconstriction could be maintained throughout the stabilization procedure. This administration line was secured to the intraosseous port.

Additional medications were pushed while Steve went out to the parking lot to lower the gate to the rear of the rescue vehicle and prepare to load the portable ice bath. The hospice nurses were informed that the team was ready to depart for the parking lot and the secured exit doors were opened for the team. The ice bath was rolled out of the room, down the hallway, and out the exit doors that led to the parking lot. The total elapsed time from pronouncement to departing the building was 22 minutes. The team loaded everything on to the rear lift gate of the rescue vehicle and Steve activated the lift to raise the team into the mobile surgery suite to continue stabilization. Once secured, the rear doors were closed so that they could maintain privacy for the patient.

6. Transportation

Steve phoned Alcor to alert them that we were just about ready to depart. Once everyone was secure, Steve backed up the vehicle and drove out of the parking lot and headed towards Alcor, less than 15 minutes away. Aaron and Andrei continued to administer the large volume medications while enroute. Traffic was light and the team arrived at Alcor quickly.

CPS was continued throughout the transport to Alcor. Upon arriving, the oxygen tank attached to the bottom of the PIB began to run out of air. The supply line was disconnected and reconnected to a larger tank that is mounted inside the vehicle. This only takes a moment to switch out and compressions are stopped for less than 30 seconds.

At this point, only 40 minutes had elapsed from time of pronouncement to arrival. The DuaLogR registered a temperature of 24.0 deg C so it was decided to continue to cool the patient in the back of the rescue vehicle for a little longer, while the remainder of the large volume medications were administered. Additional ice was brought out to the vehicle to place on the patient to expedite the cooling process.

Within the next 20 minutes, the patient's temperature had continued to drop to 20.1 deg C - a point where she was now ready for surgery. The rear doors of the vehicle were opened; the PIB was moved out on to the lift gate; and everything was lowered to the ground. The vehicle had been parked directly outside the rear doors that lead to Alcor's operating room, so the transfer inside was quick.

7. Surgical Procedure

The patient was moved into the operating room and placed next to the surgical table. A layer of bagged ice had already been placed on top of the surgical table to maintain cold temperatures beneath the patient. The existing ice was removed from on top of the patient and she was pulled out of the ice bath and placed on the OR surgical table at 11:45 am.

Bonnie Magee prepped the patient's sternum with Betadine, an antiseptic agent used topically to destroy microbes. Dr. McEachern stood on a step stool to gain a higher position above the patient in order to perform a median sternotomy. This is a procedure in which a vertical inline incision is made along the sternum, after which the sternum itself is divided. This provides access to the heart for cannulation. Dr. McEachern cut through the skin of the chest with a scalpel. When she was finished, Aaron Drake placed the edge of the sternal saw blade above the sternal notch. He guided the saw distally through the patient's sternum. After the sternum separation was completed, the chest was opened with Fianchetto spreaders and the pericardial sac was exposed. Access to the heart was accomplished by cutting through the pericardium.

Dr. McEachern performed an arterial cannulation of the heart by accessing the aorta and advancing the catheter. Aaron held the catheter in place while it was secured. This process was repeated for the venous cannulation of the heart. This process took approximately 50 minutes and was completed at 12:35 pm. Now the washout process could begin. This process is used to remove the patient's blood and replace it with a cryoprotectant. The roller pumps were turned on and perfusate flowed into the tubing, through the cannulas, the heart and throughout the entire body.

The patient's head was then shaved to prep for the bur holes to be drilled through the use of a Craniotome. These holes are used to monitor the temperature of the patient's brain as well as a way to visually watch for cerebral swelling. Once the bur holes were drilled, Dr. McEachern cleaned each of the bur holes as they were completed. A temperature probe was then placed inside one of the bur holes and connected to the computer to record cerebral cooling.

Initially, the concentrations of perfusate that are introduced into the body are weak, by design, to allow the body to adjust to the chemicals. Over the next three hours, however, the concentration is slowly increased as the temperature of the patient drops. Continuous fluid readings with a refractometer were taken and recorded to monitor these levels.

By just after 4:30 pm, Hugh determined that the proper cryoprotective concentration had been achieved and the pumps were turned off and the process was shut down. The patient was moved from the surgical table to the cooldown storage box where the temperature was rapidly dropped to -110 C.

Because another patient was already in cooldown and the WB cooldown equipment was in use, Yumi was held at -110C for 7 1/2 days, until the WB cooldown dewar could be freed up. The patient's temperature was then gradually lowered to that of LN2, -196C.

At that point, the patient was transferred from the cooldown storage box to long term storage in a big-foot dewar.

Technically the suspension went well and the desired concentration of M22 was reached – 30 minutes above 50.3 Brix in venous return. Temperature changes observed with the nasopharyngeal probe were rapid, indicating blood flow to the brain. Observation through the bur holes indicated that the brain neither swelled nor retracted. Further, the eyes did not appear to collapse either. Skin perfusion was fairly even. Her lungs were somewhat edematous after cryoprotection and she required approximately 40 liters of M22.

The data collection system started becoming very noisy, and was shut down and restarted several times. As a result, data collection was by hand and temperature data was somewhat difficult to untangle.

Chihiro Asami is now Alcor's 93rd patient.

8. Discussions and Recommendations

Issue: The inverter on the rescue vehicle did not work.

Solution: The inverter and batteries were tested and we identified that the batteries were not holding a charge and were therefore replaced.

Issue: The rescue vehicle was not very comfortable for team members to rest.

Solution: We have purchased sleeping bags, pillows and items for comfort.

Issue: We do not want to be in the way of medical staff but it is challenging to be alerted to a potential terminal event.

Solution: We have placed voice activated walkie talkies under the alarm of the CO2SMO unit to alert us immediately, even when in the rescue vehicle.

Issue: Once an individual is pronounced, what is the appropriate way to interact with the family members who are present, given the urgent need to begin the stabilization process.

Solution: Aaron will address this area of sensitivity during the team trainings.

Issue: The patient and ice slide around too much in the back of the PIB, especially when driving down the road.

Solution: We will try adding a non-slip mat to the bottom of the PIB.

Issue: The hospice does not want other patients to see the procedures being performed on the cryonics patient, while transporting down the hallway.

Solution: We will notify hospice staff when we are ready to depart and they will clear the hallway and shut the doors of the other patients' rooms.

Issue: Our surgeons struggle when it comes to finding a particular surgical instrument on their tray. Hugh has to then leave his task to locate it.

Solution: Request that the surgeons come in to Alcor and design a tray specific to their preferences, prior to surgery.

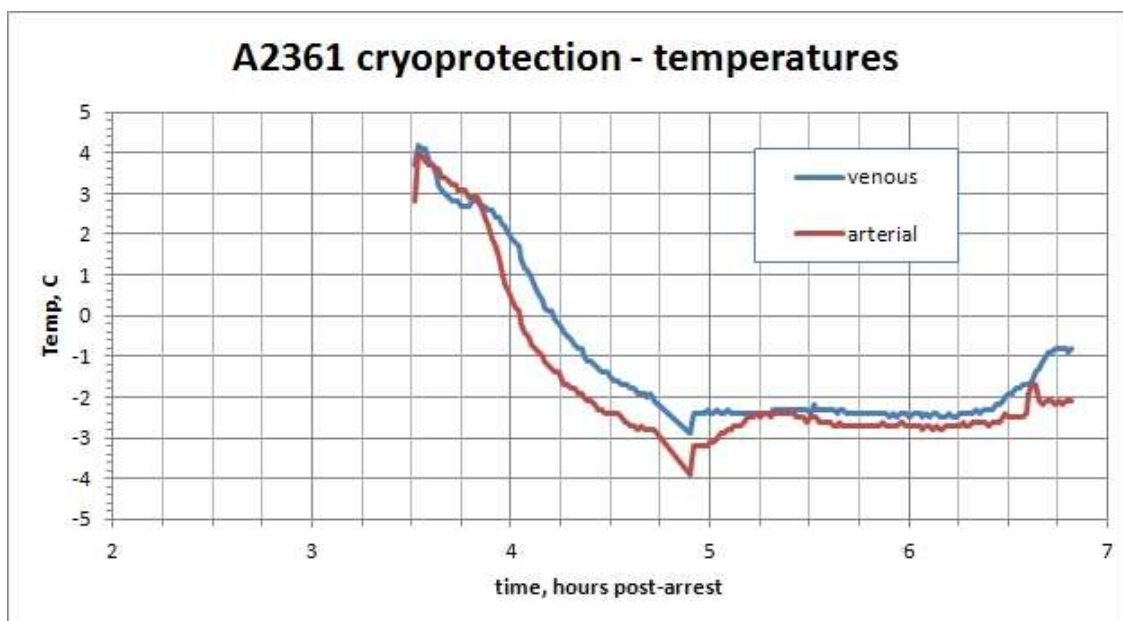
Stabilization and Surgical Timeline

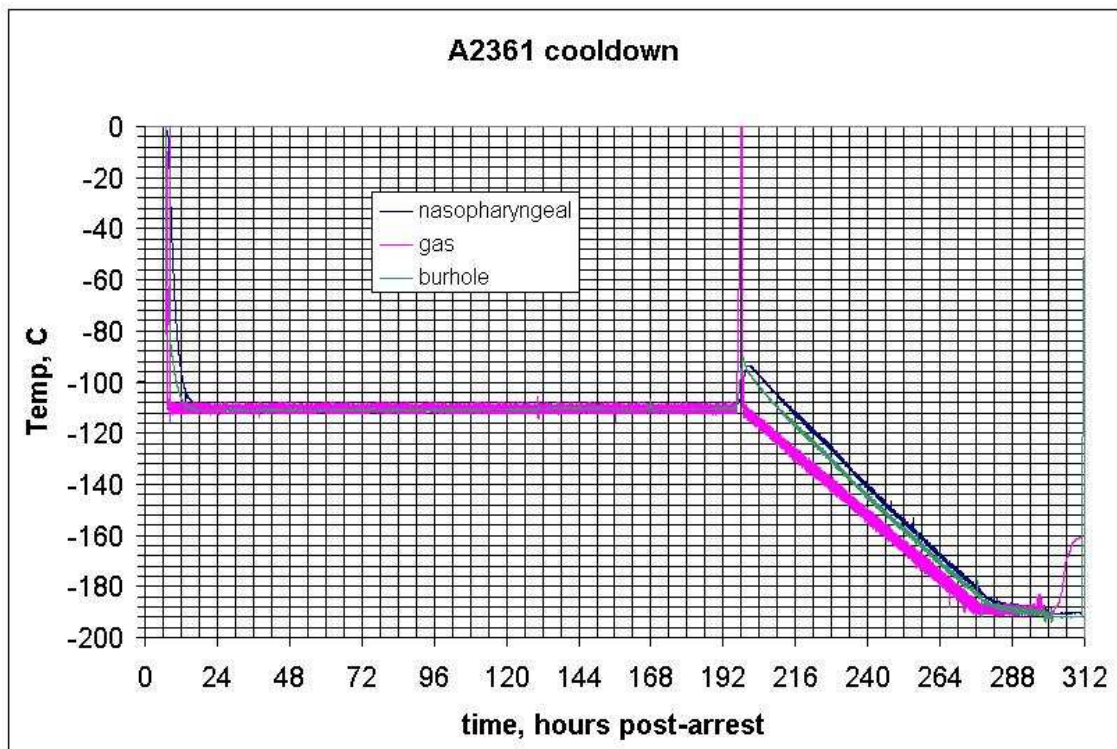
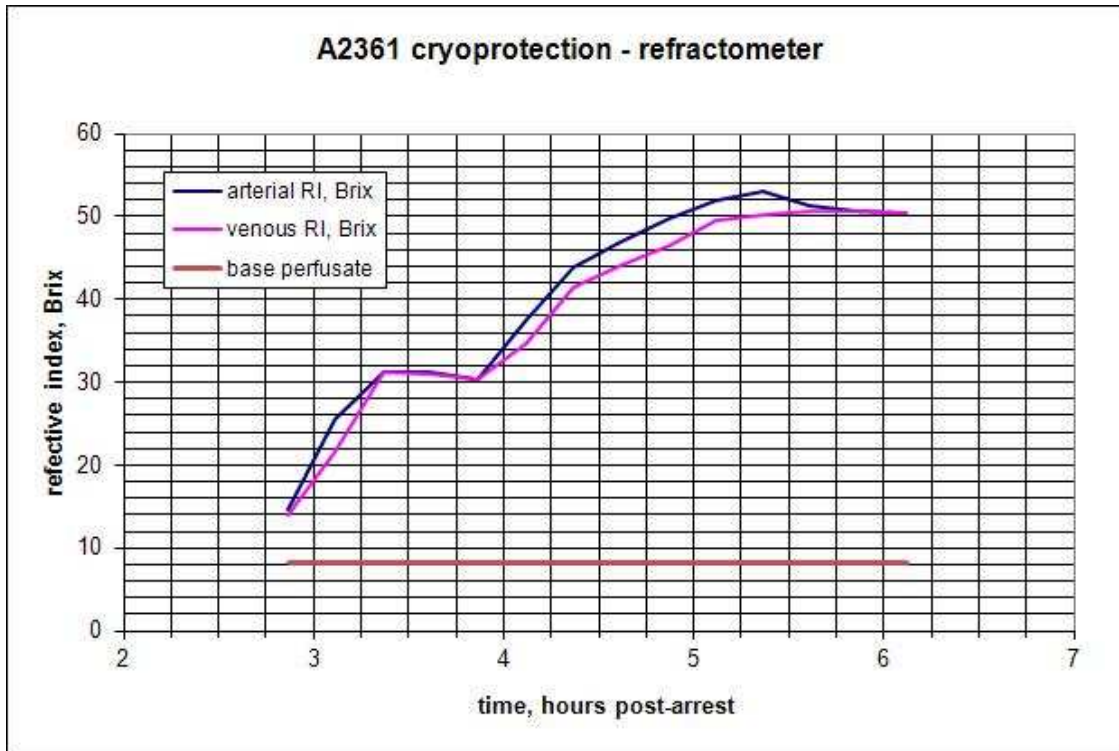
April, 14th, 2010

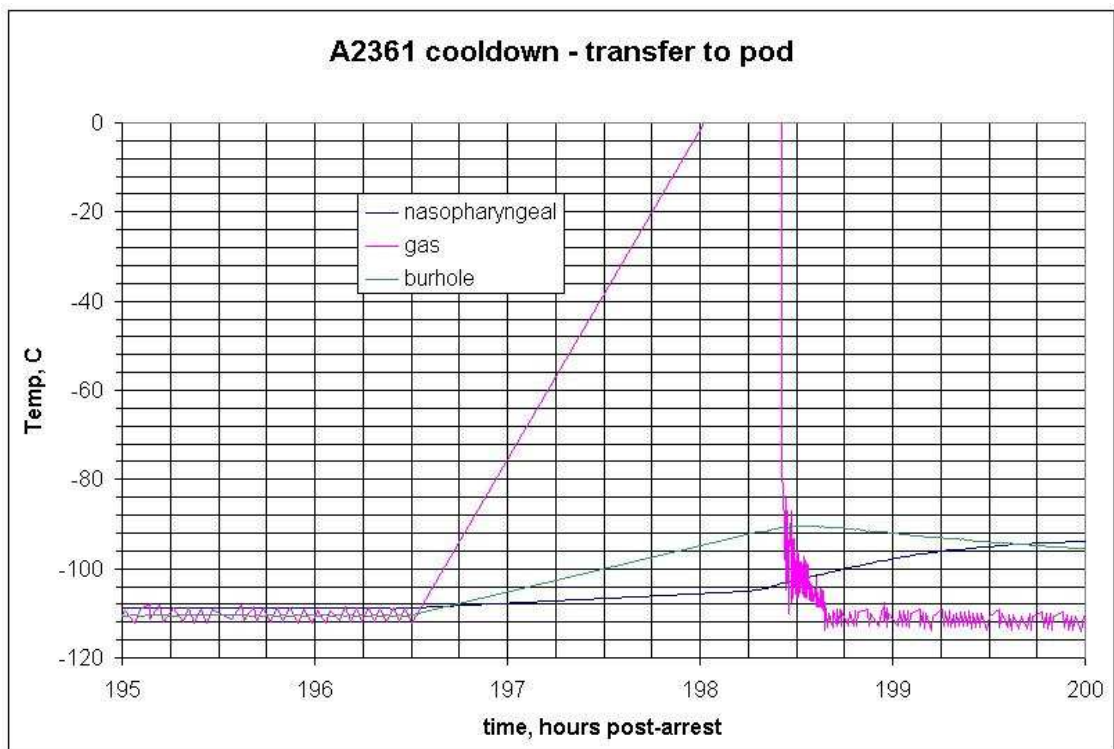
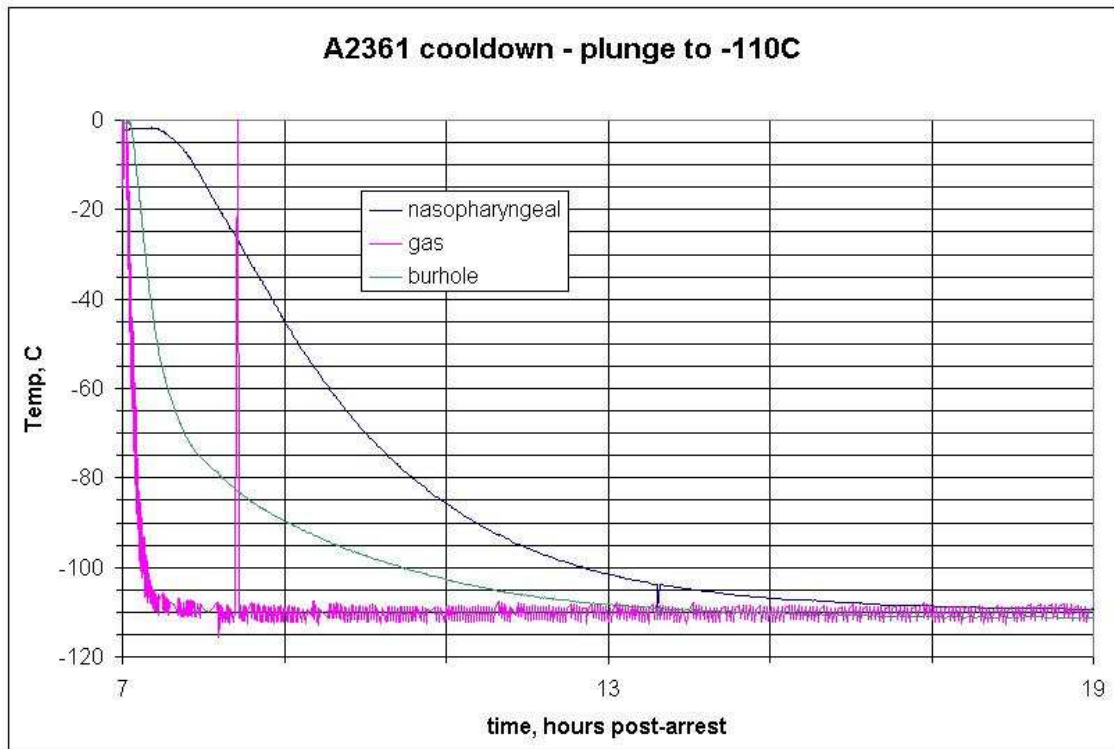
<u>Time</u>	<u>Hours</u>	
10:23	0.00	Legally pronounced
10:23	0.00	Medication administration initiated
10:26	0.05	Patient moved to ice bath
10:27	0.06	Circulation restored with Lucas
10:31	0.13	Oxygenation restored with King airway
10:32	0.15	Thermocouples placed
10:37	0.23	Intraosseous access established
10:43	0.33	ROD inserted
10:45	0.36	Patient moved from room to rescue vehicle
10:50	0.53	Rescue vehicle departs for Alcor
10:58	0.58	Arrive at Alcor. Continuing cooling with Lucas in rescue vehicle in icebath
11:45	1.37	Transfer from icebath to OR table
11:56	1.55	Finish scrubbing chest
11:59	1.60	First incision
12:09	1.77	Spread ribcage
12:26	2.05	Uncoordinated cardiac fibrillatory movement noted
12:36	2.22	Placed arterial cannula

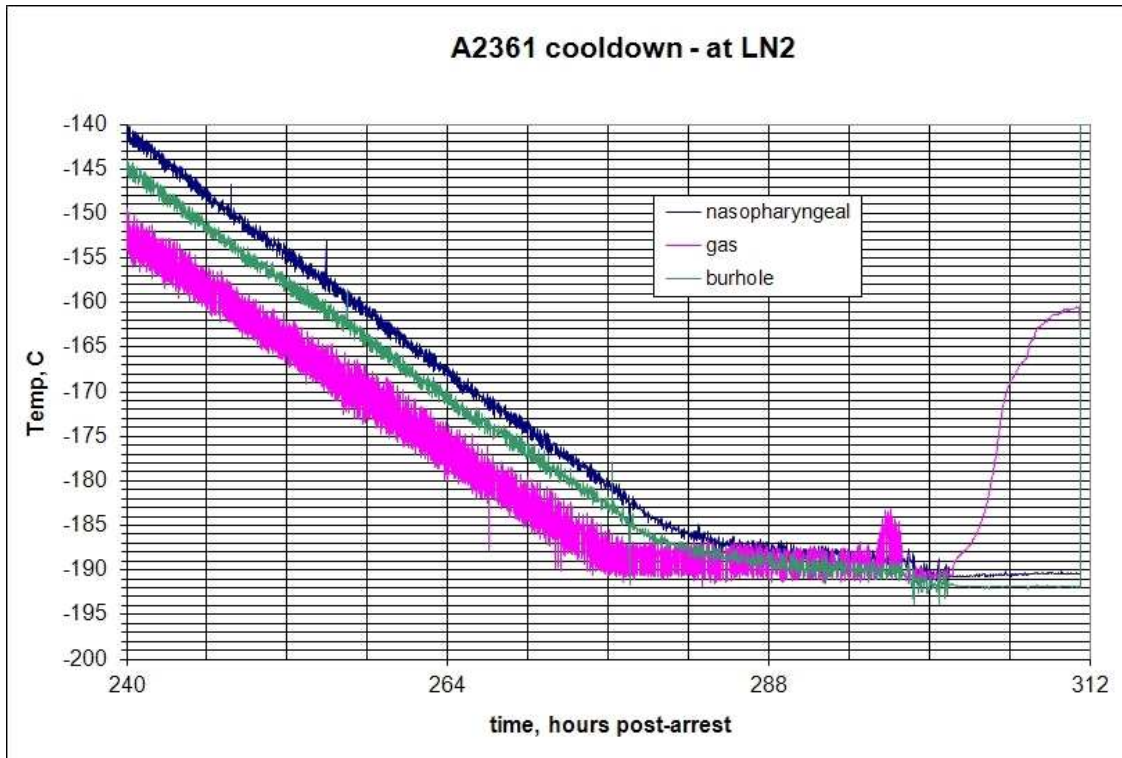
12:58	2.58	Placed venous cannula and connect tubing
13:02	2.65	Clamps off, on bypass
13:03	2.67	Began shaving head
13:13	2.83	Washout complete, began ramp
13:24	3.02	First cut for bur holes
13:34	3.18	Restart data acquisition program
13:36	3.22	Bur holes drilled
13:37	3.23	Restart data acquisition program
13:44	3.35	Data acquisition system malfunction, shift to DuaLogRs and paper for data collection
13:45	3.37	Paused ramp midway
14:04	3.68	No sign of brain contracting, swelling into left bur hole
14:15	3.87	Resume ramp
14:24	4.02	Brain surface showed good circulation
15:06	4.72	Switched TCs
15:42	5.32	Data collection system up again
15:45	5.37	Stop ramped and equilibrated
16:12	5.82	Maybe 2 liters loss to table
16:35	6.20	End cryoprotection, left lung swollen
16:55	6.53	Completed closing of chest
17:12	6.82	Bur holes closed up
17:13	6.83	Transferred patient to gurney
17:18	6.92	Transferred patient to cooldown box
17:27	7.07	Began cooldown plunge
	13.00	Below -100C
	17.00	Held at -110C
	196.50	Began transfer to pod
	198.40	Resumed cooldown at -1C/hr
	301.10	End cooldown. In LN2

9. Graphs









End of report.