

Alcor A-2628

Case Report



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1. Overview

On Friday, July 20th, 2012 Alcor was notified through our TeleMed alert system that a 90 year-old individual wishing to be cryopreserved was in serious condition in a Las Vegas hospital and was not expected to survive more than a couple of days. While this individual had previously filled out an application for membership in 2009, and was provisionally assigned the number A-2628, he had never followed through with signing the contract or providing funding.

Over the weekend, Alcor pushed hard to get more information on his medical condition, to get all necessary Third-Party sign-up documents signed, and to secure payment - all conditions necessary before we could initiate a standby or stabilization. Since the individual's health was declining rapidly, arrangements were made to have his body heparinized upon clinical death and cooled at a local mortuary until his membership status could be approved.

Once the necessary arrangements had been completed, Alcor's Medical Response Director flew to Las Vegas and arrived approximately 22 hours after clinical death to complete the medication administration and package the body for flight. An air ambulance was paid for by the family to minimize the travel time and the patient arrived at Alcor for a whole body washout and cryoprotection within the next six hours.

Member A-2628, who asked to remain confidential, was pronounced on July 23, 2012, and became Alcor's 112th patient.

2. Personnel

Aaron Drake, Medical Response Director, performed the stabilization and cooldown components of the case. He was supported by Max More, CEO; Steve Harris, M.D., Chief Medical Advisor; and Catherin Baldwin, Suspended Animation.

Personnel at Alcor's surgery suite included Dr. Nancy McEachern, Surgeon; Aaron Drake, NREMT-P, Surgical Assistant; Hugh Hixon, Cryoprotection Perfusionist; Steve Graber, Assistant Cryoprotection Perfusionist; Max More, Ph.D., Scribe; R. Michael Perry, Ph.D., Cooldown Coordinator. Surgical support staff: Bonnie Magee, Jerry Searcy and Lisa Shock. Observing: Dr. Kara Villarreal

3. Membership Approval Process

In 2009, Alcor received an application for membership from an individual who resided in Las Vegas, NV. The agreement and associated documents were prepared and sent off for an acceptance signature and funding. An interim Alcor number of A-2628 was assigned in

anticipation of receiving approval however the signed documents were never returned. Eventually, the application was closed out.

The next communication we received was from the personal accountant of the applicant, through our emergency answering service on Friday, July 20th, that this former prospective member was in a Las Vegas hospital and was seriously ill. The accountant shared that his client had always talked about being cryopreserved and additionally, the client's granddaughter was determined to see that his wish be fulfilled.

The prospective member's health history included an aortic valve replacement, a non-repaired prolapsed mitral valve and an implanted pacemaker. His pacemaker had recently failed and he was being treated with medications in attempt to regulate his heart rate. This treatment plan apparently failed and he went into sudden cardiac arrest. Although he was resuscitated, he remained on a ventilator and was in full renal failure, fluid overload and only able to maintain a minimal blood pressure with the assistance of vasopressors. He showed signs and symptoms of a cerebral hemorrhage and his medical providers suspected that he may be brain dead.

In order for Alcor to approve this individual for membership, we could not use the previously submitted application and contract as the individual was no longer able to execute the document, given his unresponsiveness. Instead, a new third-party application and contract would need to be signed, approved and funded before Alcor could initiate any standby or stabilization efforts.

With the clock working against us, especially given the upcoming weekend when administrators and bankers are not always available as you need them, we started the signup process. Alcor continued to communicate with the personal accountant for the family, who acted as a liaison for the granddaughter, to complete the required paperwork and start the financial transfer. The accountant recalled when the contract was originally received back in 2009. Perplexed as to why he had not completed his membership with Alcor when he first applied, the accountant stated that while the individual was extremely wealthy, he was also extremely frugal, and wanted to save the cost of the monthly membership dues since he considered himself to be in excellent health. Ironically, with third party contract surcharges of \$50,000, that premium far and above exceeded any expected savings, not to mention the risk of not being cryopreserved at all.

The hospital said they planned to discontinue life support based upon the results they obtained through CT scans of the patient. The family offered to self-pay the hospital charges to delay the process and buy the additional time needed to complete the sign-up process and get an Alcor team in place. Alcor also requested of the hospital to quickly pronounce, administer and circulate Heparin while cooling the body if clinical death occurred prior to our arrival. The hospital agreed to comply with these requests. Alcor then contacted Suspended Animation and placed them on

alert but cautioned them that if this turned into a postmortem response, Alcor would not be in need of their services.

While the 3rd party sign-up documents were completed over the weekend, no progress was made on funding the contract as banks were all closed. Additional measures were taken by Alcor to ensure that any remaining family members agreed to the cryopreservation and that the next-of-kin status gave the granddaughter the full authority to make the anatomical donation.

Numerous back-and-forth calls were made on Monday, July 23rd, but delays occurred in transferring the funds from one account to another before Alcor could be paid. Word came from the hospital's medical providers that the grandfather's health was quickly failing. Alcor stressed the urgency of the situation to the personal accountant as we maintained that we would not deploy a response team until all components, including paperwork and funding were completed.

For planning purposes, Alcor discussed a variety of response options including driving the rescue vehicle to Las Vegas or taking a private or commercial flight. After further discussions with the granddaughter, she offered to also pay for an air ambulance to transport the patient back to Scottsdale to minimize transport delays. Quotes were obtained from a local air ambulance company that Alcor had previously used and forwarded these on to the granddaughter to secure.

On Monday evening, at 7:40 pm, we received a call that the patient had clinically died following a cardiac arrest. The granddaughter was aware that the sign-up process was still in progress but she fully intended to follow through on her grandfather's wishes. Almost two hours later, she called back in great frustration to say that her grandfather had yet to be officially pronounced or heparinized and cooled as the hospital had promised. Max authorized Aaron to intercede despite membership approval being approved yet. Aaron called the hospital to identify the problem and it was explained that no doctors were in the ICU at that time and the nurses were not allowed to pronounce. They had the Heparin ready to administer but had to wait until permission was given. Aaron then contacted the Emergency Room physician of the same facility with a desperate plea to break away from his patients for a moment to report to the ICU to make the pronouncement. The physician agreed and he responded immediately. The official time of death was at 9:35 P.M.

4. Field Stabilization, Cooling & Transportation

On Tuesday morning, July 24th, Alcor finally received the wire transfer of funds to complete the sign-up process. A cooperative mortuary had previously been identified and had already removed the decedent from the hospital's morgue and relocated him to the walk-in cooler at the funeral home, covering the body with bags of ice. As this was now a postmortem response, Alcor sent Aaron with the medications and supplies to complete the stabilization process. The first

available flight departed at 2:50 pm and was scheduled to arrive an hour and ten minutes later at 4:00. Unfortunately, mechanical problems delayed the departure by two hours. Aaron arrived at Las Vegas McCarran airport at 6:10 PM. After retrieving the supplies from the baggage carousel, Aaron took a taxi directly to the funeral home and arrived around 7:15.

After briefly meeting with the funeral director and providing the proper documents, Aaron was taken into the mortuary prep room where the patient had been moved. He was enclosed in a body bag had been covered with ice bags. Aaron unzipped the body bag, revealing additional bags of ice placed directly on the body. Some of these bags were removed to expose the head, chest and the right side of the body.

A thermocouple was placed into the patient's nasopharynx, secured with a surgical stapler and attached to a DuaLogR to record the current temperature and descent while being transported. The IV port that had been left in the right arm by the medical providers at the hospital did not appear to still be patent, therefore a Bone Injection Gun was used to obtain intraosseous access in the right tibial plateau for medication administration. Each of the stabilization medications were administered as each vial was prepared. Roughly every five minutes, an AMBU CardioPump was used to compress the chest to circulate the medications throughout the vascular system, while the administration continued. Some medications were omitted: the general anesthetic was bypassed due to the time that had elapsed from clinical death; there was no need to administer any of the vasopressor medication(s) as when a patient's body temperature is near or below +20 °C at the time of the administration, those medications become ineffective at cold temperatures; and additionally, no gastric buffering medication was administered due to inability to establish an oral airway. This was probably due to rigidification of the jaw, which is the stiffening of the body's muscles after death. This process affects the smaller muscles of the body first, including the face and neck.

After administration of all the remaining medications and performing manual chest compressions to aid in circulation, the body bag was closed and a secondary heavy duty transport body bag was placed around it to prevent any leaks from occurring during loading/unloading and throughout the flight. The previously removed bags of ice were replaced in-between the primary and secondary body bags. The transport documents were secured and the mortuary's administration paperwork was signed and the bill for services was paid.

The patient was loaded into the back of the mortuary vehicle and they departed for the airport. A stop was made along the route at a convenience mart to purchase additional bags of ice for the flight. After arriving at the private jet side of the airport, they waited to be cleared through security to pass through the gate so they could drive up next to the jet on the tarmac. Once at the plane, the bagged ice was removed from the outer body bag and placed into an empty cooler.

This lightened the body bag sufficiently to be carried up the stairs of the plane and be secured onto the medical cot. The remaining ice bags were then reloaded in-between the two body bags.

After clearance from the tower, the plane departed Las Vegas and landed at Scottsdale, AZ airport thirty seven minutes later. Alcor's rescue vehicle was waiting at the airport to receive the body and drive the ½ mile to the Alcor facility where the surgical team was waiting.

5. Surgery & Perfusion

When the rescue vehicle arrived at Alcor, the body bags were offloaded on to a church truck that could be rolled directly into Alcor's operating theatre. The bags were unzipped and the patient was lifted onto the surgical table which had been covered with a base layer of ice. Additional bags of ice were placed on top of the patient to continue cooling. Aaron shaved and aseptically prepped the sternum using a Betadine surgical scrub applied in expanding concentric circles. The chest was then draped and secured with Backhaus towel clamps, leaving only the sternum exposed. Meanwhile, Dr. McEachern shaved and prepped the head in anticipation of establishing burr holes later in the procedure.

Dr. McEachern returned to the chest to perform a median sternotomy. Using a #10 scalpel blade, she made a vertical inline incision along the patient's sternum from the suprasternal notch to just below the xiphoid process. This revealed that the patient had a previous open heart procedure as the sternum had been reattached with sternal wire. Hugh went to retrieve wire snips and a vice grip to cut and remove the pieces of wire from the chest. Dr McEachern and Aaron carefully removed all of the pieces of wire that threaded through the sternum. Aaron then placed the guide of the Sarns sternal saw under the sternum at the suprasternal notch. Steve Graber operated the foot pedal on the floor as Aaron lifted and guided the saw, dividing the sternum. The rib cage was opened with Finochietto rib spreaders, exposing the pericardial sac.

It was immediately observed that the pericardium had numerous adhesions to the chest wall and as the ribs continued to spread, it began tearing into the pericardial sac. Suction was applied to stem the flow of blood to allow visualization of the surgical field. After further examination, a tear in the right atrium was identified which proved too large to allow standard cannulation to occur. After discussing the various options available, it was determined to revert to a modified field-neuro procedure to salvage the perfusion. By cannulating the carotids, they would still be able to perfuse the brain with cryoprotectant, but unfortunately not the remainder of the body.

While Hugh modified the existing open circuit with a Y-shaped connector for the carotid cannulae, Dr. McEachern made two vertical incisions with a #10 scalpel blade to expose the skull. The scalp was parted with Weitlanders and Aaron created bilateral burr holes using a

Codman perforator. Dr. McEachern cleaned each of the burr holes with a Kerrison rongeur prior to inserting two crack-phone elements bilaterally and a thermocouple wire which were secured using a surgical stapler.

Aaron aseptically prepped the neck region to be incised and then the patient's face and chest were draped and secured with Backhaus towel clamps, leaving only the neck exposed. Dr. McEachern then proceeded make a lateral incision with a #10 scalpel blade along the anterior border of the right sternomastoid and divided the loose areolar tissue through dissection using a Metzenbaum and Debaquey forceps. The surgical field was held open with two Army Navy retractors. Once the right carotid artery was identified and isolated with a right angle Mixer forcep, a Red Robinson and Rumel snare was used to maintain vascular control. The same procedure was repeated for the left carotid artery. Using a #11 scalpel blade, a vertical cut was made in the upper half of both carotid arteries so that primed Red Robinsons could be advanced proximally. Once both vessels were cannulated, they were secured using basket stitches. Washout was initiated and both jugular veins were severed to allow all fluids to flow freely.

Perfusion Summary by Hugh Hixon:

We achieved 100% of CNV, but face swelled, eyeballs and brain did not shrink, possibly due to 26- hour gap between arrest and arrival due to last-minute aspect of arrangements. Medical events in three days prior to arrest may have caused additional complications (kidney failure and edema, cardiac arrest and resuscitation, 91 years old). The body was not perfused because of a major tear in the right atrium from an adhesion due to a prior median sternotomy. Neuroperfusion was single-pass through the carotids. Clots were observed in the effluent. No sign of a temperature pause for ice formation in initial cooldown plunge. Used both new data acquisition system and the old system. Perfusate usage: B1 – 20 liters, M22 x 1.25.

6. Timelines

Stabilization

Date: July 24th, 2012, Mountain Standard Time

<u>time</u>	<u>comment</u>
19:15	arrived at mortuary
19:27	exposed and examined patient
19:31	placed thermocouple into nasopharynx and secured
19:33	started DuaLogR recording
19:34	IV line tested for patency
19:36	established IO access in right tibial plateau

19:38	administered 50,000 Heparin
19:40	administered 250,000 IU Steptokinase
19:42	administered 300 mg Aspirin
19:44	administered 80 mg Gentamicin
19:45	60cc bolus normal saline
19:47	chest compressions for 2 minutes
19:50	administered 15 mg Ketorolac
19:52	administered 2.0 g Ni-Ky
19:54	administered 400 mg SMT
19:57	60cc bolus normal saline
19:59	chest compressions for 2 minutes
20:03	administered 70 ml Vital-Oxy
20:00	administered 100 ml THAM
20:05	60cc bolus normal saline
20:07	chest compressions for 2 minutes
20:11	administered 250 ml Hetastarch
20:16	chest compressions for 2 minutes
20:21	administered 500 ml Mannitol
20:30	chest compressions for 2 minutes
20:40	replaced ice around body and then double bagged patient
20:55	Secured transport documents
21:05	Loaded patient into mortuary vehicle
21:09	Departed for airport
21:14	Stopped at convenience mart along route for additional ice
21:36	Arrived at airport security gate
21:40	Arrived at plane
21:43	Loaded Plane
21:51	Departed Las Vegas
22:28	Landed in Scottsdale, AZ

Surgical

<u>time</u>	<u>comment</u>
22:50	filled mixing reservoir with 20 liters B1
22:54	arrival in OR. OR temp 66°F; lowered about 10%
23:04	hook up LN2. temp 9.4°C
23:12	move to OR table
23:15	head shaved
23:18	vacuumed head and chest
23:20	Aaron preps sternum
23:23	main incision in sternum - Dr. McEachern

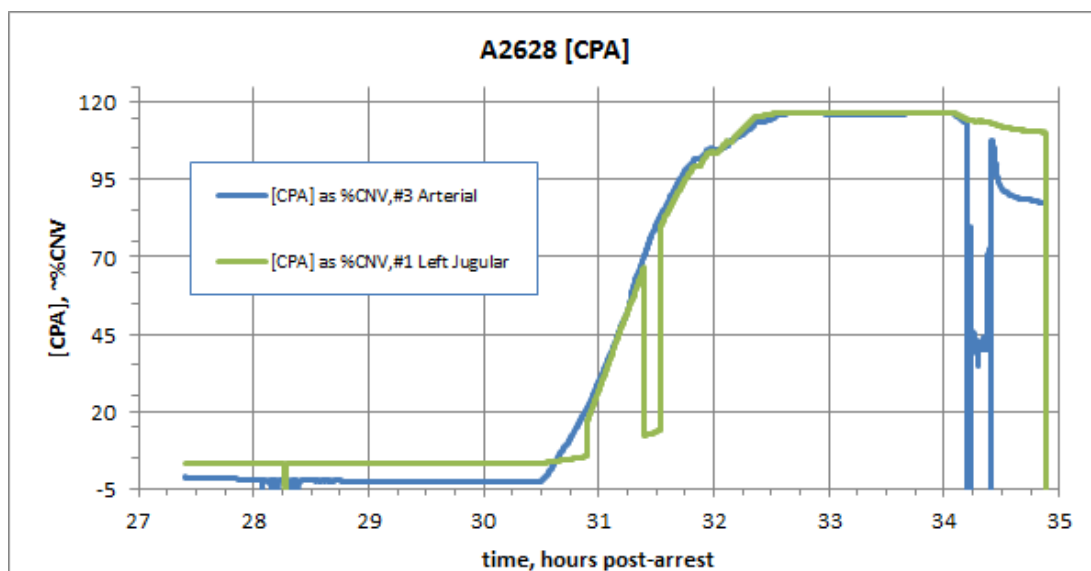
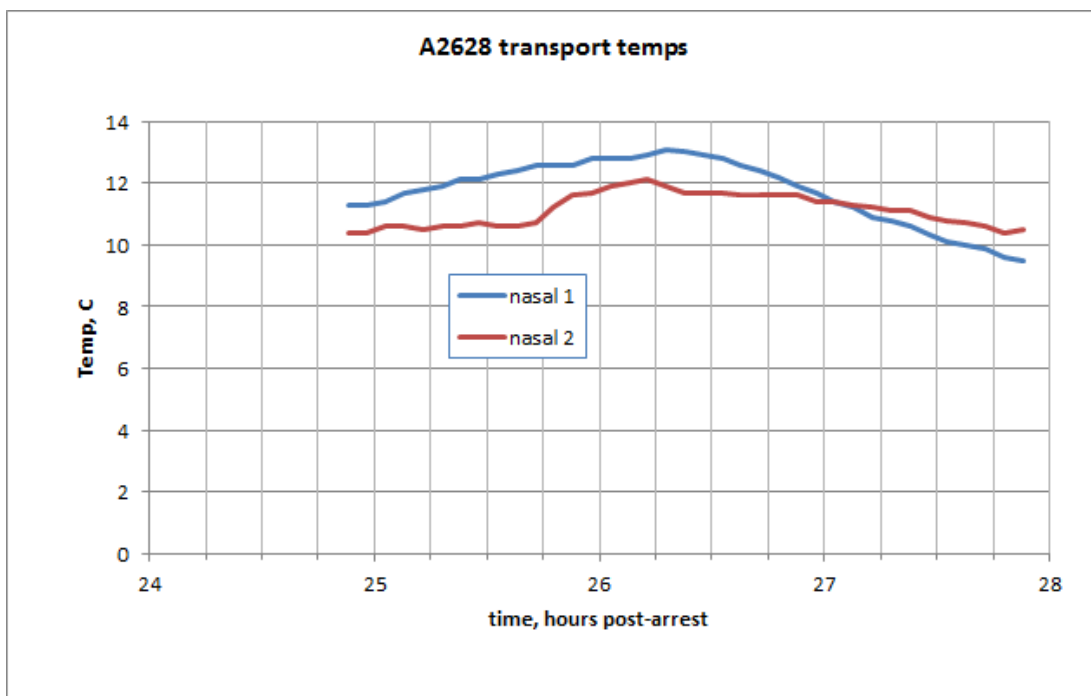
23:25 Hugh retrieves diagonal cutters from shop
23:35 snipped and removed wires in sternum
23:37 some wires required vice-grip to extract
23:40 one more wire found - transverse
23:43 sternal saw - Aaron
23:45 Finochietto rib spreaders - open chest
23:47 suction
23:50 pericardium has many adhesions - tearing apart
23:52 right atrium torn open - heart weak and torn, unable to repair

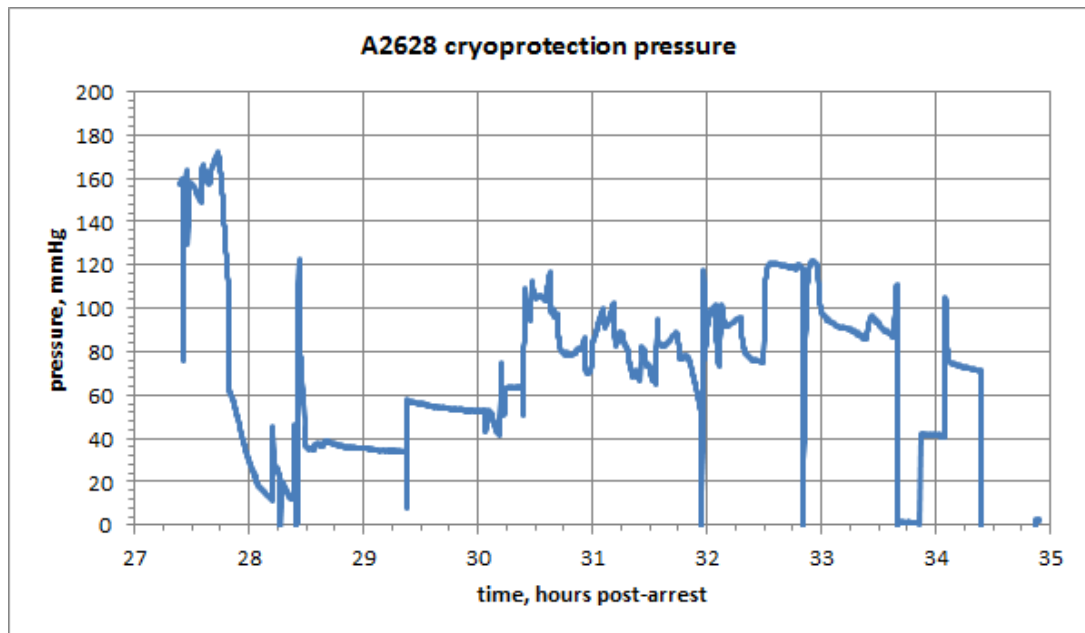
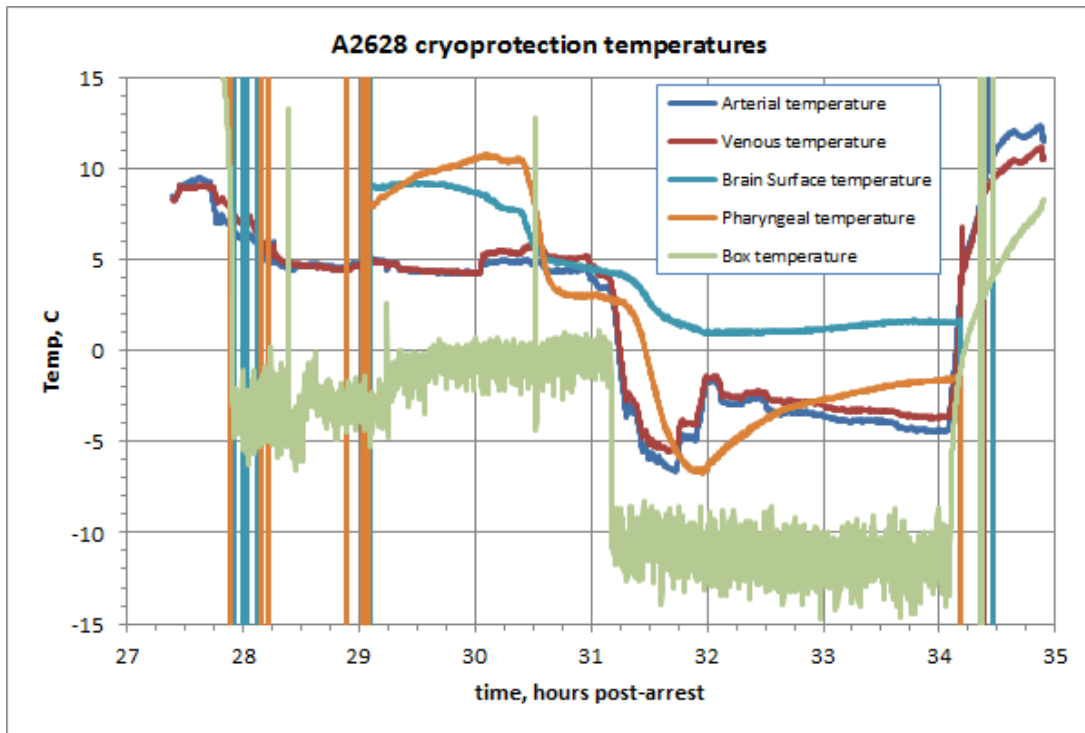
Date: July 25th, 2012

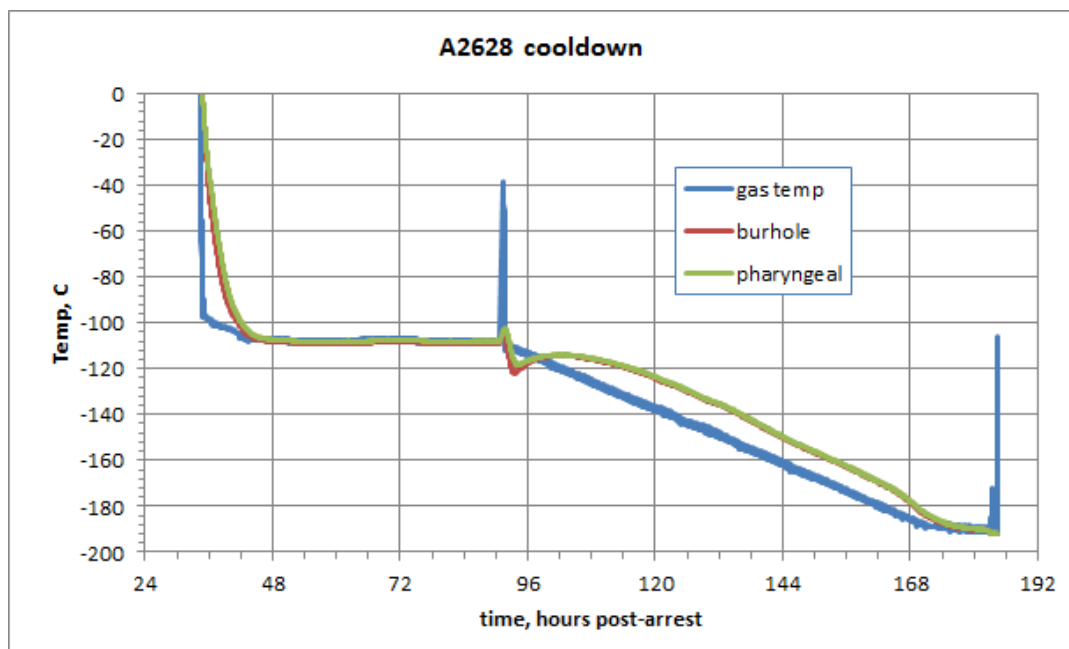
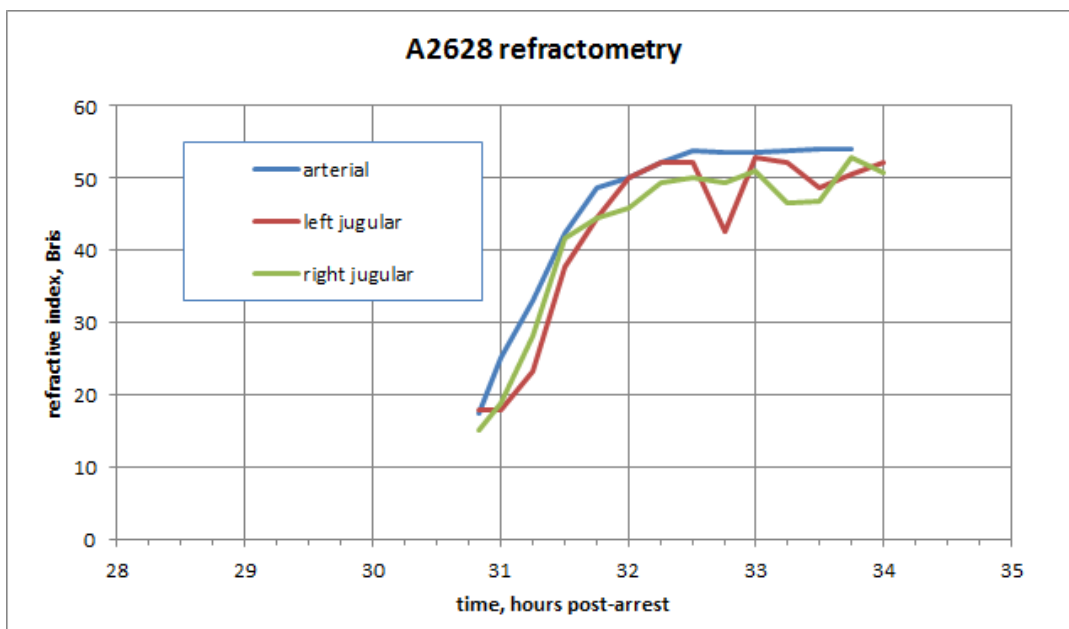
0:00 decision made to perform modified field neuro by cannulating carotids
0:05 Dr. McEarnern makes incisions for burr holes
0:07 spreaders on burr holes
0:10 right burr hole - Aaron
0:11 left burr hole - Aaron
0:13 Dr. McEarnern cleaned up holes
0:17 2 sets of data wires, 1 thermocouple placed in burr holes
0:20 sensor wires twisted - untwisted
0:24 burr hole 10.0°C, nasal 8.0°C
0:27 tracheal tube removed - internal bleeding indicated
0:30 lateral incisions in throat front
0:34 misleading readings - Hugh - pressure on pump from kinked line
0:36 exposing carotid
0:38 new data acquisition system numbers match existing system
0:48 identified right carotid artery
0:51 moved to left side
0:55 Hugh asks about clotting - Aaron: blood flowing well
1:06 isolated left carotid artery
1:10 Rumel snare placed
1:12 left carotid cannulated
1:15 right carotid cannulated
1:19 red robinson catheters opened and connected to equipment
1:20 ends cut of red robinsons - both carotids connected
1:22 washing out - tubing functional
1:25 exposing jugular
1:26 venous flow coming out
1:28 discussing cutting jugular
1:29 temp cut off flow to head

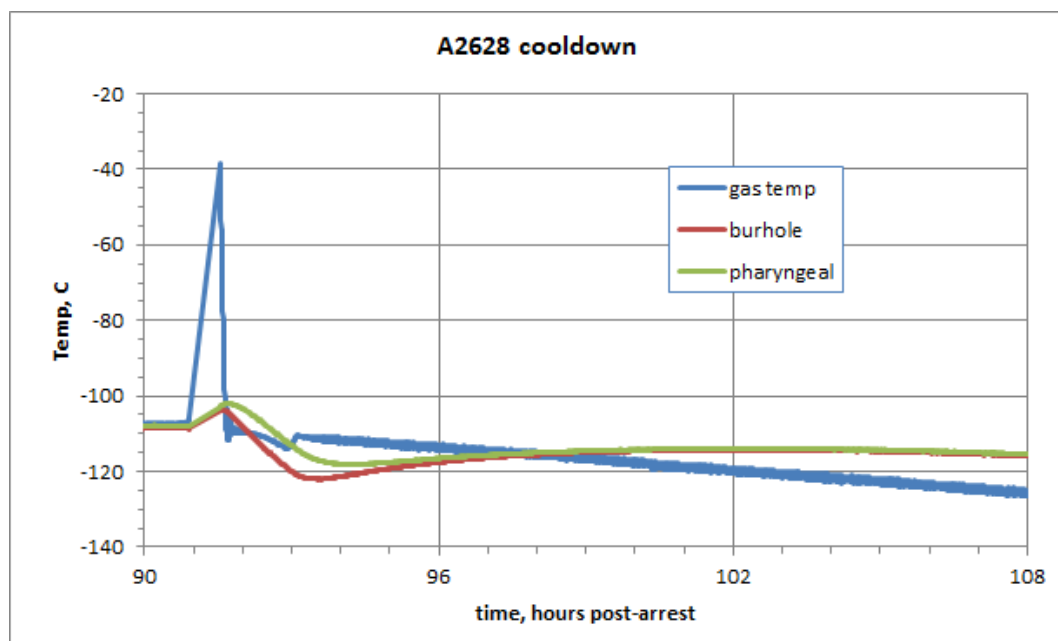
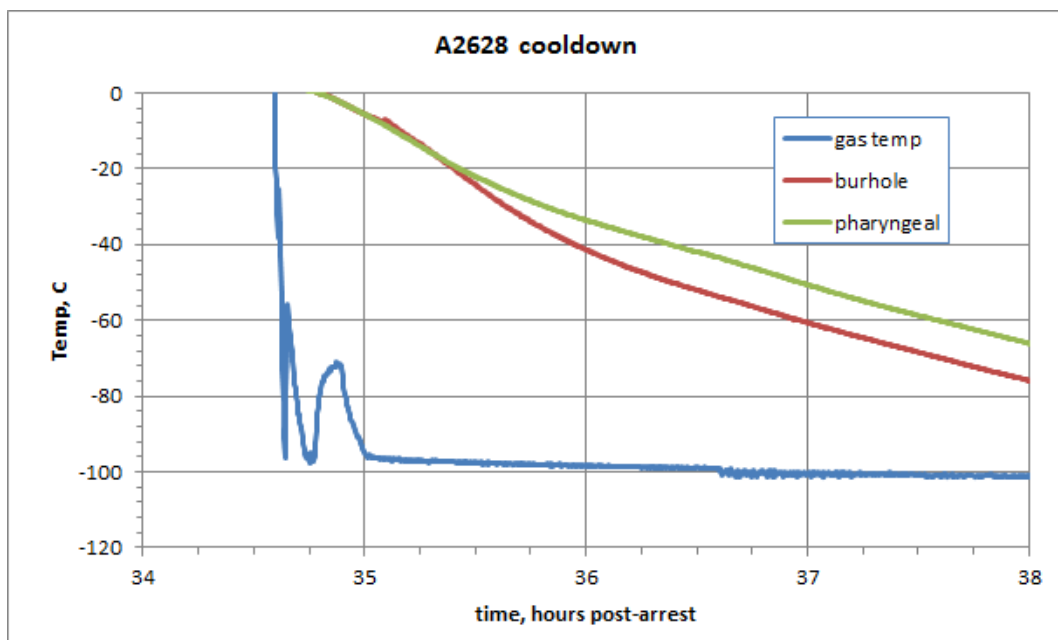
1:31 basket stitch on left carotid artery
1:32 basket stitch on right carotid artery
1:38 right and left jugular cut
1:39 120mm HG on pressure from new data acquisition system
1:42 on ramp
1:45 burr hole 7.6°C, nasopharyngeal 8.0°C
1:47 9.3 Brix
1:49 jugular flow clear
1:50 jugulars completely severed
1:51 flowing fast out of oropharynx
1:58 possible extrusion via burr hole
2:02 Dr. McEarnern leaves building
2:05 retractors placed in burr holes - no extrusion, no shrinkage
2:06 18.0 venous Brix
2:07 16.0 arterial Brix
2:08 foam in pump system – possibly lipids
2:09 speeding up ramp to make up volume loss
2:17 skin turning yellow
2:17 25.2 venous Brix, 18.2 arterial Brix
2:19 effluent dumped - 10 liters (single pass perfusion to table)
2:25 switching to -3°C perfusion
2:27 lowered temp and upped ramp rate
2:48 facial tissue expanding
2:48 brain temp -5°C
3:08 left: 44.5 Brix; right: 44.6 Brix
3:11 outflow from chest cavity - lot of volume
3:15 effluent dumped - 9 liters (single pass perfusion to table)
3:30 ramp off
3:53 facial tissue exceptionally swollen
5:18 Brix acceptable to Hugh
5:20 pump turned off
5:37 hoist (transfer to gurney)
5:58 cooldown begun

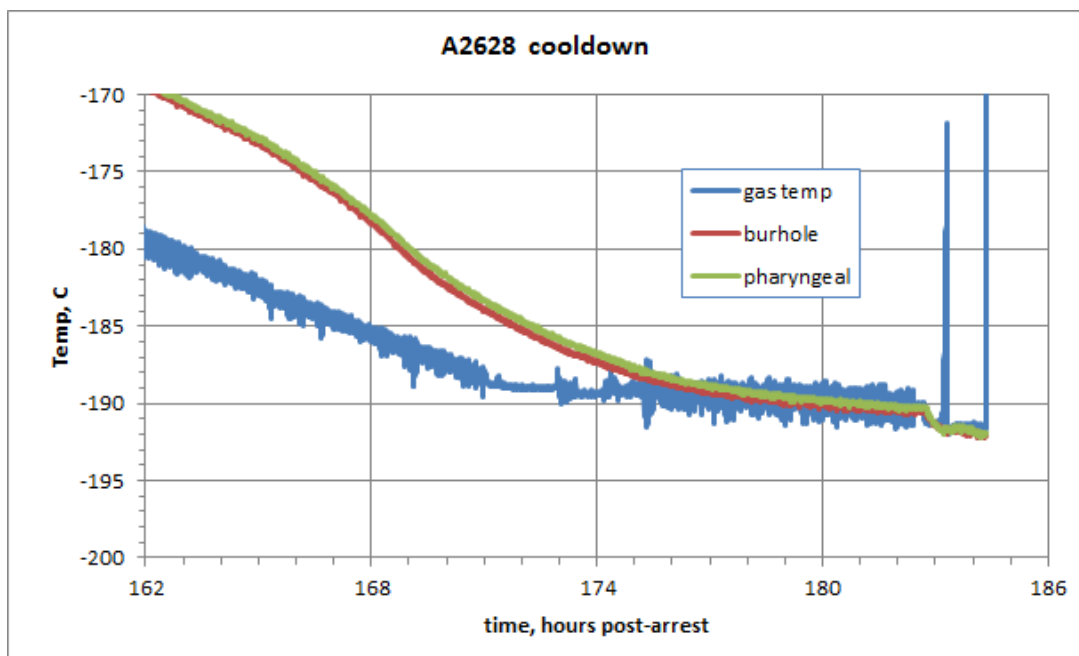
7. Graphs











-End of report-