

# CryoPreservation Case Report: The Cryopreservation of Patient A-1772

by Todd Huffman and Tanya Jones

**A**lcor patient A-1772 had been a member for approximately five years, before developing pancreatic cancer late last year. Conventional cancer treatments had been tried with poor results, and experimental cancer treatments were attempted. Though the experimental treatments initially showed promising results, his cancer ultimately progressed to a terminal state.

Approximately two weeks before the patient's arrest, his wife called us to discuss the possibility of moving to Scottsdale. The patient's physician determined that with emboli in his lungs, air transportation would represent a significant risk. Driving would have been problematic, since the patient's condition was declining rapidly. He and his wife made the decision to remain in Florida. Alcor kept in regular touch with the physician, and as the patient's condition worsened, sent a representative to Florida to assemble a field team for standby.

When the physician felt the patient's health was declining significantly, Tanya Jones flew out to meet with the patient and his family. In an early morning meeting, she met with the patient, his wife, and friends. While the patient slept in the other room, Tanya discussed Alcor's arrangements and procedures, the importance of a rapid transport, standby funding preparations, and other aspects of Alcor's procedures with his wife. On the whole, this was a critical meeting, as the patient had never discussed specifics with his wife once his arrangements were in place, since she had not chosen cryonics for herself. Once they understood what was desired, the family was cooperative and supportive on all issues.

Later that afternoon, Tanya encouraged admitting the patient to a nearby hospice for 24-hour care, and drove with the family to see the patient settled into the facility. At this point, the patient's doctor estimated a terminal event within no more than a week. A standby was launched, and the Florida team members assembled their equipment, rented a van, and departed for the hospice. Over the next couple days, the patient

appeared to improve, but his doctor was now estimating a terminal event with 2-5 days. A decision to remain on standby was made, and arrangements with a local mortuary were made.

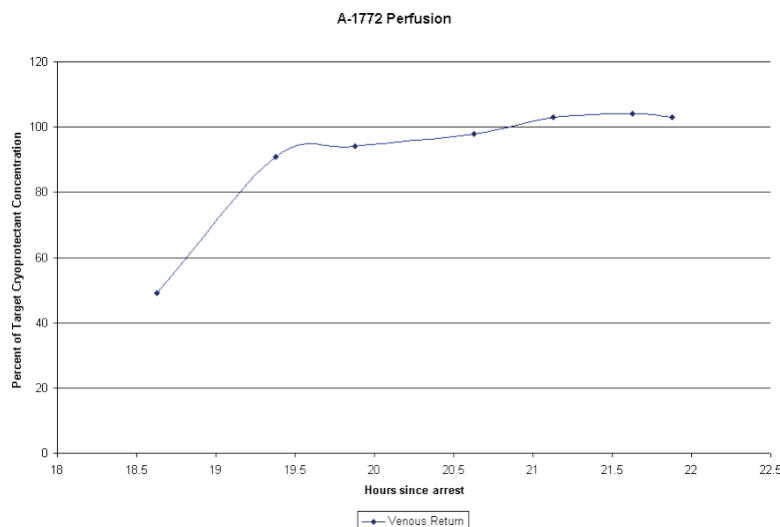
Because some investigation had already been done into nearby funeral homes, the team had a contact in the area. When they arrived at the funeral home to discuss specifics of the preparation and documentation requirements, the general manager was uncomfortable and tried to back out of the verbal agreement. Being prepared however, team members were able to produce copies of emails exchanged that clarified the level of cooperation that had previously been discussed. With written confirmation in hand, the manager changed his mind and became supportive.

During this time, the funeral home had to confer with their corporate headquarters, because they'd never worked with on a cryonics case. The corporate headquarters gave the necessary approvals, and authorized the funeral director to assist Alcor personnel with the cutdown and washout. Alcor's remote team was treated and billed as an out-of-state funeral home. The funeral home allowed the remote team to store equipment on the premises and made a funeral director available 24-hours a day to assist in cannulating the femorals. The remote team was given priority access to the preparation room when needed. Portions of the equipment used in the washout were stored at the local funeral home, and transport equipment was stored at the hospice.

In the week before his legal death, our patient had been losing significant amounts of blood in his urine and exhibited extensive bruising. Evidence of jaundice was seen on his limbs, and his

stomach was distended. Emboli were present in the lungs. The patient came in and out of consciousness, and on occasion, was able to smile and recognize one of the standby members who knew him prior to his cancer. Though most of his conversation was inappropriate at this point, he did have occasional moments of lucidity.

By this time, chemotherapy and other treatments had been



discontinued, and the bulk of the medications being administered were for comfort. The patient had been receiving coumadin, but this was discontinued due to the internal bleeding and bruising. Because simply stopping the coumadin would not have acted quickly enough to slow the bleeding, a dose of vitamin K was administered while he was in the hospice. Unfortunately, vitamin K takes some time to begin counteracting the effects, and was not administered in time to actually show signs of helping prior to the patient's pronouncement. As a cryonics patient, this was not a significant development in the transport, as the coumadin was acting in very similar fashion to the heparin we administer during a stabilization. All medications were being administered by hospice personnel through a stent line, which was subsequently left in place after pronouncement for use by the transport team.

As needed medications included: Ambien for sleep, Marinol for appetite, Tagamet for upset stomach, Adavan (lorzapan) for nausea, and Effexor for depression. He was receiving Oxycontin for pain, twice a day; Digoxin for irregular heart beat, 125 mg once per day; and Cartia (a low dose aspirin), 180 mg per day. On his second day in the hospice, a foley catheter was introduced to monitor both urine output and to allow for on-going observation of the internal bleeding indicated by blood in his urine. The patient was confused by the foley and tried to get out of bed a few times to use the restroom, despite being told he had a catheter in place for that purpose.. Examination of the urine output revealed continued levels of blood.

Final preparations for the transport were made, including calculating medication doses, bagging ice, and assembling the portable ice bath. Early in the morning a couple days into the standby, the hospice staff felt the patient's status was declining and called Tanya Jones at 0637. Tanya, who had been getting some rest in a nearby motel, arrived several minutes later and joined the night-shift team members. The timing was quite good, as at 0645, the patient arrested. The nurses and doctor were

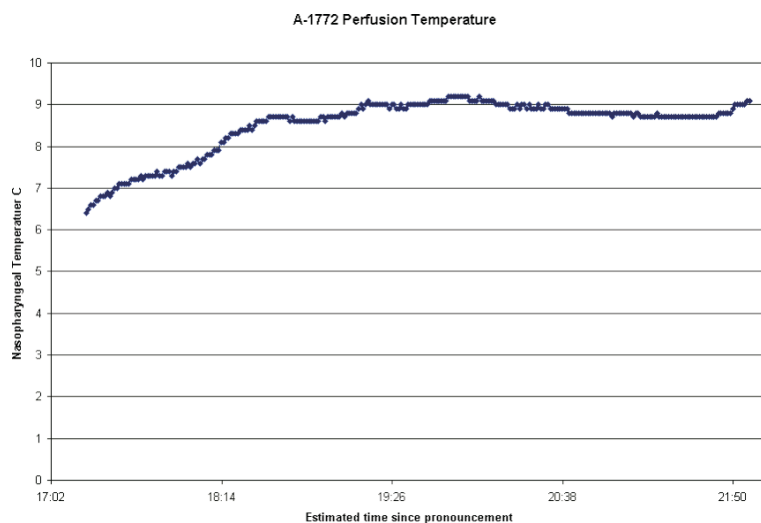
present, and the patient was pronounced immediately. The transport team placed ice around the patient, focusing on the head, axilla and groin. Concurrently, the first round of emergency medications were administered. Once the medications were completely administered, the patient was transported by the funeral directors to the mortuary.

Tanya and one of the Florida team members went ahead to the funeral home, while two others remained with the patient to continue administration of the large-volume medications and to await the funeral director and his vehicle for transport. By the time the patient arrived at the funeral home, the ATP and surgical equipment were set up, and perfusion circuit was primed and de-bubbled. As an aside, setting up the perfusion circuit has been much-simplified over the years and the making the actual connections took less than ten minutes for a person who'd not seen the system in years. This represents a significant improvement to emergency transport capability, as the preparing for perfusion used to take more than an hour to string, prime and de-bubble the field pump.

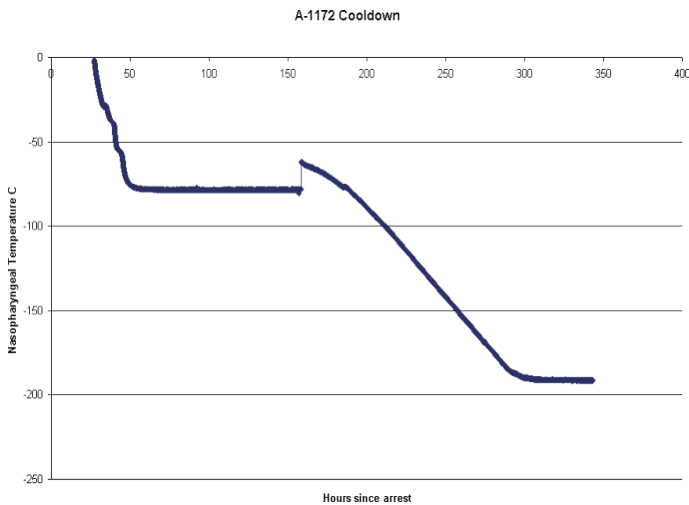
At 0913, the first surgical incisions were made. Femoral veins and an artery were cannulated without incident by 0929. Connecting the circuit and starting the bypass proceeded without difficulty. The blood washout began immediately, and good return volume was obtained from the venous lines. Unfortunately, the transport team members were unable to locate the manometer in the field kit, so no pressure information was available. As a result, the washout proceeded at a lower, more conservative pressure in order to avoid damaging the vascular system. When the circuit was closed at 0945, we observed a consistent reduction in circulating volume, further indication that internal bleeding continued. The patient's temperature was 30.1 degrees C at the beginning of the washout and was reduced to 12.9 by the time perfusion was stopped due to the significant loss of circulating volume at 1030. Perfusate circulation was continued until the last possible moment.

While the washout was being done, the local funeral director started preparing the paperwork and flight arrangements for shipment. The nearest airport was two hours away, and we would have to drive fast to make certain we reached the cargo terminal in time for the pre-flight screening deadlines required since September 2002. The patient was promptly packed in ice and insulated for the trip; and by 1120, was secured for shipment via commercial airline. The prep room was cleaned and the equipment repacked in time for the departure. Tanya followed the funeral director to the airport and accompanied the patient on the flight to Phoenix. The patient's flight took a little longer than we like, because departing from a smaller airport meant a transfer and subsequent time delay at an intermediate airport.

The patient's flight arrived in Phoenix at 2034, and the patient was secured by our local funeral director. By 2138, the patient arrived at Alcor and was transferred from the Ziegler case to the operating room table at 2141. One area that has been improved in recent cases is in reducing the time between patient arrival and start of surgical procedures.



*The target temperature during glycerol perfusion is 9 degrees C, because at lower temperatures, glycerol becomes too viscous to perfuse. The patient arrived several degrees colder, was warmed by the perfusion to 9 degrees.*



*The patient's cooldown followed the prescribed curves. At around 150 hours, there is a temperature jump because of the temperature differential between the Silicool system and the cooldown dewar.*

This has been achieved by improving the personnel and equipment organization and preparation before the patient arrives. The patient arrived at the facility with a nasopharyngeal temperature of 5.1 degrees C, and there were still substantial amounts of ice in the Ziegler case. The amount of ice that could be placed in the Ziegler case was a concern in this case, because of the airplane transfer and time delay, and the size of the patient being larger than we usually see.

The patient's arrangements were for a whole body glycerol perfusion, and access to the vascular system was obtained through a median sternotomy and cannulation of the aorta. The venous return was obtained via the right atrium. Surgical preparations were complete, and the first incisions were made at 2206, with the only delay being a short in the electrocautery knife, which was immediately replaced. Once the perfusion circuit was connected to the cannula and flow initiated at 2250, perfusion solution began accumulating in the chest cavity. Our surgeons paused the perfusion as they clamped off a compromised vein. Some difficulty was experienced keeping the cannula in place, and lines were stitched into place to avoid unwanted extubation. After 30 minutes on bypass, the concentration ramp was initiated, increasing the concentration of cryoprotectants. The first signs of glycerolization were seen on the chest, as the skin took on the characteristic bronze color.

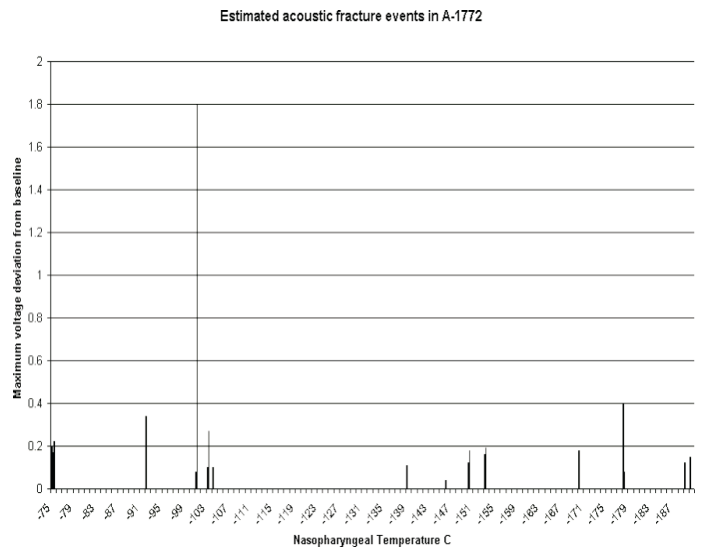
Burr holes were drilled to observe the surface of the brain, and temperature and thermoacoustic probes installed. Fluid was obtained from the burr holes, and there has considerable discussion about the composition of the fluid. The fluid may be coming from the vasculature disrupted in making the burr holes, or the fluid may be a product of the cerebrospinal fluid system. Determining the origin of the burr hole fluid is important, and analysis of the fluid is expected to provide further information as to how well the brain is perfusing. On future cases, more effort

will be expended in trying to accurately monitor the activity of the burr holes.

During the case, significant perfusion solutions built up in the abdominal cavity. This phenomenon is not unknown, and was not surprising in this case, because of the extensive cancer in the abdominal area. A sample of the fluid was removed at the end of the case and analysis indicates it most likely occurred during the remote washout portion of the procedure, where no direct measures could be taken to stop the internal leakage that ultimately caused the field washout to be stopped.

The whole-body cooldown proceeded according to protocol and without incident. A total of 20 acoustic fracturing events were recorded, beginning at about -75 degrees C and with the last occurring at near-liquid nitrogen temperature. There were three distinct events recorded at -75 that may have been artifacts of physical or other disturbance of the monitoring system, as those events occurred at temperatures about 20 degrees above the glass transition point. The next acoustic event was recorded at about -93 degrees C and is believed to be the first actual fracture event for this case.

This patient was transferred to long-term storage a few days later. His family drove out for a visit a couple weeks later, bringing some personal items for Alcor to store in its underground vaults, to hold in trust for the patient when he's awakened. This is a practice we encourage for all our patients and their families, and we really appreciate when one takes the time to prepare these items for archival storage. A-1772 was Alcor's 62nd patient.



*A total of 20 acoustic fracturing events were recorded. The first event occurred at -75 degrees, and the final event at -190 degrees C. Determining what constitutes an acoustic fracturing event is difficult, and there is some controversy on the three events at -75. Those events did not exhibit the same behavior of most known events, and occurred approximately 20 degrees higher than the glass transition temperature of glycerol.*