Organ & Tissue Donation Advances

by Jack Adams, CFSP

I can remember in 1987 when organ and tissue donation surfaced in the Chicago – Cook County area. The Funeral Directors Services Association of Greater Chicago (FDSA) were communicating with ROBI, the Regional Organ Bank of Illinois. Procurements were mostly of long bone, skin, and various organs. I got involved when my brother volunteered my services on a committee to communicate with the tissue bank and, more directly, with the procurement technicians and their supervisors. Early procurements seemed to be done without too much thought of what the embalmer might need to achieve a successful embalming. I don't believe this was done on purpose, but more from not being knowledgeable about the embalming process.

The committee working on organ donation gathered comments and complaints to see if they were related to the procedure or to a particular technician. We found out that, just like autopsies, some donation cases weren't as good as others or some were damaged to a point where the embalming process was more difficult.

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While investigating the causes of these difficulties, one thing became evident from the beginning. Most people doing the procurements didn't have a clue what embalming was all about or know anything about the embalming process. We began communicating with ROBI, which, by the way, was very receptive to our input. We were invited to observe the retrieval of tissue and to even comment on the process. This communication has gotten even better with the Gift of Hope which is now the organ tissue bank for Illinois. They also have an experienced embalmer on staff who oversees procurement training.

I can remember when I asked the retrieval team if they tried not to severe major arteries. They said that they had not tried to save or protect arteries, but they would try. They also said that no one had ever asked them to leave arteries intact or to be careful not to severe arteries. They were trained to retrieve the long bone and that is what they did. I observed and couldn't help making comments like, "It would be helpful if you kept the femoral intact," and, "It would also be a plus if you tagged the major vessels or placed a ligature around it so we could easily locate it if we needed to."

I believe that, initially, they weren't real happy about us looking over their shoulders and commenting on their work. We made it a little easier by inviting them to observe the embalming of the case they were working on - and so it went. We'll watch you and you can watch us, so we might be able to understand the processes that we both use and the difficulties that we both encounter doing our jobs. The tissue bank people were pleasantly surprised that they found ways to be more careful of arteries without adding any significant time to the process. After a few procurements using the new techniques, they seemed to have it down pat. Until, of course, when a new technician started or someone made a mistake like we all do, including pathologists. Some things just happen no matter how careful you are. However, when mistakes or surgical slip-ups occur we should let the organ tissue banks know.

I find that most banks are very willing to communicate about all phases of the donation process, including methods of retrieval. As time went on, new tissues were recovered like the radius and ulna bones, as well as an occasional mandible. Block type procurements of retrieving muscle tissue, as well as bone procurements, became more common. These types of block procurements are being used for elbow and knee joints. Sometimes it can be beneficial to take all the tissue of the knee and separate it in the labs. As new types of procurements occurred, we've always made sure that we could demonstrate how to preserve the donor's body.

We all know that no matter what condition an autopsy case, an organ donor case, or any case for that matter is in, the embalmer and funeral home are responsible for a trouble-free viewing experience for the family. Unfortunately, they may be reminded of this fact in court with a mental anguish claim caused by an embalming failure. When conventional arterial embalming is not successful because the arteries are either damaged or missing, it's time to use plan B.

Arteries are now removed during the procurement procedure, which means that some alternative preservative steps are needed. I prefer to pre-cauterize all cases that have any raw tissue such as cranial autopsies, long bone donors, trauma bodies, or skin donor cases, prior to the arterial injection. When the embalming is complete, you can return to finish treating the raw tissue that is now dried and preserved.

By the time you're finished with these types of difficult cases, you may have attempted several different techniques to preserve the body. Organ donation is really just another difficult case and, like all difficult cases, more time is needed to successfully embalm the body. Hypodermically injecting preservative solution, as well as applying surface gels and cauterant packs are alternative preservative techniques commonly needed with such difficult cases.

If the procurement sites are open and cauterized first, the remainder of the body can be embalmed, and by the time you return to the previously raw

tissue, it is well on its way to being dried and preserved. If no vessels are accessible, hypodermic injection and the application of a preservative gel will do the job on this pretreated tissue.

Pre-treating raw tissue is a valuable technique when embalming a full thickness skin donor. Generally the back skin and/or upper leg skin are taken during this procurement. Many funeral homes have now received full thickness skin donor cases. At first sight, it looks awfully tough to treat. We're used to the thin skin procurements using a dermatome that removes skin pieces that are so thin they are almost transparent. The fatty pad is left intact. This thin skin is commonly retrieved for temporarily treating burn victims, to wrap the raw tissue to allow the tissue to begin the healing process. Many times, this is followed by autograft skin surgeries from the victim's own skin tissue. This can be very painful and new infections can develop at the autograft surgical sites.

The full thickness skin procurement is deeper, includes the fatty pad, and goes to the muscle line. This allograft donor tissue may be the only surgery necessary for a third degree burn. The allograft can not only heal quickly but it can vascularize and become your own tissue without the usual rejection at the surgical site. Allograft tissue is successfully being used for facial cancer repairs, large abdominal hernia surgeries, breast cancer, implant surgery, and many other lesser known uses.

Allograft surgeries used for large hernia repair are correcting these serious conditions that are very difficult to repair by any other type of procedure. Medical science continues research on this amazing allograft that heals quickly, vascularizes, and becomes your own tissue with little scar tissue.

On the full thickness skin donor body, the procurement site tissue looks harder to treat because of the large amount of moist, raw tissue, but it is actually easier to dry muscle tissue than fat. The fatty pad beneath the thin skin procurement retains moisture and is more difficult to dry.

New tissues are being tested and evaluated for procurement and donations to organ/tissue recipients. Recently, I was invited by the Musculoskeletal Transplant Foundation (MTF) to Kansas City to observe the procurement of a potentially very valuable tissue to help recipients to heal faster and improve their quality of life. A team of eight flew into KC from various parts of the country for this research. This group consisted of doctors and tissue bank procurement healthcare workers. I like to think of this group as "the good hands people." Members of this group would be successful doing any job that required good hand coordination. Being an embalmer, I appreciate the talent involved with procurement surgeries. I was honored to be asked to be the ninth member of the team.

When medical research finds new uses for tissue, this team finds the best way for the procurement without contaminating or damaging the tissue. One type of new research involved mesenchymal stem cells. These cells are potent stem cells that can differentiate into a variety of cell types and can contribute to regeneration of various types of tissue. The medical team was very interested in the embalming and restoration of the remains following the procurement.

This tissue consists of the lower spine between the tenth thoracic and fifth lumbar vertebrae. It happens to have a good population of stem cells that have been found to help bones heal quickly. This was the initial step in planning future procurements of the lower spine. We had two donated cases to work on. One was a full thickness skin and spine donor and the second case was a spine only donor.

The full thickness skin was recovered from the back first which included the fatty pad beneath. The muscle tissue was left and the spine was exposed beneath the muscle layer.

The team talked about the best methods of procurement with the least possibility of any contamination. They carefully dissected around the lower ribs to expose the bone for separation. The ribs were then snipped on each side of the spine from the tenth thoracic to the fifth lumbar vertebrae. Once the ribs were detached, the osteotome, or surgical chisel, was used to transect the spine at the T9/T10 and L5/S1 levels. The peritoneum was still in place between the spine and abdominal cavity. Once the spine is retrieved and processed it is safely made into an allograft called Trinity Evolution. Trinity Evolution is a donated allograft processed to maintain active adult mesenchymal stem cells.

An autograft or tissue taken from a patient's own body is considered the gold standard for bone graft because it contains the three components to achieve bone growth. These components are an osteoconductive matrix, osteoinductive growth factors, and mesenchymal stem cells. Synthetics and demineralized bone matrices don't contain the necessary osteogenic cellular components necessary for growth and healing. Therefore, surgeons have relied on autograft tissue from a second surgical site.

Some drawbacks of using tissue from a second site are:

- Longer surgical time.
- Infection at the second surgical site.
- Longer recovery time and potential long term pain at the site.
- Poor bone quality and quantity due to the age or condition of the patient.

These are all reasons that surgeons may recommend something other than autograft tissue for repair of bone defects.

A viable cell allograft is one that contains active, live cells – specifically mesenchymal stem cells, which may enhance the patient's bone healing. Trinity Evolution is an example of a viable cell allograft that we'll be hearing many good things about as research continues. This new product offers an ideal alternative to autograft and other bone grafting options without their drawbacks.

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Trinity Evolution supplies all three essentials for robust bone formation:

- Osteoconductive scaffold.
- Verifiable osteoinductive potential.
- A reliable number of viable osteogenic cells retained in the matrix.

Some early research has confirmed that some bone defects show signs of very quick healing.

Advances in this medical research means that we'll be seeing some of these donor cases soon in our prep rooms. Like the full thickness skin donor, the spine donor can be pretreated with a cauterant or gel. For this treatment, mix SynGel HV and Basic Dryene. This kicks up the preservative strength and drying power to make a "super gel." Add just enough Basic Dryene to the SynGel HV to maintain a gel consistency for easy application using a large 4" utility brush. Ideally, an embalmer would have an assistant to help roll the body up on its side to apply the "super gel." Gel treated Webril packs can be used to place on all raw tissue of the empty spinal cavity. These Webril packs should be covered with the shrink wrap. If an embalmer is working alone, the shrink wrap and treated packs can be placed on the table before the remains is placed on the table. Once the raw tissue is treated with the gel packs, the shrink wrap can then be used to cover the open tissue and wrapped around the body to effectively deliver the preservative and hold down fumes.

Following the embalming procedure, the gel can be applied to any tissue where needed for additional preservation. This will definitely do the job of preserving and drying. If time permits, it's always a good idea to allow the tissue to dry overnight.

A final check of the tissue to make sure that it is dry and preserved should be done before wrapping. More "super gel" and then a layer of VP (a strong preservative drying compound) to cauterize the tissue can be applied. I like to add an extra application of VP to the edges of the dissected tissue where the full thickness of the fatty pad is exposed. This final application should do the job of preserving and drying. Before the area is shrink wrapped, the back should be covered with an absorbent sheet (Cat. No. #038340) that is cut to size for covering all the raw tissue on the back. These sheets can hold huge amounts of moisture. Layers of shrink wrap can then be placed over the absorbent sheet covering any areas of the body that had raw tissue. The shrink wrap will not only seal, but it will return a natural form to the body, no matter what tissue was taken from the posterior or anterior part of the body. This application is also the key to stopping odors.

The body would then be placed in a unionall with an additional application of the highly absorbent VP to make sure there was no moisture escaping the shrink wrap. The end result would be a restored donor body ready to be dressed and casketed properly.

We've probably all witnessed what happens if we put a very moist body into a unionall and sprinkle powder inside for extra treatment. It's very common for such a unionall to fill with fluid from a wound, edema with blisters that develop and break, etc. This additional leakage into the unionall can accelerate decomposition and it will inevitably find its way into the casket with visible moisture and odors. I feel the most effective way to treat any moist or raw tissue is to go directly to the damaged tissue and cauterize it and then wrap it. The overlapped shrink wrap will stop leaks and retain the shape of the body. If raw tissue is treated, shrink wrapped, and then placed in a unionall with some absorbent powder (DodgeSorb or VP) added, this will cut down the possibility of leakage or odor in any type of donor case. This same strong shrink wrap that is used by the trucking industry for wrapping and securing pallets is ideal to use in the prep room for leak proofing our difficult cases. I believe shrink wrap should be in every prep room. It can be found at restaurant suppliers or your local warehouse clubs.

That's the good news. The bad news is you'll need two people for this wrapping of the body, and perhaps three people on a large body.

The treatment of the full thickness and spine donor cases requires extra help, just as the preparation of an overweight remains does. Turning over the remains and applying gels directly to the affected tissue demands extra help. By the way, you can temporarily place Webril toweling on a head rest on which to place the forehead while working on the remains facing face down. There are special padded supports the tissue banks use for this purpose. If these cases become more common, it might be worth it to purchase such a device for this face down position.

Many tissue banks will reimburse you for your extra efforts. This work may take more time and effort but we can meet the challenges of all difficult cases. Embalming any type of case for a traditional funeral service is vital for our survival. This work is good work!

The end result will be a well embalmed donor body that is ready for a trouble-free viewing for the family and friends. That means no leaks, no odors, and no decomposition. The big benefit from all this treatment is for the embalmer who will be able to sleep well after the treatment, because the effort will insure the family doesn't experience any undesirable mishaps during viewing.

Jack is Dodge's busiest embalming educator and lecturer. Along with working for Dodge as a sales representative in northern Illinois, he is an Embalming Lab Instructor at Worsham College.

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