

Dodge

A person wearing full personal protective equipment (PPE) including a white hairnet, a clear face shield with "SAFEMARK" written on it, a white N95-style respirator mask, and blue nitrile gloves. They are wearing light blue scrubs and are focused on a task in a clinical or laboratory setting.

Best Practice: Preparation of Human Remains Following Tissue Procurement ©

Practices and Procedures for the Embalmer

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The purpose of this document is to guide embalmers through a best practice protocol in meeting different types of organ and tissue procurement. More than 114,000 individuals are waiting for an organ, every 10 minutes one person is added to the waiting list, and every day 20 people die waiting for an organ transplant. Thousands more need tissue and corneal transplants. While donors and families make these gifts to help others, it is the embalmers responsibility to handle and analyze each case on an individualized basis while following a proven method for embalming.

The following is a generalized list of all the organs and tissue that may be considered in the procurement process:

Organs: Heart, lungs, kidneys, liver, pancreas, and intestine.

Tissues: Heart valves, eyes (including the sclera and cornea), saphenous vein, patellar tendon; Achilles tendon, anterior and posterior tibialis tendon, peroneus longus tendon, semitendinosus tendon, gracilis tendon, longus tendon, various types of cartilage, fascia lata, rotator cuff, pericardium and numerous nerves.

Bones: Humerus, radius and ulna, femur, tibia and fibula, pelvis.

Specialty Grafts: Phalanges, metatarsals, spine, face and hand/forearm.

General Preparation Considerations - Identification

The chain of custody must be complete from place of death to the funeral home. The funeral director must know that the deceased has been positively identified at initial transfer of custody to eliminate possible human error. Failure to identify a deceased person could result in potential mental anguish litigation by a family. Completion of an embalming report is mandatory due diligence for all cases with no exceptions.

General Guidelines for Embalming

The donor will be cleaned after the procurement, though it is still best practice for the embalmer to disinfect the remains with a topical embalming or disinfectant spray.

When full thickness skin is recovered, the embalming table should be prepared with an absorbent pad which has been treated with a cauterizing gel, on top of a plastic sheet that covers the entire table. The absorbent pad should be changed during the process at set intervals as described below.

Once the deceased has been placed on the table, the procurement area sites must be opened and exposed to provide a case analysis for arterial, topical and hypodermic treatment. All prosthetics, any packing material and/or absorbent pads should be removed to expose all tissue. **The prosthetics should be cleaned and disinfected.** If the packing material is saturated with bodily fluids, these should be discarded according to local medical waste regulations.

Topical Treatment

- Complete topical treatment prior to arterial injection.
- It is imperative to pretreat all exposed tissue with a cauterizing and preservative gel or liquid, such as Dryene II Gel or SynGel HV.
- The area should be covered with plastic wrap to control fumes as well as provide embalmer comfort.

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Arterial Treatment

- Pose and set features.
- Solution strength of 2.5% taking into consideration the condition of the tissue and length of duration prior to final disposition.
- Selection of injection sites is at the discretion of the embalmer.

Hypodermic treatment

- Once arterial injection is completed, a second application of preservation gel, such as Dryene II Gel or SynGel HV, should be applied to any visible exposed tissue.
- If time allows, the embalmer may wish to cover the decedent with a plastic covering to allow the topical preservative to penetrate effectively.
- Hypo all tissue where arterial and topical embalming has not been effective.

Reconstruction/Closure

- Prosthetic devices should be reinserted, properly sized, positioned and secured.
- An absorbent and preservative compound, such as V-P Viscerock Plus or Viscerock FF, should be applied to the tissue.
- Absorbent pads which contain an absorbent polymer, like DodgeSorb inserts, may be placed in the incisions alongside the prosthetics to aide in the absorption of any bodily fluids that remain or have been produced post-suturing.
- Tightly suture closed the exposed tissue with a baseball suture.
- During the suturing process, using a bulk cavity filler (BCF) inside and under the suture line will prevent leakage, as well as restore normal contour to the limbs.
- Seal all suture lines with a mortuary sealing product like Perma Seel.
- A preservative or cauterant gel should be applied to areas of skin donation as this will ensure the best drying and preservation in these areas.
- An absorbent pad should be applied over the gel.
 - A pre-cut pad that has a sealed backing, such as a skin recovery absorbent pad, may be used. Tape or suture in place to reduce leaking or wicking.
- Protective plastic garments are recommended for use wherever there are large suture lines and dependent areas where skin has been procured.

Types of Procurements and Recommended Treatments

Full Thickness Skin Recovery

This recovery involves both the dermal and adipose layers, which should reduce leakage. Depending on the size of the donor this process may require two people to lift/rotate the donor.

Pre-treat all exposed tissue:

- Prepare the embalming table with a covering of plastic sheeting for the donor to be placed on.

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- Apply a preservative product or cauterant, such as SynGel HV, Dryene II Gel or Basic Dryene, to the surfaces and then cover with a cotton sheeting like Webril Prep Towel.
- After completing the arterial injection, remove the initial preservative packs and plastic sheeting to check for any untreated areas.
 - Hypodermically treat sections of the tissue where arterial embalming did not penetrate, such as the buttocks or areas where the vascular system was disrupted.
- Cover the embalming table with a piece of plastic sheeting. On top of the plastic, place an absorbent pad where it will be in contact with the procured areas.
- Apply a final coat of preservative gel to the exposed tissue areas.
- Sprinkle absorbent or preservative compound, such as Viscerock FF, on the absorbent pad and position the donor with their exposed areas on the pad, leaving the plastic sheeting under the pad.
- Bring the ends of the plastic sheeting up on both sides and wrap over the chest and abdomen of the donor.
- Secure the plastic in place with white mortuary tape.
- Place the donor in the appropriate protective product; for example, unionall, coverall, shirt, pants.
 - When using plastic garments, add an absorbent product like DodgeSorb inside the garment to absorb any condensation or latent leakage.

Split Thickness Skin Recovery

A dermatome is used to recover the top layers of the skin, normally from the legs.

- Apply a preservative product or cauterant, such as SynGel HV, Dryene II Gel, Basic Dryene or Dryene II, to the surfaces and then cover with a cotton sheeting like Webril Prep Towel.
- Use a high index arterial solution, avoiding solutions containing lanolin and humectant co-injection fluids.
 - Remove the initial preservative packs and plastic sheeting to check for any untreated areas.
 - Hypodermically treat sections of the tissue where arterial embalming did not penetrate, such as the buttocks or areas where the vascular system was disrupted.
- Apply a second coat of preservative gel to the exposed tissue areas.
- Place the body on blocks or body rests so the back does not rest on the table.
 - You may want to consider running a fan near the donor to speed drying of the skin recovery area.
- Sprinkle absorbent or preservative compound, such as Viscerock FF, on the absorbent pad and position the donor with their exposed areas on the pad.
- Place the donor in the appropriate plastic garment; for example, unionall, coverall, shirt, capri.
 - When using plastic garments, add an absorbent product like DodgeSorb inside the garment to absorb any condensation or leakage and prevent odor.
 - Secure the plastic in place with white mortuary tape.

Long Bone and Connective Tissue Recovery

The anatomical form has been restored by prostheses provided by the recovery team. If an autopsy has been performed or if organs have been removed, regional injection will be necessary.

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- Prior to arterial injection, all incisions should be opened, and prosthetics should be removed to assess the tissue and look for any vascular disruptions.
- Any bodily fluids present inside the incision should be dried.
 - Pack or coat all exposed tissue with a liquid or gel cauterant; examples include Basic Dryene, Dryene II, Dryene II Gel or SynGel HV.
- Allow the packs to work during the arterial injection.
- A minimum suggested solution strength of 2.5% is recommended due to postmortem delay and other potential issues. The embalmer needs to ensure that the injection solution is a high enough concentration to achieve thorough preservation.
- The arterial injection will require multiple sites and dye may be added to help monitor the distribution of the solution.
 - Having several hemostats available will assist in clamping any leaking vessels while helping to build intravascular pressure.
 - Inject arteries that are distal to the normal injection sites (e.g., common carotid and femoral) as necessary to achieve proper distribution to the tissue.
- Hypodermic treatment will be required to treat sections of tissue where proper arterial distribution has not taken place.
- Upon completion of arterial injection, remove all cauterant packs and assess the degree of drying and fixation. Determine if additional hypodermic treatment is needed.
- Distribute the proper preserving and drying compounds, such as Viscerock FF, inside the cavities where long bone and tissue have been procured.
- Replace the disinfected prosthetics and tightly suture all incisions.
 - When rebuilding en-bloc dissections, the embalmer must ensure the prosthetic is sized correctly using the adjustment process.
 - The prosthetic should be secured into the proximal and distal tissue using screw-type attachments or sutures, when possible.
 - The proper contour of a limb can be restored using bulk filling material designed for moisture absorption. The shape created by the restoration of the limb allows for proper fit of clothing and provides the appearance of normal proportions.
 - Adding absorbent pads around the prosthetics will also contour shape.
- Apply a mortuary sealant such as Perma Seel to all incisions and cover with cotton toweling like Webril Prep Towel to complete the process.
- Distributing a drying compound, like DodgeSorb or V-P Viscerock Plus, into any plastic garments used will help reduce the potential for leakage.

En bloc Tissue Recovery

This is when the procurement team recovers tissue in one complete section versus select bone and connective tissue. When this recovery takes place it may be in conjunction with or without skin.

- Prior to arterial injection all incisions should be opened, and prosthetics should be removed.
- Any bodily fluids present should be dried.
 - Pack or coat all exposed tissue with a liquid or gel cauterant; examples include Basic Dryene, Dryene II, Dryene II Gel or SynGel HV.
- Allow the packs to work during the arterial injection.

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- A minimum suggested solution strength of 2.5% is recommended due to postmortem delay and other potential issues. The embalmer needs to ensure that the injection solution is a high enough concentration to achieve thorough preservation.
- The arterial injection will require multiple sites and dye may be added to help monitor the distribution of the solution.
 - Having several hemostats available will assist in clamping the severed vessels while helping to build intravascular pressure.
 - The arteries may have been recovered with the en bloc graft.
- Hypodermic treatment will be required to treat sections of tissue where arteries have been recovered.
- Upon completion of arterial injection, remove all cauterant packs and assess the degree of drying and fixation.
- Replace the disinfected prosthetics and tightly suture any exposed tissue together.
 - When rebuilding en-bloc dissections, the embalmer must ensure the prosthetic is sized correctly using the adjustment process.
 - The prosthetic should be secured into the proximal and distal tissue using screw-type attachments or sutures, when possible.
 - Adding absorbent pads around the prosthetics will also contour shape.
- Apply a mortuary sealant such as Perma Seel to any exposed tissue that has been sutured.
- Distributing a drying compound, like DodgeSorb or V-P Viscerock Plus, into any plastic garments used will help reduce the potential for leakage.

Organ Recovery

When organs have been recovered, you'll need to take into consideration a different approach to preservative solution concentration. In optimal situations the iliac and carotid arteries should be tied off for identification by the OPO.

- Use a multi-point injection with drainage at each site, the right and left common carotids, axillaries and femoral arteries.
 - Dye may be added to monitor the distribution of fluid.
- If procurement is limited to the heart and lungs, inject from inside the thoracic cavity while using the right and left subclavian arteries to preserve the arms and shoulders.
- To preserve the head, you'll want to inject the right and left common carotid arteries; injecting down the abdominal aorta will preserve the viscera, trunk walls, and legs.
 - While injecting the descending abdominal aorta, clamp the end of the femoral arteries to create vascular pressure within the abdomen.
 - It may be required to use the femoral arteries to preserve the legs and then inject superior toward the trunk to reach all tissue in this area.
 - If injection via the femoral arteries is required, clamp off the abdominal aorta in the cavity to control the pressure and flow.
 - If the liver has been recovered, a portion of the iliac arteries and abdominal aorta are removed.
- Individual organs that have not been transplanted may need hypodermic treatment.

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- Inject hypodermically with a 50cc syringe and 15-gauge needle, if injection by trocar proves to be problematic.
- A cauterant chemical, such as Basic Dryene, will preserve and dry individual organs treated hypodermically.
- The side walls of the thoracic and abdominal cavities may require additional hypodermic injection.
 - Coat the thoracic cavity with a preservative gel like SynGel HV and use a drying compound, such as Viscerock FF, to preserve the tissue.
- The thoracic and abdominal cavities will need to be aspirated and a preservative cavity chemical should be injected into both cavities via trocar.

Whole Eye Enucleation

Swelling and bruising in the soft tissue surrounding the eye is the most common response to an enucleation.

- It is important to keep the head elevated as it is crucial in keeping potential swelling, leakage and bruising of the eye tissue to a minimum. The less blood gravitating to the head the better.
- Massage cream should be used to protect the surface tissue against any bleaching or cauterizing chemicals, as well as reducing damage during manipulation.
- Remove all existing packing from the orbital cavities and apply another layer of massage cream to the skin surfaces surrounding the eyes.
- Saturate cotton with a liquid cauterant, such as Basic Dryene, and repack the cavities.
 - Fill each cavity with enough cotton to recreate a normal contour to the eyelid.
 - If swelling occurs, remove the pack to monitor the orbital area while trying to avoid excessive manipulation of the eye lids prior to embalming.
- Using a restrictive cervical injection via the carotid arteries will give greater control and avoid potential swelling.
 - After injection, remove the packs from the orbit of the eye and dry the area completely.
- Seal the optical foramen using a mastic compound like Inr-Seel and insert prep towels to adjust the eye contour to a natural height.
- Cover both sides of an eye cap with an adhesive emollient cream (Kalip Stay Cream) and gently insert to create a natural eye closure.

Corneal Enucleation

When the cornea has been removed, the preparation work is minimal compared to a whole eye enucleation, and the embalming procedure selected can be at the discretion of the embalmer.

- Aspiration of this fluid should be performed first so the globe of the eye can be filled with mastic compound.
 - The front of the eye is now open and vitreous humor will be present and exposed.
- The eye closure needs to be set prior to the arterial injection.
 - Even if temporary, you may later adjust to create the natural curvature of the eye.
 - Use a mastic compound such as Inr-Seel, and an emollient adhesive cream to form the eye closure. If you use a compound or prep towel, you reduce the risk of potential leakage.
- If a cauterant chemical is to be used, mortuary massage cream should be applied to the skin surfaces surrounding the eye to guard against unwanted bleaching.

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- Place an eye cap over the globe; the height of the eye can then be adjusted by adding or removing the mastic compound or by using prep towel.

Specialty Graft Recovery

- Prior to arterial injection, the recovered graft area should be elevated.
- Any exposed area should be opened and dried.
 - Pack or coat all tissue with a liquid or gel cauterant; examples include Basic Dryene, Dryene II, Dryene II Gel or SynGel HV.
- Allow the packs to work during the arterial injection.
- A minimum suggested solution strength of 2.5% is recommended.
- The arterial injection will require multiple sites and dye may be added to help monitor the distribution of the solution.
 - Having several hemostats available will assist in clamping the severed vessels while helping to build intravascular pressure.
- Hypodermic treatment will be required to treat sections of tissue where arteries have been recovered.
- The anatomical form will be restored with the prostheses provided.
 - Adding absorbent pads around the prosthetics will also contour shape.

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