RESEARCH

Medical Examiner and Eye Banks as Partners for Transplantation in the United States

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ABSTRACT

In the United States many eye donors fall under the jurisdiction of the Medical Examiner, who in the course of routine duties for death investigation, is also the gatekeeper of these valued potential donations. Collaboration and communication between the Medical Examiner and the eye bank are critical in preserving evidence and complying with standards and protocols for eye banking, particularly as it relates to timely accessibility for recovery. This review outlines some of the areas of the death investigation which are crucial to the Medical Examiner's ability to determine cause of death and eye banks must be sensitive to the presence of death investigation evidence. The confidence of the Medical Examiner in the eye bank's ability to preserve evidence, such as vitreous collection, allows for the development of policies and protocols to meet the needs of both entities.

The National Academy of Medical Examiners has expressed support for the donation process that eye banks can build upon in forming positive relations with the Medical Examiner.

Eye or cornea donation can dramatically enhance the quality of life for visually impaired recipients. Over 48,000 cornea transplants are performed annually in the United States and since 1961 over 1 million men, women and children have had their sight restored (1).

Many potential eye transplant donors fall under the jurisdiction of the local county Medical Examiner (ME). One eye bank in Texas, Transplant Services Center (TSC), reports approximately 35% of all recovered eye or cornea donors fall under the jurisdiction of the ME (2).

In the course of routine duties for death investigation, the ME is also the gatekeeper of these valued potential donations for eyes, tissues and organs. The ME determines the cause and manner of death and preserves medical and forensic evidence for later use in criminal or civil proceedings. Procurement agencies must obtain ME consent in order to recover donated eyes, tissues, and organs under ME jurisdiction, regardless of the decedent's prior consent or family's donation wishes (3). Many cases under ME jurisdiction involve young and previously healthy individuals whose deaths are unexpected or accidental and who, if authorized/consented, may make excellent donors.

Communication and collaboration between the ME and recovery agencies is critical in preserving evidence and the timing of eye and tissue recovery. The confidence of the ME in the eye bank's ability to preserve evidence, such as the collection of vitreous, allows procurement timing to benefit donation. It is generally recommended that corneal preservation occur as soon as possible after death (4). A good working relationship with the ME may result in allowing pre-autopsy recovery of eye/corneas to accommodate timing constraints for maximum tissue

viability. If pre-autopsy recovery is not possible, it will at least result in vitreous not being drawn so that eye/cornea recovery is possible post-autopsy.

In all cases, it is important for procurement agencies to remember the ME's first obligation is to determine the cause and manner of death. The ME begins processing the body pre-autopsy. This is especially important in homicides, suicides, and accidents that may involve potential criminal prosecution. The body is tagged. "As Is" photographs are taken to document the overall appearance of the body, including the position of the clothing, which may provide information about what happened to the decedent at the time of death. Evidence is collected, and fingerprints, x-rays and toxicology tests are done.

Fingerprints, as seen in Fig 1, help to determine the identity of the deceased and may provide a source of comparison with other fingerprints found on the body and crime scene. They are taken in every case and stored.

Figure 1
Finger Printing with Ink

X-rays are a very important tool in Forensic Pathology. The value of X-rays can be seen in Figure 2 that shows fragmented bullets trapped in clothing and Figure 3 that reveals a bullet that had been found in a patient's chest tube in the ER. Had the medical intervention been removed prior to X-ray this valuable evidence may have been lost.

Figure 2
Bullet Fragments in Clothing

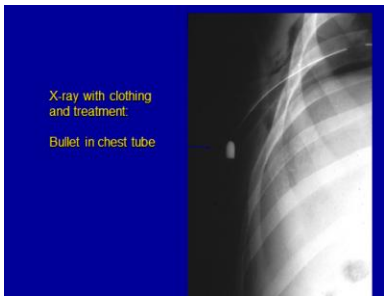

Figure 3
Bullet Lodged in Chest Tube

The Medical Examiner must maintain the chain of custody of all forensic evidence, and must document where the evidence is at all times,to ensure that it is being properly maintained and has not been tampered with. In cases involving shootings, the gunshot residue kit is collected early in the course of the autopsy, before the hands are disturbed and the evidence accidentally removed by washing or handling. The kit consists of "stamps" which contain an adhesive. Figure 4 shows the back of the hand being stamped so that the adhesive collects any gunshot residue that may have been left by firing a gun, handling a gun, or being in proximity to a gun when it is discharged. The stamps are then analyzed by the trace evidence lab on a scanning electron microscope. The fragile nature of this evidence necessitates that eye bank recovery technicians are aware of ME needs while recovering eyes/corneas.

Figure 4
Gunshot Residue Collection

Other important forensic evidence includes the decedent's hair, foreign hairs, fibers, fingernails and fingernail scrapings and DNA for identification and comparison. In sexual assault cases, swabs, slides, fluids and DNA are analyzed.

Toxicology blood samples and vitreous are drawn in all cases. In cases where the ME has allowed pre-autopsy recovery, these samples may be collected by the procurement agency for the ME in accordance with established policies and procedures. In cases where the ME has refused pre-autopsy recovery, upon request, vitreous is not drawn and the eye bank will do so post-autopsy.

At the time of recovery, eye bank recovery technicians document detailed notes of their observations of the body and provide these to the Medical Examiner. Some of this documentation includes: eye color, petechial hemorrhage, presence of arcus or edema or foreign bodies/growths in the eyes; scars, tattoos, body piercing, IV sites and surgical drains, potential puncture sites indicating potential drug use, cuts, abrasions, bruises, moles, puncture wounds, autopsy or organ recovery incisions on the body.

Being sensitive to the needs of the Medical Examiner includes developing mutually agreeable policies, procedures and protocols addressing their forensic needs, as well as the concerns and contraindications for achieving transplantable ocular standards. Successful collaboration will result in recovering more transplantable grafts while simultaneously supporting the medico-legal death investigation.

A history of ME involvement in eye and tissue donation is longstanding. As a way of addressing the serious shortage of corneas, pituitary glands and organs for transplantation, in the United

States in the late 1960's, 28 states employed the doctrine of "presumed consent", some broadly and others on a limited basis (5). The ME was authorized to allow recovery of corneas (and sometimes pituitary glands and other tissue and organs) in the absence of a known objection to the donation by the decedent or a family member (6). The 1987 Uniform Anatomical Gift Act (1987 UAGA) reinforced this trend in presumed consent statutes and recommended presumed consent for the donation of eyes, tissues, and organs from cadavers under the jurisdiction of the ME. It required the ME to make a "reasonable effort" to review the decedent's medical records and speak to family members before implementing presumed consent (7).

Figure 5 below illustrates the large jump in the number of corneas transplanted after these states enacted legislation encouraging ME use of "presumed consent", as reported (8,9,10,11).

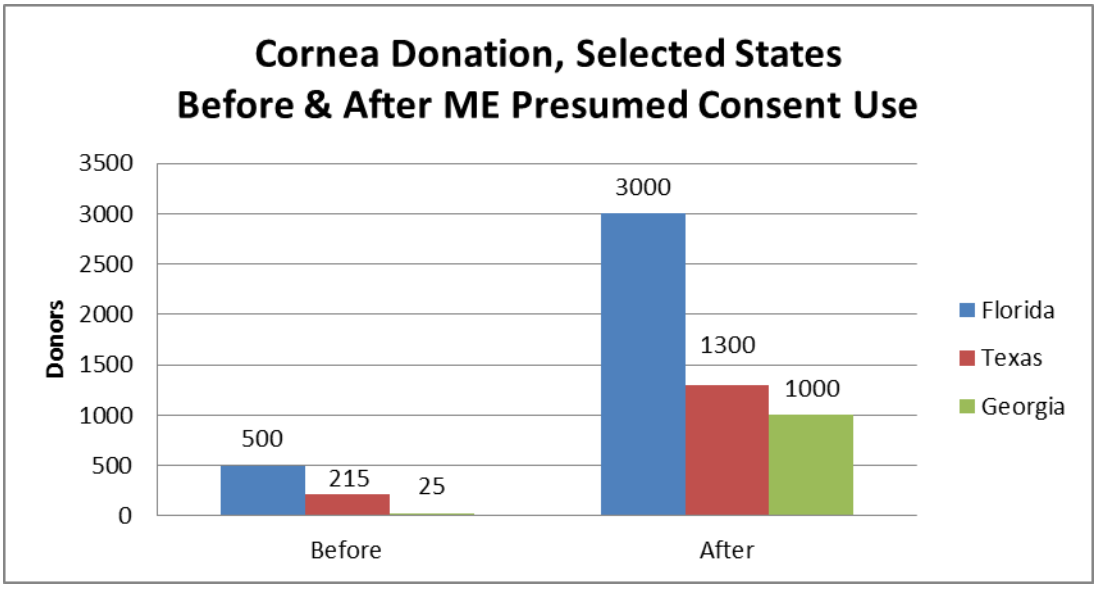

Figure 5
Comparison Before and After ME Use of Presumed Consent

By the early 1990's, several factors resulted in a move away from presumed consent use in the ME offices. HIV deaths and fear of high risk communicable disease, along with court decisions

regarding informed consent and property rights supported these concerns. Prior to changes in the law, many eye banks abandoned use of presumed consent in favor of informed consent, in order to obtain a medical/social history of the deceased. The Revised Uniform Anatomical Gift Act (2006 UAGA) eliminated the presumed consent provisions of the 1987 UAGA and recommended the recovery of corneas, tissue and organs only when there was actual consent by the decedent or by a family member (12).

Following the regulations of the 2006 UAGA and with First Person Authorization donations legal in all 50 states, the ME remains the gatekeeper in all cases under ME jurisdiction. The 2006 Revised Uniform Anatomical Gift Act (2006 UAGA) sets up an order of priority of those who may donate, as seen in Figure 6 (13).

2006 UAGA Section 9
Identifies the Authorized Individuals Who May Make an Anatomical Gift of Decedent's Body or Part:

(1) an agent of the decedent at the time of death who could have
made an anatomical gift under Section 4(2) immediately before the decedent's death;
(2) the spouse of the decedent;
(3) adult children of the decedent;
(4) parents of the decedent;
(5) adult siblings of the decedent;
(6) adult grandchildren of the decedent;
(7) grandparents of the decedent;
(8) an adult who exhibited special care and concern for the decedent;
(9) the persons who were acting as the guardians of the person

Figure 6
United States Suggested Authorized Persons Who May Donate (*Each state may have additional individuals who may donate).*

The National Academy of Medical Examiner's Position Paper states, "Donation can be accomplished in virtually all cases without detriment to evidence collection, postmortem examination, determination of cause and manner of death, or the conduction of criminal or civil legal proceedings. Although our primary function is to investigate death, enabling transplantation is one of the few opportunities we have to directly save and improve lives" (14).

Throughout the United States where eye banks work in harmony with ME offices in fulfilling their respective duties: to maximize donation by implementing protocols to assist with the release of donors from the ME's offices, protect the collection of forensic evidence, and provide clinical information to support the ME investigation, cornea/eye recovery proceeds to meet transplantation needs. Medical Examiners are part of the transplantation process providing both access to potential donors and valuable medical and social history information for patient safety.

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(3) Revised Uniform Anatomical Gift Act (2006) Section 22 and 23

(4) Eye Bank Association of America, Medical Standards, 2011, D1.600

(5) Michele Goodwin, Rethinking Legislative Consent Law?, *5 DePaul J. Health Care L.* 257, 274-75, 278

(6) David Orentlicher, Presumed Consent to Organ Donation: Its Rise and Fall in the United States, *Rutgers Law Review*, Vol 61:2, 300

(7) Uniform Anatomical Gift Act Section 4 (1987), Section 4 (a)(b)

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(11) Emile J. Farge et al., the Impact of State Legislation on Eye Banking, 112 *Archives Opthamology* 180, 181 (1994)

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(13) Revised Uniform Anatomical Gift Act (2006), Section 9

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