The Impact of Donor Preparation for Tissue Recovery on Postmortem Vitreous Isopropanol Concentration

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Title - The Impact of Donor Preparation for Tissue Recovery on Postmortem Vitreous Isopropanol Concentration (2020-2022)

Background - Volatile chemicals can be relevant in determination of cause and manner of death by forensic pathologists. Isopropanol is a secondary alcohol that is occasionally seen in postmortem toxicology testing. A series of 11 forensic autopsy cases was previously reported in which the presence of isopropanol in the vitreous humor was suspected to be due to postmortem contamination from the body preparation process for tissue recovery which often utilizes isopropyl alcohol. We present the findings of our published manuscript.

Hypothesis - Pre-recovery preparation of the donor body using isopropyl alcohol for tissue recovery can lead to contamination of donor vitreous humor; but with application of a nylon stockinette over a donors head and face during tissue recovery, alcohol contamination may be prevented.

Methods - In collaboration with a tissue recovery agency, 50 donor vitreous humor samples were collected from one eye before body preparation for recovery and 50 samples from the other eye post-recovery. Samples were labeled, refrigerated, and then transported to an off-site lab by courier for volatile analysis of methanol, ethanol, isopropanol, and acetone using headspace gas chromatography. 18 of 50 cases utilized a nylon stockinette over the donor's head and face during preparation and recovery. Donors underwent a uniform preparation process prior to tissue recovery, including multiple rinses using isopropyl alcohol.

Results - Undetectable isopropanol was found in all but one sample pre-preparation, while varying concentrations were found post-recovery with 16% (8 of 50) of samples testing positive for isopropanol with concentrations ranging from 5 to 104 mg/dL (Table 1). All samples that had detectable isopropanol post-recovery were significantly different than the isopropanol concentration in pre-preparation samples ($P < 0.05$). Of the 18 donors with stockinette head coverings, 11% (2 of 18) of these cases showed an increase in isopropanol concentration post-recovery compared with 19% (6 of 32) of those that did not have a stockinette in place. 75% (6 of 8) of cases with an increase in isopropanol concentration did not have a stockinette over the head during body preparation or recovery. In addition, this study was significant in that all post-recovery samples with isopropanol present were negative for acetone indicating a lack of isopropanol metabolism in the body.

Conclusions: This study suggests that surface contamination of the skin and mucous membranes during donor preparation using isopropyl alcohol can lead to elevated concentrations of volatile substances in postmortem vitreous humor samples. It is essential for forensic pathologists to consider this potential

source when interpreting postmortem vitreous humor samples and determining cause of death. To eliminate this as a potential source of isopropanol, vitreous humor should be collected by the tissue recovery agency before body preparation. If this is not possible, the agency should use a stockinette style head covering to reduce contamination.

Limitations of the study: small sample size, uneven stockinette usage.

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PURPOSE

Volatile chemicals can be relevant in the determination of cause and manner of death by forensic pathologists. Isopropanol is a secondary alcohol that is occasionally seen in postmortem toxicology testing. A series of 11 forensic autopsies reported the presence of isopropanol in the vitreous humor. It is suspected that it was present due to postmortem contamination from the body preparation process for tissue recovery which often involves the use of isopropyl alcohol. We present the findings of our published manuscript.

Pre-recovery preparation of the donor body using isopropyl alcohol for tissue recovery can lead to contamination of donor vitreous humor; but with the application of a nylon stockinette over a donor's head and face during tissue recovery, alcohol contamination can be prevented.

METHODS

In collaboration with a tissue recovery agency, 50 donor vitreous humor samples were collected from one eye before body preparation for recovery and 50 samples from the other eye post-recovery.

- Samples were labeled, refrigerated, and then transported to an off-site lab by courier for volatile analysis of methanol, ethanol, isopropanol, and acetone using headspace gas chromatography.
- Eighteen of 50 cases utilized a nylon stockinette over the donor's head and face during preparation and recovery.
- Donors underwent a uniform preparation process prior to tissue recovery, including multiple rinses using isopropyl alcohol.

RESULTS

Undetectable isopropanol was found in all but one sample pre-preparation, while varying concentrations were found post-recovery with 16% (8 of 50) of samples testing positive for isopropanol with concentrations ranging from 5 to 104 mg/dL (Table 1). All samples that had detectable isopropanol post-recovery were significantly different from the isopropanol concentration in pre-preparation samples ($P < 0.05$).

- Of the 18 donors with stockinette head coverings, 11% (2 of 18) of these cases showed an increase in isopropanol concentration post-recovery compared with 19% (6 of 32) of those that did not have a stockinette in place.
- Three quarters (6 of 8) of cases with an increase in isopropanol concentration did not have a stockinette over the head during body preparation or recovery.
- In addition, this study was significant in that all post-recovery samples with isopropanol present were negative for acetone indicating a lack of isopropanol metabolism in the body.

TABLE 1: CASES WITH CHANGE IN CONCENTRATION OF VITREOUS ISOPROPANOL AFTER BODY PREPARATION*

Sample	Pre-preparation mg/dL	Post-preparation mg/dL
1	<5	6
2	<5	5
3	<5	20
4	<5	19
5	<5	17
6	<5	104
7	17	21
8	<5	13

* *"Post-preparation" and "post-recovery" are used interchangeably.*

CONCLUSION

This study suggests that surface contamination of the skin and mucous membranes during donor preparation using isopropyl alcohol can lead to elevated concentrations of volatile substances in postmortem vitreous humor samples. It is essential for forensic pathologists to consider this potential source when interpreting postmortem vitreous humor samples and determining the cause of death. **To eliminate this as a potential source of isopropanol, vitreous humor should be collected by the tissue recovery agency before body preparation.** If this is not possible, the agency should use a stockinette-style head covering to reduce contamination.

Limitations of the study: small sample size, uneven stockinette usage.

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