A RARE CARCINOGENIC OCCUPATIONAL SOLVENT CAUSING MULTIPLE CANCERS

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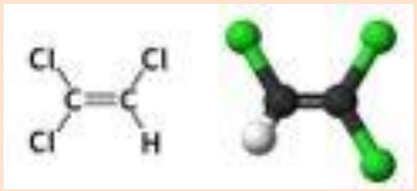
Background

Trichloroethylene (TCE) is a volatile, chlorinated organic solvent that has been used industrially for more than 100 years. Because of the extensive industrial use, TCE is now among the most frequently detected xenobiotics in groundwater. We present a unique yet brain-stimulating case of TCE exposed patients who presented with multiple malignancies associated with the evil carcinogen and wanted to alert the physician community to be more vigilant about closed surveillance and screening of TCE related cancer in these group of Cohort. This case is unique because the patient had multiple primary cancers but no common risk factors or a significant family history/genetic mutation. The importance of a detailed history is also highlighted, and this led us to explore the hidden carcinogen that likely caused the wide array of cancer seen in this patient.

Case Report

A 71-year-old male with remote history of invasive papillary urothelial carcinoma of the bladder, recent castration-resistant prostate cancer with bony metastasis currently on chemotherapy presented to the hospital with 3 days of worsening altered mental status. Basic metabolic panel showed elevated calcium of 15.6. He was admitted, started on intravenous fluids and diuretics. Additionally, he was given one dose of pamidronate. Chest X-Ray revealed single focal opacity in the right mid-lung. CT of the chest, abdomen and pelvis demonstrated multiple lesions in the liver and bone and a new band-like opacity in the right middle lobe of his lung. Upon further questioning, the patient reported that he previously worked as an airplane mechanic and was exposed to chemical solvents -especially TCE, without the use of protective equipment. He denied smoking, alcohol or other illicit drug use. Family history was significant for unspecified cancer in his mother and maternal aunt.

CHEMICAL COMPOUND OF TRICHLOROETHYLENE



Imaging

Figure 1 – CT chest demonstrating Right middle lung opacity suggestive of carcinoma

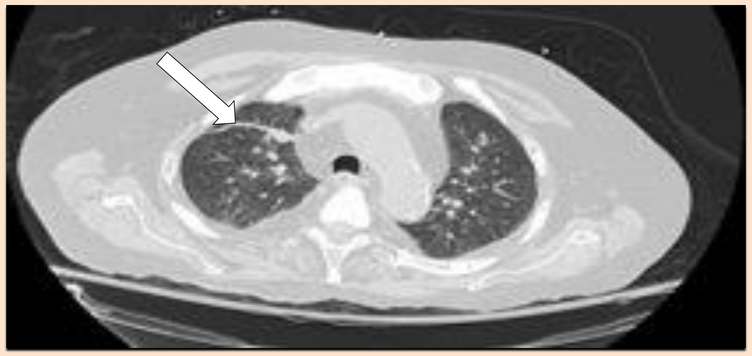


Figure 2: CT abdomen/pelvis demonstrating multiple opacities in liver

References

1. Corton JC. Evaluation of the role of peroxisome proliferator-activated receptor alpha (PPARalpha) in mouse liver tumor induction by trichloroethylene and metabolites. Crit Rev Toxicol. 2008;38(10):857-75. doi: 10.1080/10408440802209796. PMID: 18821149.

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Discussion

Patient’s hospital stay was uncomplicated, calcium level trended down with diuresis and fluids and the patient attended short term rehabilitation and outpatient palliative chemotherapy. Unfortunately, the patient deteriorated at rehab, was transitioned to comfort care and shortly thereafter passed away. Literature search showed that TCE is known to cause lymphoma, leukemia, lung cancer, liver cancer, prostate cancer, and bladder cancer. This patient had multiple primary cancers including bladder, prostate, lung in the absence of smoking history, and is unique in a way that patient developed multiple malignancies associated with TCE exposure which is rare in a single individual. TCE accumulates in the body, and measurements of main urinary TCE metabolite trichloroacetic acid (U-TCA) provides a reliable measure of exposure to TCE.

Metabolism is critical for the mutagenicity, carcinogenicity, and other adverse health effects of trichloroethylene .TCE metabolism occurs through two major pathways: cytochrome P450 (CYP)-dependent oxidation and glutathione (GSH) conjugation catalyzed by GSH S-transferases (GSTs). The GST pathway conjugate S-(1,2-dichlorovinyl)glutathione (DCVG) is further processed to multiple highly reactive species that are known to be mutagenic and carcinogenic.

If a person presents symptoms that could be associated with a TCE exposure, a complete evaluation of symptoms is recommended in addition to a complete environmental, occupational and residential history. Breath testing must occur within an hour or two after exposure. Blood and urine tests can find TCE and metabolites up to a week after exposure. TCE in the blood and urine has a short half-life and analysis for TCE is not. If blood is found in the urine, then a thorough workup should be conducted to find an etiology to rule out kidney, bladder and other types of cancer

Conclusion

We recommend that further studies should be done to better understand the Carcinogenic effect of TCE, an intermittent urinary screening of U-TCA levels to be done in the workers exposed to TCE as a part of the occupational surveillance protocol and in future a more efficient screening methods should be developed to prevent the incidence of cancers in the exposed population.