H71 Insights Into the Postmortem Redistribution (PMR) of Diazepam, Methadone, and Morphine: Sampling Site, Time, and Method Matter

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After attending this presentation, attendees will understand that the site of sampling, the technique used, and the postmortem interval influence measured postmortem drug concentrations.

This presentation will impact the forensic science community by illustrating that popliteal blood yields lower drug concentrations than femoral blood samples and may more closely approximate antemortem drug concentrations. Also, sampling techniques and postmortem interval are associated with blood concentration variations of importance.

Fifty-seven cases were sampled as follows: Subclavian Blood – Dissection/Clamp (SBDC) technique; Subclavian Blood – Blindstick (SBBS) technique; Femoral Blood – Dissection/Clamp (FBDC) technique; Femoral Blood – Blindstick (FBBS) technique; Intracardiac Blood (ICB); and Popliteal Blood (PB). Cardiac blood was sampled in the right auricle after chest dissection. Popliteal blood was sampled after dissection and clamping of the popliteal vein because of its small caliber and depth in the popliteal fossa.

In 30 cases, blindstick and dissection/clamping were used at subclavian and femoral sites at the same time. In 27 cases, two samples were performed on the same body after a known time interval, alternating the sampling method.

Cases were divided in three groups: Group 1 (both methods), Group 2 (dissection/clamping), and Group 3 (blindstick).

To assess Postmortem Redistribution (PMR) for each substance and for each group, mean concentrations ratios were calculated as follows: [cardiac]/[subclavian], [cardiac]/[femoral], [cardiac]/[popliteal], [subclavian]/[femoral], [subclavian]/[popliteal], and [femoral]/[popliteal]. Ratios were compared between groups 2 and 3 to assess the difference between a blindstick and vein dissection.

Time-dependent variation of blood concentration and ratios was assessed two ways. One was to look at correlation between concentrations ratios and estimated postmortem interval (all cases). The second was to look at differences in concentrations in two samples taken after a time interval in the same case (27 cases).

Results indicate that the popliteal site appears to be less subject to PMR as seen in the mean concentrations ratios [femoral]/[popliteal] in Group 1: diazepam (N=24, mean ratio=1.45, $p < 0.001$); methadone (N=60, mean ratio=1.36, $p < 0.001$); morphine (N=49, mean ratio=1.49, $p < 0.001$).

Mean [femoral]/[popliteal] ratios tend to differ depending on sampling technique, except for morphine: Group 2: diazepam (N=20, mean ratio=1.13, p=0.097); methadone (N=38, mean ratio=1.25, $p < 0.001$); morphine (N=33, mean ratio=1.44, $p < 0.001$; Group 3: diazepam (N=18, mean ratio=1.95, p=0.0004); methadone (N=46, mean ratio=1.41, $p < 0.001$); morphine (N=33, mean ratio=1.43, $p < 0.001$).

Estimated postmortem interval appeared to increase mean [femoral]/[popliteal] ratios except for morphine (diazepam: r=0.61, p=0.0017; methadone: r=0.56, $p < 0.0001$; morphine: r=-0.029, p=0.85). Sampling interval appeared to affect methadone and morphine subclavian concentrations (methadone: difference=+124.06, p=0.009; morphine: difference=+31.00, p=0.042) whereas mean concentrations were not significantly different at the popliteal site for all substances.

This study is the first to evaluate concurrently three aspects of PMR in three selected drugs. Popliteal blood mean concentrations are significantly lower than femoral blood, a commonly used site for peripheral sampling, for all substances. Sampling method appears to have an effect, since [femoral]/[popliteal] mean ratios were lower when using the dissection/clamp technique. Postmortem interval also showed significant influence on mean subclavian blood concentrations and on [femoral]/[popliteal] ratios, suggesting that PMR is a progressive phenomenon in central and peripheral compartments, but popliteal blood seems more resistant to it.

Postmortem Redistribution, Sampling Techniques, Postmortem Interval