Identifying risk factors for silicone oil droplets in anti-VEGF injections: a quantitative in vitro study

Julia Farah, MD
Calgary, AB

Aleena Virani, BScH, Emi Sanders, BSc, CCRP, Riyaz Virani, BSc, Amin Kherani, BSc. MD. FRCSC., Geoff Williams, MD, FRCSC

Purpose:

To determine the risk factors of compounding and injection techniques on the release of Silicone oil (SiO) droplets for anti-VEGF injections

Methods:

This is a quantitative in-vitro study of three anti-VEGF agents (Bevacizumab, Ranibizumab and Aflibercept) that underwent the standard compounding process: the content of the industry vials was drawn into a 3 cc syringe (“base syringe” – BD and TERUMO) and compounded into the drug delivery syringe (BD 0.3ml Insulin Syringe). Content from all syringes was analyzed and SiO droplets were quantified using Brightfield light microscopy. "Normal force" and "Heavy force" and flicking was used as variables for injection techniques. The process was repeated using sterile water (SW) as a control group. In total, we completed 276 trials, each one counted in triplicate.

Results:

Overall, double the number of SiO droplets were found in trials involving the TERUMO base syringe. On average, control SW trials contained only .04 droplets of SiO per μl compared to 4.62 droplets of SiO per μl in the trials utilizing any anti-VEGF. Heavy versus normal technique found almost 25% more SiO droplets when quantified. There was almost 12 times the number of SiO droplets in the delivery syringe compared to the base syringe. There were 5 out of 276 trials with counts of 50 or more SiO droplets per μl, all with anti-VEGF and 3 using heavy technique.

Conclusions:

This study demonstrates that the compounding process and injection techniques can be a source of SiO droplets for anti-VEGF injections. Syringes containing anti-VEGF agents release over 100 times more silicone oil droplets compared to syringes with sterile water, suggesting a possible interaction between the anti-VEGF molecules and SiO. The “Heavy force” technique is associated with an increased number of SiO droplets per trial. This study has also showed variability between insulin syringes of the same manufacturer, suggesting that the amount of SiO as lubricant in each syringe may be variable.