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Introduction

Vaso-occlusive crisis (VOC) is the physiological consequence of morphological changes in red blood cells (RBCs) within the microvasculature. A wide variety of factors can influence a VOC, but all events have the underlying molecular characteristics of low oxygen in RBCs promoting hemoglobin polymerization. The loss of RBC circularity prevents the hypoxic cells from effectively flowing through the microvasculature that further expands hypoxia to tissues at sites distal to blockade. Current treatment regimens that reduce absolute blood HbS levels (transfusion and hydroxyurea) have demonstrated complete elimination is not necessary to promote a positive clinical effect. SANGUINATE is a dual gas transfer agent that has been shown to revert SCD RBCs to a more normal morphology *in vitro.* A phase 2 study is underway to determine whether infusing SANGUINATE during an acute VOC episode can reduce the need for IV opiates and prevent hospitalization. Blood samples were collected to ascertain the impact of SANGUINATE upon RBC morphology.

Methods

Whole blood samples were collected prior to infusion, at the time of patient discharge and 72 hours post-infusion. Samples were shipped by priority overnight to Prolong Pharmaceuticals for imaging cytometry and shape analysis.

Results

SANGUINATE infusion caused a shift in the number of abnormally shaped cells to a more normal morphology, which is consistent with *in vitro* results. This shift occurred within hours of infusion and was sustained at the 72 hour sampling period. The placebo treated patient showed no shift in cell morphology during the sampling period.

Conclusion

SANGUINATE returns RBCs to a more normal shape in patients experiencing VOC and for a prolonged period. These results support the use of SANGUINATE in this patient population to reduce opiate use and prevent hospitalization for VOC.