Intravital capillaroscopy in sickle cell disease: Clinical potential

Mark Layton
Department of Haematology
Imperial College, London
Pathogenesis of vaso-occlusion in sickle cell disease

HbS polymers seen by X-ray diffraction

Steinberg Br. J. Haematol. 2005

SCAD
Intravital microscopy of capillary haemodynamics in sickle cell disease

- Nailfold capillary microscopy
- *In situ* measurement of red cell velocity

SS  steady state  n= 20
crisis  n=10
AA n=14

Intravital microscopy of capillary haemodynamics in sickle cell disease

Capillary network topography similar in AA and SS
Temporal fluctuation in flow
Capillary occlusion in steady state and crisis
Resting red cell flow ($V_{rbc}$) elevated in crisis
Blunted vasodilatory response in crisis

Intravital microscopy of capillary haemodynamics in sickle cell disease

“The need for techniques to detect the subtle differences between normal and HbSS microvascular perfusion is also strikingly apparent, particularly in the quest for an objective evaluation of the state of crisis in a sickle cell patient.”

Lipowsky, et al. 1987
Microvascular abnormalities in sickle cell disease

Resolution of vascular changes following crisis

Computer assisted intravital microscopy of conjunctival microcirculation

SCD patients exhibit morphometric abnormalities and reduced vascularity
Red cell velocity reduced
Vascularity, vessel diameter and red cell velocity are reduced further during painful crisis
Changes reverse after resolution of crisis

Conclusions

Intravital microscopy offers a non-invasive tool to reproducibly quantify microvascular abnormalities in SCD.

Observed abnormalities of microcirculation correlate with clinical status.