Adhesive behaviour of mesenchymal stem cells from flowing blood: implications for intravenous therapy

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AIM: Mesenchymal stem cells (MSC) are used in therapy, often by injection into the blood. Adhesion from flowing blood may be a critical step for their recruitment in the microvasculature. We aimed to understand how MSC might ‘home’ to injured tissue.

METHODS: MSC from Wharton’s jelly (WJMSC), bone marrow (BMMSC) or trabecular bone (TBMSC) were suspended in culture medium or added to whole blood, and perfused through capillaries coated with matrix proteins (collagen or fibronectin) or P- or E-selectin. Adherent cells were observed microscopically and counted.

RESULTS: None of the isolated MSC adhered to selectins even at low shear rate, but all were able to adhere to collagen or fibronectin. However, MSC perfused in whole blood failed to bind to fibronectin, while the fibronectin itself became covered in a single layer of spread platelets. When perfused over collagen, only WJMSC were found to attach, forming aggregates with platelets on the collagen surface. Interestingly, all isolated MSC adhered to a surface coated with platelets, but only WJMSC caused platelets to aggregate in a stirred suspension. When WJMSC or BMMSC were injected systemically via the tail vein in mice, WJMSC caused a decrease in blood platelet count but BMMSC did not.

CONCLUSIONS: MSC show origin-dependent interaction with platelets that may influence their adhesion to damaged vessels, and potentially cause thrombotic complications, depending on the degree of activation of the platelets adhered to the MSC.