Microdialysis As a Method of Investigating Factors Controlling Microcirculation Following Free Flap Transfer

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INTRODUCTION: 'Choke vessels', linking angiosomes, are thought to dilate in the first 72 hours when blood flow to an area is disrupted, either following surgical delay, or following immediate flap transfer[1-3]. The objective of this study was to investigate factors mediating circulatory change within free flaps.

MATERIALS AND METHODS: Eleven patients undergoing DIEP flap breast reconstruction were recruited for this pilot study. Microdialysis catheters with specialised 'high cut-off' membranes for the collection of larger molecules were chosen to measure changes in tissue fluid in DIEP flaps, a technique not previously reported in free flaps. Three catheters per patient were inserted intraoperatively into Hartrampf[4,5] DIEP zones 1, 2 and 4. Microdialysis continued for 72 hours with dialysate collected every 4 hours. Initial analysis was performed as planned on a subset of six of the eleven patients as part of an investigative phase. ELISA kits were used to detect human interleukin-6, fibroblast growth factor and tumour necrosis factor alpha.

RESULTS: Three hundred and twenty four samples were analysed by ELISA.

Interleukin-6 (IL-6) concentrations showed an increasing trend until about 36 hours post operatively before remaining relatively constant. There did not appear to be any differences between the zones. Overall there was an increase ($p<0.001$) over the period from 4 hours to 72 hours best explained by a linear trend.

Fibroblast growth factor basic (FGFβ) concentrations did not appear to have any overall difference in concentration with time and there were no differences between the zones. The concentrations however appeared to oscillate about a horizontal trend line and did not display a linear time trend.

Tumour Necrosis Factor alpha (TNFα) similarly did not show any uniform differences between the zones. There appeared to be a peak around 20 - 24 hours before a gradual decrease. There was a significant linear time trend ($p=0.029$) between 4 and 76 hours that was slightly decreasing over the time period.

CONCLUSION: This study shows that, as well as its use flap monitoring, microdialysis can be used as a research tool to evaluate changes in larger molecules such as cytokines and as such is a valuable technique to increase our understanding of flap physiology.

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