

Exercise mechanisms in cancer prehabilitation

Exercise prehabilitation is recognised as a low-toxicity adjunct to neoadjuvant cancer treatment, with potential effects extending beyond physical fitness and postoperative recovery to tumour biology and treatment response. This presentation examines the biological plausibility and emerging evidence underpinning these effects. Prescribed exercise may influence cancer hallmarks through anti-inflammatory myokine signalling, vascular shear stress, improved tumour perfusion and oxygenation, metabolic regulation, and enhanced immune surveillance. Acute and regular exercise can mobilise natural killer and CD8+ T cells, increase cytotoxic activity, promote tumour-infiltrating lymphocytes, and potentially convert immunologically "cold" tumours into more treatment-responsive "hot" phenotypes. Early translational studies in rectal, oesophagogastric and breast cancer suggest that exercise during neoadjuvant therapy can preserve cardiorespiratory fitness, improve treatment completion and quality of life, reduce toxicity and complications, and may enhance pathological tumour regression. However, findings remain heterogeneous, with small samples, variable exercise prescriptions, differing cancer subtypes and inconsistent mechanistic endpoints. Future research should move beyond traditional outcomes such as length of stay and fitness alone. Adequately powered translational trials are required to define dose, timing and modality using FITT-VP principles, characterise tumour and immune responses, identify responders, and personalise prehabilitation by tumour subtype and treatment pathway to improve cancer outcomes.