Intervertebral discs and disc hydration: An anatomical and physiological review with implications for the clinical setting

Degenerative disc disease is strongly associated with spinal pain often leads to disability.\(^1\)\(^-\)\(^3\) The IVD consist of a nucleus pulposus (NP) surrounded by concentric rings forming the annulus fibrosis (AF).\(^4\)\(^,\)\(^5\), IVDs are an integral component of the vertebral column, allowing for both stability and flexibility of the spine.\(^5\) Microcirculation and diffusion of nutrients through cartilaginous endplates (CEP) and the AF support proteoglycans (PG) and glycosaminoglycans (GAG) accounting for the IVD’s osmotic hydrophilic nature.\(^6\)\(^,\)\(^7\) Normal fluctuations of IVD hydration occur during loaded and unloaded states, and are necessary to maintain homeostasis.\(^6\) However, a combination of normal maturation and injury to the CEP, AF and NP results in chronic dehydration that alters mechanical stresses and gene expression in these structures.\(^6\)\(^,\)\(^8\)\(^-\)\(^12\) Importantly, ossification of the CEP and loss of PGs in the AF and NP leads to DDD.\(^8\)\(^,\)\(^13\) Ten percent of people with spinal pain become disabled.\(^1\)\(^,\)\(^14\)\(^,\)\(^15\) However, up to 90% satisfaction has been reported with conservative management of spinal pain.\(^8\) Interventions that affect the hydration status by decrease abnormal stress, normalize mechanics and providing stimuli to the NP and AF help to treat and prevent abnormal gene expression and may retard or prevent DDD and its symptoms. Positional changes and/or exercises in supine, side lying, prone, aquatics environments, and various sitting positions have been found to improve IVD hydration.\(^8\)\(^,\)\(^16\)\(^-\)\(^25\) Optimal clinical management for IVD pathologies requires evidence informed practice based on scientific principles to be applied to the physical conditions that affect hydration status to treat and potentially prevent DDD.

References:


