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• 中文摘要

下背痛是近年來常見之脊椎疾病，並造成病患於醫療花費上極大之開銷。雖然至今對於引發下背痛之原因仍不清楚，但許多研究報告指出，椎間盤之退化與其息息相關。當椎間盤開始發生退化時，在生化成分、細胞、以及組織學型態皆會隨之改變，進而影響其生物力學特性。椎間盤在脊椎中所扮演之主要角色，為承載與傳導力量。當負載施予椎間盤時，椎間盤內壓會上升，並使椎間盤高度下降以及環狀纖維向外膨脹，椎間盤內流體亦會藉由孔洞向外排出，藉以抵抗與傳遞負載，因此瞭解應力於椎間盤內各結構之分布情形，可有助於評估椎間盤之正常機械功能性。椎間盤細胞外基質主要是由膠原蛋白與醣蛋白所組成，而膠原蛋白之交聯為提供椎間盤正常生物力學特性之重要鍵結。當椎間盤開始產生退化時，各結構之膠原蛋白與其交聯型態會隨之改變，作以退化之補償。然而利用交聯製劑梔子素行椎間盤外緣性交聯，已被發現可以改善椎間盤退化所引發之脊椎不穩定、增加椎間盤環狀纖維之機械性質，以及回復椎間盤受穿刺傷害後之完整性。而根據我們最近之研究，亦發現梔子素可改變流體於椎間盤鄰近終板流動之方向性、改變椎間盤環狀纖維之黏彈性、降低椎間盤環狀纖維之孔洞性與通透性，以及在椎間盤髓核之內壓會降低。但目前鮮少研究針對椎間盤經過梔子素處理後，於承載力下在各結構的應力分布之變化，因此本篇研究之目的在於以體外實驗，利用梔子素行椎間盤外源性交聯後，再實施椎間盤內應力圖量測，以觀察在椎間盤在承載力下之應力分布情形。 本研究進行豬腰椎體外實驗，並將其分別浸泡至生理食鹽水與梔子素，或是注射生理食鹽水與梔子素至髓核，再利用特製之針型壓力感測器與自行開發之接頭組，量測椎間盤內應力圖量測。結果發現，以本研究所開發之相關儀器進行量測椎間盤內應力圖為可行，但在髓核處之內壓，比較過去文獻指出之結果有較低值。造成此現象之原因，可能是在實驗中，會先利用針頭進行椎間盤穿刺，用以形成預鑽孔與路徑，使針型壓力感測器易放置與移動於椎間盤，造成髓核可能流出至椎間盤，進而使椎間盤內壓之下降，亦造成負載傳遞至環狀纖維，並導致內側或外側環狀纖維有較高應力峰值。然而，以梔子素行椎間盤外緣性交聯後，對於椎間盤內壓有較佳之保存作用，並且可將承載力平均散佈至前側或後側之環狀纖維。 本研究之結果與限制可作為未來進行活體豬體內實驗之驗證與基礎技術，實驗之相關儀器亦可再作更改，以符合實驗所需，於近期在進一步確認體外實驗之結果後，將會立即實施活體體內量測作業。

• 英文摘要

Although the exact factor of the low back pain was not clearly, but the associated intervertebral disc degeneration (IVD) might induce the pain. The IVD is characterized by a complex set of biochemical, cell exhibition, and morphologic changes to influence on mechanics properties. When a loading applies on the disc which increases the intradiscal pressure, decreases the disc height, bulges the annulus fibrosus outward, and fluid flow outward from the disc via pores to resist and transport the loading. Therefore, the normal mechanical function of the disc can be examined by the intradiscal stress profilometry. The extracellular matrix of the disc consists with collagen and proteoglycan. The collagen crosslinks are important bonds to provide normal mechanical properties of disc. Utilizing the crosslinking reagent genipin for disc has been found that could be better spinal stability, increase the mechanical properties of annulus, recover the integrity of disc after stabbing injury. The genipin also could change the bi-direction of fluid flowing in the endplate, influence on viscoelastic properties and reduce the porosity and permeability of annulus, and decrease the intradiscal pressure. But there are few researches to investigate the stress profilometry within disc after genipin treatment. Therefore, the aim of this study was base on the in vitro experiment to use the genipin for exogenous crosslinking of disc, and to perform the intradiscal stress profilometry within disc under loading. The procine lumbar motion segments specimens were individually soaked into PBS and genipin solution, or injected the PBS and genipin solution into the nucleus. The custom-made needle sensor and joint system were used to measure the intradiscal stress profilometry. In results finding, using the custom-made apparatus is practicably to test the intradiscal stress profilometry, but the intradiscal pressure is lower than the results indicated by previous studies. The reason may attribute to the disc injury by needle insertion to form the pass route before input the needle sensor, and also may lead the neuclues flow outward from disc and cause the stress to transmit to the annulus. However, the genipin treatment not only retains the intradiscal pressure but also transports the loading to posterior and anterior annulus.