

Experimentelle Forschung | Aktualisierungszeit: 13.05.2023

Auswirkungen der Akupunktur an den Akupunkturpunkten „Houxi-Huantiao “ auf den HMGB1/RAGE-Signalweg im Spinalnervenstammgewebe von Ratten mit lumbalem Bandscheibenvorfall

Effects of Acupuncture at Paired Points of “Houxi (SI 3) ”-“Huantiao (GB 30) ” on HMGB1/RAGE Pathway in Spinal Nerve Trunk Tissue of Lumbar Disc Herniation Model Rats

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Abstract

Objective

To explore the possible mechanism of acupuncture at the paired points “Houxi (SI 3) - Huantiao (GB 30) ” on lumbar disc herniation (LDH) .

Methods

Thirty-two SD rats were randomly divided into sham operation group , model group, ordinary acupuncture group and paired acupoints group, with eight rats in each group. Except for the sham operation group, the rat model was established by autologous nucleus pulposus transplantation in the other groups. Three days after modeling, the rats in the ordinary acupuncture group were needled at the selected points including “Shenshu (BL 23) ”, “Dachangshu (BL 25) ” and “Weizhong (BL 40) ” while those in the paired acupoints group were needled at “Houxi (SI 3) ” and “Huantiao (GB 30) ”, with insertion of 1-2mm by filiform needle, even supplementation and drainage once every 10 min, and with needle retention of 30 min. The sham operation group and the model group were bound for 30 minutes daily at the same time. Each group was intervened for 14 days. The thermal pain stimulator was used to detect the time required for the rat's foot-lifting reaction as the pain threshold at 1 day before and 3 days after model establishment, and after 14 days treatment. At the end of treatment, L5 spinal nerve stem was collected for HE staining to observe pathological changes. Enzyme-linked immunosorbent assay (ELISA) was used to detect serum interleukin-1 β (IL-1 β) , interleukin-6 (IL-6) , and nuclear factor κ B (NF- κ B) levels. Immunofluorescence was used to detect the expression of high mobility group box B1 (HMGB1) and receptor for advanced glycation end products (RAGE) in spinal nerve trunk tissues, while Western Blot was used to detect the protein expression of HMGB1 and RAGE; real-time fluorescent quantitative PCR was used to detect mRNA expression of HMGB1 and RAGE in spinal nerve trunk tissues.

Results

Compared with the 1 day before modeling, the pain threshold in the model group, the ordinary acupuncture group and the paired points group all decreased significantly at 3 days after modelling ($P < 0.05$). After 14 days intervention, the pain threshold in the model group was significantly lower than in the sham operation group ($P < 0.05$), while that in the ordinary acupuncture and the paired points acupuncture group was significantly higher ($P < 0.05$). HE staining showed that compared to those in the sham operation group, the myelin sheath of L5 spinal nerve in the model group partially disappeared and formed a cavity, and Wallerian degeneration appeared; nerve fibers in the ordinary acupuncture group was partially repaired; the arrangement of nerve fibers in the paired points acupuncture group was relatively neat, and the vacuolar changes significantly decreased, suggesting that the edema was significantly reduced. Compared to those in the sham operation group, the serum IL-1 β , IL-6, NF- κ B levels increased, and spinal nerve trunk HMGB1, RAGE fluorescence expression, as well as HMGB1 and RAGE protein and mRNA expression significantly increased in the model group ($P < 0.05$). Compared to those in the model group, the fluorescence expression of HMGB1 and RAGE decreased in the paired points acupuncture group, as well as the serum levels of IL-1 β , IL-6, and NF- κ B, and the protein and mRNA expressions of RAGE and HMGB1 ($P < 0.05$); compared to the ordinary acupuncture group, the paired points acupuncture group was superior in reducing the serum IL-6 and the mRNA expressions of HMGB1 and RAGE ($P < 0.05$).

Conclusion

Acupuncture at the paired acupoints of "Houxi (SI 3)"-"Huantiao (GB 30)" can significantly improve the vacuolar degeneration and systematic inflammatory response in the spinal nerve trunk tissue in LDH model rats, and the mechanism may be related to the inhibition of HMGB1/RAGE pathway in spinal nerve trunk tissue.

Keywords

lumbar disc herniation; Houxi (SI 3); Huantiao (GB 30); high-mobility group box protein B1; receptor for advanced glycation end products; inflammatory factors; pain threshold

Verweise

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