

Electroacupuncture relieves overactive bladder symptoms by modulating the generation and transduction of Piezo1 channel mediated mechanosensory signals in the urothelium

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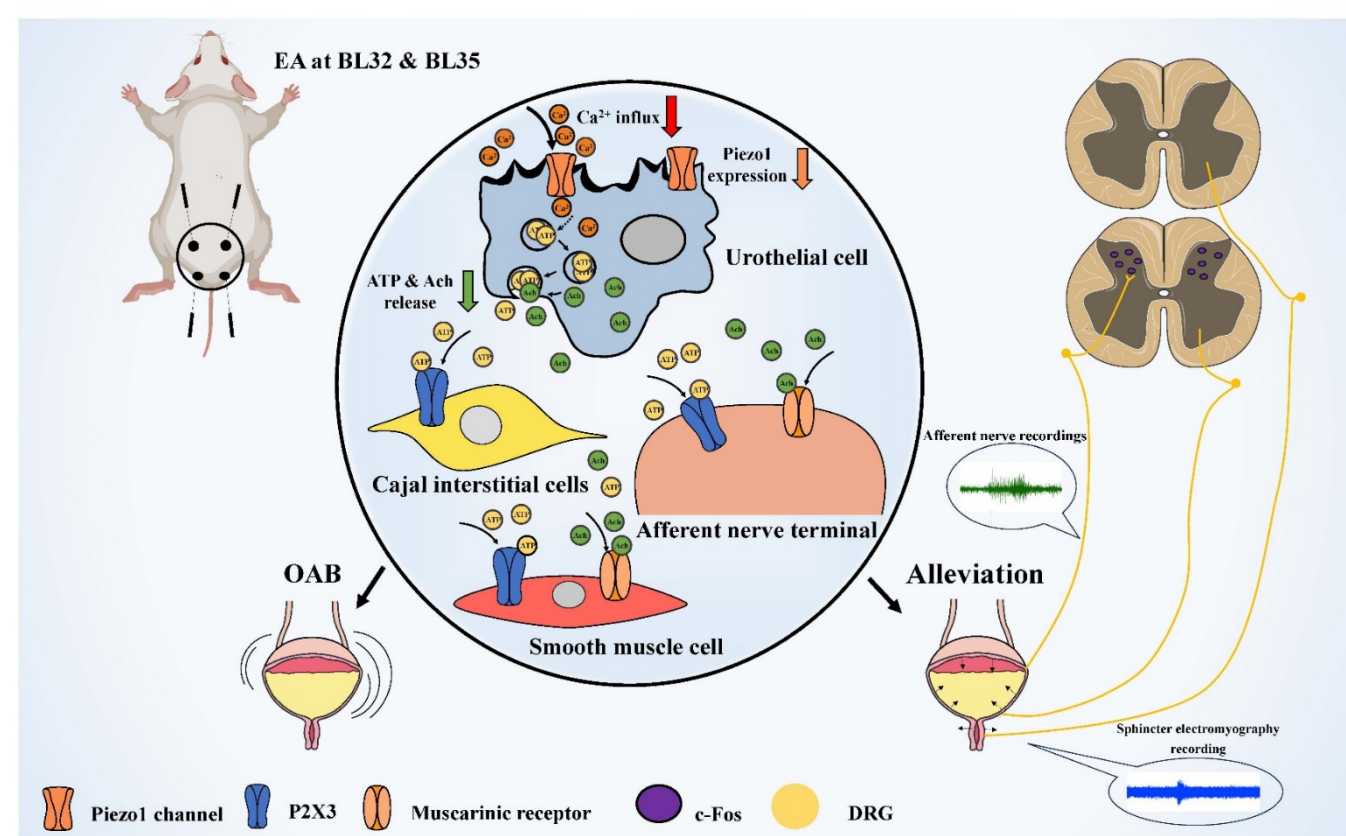
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Aims of study

EA has been found to be an effective treatment for OAB, but its mechanisms of action remain unclear. This study aims to reveal the modulatory mechanisms of EA on Piezo1 channel mediated sensitivity of the urothelium in an OAB rat model.

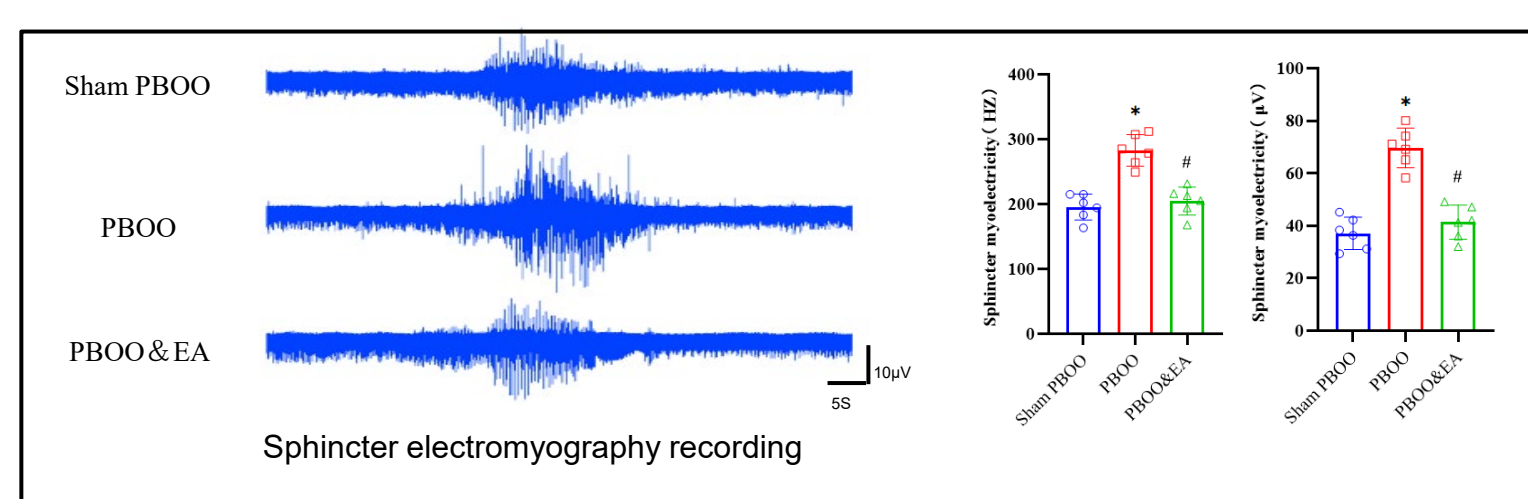
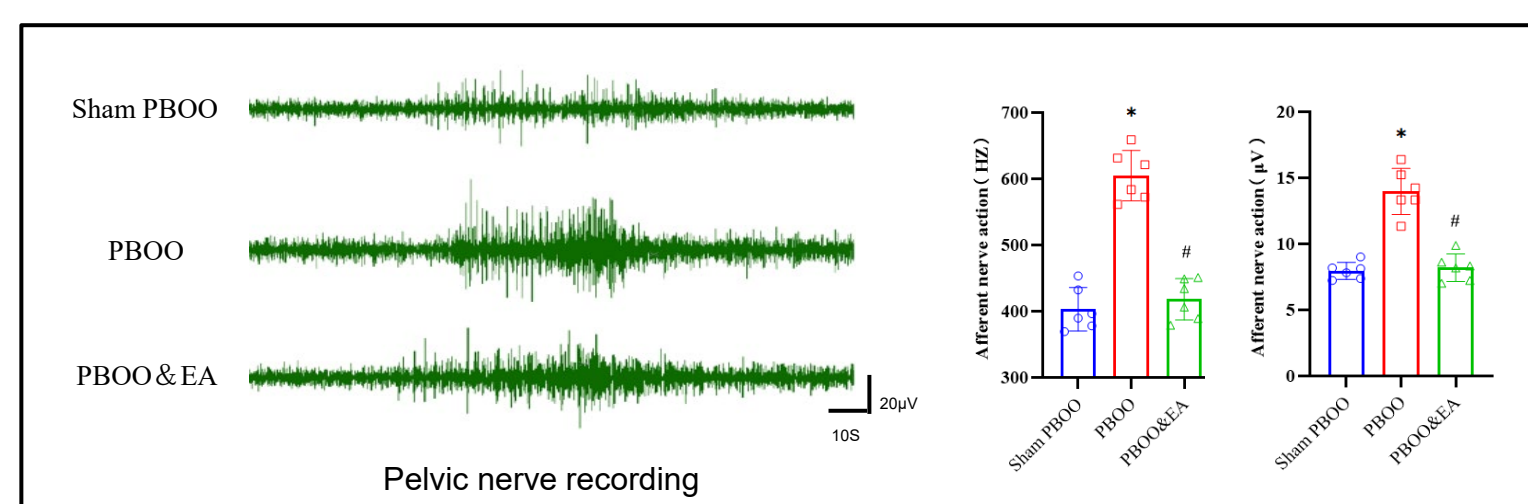
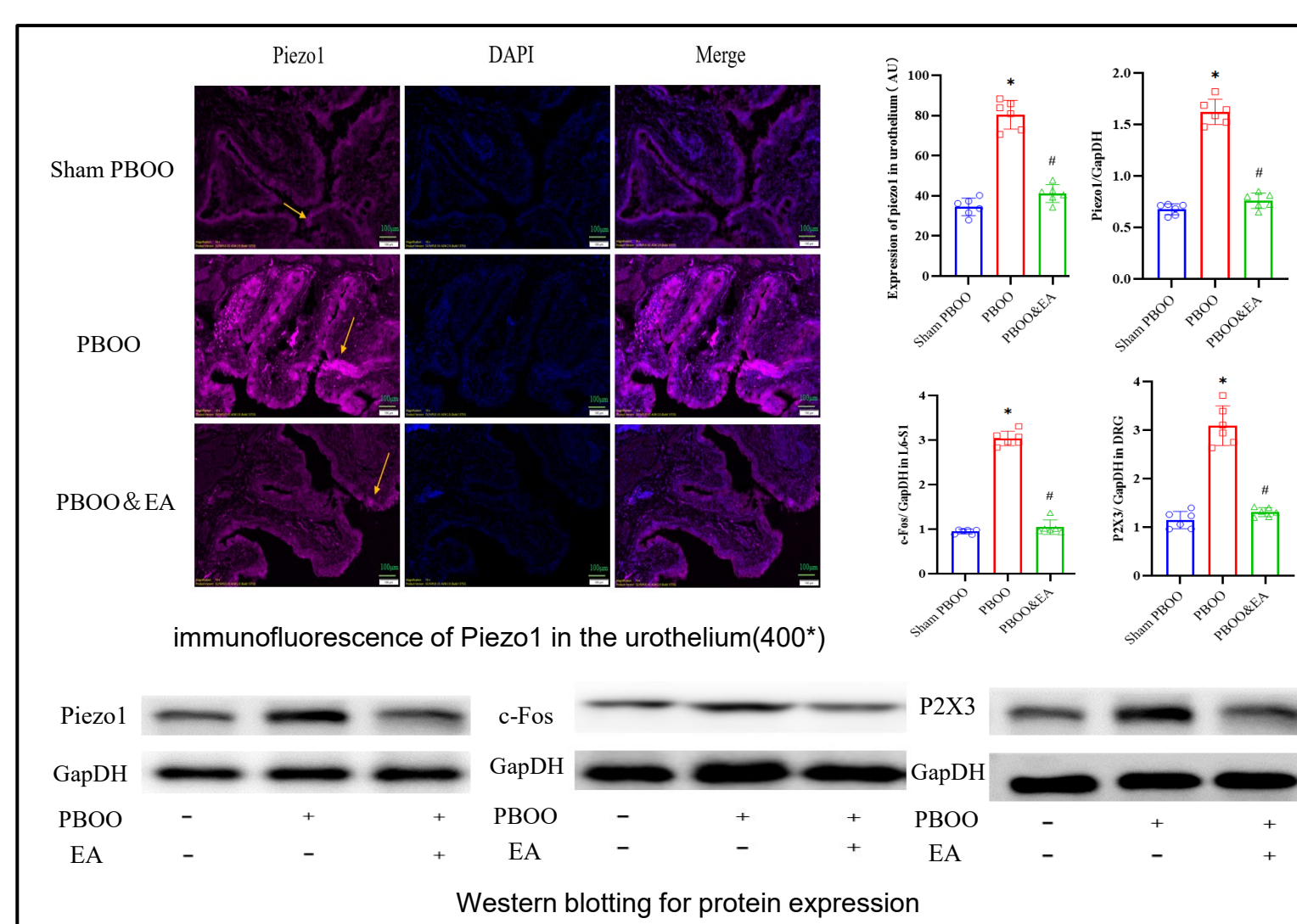
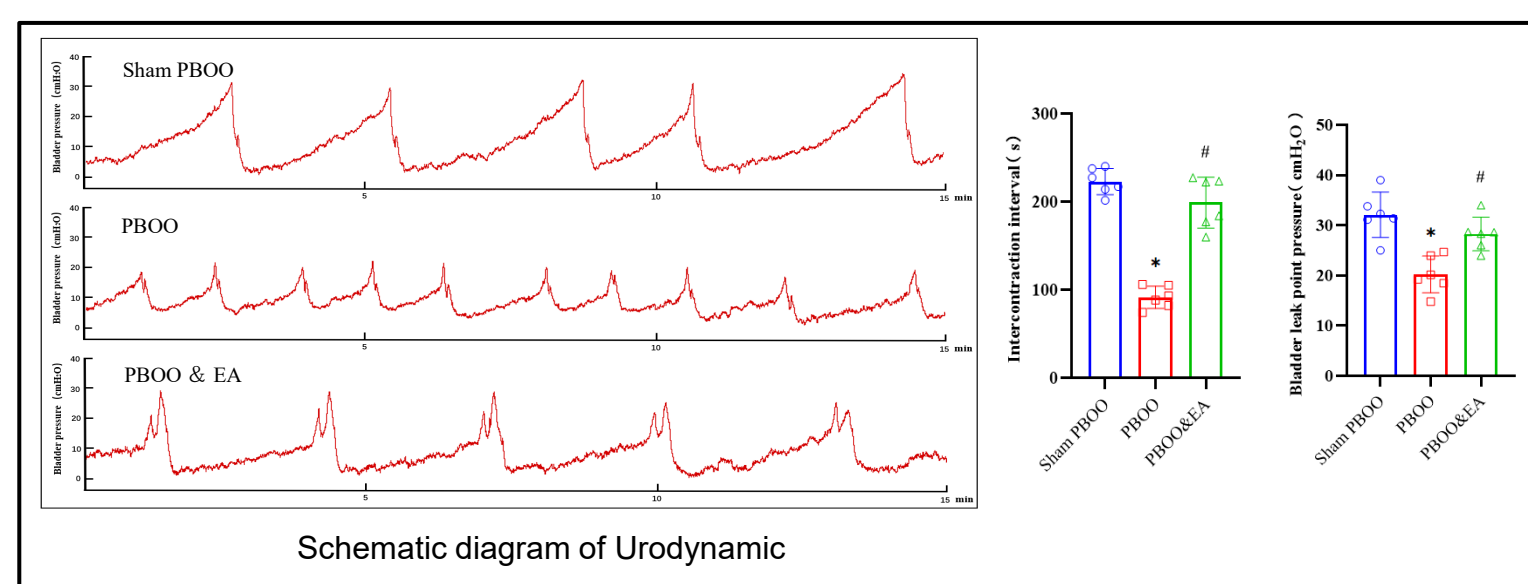
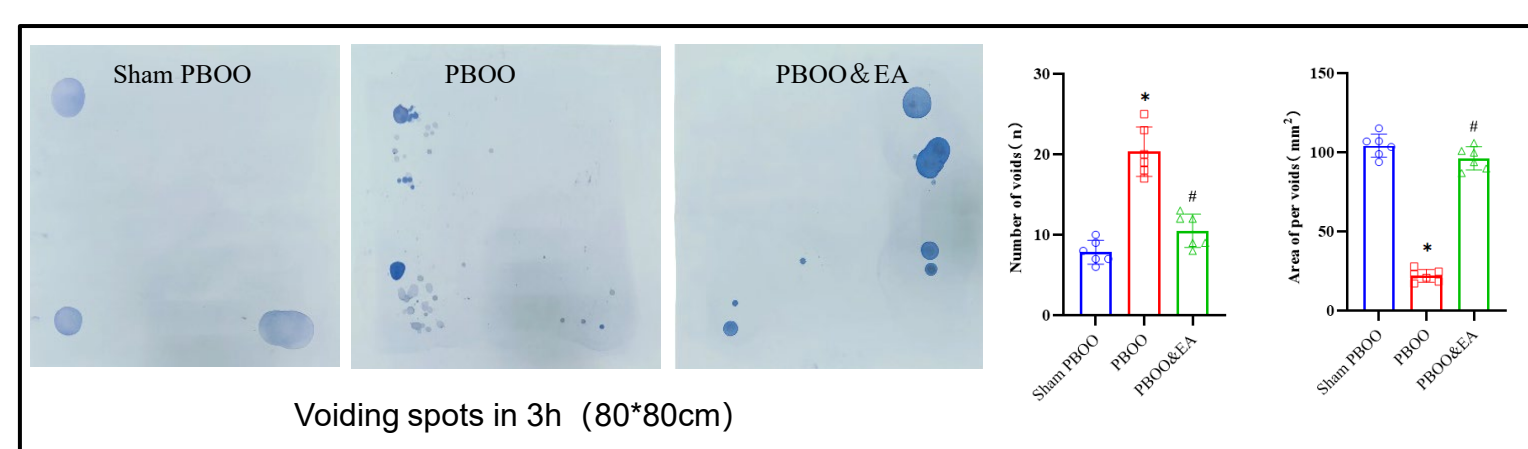
Study design, materials and methods

Eighteen female SD rats (7-week-old, 220-230g) were randomly divided into Sham partial bladder outlet obstruction (PBOO) group, PBOO group and PBOO & EA group. The EA treatment consisted of one week of needling in bilateral Ciliao (Located in the 2nd posterior sacral foramen) and Huiyang acupoint (located at anteromedial of the transverse process of the 6th lumbar spine). The EA-induced bladder functional changes were assessed by voiding spots test and urodynamic study. The expression of Piezo1 in the urothelium were detected by immunofluorescence. The expression of c-Fos in L6-S1 segments, and P2X3 in dorsal root ganglion were detected by WB. Calcium imaging was used to measure Ca²⁺ concentration in the urothelial cells. The ATP content in the urine of rats was detected by ELISA. Afferent nerve signals were observed by pelvic nerve recording, and external urethral sphincter electrical activity was observed by electromyography recording.



Results

After one week of EA treatment, the functional indices of bladder storage phase in OAB rats were significantly improved, with no significant difference compared with sham PBOO group. In addition, EA significantly reduced the expression of urothelial Piezo1 and the release of ATP in the urine, as well as inhibited the transmission of excitatory signals from the pelvic nerve to the spinal cord level.



*P < 0.05 vs Sham PBOO; # P < 0.05 vs PBOO.

Conclusions

EA significantly relieved OAB symptoms in a rat model, possibly through downregulating urothelial Piezo1 expression and attenuating its downstream mechanosensory signals from pelvic nerve to the dorsal root of spinal segment to minimize excitatory afferent inputs.