

CHANGE OF CAJAL-LIKE CELLS OF INTERSTITIAL IN DOME OF BLADDER: THE ORIGIN OF DETRUSOR OVERACTIVITY? THE RESULT OF RAT EXPERIMENT

Hypothesis / aims of study

Changes of excitability of detrusor may play a significant role in the occurrence of Detrusor Overactivity (DO). Excitability probably originates from the Cajal-like Cells of interstitial, which are very similar to the interstitial cells of Cajal (ICCs) in the enteric nervous system. If the Cajal-like cells of interstitial really innervate the spontaneously contraction of bladder detrusor, there must be a bladder pacemaker to keep the contraction smooth and coordinate. Unfortunately, there are few reports about the bladder pacemaker.

The object of the study is to establish a model of rat DO and explore the change of number, function, excitability and signal transmission of bladder Cajal-like cells of interstitial in the dome, lateral, base and triangle zone between the DO and normal rats, so as to investigate the position of bladder pacemaker and its distribution to DO.

Study design, materials and methods

Animal model: 30 female Wistar rats divided into 2 groups randomly, one group (20) carried out an operation of partial bladder outlet obstruction, the other group (10) as normal compare. 6 weeks later, urodynamic evaluation was performed.

The difference of number and distribution of Cajal-like cells of DO rat compare to normal was detected by immunofluorescence methods, expression of c-kit protein of Cajal-like cells of interstitial in different part of DO rat bladder compare to normal was analyzed through West-blot.

The relationship of HCN2 protein and Cajal-like cells of interstitial was assessed by double-labelled immunofluorescence with HCN2 and c-kit. The change of expression of HCN2 protein of different part of DO group compared to control group was analyzed on the level of protein and using Western-blot. The same method was used to research the relationship of connexin43 and c-kit, the expression of connexin43 was also analyzed by Western-blot.

Results

One rat of model group died, the rest 19 rats were evaluated by filling cystometry. DO occurred in 14 rats, 2 normal, 3 without any change of bladder pressure during test.

Immunofluorescence showed ICCs mainly located in dome of bladder in both group (DO and normal control), the number of ICCs in DO rats growth obviously in every part of bladder compare to normal group, especially in dome of bladder. Expression of c-kit protein of DO rat was obviously higher than normal control and focus on the dome of bladder

HCN2 and connexin43 was identified in Cajal-like cells of interstitial of rat bladder. The expression of HCN2 and connexin43 protein of each part of DO rat was obviously higher than its counterpart of normal rat. There was no difference of expression of HCN2 and connexin43 among four parts of bladder wall of normal rat. The expression of HCN2 and connexin43 of the dome wall of DO rat was significantly higher than other parts.

Interpretation of results

The expression of c-kit, HCN2 and connexin43 reflect the number, excitability and signal transmission of bladder Cajal-like cells of interstitial respectively. Immunofluorescence and expression of c-kit revealed the number of ICCs in DO rat growth obviously than normal control and focus on the dome of bladder. The dome of bladder is the most likely pacemaker of DO rat. The expression of HCN2 and connexin43 protein indicated the change of excitability and signal transmission of bladder Cajal-like cells of interstitial may also contribute to DO.

Concluding message

There is a significant difference of expression of c-kit, HCN2 and connexin43 between the dome wall and other parts of DO rat bladder while normal control group have not been seen. The change area of Cajal-like cells of interstitial of the dome wall of DO rat compared to its counterpart of normal rat is also larger than other parts. The quantity, function, excitability and signal transmission of Cajal-like cells of interstitial are enhanced in DO rats. All results indicated the bladder pacemaker is more likely located in the dome wall of bladder in DO rat.

References

1. Zhang ZB, Zhou DR, Song B. Gap junctional protein connexin 43 in rat detrusor muscle with unstable bladder. Chin Med J (Engl). 2008 Sep 5; 121(17):1698-701.

Disclosures

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