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INTRAVESICAL ELECTROMOTIVE DRUG ADMINISTRATION (EXPERIMENTAL STUDY)

Hypothesis / aims of study

Interstitial cystitis (IC) is a chronic clinical syndrome of obscure etiology and consequently, lacking specific treatment. The syndrome characterized by a complex of symptoms including urinary frequency, urgency, nocturia and suprapubic (urethral) pain [1]. Unfortunately conventional conservative therapy for the treatment of interstitial cystitis is poor. It is well known that insertion of some pharmaceutical substances in human tissues under the direct current provide their deep penetration and deposition [2]. This investigation is performed to study the depth of penetration of the bladder wall by a pharmaceutical substance during intravesical electromotive drug therapy and the influence of this method on the functional condition of the lower urinary tract.

Study design, materials and methods

The study was performed on 15 female dogs. They were undergone intravesical electromotive drug therapy under the general anesthesia (7 procedures, twice a week, 20min for one procedure). We used low voltage direct current for the procedures (60-80 V).The drug combination was standard in every procedure (hydrocortisone suspension 5 ml, DMSO 30%-20 ml, heparin 20000ED, lydocaine 2%-15 ml). The drug combination was inserted in the bladder via specially designed silicone catheter (14 F) with electrode inside. After this the external part of the electrode was pinched till the end of the procedure. The evaluated parameters of functional condition of the lower urinary tract were intravesical pressure, pressure-volume characteristics and bioelectrical activity of the urethra. The pressure was measured by electromanometry and simultaneously the bioelectrical activity of the urethra was determined by electromyography and tetrapolar rheography. Cystomanometry was performed on all animals under general anesthesia. Blood and vesical bladder tissues were obtained for immunofluorescent investigation before and after the experiment.

Results

Our investigation shows that mucosal and submucosal layers achieved the highest concentration of pharmaceutical substance (Lidocaine hydrochloride 0.039 $\pm$ 0.0012 and 0.0338 $\pm$ 0.0050 mkm/mg of the tissue accordingly). The vesical bladder pressure after intravesical electromotive drug therapy was lower than before the procedure at the corresponding bladder volume. The medium amplitude of spontaneous pressure fluctuations during the filling phase after the procedure was lower (3.8±0.4 cm H2O). After electromotive drug therapy the intravesical pressure during micturition was relatively lower than before the procedure (-37$\pm$1.2cm H2O, $p < 0.02$). In addition the maximal bladder capacity and its compliance after the treatment increased (+11±1.2 ml and + 3.1$\pm$ 0.7 ml/cm H2O accordingly). Measurement of the bioelectrical activity of the urethra before and after intravesical electromotive therapy was standard at the same level of bladder pressure and volume. It was relatively lower after the procedure at rest and after intravenous injection of 40 mg of Lasix.

Interpretation of results

According to our results after electromotive therapy mucosal and submucosal layers of the bladder wall can deposit pharmaceutical substance (Lidocaine hydrochloride) at a relatively high level. It positively effects on the urodynamic of the lower urinary tract. Besides intravesical electromotive drug therapy has definite spasmolitic effect on bladder wall. Decrease of the bioelectrical activity of the urethra after the treatment causes reduction of such symptoms as frequency and urgency.

Concluding message

Our investigation shows that some pharmaceutical substances can penetrate through vesical wall deeply. The method of intravesical electromotive drug therapy has successfully used in

clinical practice. This effect may serve to be the basis for new methods of treating patients with interstitial cystitis.

References

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