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A MODEL FOR INDUCING URINARY BLADDER OVERACTIVITY USING THE OXIDATIVE STRESSOR HYPOCHLORITE.

Aims of Study

Unvoluntary detrusor contractions can play a role in the development of urge incontinence. Also in vitro, contractions can be seen which develop spontaneously; a parallel with the in vivo observations is likely. Previous research showed that these spontaneously developing contractions have a faster rate of force development compared to otherwise provoked contractions. We found that it was possible to induce this muscle overactivity in a hypochlorite solution.

Methods

Urinary bladder muscle strips from pigs were mounted in a custom made organ bath and incubated for 20 minutes in Krebs solution. A baseline Electrical Field Stimulation (EFS) and a pharmacological stimulation using Acetylcholine (ACh) 10µM was applied to see if the strips were vital. When there was a force development of less than 100µN the strips were discarded. Next a 10µM hypochlorite solution was added to the organbath in order to see if the strips became overactive. Overactivity was defined as a development of more than 5 phasic detrusor contractions per minute without any other provocation in the 30 minutes following addition of hypochlorite to the solution.

Results

Of the 49 strips which were used 26 (53%) became overactive in the hypochlorite solution during 30 minutes recording. Two strips (4%) became overactive spontaneously. The time to the start of overactivity differed largely. In 76% of the overactive strips it started within 5 minutes, in 19% between 5 and 15 minutes, and in 5% it took longer than 15 minutes. Rate of force development was significantly faster compared to the provoked baseline contractions.
The overactivity could be stopped by washing out the hypochlorite for 10 minutes after which still a significant EFS and ACh stimulation was seen.

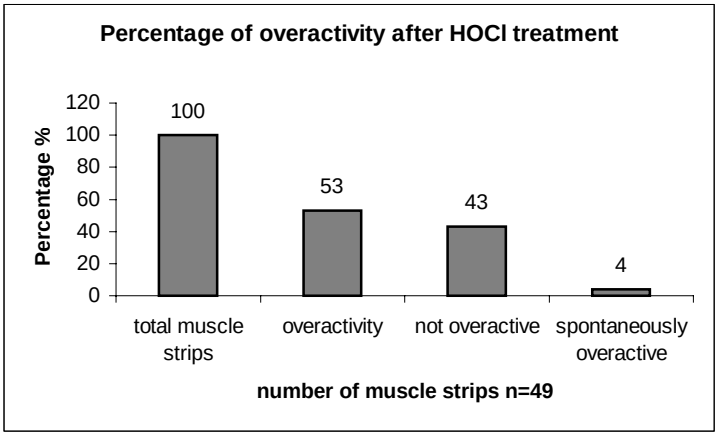

figure 1. Percentage of overactive muscle strips after adding HOCl solution

Conclusions

We can conclude that an oxidative stressor, like a hypochlorite solution, is capable of inducing smooth muscle overactivity. This in vitro model can be used for the development and testing of new treatment modalities for the overactive detrusor. In addition this study provides evidence for a causal relation between oxidative stress and detrusor overactivity. A parallel with interstitial cystitis seems likely.