

EFFICACY OF A TRANSDERMAL AMPLITUDE-MODULATED SIGNAL (TAMS) IN A CANINE OVERACTIVE BLADDER (OAB) MODEL

Hypothesis / aims of study

The aim of this study was to demonstrate the efficacy of non-invasive pudendal nerve stimulation using a novel transdermal amplitude modulated signal (TAMS) in a survival canine overactive bladder (OAB) model.

Study design, materials and methods

Isovolumetric contractions were induced in 3 male Mongrel dogs (9-15 Kg, 6+ months) by infusion of physiologic saline at 6-10 ml per minute via a transurethral Foley catheter. Animals were anesthetized using alpha-chloralose at a loading dose of 30 mg/Kg and maintenance dose of 35 mg/Kg/hr, which proved suitable for providing an adequate plane of anaesthesia while preserving the micturition reflex. Intravesical pressure was monitored by PowerLab (AD Instruments) physiologic platform. Infusion of saline was maintained then discontinued when a bladder contraction was noted. The inflated Foley catheter prevented expulsion of the bladder contents resulting in a continuous cyclic pattern of bladder contractions. Once the contractions were stabilized, TAMS was delivered non-invasively via electrodes (Noraxon, dia. 1 cm, inter-electrode distance: 2 cm or Tyco, 2.25 inches X 2.5 inches) applied to the rectal branch of the pudendal nerve. Ipsilateral anorectal muscle contraction was used as a guide for electrode placement. Waveform parameters tested include 5 Hz and 10 Hz at variable pulse widths and amplitudes. In all experiments, a carrier frequency of 210 kHz was used. A National Instrument (NI) signal generator with custom amplifier was used for signal generation.

Results

A 5 Hz, 17 V, 30 ms, TAMS waveform caused complete bladder inhibition while a 10 Hz, 1 ms signal at 10 V and 13.5 V caused only partial inhibition. Control stimulation applied with just the high frequency carrier waveform did not result in bladder inhibition. The model was unstable because of issues involving alpha-chloralose metabolism, rendering further investigation impractical.

Interpretation of results

Preliminary results indicate that the non-invasive pudendal nerve stimulation using TAMS can inhibit bladder contractions in a canine isovolumetric OAB model. The partial inhibition observed at 10 Hz may have been an outcome of using a larger footprint electrode (Tyco) and a smaller pulse width signal. Additional experiments in a feline OAB model have validated findings from the current study [1, 2].

Concluding message

Bladder inhibition in a canine OAB model was demonstrated through non-invasive stimulation of the pudendal nerve using a novel, transdermal amplitude-modulated signal. Further (clinical) studies are required to assess the usefulness of this technology in treating OAB.

References

1. Bing Shen, James R. Roppolo, Jeyakumar Subbaroyan et al., Neuromodulation of Bladder Activity by Stimulation of Feline Pudendal Nerve Using Transdermal Amplitude Modulated Signal (TAMS), Accepted for publication in Neurourology and Urodynamics, 2011.
2. Changfeng Tai, Bing Shen, Jicheng Wang, et al., Inhibition of Bladder Overactivity by Stimulation of Feline Pudendal Nerve Using Transdermal Amplitude Modulated Signal (TAMS), Accepted for publication in British Journal of Urology, 2011.

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Is this a clinical trial?	No
What were the subjects in the study?	ANIMAL
Were guidelines for care and use of laboratory animals followed or ethical committee approval obtained?	Yes
Name of ethics committee	Institutional Animal Care and Use Committee (IACUC), Ethicon, Inc.