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SPONTANEOUS CONTRACTILE ACTIVITY OF HUMAN NEUROGENIC BLADDER STRIPS: Can we predict a correlation with between clinical factors, urodynamics and histological features?

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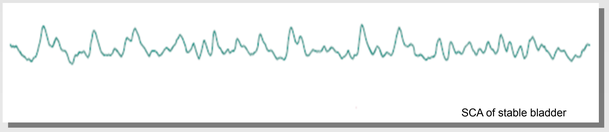
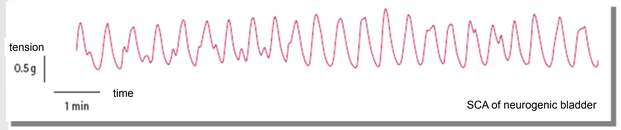
BACKGROUND

Data from animal and human experiments have shown an increased spontaneous contractile activity (SCA) developed by bladder strips from neurogenic patients. But the physiological and clinical meaning of this SCA is still unknown. A correlation between this SCA observed in vitro and datas observed in vivo, including clinical, urodynamic and histological datas has never been performed. Histological analysis of neurogenic bladder may provide additional understanding of the neurogenic bladder.





OBJECTIVES

- 1/ To determine whether there is a correlation between the SCA displayed by bladder strips from neurogenic patients, and clinical, urodynamic and histological prognostic factors.
- 2/ To determine whether there is a correlation between the histological changes observed in neurogenic bladders and clinical and urodynamic factors.

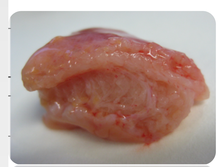
MATERIALS & METHODS

Human bladder samples preparation

Fresh human bladder samples were obtained from 34 neurogenic patients undergoing cystectomy. Detrusor strips with or without mucosa were mounted isometrically in organ baths filled with Krebs-HEPES (pH = 7.4, 37 ° C, 95% O2-5% CO2).

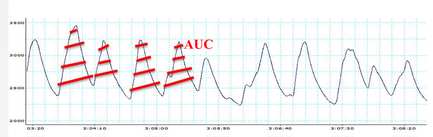
In vitro experiments on spontaneous contractile activity of bladder strips

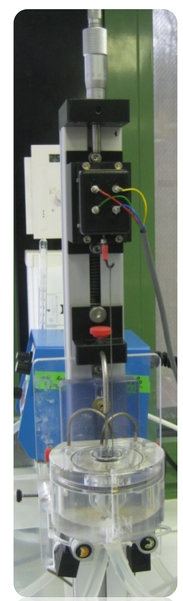
The strips were equilibrated for 90 minutes. The SCA displayed by bladder strips was recorded and phasic contractile activity was quantified by calculating the area under the force-time curve (AUC, $mg.min^{-1}$) using the low points of the phasic contractions as the baseline. Analyses were performed with Elphy, version 3.0.0.45, software (CNRS-UNIC, France).



Fresh bladder sample

Bladder strip





Organ bath

Correlation with clinical, urodynamic and histologic prognostic factors

A correlation between the AUC of spontaneous contractions of bladder strips with and without mucosa and clinical, urodynamic and histological factors was investigated. A correlation between these clinical and urodynamic factors on the one hand, and bladder inflammation, oedema and fibrosis on the other hand was investigated. Statistical tests were performed using Stata 10 software (Stata Corporation, College Station, TX). $P<0.05$ was considered statistically significant. The research was conducted in accordance with french ethical rules and autorisations.

Clinical factors

- Age at surgery
- Gender
- Neurologic disease
- Time of evolution of neurologic disease
- If spinal cord injured: level of injury and ASIA score
- Urinary continence modality
- Voiding modality
- Antimuscarinic treatment and duration
- Intradetrusor botulinum toxin injections
- Cause of surgery

Urodynamic datas

- Maximal cystometric capacity
- Maximal detrsuor pressure
- Detrusor overactivity
- Compliance disorder
- Bladder acontractility

Histological features

- Inflammation (grade 1, 2, 3)
- Oedema (grade 1, 2, 3)
- Fibrosis (< or > à 20%)

RESULTS

- A significant correlation was found between age and the AUC of spontaneous contractions developped by bladder strips (p = 0,006) but not by detrusor strips without mucosa.
- A significant correlation was demonstrated between the failure of previous treatment with antimuscarinics and the AUC of spontaneous contractions of bladder strips (p = 0,02).
- No significant correlation between AUC and urodynamic and histological data was highlighted. Only age was significantly correlated with the degree of fibrosis observed in the neurogenic bladders (p = 0,02).

CONCLUSIONS

- The pathophysiology of abnormal bladder behavior in patients with neurological damage is still poorly understood. This first work highlights that the correlation between the SCA of bladder strips with various clinical, urodynamic and histological prognostic factors is not evident. Nevertheless, SCA analyzed from neurogenic bladder strips is particularly abnormal and may result from a chain of myogenic and neurogenic disorders. Understanding the origin and meaning of the SCA of bladder could help in identifying new therapeutic strategies for detrusor overactivity. This type of study on fresh human bladders is promising and should be continued by creating an international data base.