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MYOGENIC BASIS OF DETRUSOR OVERACTIVITY : CORRELATION OF ULTRASTRUCTURAL FEATURES IN NEUROGENIC AND NON-NEUROGENIC OVERACTIVE HUMAN DETRUSORS

Hypothesis / aims of study

Our previous ultrastructural studies have demonstrated a relative abundance of ultraclose junctions compared with normal intercellular junctions in patients with non-neurogenic detrusor overactivity and reduced detrusor compliance (1). It is postulated that these abnormal junctions may represent gap junctions capable of rapid intercellular conduction that allow spontaneous electrical activity to spread, causing involuntary detrusor contraction. A further study demonstrated increased expression of connexin 43 and 45, the commonest isoforms of gap junctional proteins in the detrusor muscle of patients with non-neurogenic detrusor overactivity and poor compliance compared to controls (2). The aim of this study was to compare ultrastructural features using the same standardised protocol in patients with neurogenic and non-neurogenic detrusor overactivity.

Study design, materials and methods

Detrusor muscle biopsies were obtained at cystoscopy from 8 patients, 2 with urodynamically proven neurogenic detrusor overactivity (DO), 4 patients with non-neurogenic detrusor overactivity and 2 controls (normal urodynamics). The muscle biopsies were processed for transmission electron microscopy. Previously established diagnostic criteria were used for ultrastructural analysis (myocyte irregularity, myocyte cell separation, collagenosis, normal and abnormal intercellular junctions). Intercellular junctions were counted in at least 20 micrographs including over 200 myocyte profiles and a ratio was obtained expressing the number of abnormal protrusion junctions and ultraclose abutments to normal intermediate junctions.

Results

Abnormal intercellular junctions (protrusion and ultra-close abutments) were identified on electron microscopy in both controls and patients with DO. However the dysjunction pattern with predominance of abnormal intercellular junctions was present in biopsies from patients with neurogenic and non-neurogenic detrusor overactivity. The mean ratio of abnormal to normal junctions was 17.5:1 in patients with neurogenic DO, 4.3:1 in patients with non-neurogenic DO and only 0.9:1 in controls.

Interpretation of results

The detrusor ultrastructure of patients with neurogenic and non-neurogenic detrusor overactivity is remarkably similar with predominance of the dysjunction pattern and increased numbers of abnormal intercellular junctions relative to normal intermediate cell junctions. This suggest the presence of a common myogenic effector mechanism contributing to the pathogenesis of the overactive detrusor contraction.

Concluding message

We have demonstrated similar ultrastructural features in detrusor biopsies of patients with neurogenic and non-neurogenic detrusor overactivity. In particular there is increased numbers of abnormal intercellular junctions found on transmission electron microscopy and support the hypothesis of a common myogenic mechanism for the generation of the overactive detrusor contraction in patients with neurogenic and non-neurogenic overactive bladder.

References

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2. Brammah S, Chan L, Tse V, Wills E. Myogenic basis of detrusor overactivity: correlation of gap junctional protein expression and ultrastructural features in the overactive human detrusor J Urol.2007;177(4):326

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