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SERUM CALCIUM AND MAGNESIUM LEVELS IN WOMEN WITH DETRUSOR OVERACTIVITY

Hypothesis / aims of study

Detrusor Overactivity (DO) is the second commonest cause of urinary incontinence after urodynamic stress incontinence (USI), accounting for 30-50% of cases investigated. Patients most commonly present with 'irritative' symptoms comprising mainly of frequency, urgency, nocturia and urge incontinence. The pathophysiology of DO remains a mystery. In-vitro studies have shown that the detrusor muscle in DO contracts more than normal detrusor muscle. The importance of calcium ions in the excitation and contraction of muscles is well recognized and calcium entry from the extracellular space causes bladder smooth muscle activation. Magnesium affects the transport of calcium ions by antagonizing their transport through the smooth muscle membrane. In-vitro studies have shown that magnesium inhibits calcium ion influx across human detrusor membrane and reduces muscle contractions spontaneous or induced (Montgomery et al. 1992) [1]. Any manipulation of these may improve bladder function. This study was therefore conducted to determine whether abnormal serum levels of magnesium and calcium occur in women with detrusor overactivity and to compare the results with the serum level of magnesium and calcium ions in women with urodynamic stress incontinence.

Study design, materials and methods

This is a pilot study, which was approved by the local ethical committee. All participants were in good health with no intercurrent medical problems.
20 women with urodynamically proven detrusor overactivity were recruited into the study.
In addition 20 women with urodynamic stress incontinence (USI) and no evidence of DO were recruited as controls.
Each woman gave fully informed consent prior to recruitment into the study.
All patients underwent clinical evaluation and pelvic examination, urine culture, frequency /volume chart and cystometry.
A blood test was taken to determine serum levels of total magnesium, free and corrected calcium and liver functions tests immediately following the confirmatory urodynamic studies.
Hospital notes were examined for patient's demography.
Exclusion criteria included active urinary tract infection, concurrent magnesium or calcium supplements, abnormal liver function tests, neurological disease, impaired renal functions, poorly controlled diabetes mellitus, and use of drugs affecting lower urinary tract (including anticholinergics).
The types of variables being measured are continuous and therefore a normal distribution is appropriate. Both non-parametric (Mann-Whitney) and parametric (two sample t-test) were used to compare the two groups with respect to the variables Calcium (Ca), Ca corrected (Ca Corr), Magnesium (Mg), Calcium and Magnesium ratio (Ca: Mg), Calcium Corrected and Magnesium ratio (Ca Corr: Mg) and Phosphate.

Results

The age range was 38-73 years with mean age of 55 years. The results are shown in Table 1.
The mean, median and standard deviation of the two groups are very similar for each of the variables with all p-values > 0.05. Therefore, there is no evidence to suggest that there is any statistically significant difference between detrusor overactivity and urodynamic stress incontinence with respect to these variables.

Table 1 GROUP STATISTICS

GROUP		N	Mean	Median	Std.Deviation	Std. Error Mean	p - value (Mann-Whitney)	P-value (t-test)
Calcium(Ca) mmol/L	**DO**	20	2.440	2.4200	0.106	0.024	0.6748	0.62
	USI	20	2.458	2.4450	0.127	0.028		
Ca Corrected mmol/L	**DO**	20	2.382	2.3650	0.109	0.024	0.7452	0.68
	USI	20	2.398	2.3700	0.129	0.029		
Magnesium(Mg) mmol/L	**DO**	20	0.8820	0.88500	0.0625	0.014	0.5971	0.71
	USI	20	0.8905	0.90000	0.0790	0.018		
Ca : Mg	**DO**	20	2.770	2.7900	0.220	0.049	0.6358	0.94
	USI	20	2.777	2.7050	0.330	0.074		
Ca Corrected : Mg	**DO**	20	2.708	2.7150	0.223	0.050	0.6948	0.97
	USI	20	2.712	2.6250	0.340	0.076		
Phosphate	**DO**	20	1.098	1.0600	0.159	0.036	0.5607	0.66
	USI	20	1.076	1.1050	0.165	0.037		

[N] is the number of women in each group.
DO (Detrusor overactivity)
USI (Urodynamic stress incontinence)

Reference values: Calcium (2.10-2.70mmol/l), Calcium corrected for Albumin (2.10-2.70mmol/l), Magnesium (0.7-1.0mmol/l) and Inorganic Phosphate (0.8-1.4mmol/l)

Concluding message

This study suggests that serum calcium and magnesium levels are not altered in women with detrusor overactivity compared with controls. Manipulation of serum levels using magnesium and /or calcium supplements would appear to have little role to play in the therapeutic treatment of overactive bladder syndrome.

References

1. Montgomery BS, Thomas PJ, Fry CH. The action of extracellular magnesium on isolated human detrusor muscle function. Br J Urol 1992; **70:** 262-268