DP 28

Effect of oral magnesium therapy on spasticity and constipation in children with spastic cerebral palsy

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OBJECTIVES

The aim is to study the therapeutic and adverse effects of oral magnesium sulfate therapy on spasticity and constipation in children with spastic cerebral palsy suffering from chronic constipation.

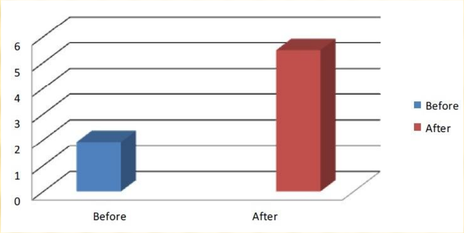

Figure (1): Frequency of bowel movements per week before and 1-month after Magnesium sulfate therapy

Table (1): Constipation before and after oral magnesium therapy

Constipation	Before (n=30) No.	%	After (n=30) No.	%	P-value
Yes	19	63.3%	7	23.3%	0.000
No	11	36.7%	23	76.7%	
Total	30	100.0%	30	100.0%	

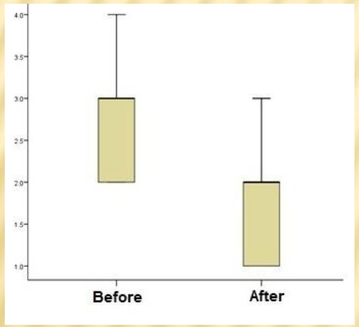

Figure (2): Modified Ashworth scale before and 1-month after Magnesium sulfate therapy

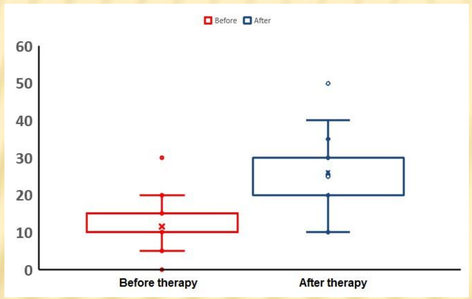

Figure (3): Passive Ankle joint dorsiflexion degree before and 1-month after Magnesium sulfate therapy

Table (2): Comparison of spasticity assessment tools delta change before and after magnesium sulfate therapy:

Total n.=30 pt.	Before	After	Delta change Mean ± SD	p
MAS Mean ± SD	2.73 ± 0.64	1.73 ± 0.64	-38.61 ± 9.15	0.000
AJDF-ROM (^{0}) Mean ± SD	11.5 ± 17.82	26.00 ± 33.27	14.5 ± 5.62	0.000

Paired t-test used for comparison MAS= Modified Ashworth scale.
AJDF-ROM= Ankle Joint Dorsiflexion range of motion (ROM) by hand held goniometer.
Pt = patient

METHODS

A pilot exploratory, intervention, prospective cohort study. Conducted in the Neurology clinic, Children's hospital, Faculty of Medicine, Ain shams University. Part of study registered with **ClinicalTrials.gov Identifier:** NCT02510222. From May 2015-January 2016

Design: Oral magnesium sulfate (OMg) 10 mg/kg/day as a single dose given regularly in the morning daily for 1 month. Modified Ashworth scale, Ankle joint dorsiflexion range of motion by hand held goniometer , and constipation ROM lll criteria, were assessed at enrollment and 1 month after regular OMg therapy.

Eligibility: Children with spastic cerebral palsy and constipation, age below12 years, presence of spasticity without joint contracture, constipation (presence of at least 2 of the following: 2 motions/ week, history of painful or hard bowel movement, and presence of large diameter stools that may obstruct the toilets), acceptance of caregivers to participate in the study and signing the written consent.

Exclusion: Children with severe growth retardation (<10th centile for weight and length in charts for children with cerebral palsy), gastrostomy tube feeding, joint contractures, congenital malformations& suspected inborn error of metabolism or inherited neurologic disease, presence of cardiac, renal, GIT problem or chronic diarrhea.

Primary Outcome Measure:

Decrease in muscle tone and improved constipation after 1 month.

RESULTS

Thirty out of 50 enrolled children with spastic CP completed the study, age 2.2 – 12 years (Mean ± SD 6.27 ± 2.84), 21 males (70%) and 9 females (30%), 25 spastic quadriplegic CP (83.3%) and 5 spastic diplegic CP (16.7%). Twenty children were excluded (12 were not on regular treatment, and 8 lost follow up).

Statistically significant increase in bowel movements per week after 1 month of OMg therapy, before therapy (mean ± SD = 1.92±0.57) compared to after therapy (mean ± SD = 5.48 ± 0.77); p = (0.001), Figure (1).

Before therapy 19 (63.3%) had constipation , decreased to 11 patients (36.7%) after 1-month of OMg therapy, p = (0.000). Table (1)

Statistically significant reduction in Modified Ashworth scale, Figure (2); and increased passive Ankle joint dorsiflexion range of motion (degree) by hand held goniometer Figure (3) after Omg therapy, p=0.000. Table (2).

DISCUSSION

Children with cerebral palsy (CP) often experience comorbidities as muscle spasticity **(Gonzalez et al., 2000)** and constipation **(Rivi et al., 2014)**. Spasticity is a complex problem that requires specialists (neurologist, rehabilitation doctor, occupational therapist, orthopedic surgeon, general practitioner, etc.) to work as a team in order to achieve the goals set out **(Vivancos-Matellano et al., 2007)**. Constipation is considered a frequent problem in spastic CP children due to reduced mobility, difficulties in feeding and as a side effect of many muscle relaxing medications. It is estimated that 74% of children with cerebral palsy suffer from constipation **(Faleiros-Castro and de Paula, 2013)**.

In our work, the effect of oral magnesium sulfate on muscle spasticity and constipation in children with cerebral palsy was studied. There are decrease in spasticity and consequently increased ankle range of movement, together with treatment of constipation.

Magnesium sulfate has a historically famous role as a muscle relaxant. It has a pre-synaptic effect by inhibiting acetylcholine release at motor nerve terminals. Furthermore, some studies have shown that increasing extracellular magnesium reduces the size of acetylcholine-evoked responses at the mouse end-plate **(Grassi & Degasperi, 2000)**. Being an osmotic laxative **(Vu et al., 1999)**, it acts by accelerating small intestinal transit and reducing the intestinal absorption of fat, protein and carbohydrates following solid meal ingestion **(Holgate & Read (1983)**; it tends to increase the frequency and weight of stools **(Gomes et al., 2011, Ikarashi et al., 2011)**.

The efficacy of intravenous magnesium sulfate infusion were proved in treatment of painful nocturnal leg cramps **(Deiner and Westphal, 2013)**, the control of rigidity and muscle spasms in adults with tetanus **(Mathew et al., 2010)**, and treatment of persistent pulmonary hypertension in newborn **(Yoshioka et al., 2001)**. Also, it reduces rocuronium (neuromuscular blocking agent) requirements and postoperative analgesic consumption in children with CP undergoing orthopaedic surgery **(Na HS et al., 2010)**, but was not effective as a muscle relaxant in complex regional pain syndrome related dystonia **(van der Plass et al., 2013)**.

CONCLUSIONS

- Muscle spasticity and constipation markedly improved in children with spastic cerebral palsy treated with oral magnesium sulfate for 30 days, with no recorded adverse effects.
- Longer duration of therapy with oral magnesium sulfate for children with spastic CP will be considered, to find out its exact benefits and side effects.
- We recommend oral magnesium sulfate use as a standard therapeutic protocol for treatment of spasticity and constipation in children with cerebral palsy.

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