



ORIGINAL RESEARCH PAPER

Physical Medicine & Rehabilitation

THE EFFECT OF OXYBUTYNNIN ON NEUROGENIC DETRUSOR OVERACTIVITY IN SPINAL CORD INJURY PATIENT: A HOSPITAL BASED INTERVENTIONAL STUDY

KEY WORDS: Spinal cord injury, Urodynamic study, Oxybutynin

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ABSTRACT

Neurogenic bladder dysfunction is one of prominent impairments following Spinal Cord Injury (SCI) and is seen in 90% of patients. This study has been undertaken to correlate the effect of anticholinergic drug (oxybutynin) on urodynamic parameters in neurogenic bladder of SCI patients. This is a hospital based non randomized prospective interventional study. After initial baseline urodynamic study, patients with detrusor areflexia were excluded from the study group and thirty patients showing detrusor overactivity and detrusor sphincter dyssynergia were treated with oral oxybutynin 5 mg for 7 days followed by repeat urodynamic evaluation thereafter. Our study concluded that mean bladder compliance improved from 6.114 to 17.95 ml/cmH₂O after intervention and mean bladder capacity also increased after intervention (229.7ml) from (165.3ml) and changes were statistically significant. Antimuscarinic (Oxybutynin) is an effective drug in management of neurogenic bladder in SCI patients increases bladder compliance and capacity and results are objectively achieved within seven days

INTRODUCTION

Neurogenic bladder dysfunction is one of prominent impairments following Spinal Cord Injury (SCI) and is seen in 90% of patients.¹ Neurogenic detrusor overactivity can cause renal function deterioration and renal failure which is one of the leading causes of mortality in SCI. Bladder function is the most important goal for SCI individuals, more important than recovery in ambulation or chronic pain reduction.

Even though many options are available but conservative medical therapy is the first choice for treatment of patient with neurogenic detrusor overactivity. Oxybutynin is a tertiary amine having an active metabolite, N-desethyl oxybutynin and effect of oral oxybutynin is due to exerted by this metabolite. Effectiveness of oral oxybutynin in overactive bladder is probably due to its antimuscarinic action.²

Both clinical observation and urodynamic data gathered after the resolution of spinal shock should take into account before managing neurogenic bladder dysfunction.

Efforts should be targeted to keep bladder storage pressures below 40 cmH₂O, since higher pressures carry a high risk of renal dysfunction and vesico-ureteric reflux.

Bladder compliance must also be maximized since it is known that compliance less than or equal to 12.5 cmH₂O/ml results in upper tract deterioration and pyelonephritis.³

The effect of various anticholinergic agents in SCI patients has been evaluated widely but it's effect on urodynamic parameters and tolerance has not been studied in Indian population.

This study has been undertaken to correlate the effect of anticholinergic drug (oxybutynin) on urodynamic parameters in neurogenic bladder of SCI patients.

MATERIALS AND METHODS

Patients enrolled in the study were inpatients of Department of Physical Medicine and Rehabilitation, SMS Medical College and hospital, Jaipur. Individuals aged 18 years and above with SCI of more than three months duration were eligible for the study. Written and informed consent was taken for each individual, Medical and Surgical conditions that interferes with UDS study and drugs interfering with bladder

behavior and detrusor areflexia were the exclusion criteria. Baseline information including age, sex, education level, marital status, mode of injury, ASIA scale, neurological level, bladder emptying techniques used were recorded. The present study was approved by the ethics committee of SMS medical college Jaipur which is in accordance with Declaration of Helsinki.

Laborie urodynamic machine in the department of PMR, SMS Medical College was used in this study. The patients were placed in supine position and normal saline at room temperature was infused into the bladder through a double lumen catheter at a rate of 10 ml/min (according to International continence society guidelines) and intravesical pressure was recorded. The abdominal pressure was recorded via a rectal balloon catheter. Through multichannel pressure transduction, intravesical and intraabdominal pressures were simultaneously measured/recorded on a strip chart recorder. Sphincter EMG was performed using patch electrodes (Ambu blue sensor NF) placed at the 2 and 10 o'clock positions around the anus.

Maximum cystometric capacity, bladder compliance was recorded during UDS.

Cystometric capacity defined as bladder volume at the end of the filling cystometrogram. Bladder filling was stopped if the patient had leakage, reported urgency or if 500 ml of normal saline has been infused. Compliance was defined as the relationship between change in bladder volume and change in detrusor pressure, and was calculated by dividing the volume change by the change in detrusor pressure during that change in bladder volume.

After initial baseline urodynamic study, patients with detrusor areflexia were excluded from the study group and patients showing detrusor overactivity and detrusor sphincter dyssynergia were treated with oral oxybutynin 5 mg for 7 days followed by repeat urodynamic evaluation thereafter.

RESULTS

A total of thirty (n=30) patients who satisfied the inclusion criteria were recruited in this study. Most of the study population belonged to ≤30 years age group (53.3%) followed by 31 – 40 years age group (33.3%). Most of the study subjects were male (93.3%) and only 6.7% were female.

Table 1: Bladder pattern in different Neurological level

Neurological level	Bladder pattern				Grand Total	
	DH		DH With DSD		N	%
	N	%	N	%		
Cervical	3	25.0	9	75.0	12	100
Dorsal and lumbar	5	27.8	13	72.2	18	100
Grand Total	8	26.7	22	73.3	30	100

Chi-square = 0.446 with 2 degrees of freedom; P = 0.800

Present tables shows that 75% of patients with cervical level and 72.2% patients with dorsal and lumbar level had DH with DSD bladder pattern. Application of Chi square test showed that neurological level was not associated with bladder pattern (P=0.800).

Table 2: Comparison of Bladder compliance before and after intervention

Bladder compliance (ml/cmH ₂ O)	Mean	Std. Dev.
Before intervention	6.114	10.59
After intervention	17.95	33.16

Mean bladder compliance had significant improvement from 6.114 to 17.95 ml/cmH₂O after intervention, and application of t test showed that this improvement was statistically significant (p=0.023).

Table 3: Comparison of Bladder Capacity before and after intervention

Bladder capacity (ml)	Mean	Std. Dev.
Before intervention	165.3	166.9
After intervention	229.7	189.7

Unpaired t test: t = -3.872 with 29 degrees of freedom; P < 0.001 (S)

Mean bladder capacity was higher after intervention (229.7ml) as compared to before intervention (165.3ml). Application of paired t test shows that this increase in bladder capacity after intervention was statistically significant (P<0.001).

DISCUSSION

Early diagnosis and treatment of neurogenic bladder dysfunction is essential to prevent irreversible damage of urinary tract function and potential life threatening complications. Little is known about bladder function in the acute phase of SCI and it is difficult to predict bladder and sphincter behavior on the basis of clinical somatic neurological deficits. Urodynamic studies are an established method of evaluating patients with voiding dysfunction but urological assessments are often postponed to several months post injury. Initially most patients have incontinence episodes and were managed conservatively through patient education including timed voiding, medications, intermittent catheterization or an indwelling catheter. Anticholinergic treatment is the first line therapy for neurogenic detrusor overactivity. Anticholinergics inhibit the binding of acetylcholine to the muscarinic receptors (M3) in the detrusor muscle thereby suppressing involuntary bladder contractions. The common side effects of anticholinergics includes dry mouth, constipation and blurred vision results in significant discontinuation of these drugs. Failure of one antimuscarinic drug formulation necessitates that an attempt may be made to increase dosage or to change the drug or offer a combination of drugs but this must always be supported by urodynamic findings.

Our study observed the effect of oxybutynin in SCI patients with detrusor overactivity at minimum possible dose of 5mg once daily. The onset of clinical efficacy of oxybutynin occurred within 1 week⁴ which was confirmed through repeat UDS after 7 days. Many studies support our finding that drug effect is usually seen within 7 days of treatment and UDS in SCI

patients is essential not just as a baseline evaluation, but also as a follow-up assessment.

Reference on the desirable interval of UDS is still lacking but our findings suggest that continued follow-up at frequent intervals is necessary to preserve the upper urinary tract and prevent deterioration, although this may still occur despite an efficient bladder management program and LUT integrity.

Our study concluded that mean bladder compliance improved from 6.114 to 17.95 ml/cmH₂O after intervention and mean bladder capacity also increased after intervention (229.7ml) from (165.3ml) and changes were statistically significant.

Kim YH et al⁵ compared urodynamic parameters in SCI patients using oxybutynin with those who were not on any drugs and concluded that oxybutynin improves bladder compliance and reduce upper tract deterioration.

IK Singh et al⁶ showed in children with neurogenic bladder there is significant improvement in all the urodynamic parameters after treatment with oxybutynin as well as tolterodine.

Elham Azimineko et al⁷ compared oxybutynin with tolterodine in women with neurogenic detrusor overactivity and showed that mean improvement was larger for oxybutynin in terms of urgency and urge incontinence.

There was no significant correlations statistically between neurological level of injury and type of neurogenic bladder pattern. In our study while emphasizing the importance of urodynamic study have excluded all those neurogenic bladder patterns which were lower motor neuron in function as aim of this study was to study the effect of anticholinergic drug.

Various studies in past had shown that there is no correlation between neurogenic injury pattern and type of neurogenic bladder pattern.

Kyle J et al⁸ concluded that patients with a single level of SCI, there is significant association between the level of injury and the type of voiding dysfunction while patients with combined suprasacral and sacral injuries, as identified with precise spinal imaging techniques, had relatively unpredictable urodynamic findings.

Mrinal Joshi et al⁹ also showed that somatic neurologic findings, spinal imaging, and urodynamic findings were not correlative. They suggested that bladder management should not completely rely on clinical bladder evaluation or neurological examination alone, but should always include urodynamic studies.

CONCLUSION

Neurogenic bladder reduces quality of life in individual with SCI. The present study attempted to address it by showing that most of the patient with different level of injuries have detrusor dyssynergia and detrusor overactivity.

Antimuscarinic (Oxybutynin) is an effective drug in management of neurogenic bladder in SCI patients as it increases bladder compliance and capacity. These results are objectively achieved within seven days. and the finding are supported by many studies done in past.

Further studies are required to compare the effect of oxybutynin with newer agents and it remains low cost effective drug to manage neurogenic bladder in Indian context.

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