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Rehabilitation Outcome in Reflex Bladder in Spinal Cord Injury Patients – A Comparative Study of Early & Late Intervention

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Abstract
Background: *Renal failure and other urinary tract complications were the major causes of mortality in patients with spinal cord injury. Effective early rehabilitation will prevent the onset of complications, reduce the mortality, morbidity and improve the quality of life too.*
Objectives
1. *To compare the effects of early and late rehabilitation on the functional outcome of reflex bladder in spinal cord injury patients.*
2. *To study the associated demographic factors.*

Settings and Design: *Randomized control trial study conducted in a tertiary level multispecialty hospital.*
Materials and Methods: *44 patients with traumatic spinal cord injury participated in this study. These patients are divided into 2 groups. Group A before 3 months and group B after 6 months. All patients were given same urological rehabilitation. Patients are then reassessed after 3 months and 6 months by clinical, laboratory and Ultrasound KUB examinations.*
Results: *The main age group affected are between 31-40 yrs and males are more affected. There is a decrease in residual urine volume and recurrent symptomatic bacteriuria after treatment in both groups, more in group A. Significant increase in bladder capacity in noted in group A. Raised renal function tests was seen in group B only. Significant bladder wall thickening and hydronephrosis were observed mainly in group A.*
Conclusion: *Early urological rehabilitation optimizes the bladder functions and prevents the complications.*
Keywords: *Reflex bladder, residual urine volume, urological rehabilitation.*

Introduction

Spinal cord injury is common throughout the world. In India the most common cause of injury is fall from trees, buildings etc. In western countries, the commonest cause is road traffic accident. Urologic care of patients with SCI is one of the most important factors to define their prognosis and quality of life. The long term prognosis and survival of patients with spinal cord injury has improved dramatically since Second World War due to the development of specialised spinal injury units and the improved understanding of the pathophysiology of the condition. Until the mid 1970s, renal failure and other urinary tract complications were the major causes of mortality in patients with spinal cord injury. The decline in renal failure as a major cause of death in spinal cord injury reflects a better understanding of the mechanisms involved and improved management of both paraplegic and quadriplegic patients.

There are many types of bladder and urinary tract dysfunction depending upon the site of injury. Several classifications have been developed. One is a modification of the classification by Perkash[1]. In this, depending upon the level of neurological lesion, it is divided as uninhibited, UMN, LMN, mixed type' A, mixed type B and myogenic detrusor insufficiency. The commonest is the reflex bladder or UMN bladder or spastic bladder. Here the site of lesion anywhere between the Pons & sacral micturition centres, the 1atter remaining intact. The spinal micturition is centre rendered spastic. Urodynamically, the external urethral sphincter co-contracts with the detrusor resulting in detrusor-external urethral sphincter dyssynergia.

There will be a hyperactive bulbocavernosus reflex and a reduced bladder capacity of usually less than 300 ml. The resulting high voiding pressure leads to progressive detrusor hypertrophy with potential vesico ureteric reflux. Maintenance of normal voiding pressures of the bladder detrusor appears to be the key issue[2].

Spinal lesions above Tl0 tend to result in additional increases in sympathetic discharges from T11-T12, with an increase in tension of the internal sphincter mechanism resulting in detrusor – internal sphincter dyssynergia.

Complications of reflex bladder are primarily related to the high out flow resistance owing to detrusor- sphincter dyssynergia. A vicious cycle starts to build up when the spastic detrusor is allowed to work against high outflow resistance with elevated voiding pressures of more than 80 to 90 cm H20. The consequences are progressive detrusor hypertrophy and an increase in residual mine volumes of more than 100mI, causing recurrent urinary tract infections. Both the increased pressure work of the detrusor and the frequently coexisting cystitis promote higher levels of cord spasticity and dyssynergia. The development of ureteric hypertrophy with dilatation, pseudodiverticula formation of the bladder and vesicoureteric reflux with progressive destruction of the upper tracts is the sequalae[3].

For evaluation of a reflex bladder, detailed history including urologic is to be made first. Urologic history should includes bladder sensation, frequency of micturition, type of voiding, any incontinence, response to supra pubic tapping, fluid intake and output over 24 hours, past histories of urinary tract infection or operations, status of hand function, availability of support system etc.

Neurological examination should include current mental status, neurological level and presence of spinal shock. Rectal examination includes anal sensation and tone, presence of bulbocavemosus reflex, voluntary anal contraction, and prostate examination in male and degree of vaginal support in women. Residual urine volume should be estimated frequently.

Laboratory Tests

Routine blood examination should be done to assess the haemoglobin level and E.S.R. Routine urine examination is done to determine whether there is infection. Urine culture and sensitivity

examination is done to find the antibiotic sensitivity. Serum creatinine and blood urea values give base line information about kidney function. Ultrasound of the kidneys, ureters and bladder (USG KUB) is useful for the detection of vesicoureteral reflux, bladder wall thickness, trabeculations, sacculations, hydronephrosis and calculi. Before starting bladder retraining program, diagnostic urodynamic study should he done. The lower urinary tract should be free from infection.

Shirley MeCluer[4] says that the principles of management of a neurogenic bladder are to achieve low pressure bladder filling, and no more than 0-1 UTI's per year. This is accomplished by:

1. Drinking - voiding - catheterisation schedule
2. Bladder stimulation by suprapubic tapping
3. Drugs: Anticholinergics
4. Denervation procedures: Pudental nerve block and neurectomy
5. Other Surgical procedures: sphincterotomy, bladder augmentation, continent diversion.

Drinking schedule

400 ml with major meals (break fast, lunch, and supper), 200 ml at 10 AM, 2 PM, and 4PM to a total of 1800 ml/24 hr.

Voiding / Catheterisation schedule

Void / catheterise on awakening, 1 ½ hrs after main fluid intake, every 2 -3 hrs, before going to bed and once in the night.

Clean Intermittent catheterization using a sterile technique was introduced by Guttmann and Frankel. Lapides et al.25 in 1972 proposed a nonsterile but "clean" technique for the management of chronic retention and infection[5]. After the procedure, patients wash their catheter with soap and tap water so that they can reuse the same catheter.

Voiding technique: This is by stimulation of bladder affected through suprapubic tapping. The patient taps with finger tips over the suprapubic area of the abdominal wall. This produces a mechanical stretch of the bladder wall and subsequent contraction. Controlled studies have shown that deeper indentation of the bladder with a jabbing technique is the most effective maneuver.[6].

Drugs - Anticholinergics are used to control detrusor over activity by blocking acetyl choline receptor sites. Oxybutynin exerts a direct antispasmodic effect on the smooth muscle cell membrane (musculotropic effect) and to a lesser extent, inhibits the muscarinic action of acetyl choline on smooth muscles. It increases bladder capacity and decreases urgency, frequency and incontinence. Dose is 5 mg bid/tid/ qid[7]. Tolterodine tartrate is a new generation anticholinergic which reduces frequency, urgency or incontinence[8]. Dose is 2 mg bid. Intravesical therapy with Botulinum A toxin, given by injection at 30 to 40 sites in the bladder wall reduces or abolishes hyperactivity for up to 6 months[9].

Denervation procedures can be considered for selective patients. They can be done at the root (e.g. sacral rhizotomy), peripheral nerve (e.g. unilateral pudental nerve block or neurectomy) or at the perivesical area (i.e. gangliectomy) [10].

Transurethral sphincterotomy is considered in male patients with frequent episodes of autonomic dysreflexia due to hyperreflexic detrusor - external sphincter dyssynergia despite pharmacological measures and intermittent clean catheterisation[11].

Bladder augmentation (augmentation cystoplasty) can be considered to increase bladder capacity and to reduce intravesical pressure. It is indicated in contracted bladder. The distal ileum is usually used. Increased mucus secretion which can be annoying can be modified by daily clean intermittent catheterisation with bladder irrigation [12,] Continent diversion uses bowel not just to increase bladder capacity, but also to form a continent catheterisable channel which opens into the abdominal wall. Compliance with daily intermittent clean catheterisation is mandatory after augmentation cystoplasty[13].

Urinary tract infection is the most common complication. The major causative organism is E. Coli. It is not recommended to treat asymptomatic bacteriuria with no evidence of tissue invasion [14].

Lower urinary tract changes: Trabeculations, sacculations and diverticula formation can occur when obstruction and pressure are high.

Ureteral reflux or high bladder pressure in the absence of reflux can cause upper tract dilatation Hydro/ uretero nephrosis. Most common cause of urinary tract calculi is infection (mainly urea splitting bacteria). Pyelonephritis is associated with vesicoureteric reflux, kidney stones and outlet obstruction. This can lead to renal function deterioration[15].

Materials & Methods

Study Design: Randomized control trial study

Study Setting: Patients with spinal cord injury attending a tertiary level multispecialty hospital in Kozhikode, Kerala were selected for this study. Complete history of the patients including details of spinal cord injury, frequency of micturition, method of voiding, bladder sensation etc. was taken. Physical examination included tone & voluntary contraction of anal sphincter, bulbocavernosus reflex, measurement of residual wine volume at the end of micturition, presence of perianal sensation etc. Cystometrogram was then performed.

Laboratory tests:

- Blood & urine R/E.
- Urine C/S.
- Blood urea, S. creatinine.
- U.S.G. KUB: to rule out bladder wall thickening, hydro- uretero- nephrosis, calculi etc.

Examination & investigations are repeated after 3 months and 6 months.

Method

44 patients who give valid written consent and satisfying inclusion criteria were selected and distributed into two equal groups. Group A & group B. Group A is between 2 and 3 months after spinal cord injury and group B after 6 months. This included a retrospective group as well as a prospective group that satisfied the inclusion criteria. The effects of urological rehabilitation in both groups are listed and analysed.

Inclusion Criteria

1. Patients with reflex bladder
2. Patients who were put on proper bladder training between 2 and 3 months after spinal cord injury in group
3. Patients who were put on proper bladder training between 6 month after spinal cord injury in group B.

Exclusion Criteria

1. Other types of bladder dysfunction in spinal cord injury.
2. Patients in spinal shock.
3. Patients between 3 months and 6 months after spinal cord injury.

Study Tools

1) Residual urine volume.
2) Routine blood and urine examination.
3) Urine C/S.
4) Renal function tests — B. urea, S. creatinine.
5) U.S.G KUB.

Statistical Analysis

Results were analysed using SPSS 16 version. Chi-square tests are used to analyse the data.

Results

Age distribution

As depicted in table – 1, the main age group affected in both groups is between the 31-40 yrs.

Table No. 1.

Age	Group A		Group B	
	No	%	No	%
11-20	0	0	2	9.1
21-30	3	13.6	6	27.3
31-40	10	45.5	9	40.9
41-50	6	27.3	3	13.6
51-60	3	13.6	2	9.1

P Value – 0.173027; not significant

Sex distribution

In the table - 2, males are more affected than females in both groups. The major cause of injury is fall from trees.

Table No. 2

Age	Group A		Group B	
	No	%	No	%
Male	18	81.8	20	90..9
Female	4	18.2	2	9.1
Total	22		22	

P Value – 0.385091; not significant

ASIA Grading

Above 40% of the patients, in both groups are in the category American spinal injury association scale (ASIA) – A.

Table No. 3.

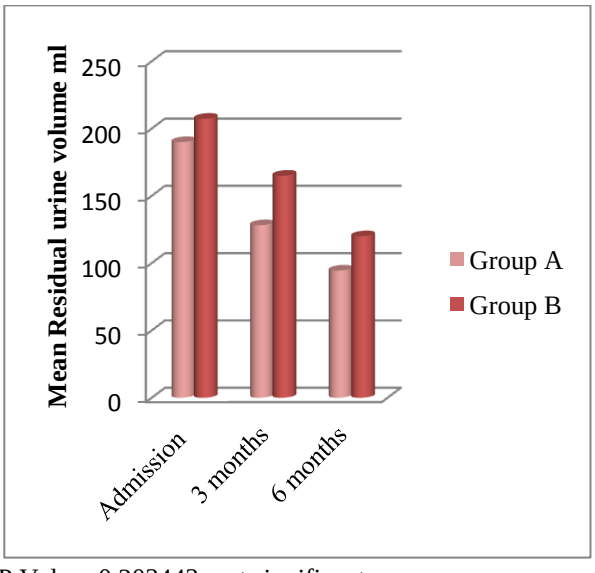
ASIA	Group A		Group B	
	No	%	No	%
A	9	40.9	10	45.5
B	2	9.1	3	13.6
C	6	27.3	6	27.3
D	5	22.7	3	11.6

P Value – 0.179611; not significant

Residual Urine Volume

Graph -1 showed that, the residual urine volume was above 100 ml in both groups initially. After rehabilitation, in group A there is a decrease in residual urine volume to below 100 ml while in group B it is remained 100 ml.

Graph No. 1.

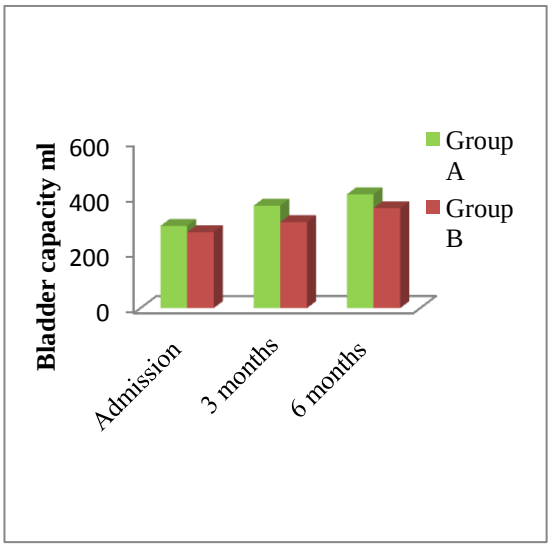


P Value- 0.203443; not significant

Bladder Capacity

As shown in graph - 2 there is significant improvement in bladder capacity after rehabilitation in both groups more in A.

Graph No. 2



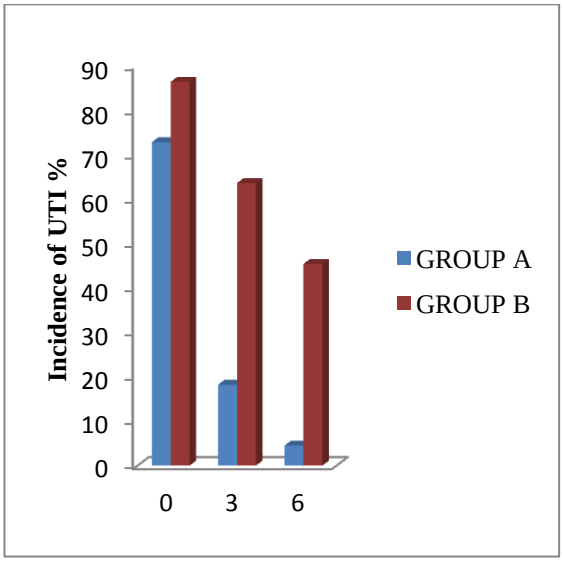
P Value- 0.000148; Significant

Bacteriuria was present at all stages of the study in all patients and the major causative organism is E. Coli.

Recurrent Symptomatic urinary tract infection

As shown in graph- 3, there is a significant reduction in the episodes of recurrent symptomatic urinary tract infection mainly in group A.

Graph No. 3.



P Value- 0.001951035; significant

Raised Renal Function Tests were found in 2 (9%) patients in the group B; it was absent in group A.

Significant Bladder Wall Thickening (>4mm) and trabeculations were observed in 12 patients of group B, while it was present in 4 patients in group A at admission. After rehabilitation, out of these 12 patients in group B, bladder wall thickness returns to normal in 7 patients. In group A, out of 4 patients who have increased bladder wall thickness, return to normal bladder thickness is seen in 3 patients.

Hydronephrosis and hydroureter were not present in group A from the beginning itself; out of 8 (36.4°) patients in group B who had these findings at the beginning, 7 gets relieved after treatment. Remaining one had to continue indwelling catheter.

Bladder calculus was present in 2 (9%) patients of group-B. No new calculus formation was observed in both groups.

Intermittent Clean Catheterisation

Out of 22 patients in the group A, 13 (59%) patients were able to avoid intermittent clean catheterisation and showed gradual development of satisfactory voiding. In the late group only 8 (36. 4%) patients were able to avoid intermittent clean catheterisation.

Anticholinergics – Nearly all patients in both groups received anticholinergics as a part of bladder rehabilitation. Patients in group A were able to avoid or reduce anticholinergics than in group B.

Conclusions

In the above study, it was found that effective early urological rehabilitation in reflex bladder increases the capacity of urinary bladder to near normal, decreases the volume of residual urine to less than 100ml and prevents the development of complications like recurrent symptomatic urinary tract infections, significant bladder wall thickening, trabeculation, hydronephrosis and hydroureters.

This study indicates the essentiality of early urological rehabilitation in Spinal Cord Injury patients with reflex bladder. Such intervention optimizes the bladder functions and prevents complications keeping morbidity and mortality low.

Limitations of the Study

The size of the sample is small. Follow up to six months only is performed. Study is conducted in a tertiary hospital.

Acknowledgement

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References

1. Perkash I: Management of neurogenic dysfunction of bladder and bowel. In Kottke FJ, Stillwell GK, LehmannlF(eds): Krusen ‘s Hand book of Physical Medicine and Rehabilitation, 3rd ed pp 724-745 Philadelphia, WB Saunders. 1982.
2. Joachim L Opitz. Gudni Thorsreinsson, Ann H Schutt, David M Barrett, Patricka K Olson -Joel A Dehisa - Rehabilitation Medicine: Principles And Practice, 492 515.
3. Barton CH, Vaziri ND, Gordon S et a! Renal pathology in end stage renal disease associated with paraplegia 22:31-41,1984.
4. Shirley McCluer - Management of Urinary Tract Infections in Spinal Cord Injuries-Fact Sheet 22: - Spinal Cord Commission. Date: March 8, 1994.
5. Lapides J, Diokno AC, Silber SJ, et al: Clean, intermittent self-catheterization in the treatment of urinary tract disease, Urol 107(3):458-461, 1972.
6. Cardenas DD, Kelly E, Mayo ME: Manual stimulation of reflex voiding after spinal cord injury, Arch Phys Med Rehabil 66(7):459-462, 1985.
7. Diana D Cardenas and Michael E Mayo - Physical Medicine & Rehabilitation - Randall L Bradom, Physical Medicine & Rehabilitation, South Asia edition 3, pp. 617- 635.

8. MA Salam - Tolterodine tartate - Principles of Urology Second edition, Volume 1; page 404.
9. MacDonald R, Monga M, Fink H, et al: Neurotoxin treatments for urinary incontinence in subjects with spinal cord injury or multiple sclerosis: a systematic review of effectiveness and adverse effects, *J Spinal cord Med* 31:157-165, 2008.
10. Hodgkinson CP, Drukker BH: Infravesical nerve resection for detrusor dyssynergia: The Ingelman- Sundberg operation. Acta Obstet Gynecol Scand56:401-408, 1977
11. Scheihammer PF, Hackler RH, Bunts RC, External sphincterotomy: An evaluation of 150 patients with neurogenic bladder. J Urol 110: 199-202, 1973.
12. Linder A.,Leach GE Raz Augmentation cystoplasty in the treatment neurogenic bladder dysfunction. J Urol 129;491-493,1983.
13. Lange; Smith's General Urology- Emil Tanagho, l6th edition.2004, pp.435- 451.
14. National Institute on Disability and Reha-bilitation Research Consensus Statement: The prevention and management of urinary tract infections among people with spinal cord injuries. Jam Paraplegia Soc 1992; 15; 194- 204.
15. Griffith DF: Infection induced stones. In Coe FL (ed): Nephrolithiasis: pathogenesis and treatment, pp203-228 Chicago, Year Book Medical Publishers, 1978.