



## Rectal Manometric Findings and Associated Clinical Changes in Myelopathy from Extradural Spine Pathology

Anant Mehrotra<sup>1</sup>, Janmejaya Jamdar<sup>1</sup>, Abhai Verma<sup>2</sup>, Kuntal Kanti Das<sup>1</sup>, Kamlesh Singh Bhisora<sup>1</sup>, Jayesh Chunnilal Sardhara<sup>1</sup>, Jaskaran Singh Gosal<sup>1</sup>, Awadhesh Kumar Jaiswal<sup>1</sup>, Rabi Narayan Sahu<sup>1</sup>, Arun Kumar Srivastava<sup>1</sup>, Sanjay Behari<sup>1</sup>

■ **OBJECTIVE:** Studies of rectal manometric findings in patients with extradural spine diseases are lacking. The objective of this study was to determine the changes in anorectal physiology caused by myelopathy from extradural spine diseases and to correlate these with other clinical features of myelopathy and improvement after surgery.

■ **METHODS:** Twenty-eight patients with myelopathy caused by extradural spine diseases were prospectively enrolled and underwent clinical evaluation. Laboratory evaluation included rectal manometry and balloon expulsion tests in each of these patients, as well as pulmonary function tests and uroflowmetry. Follow-up data at 6 weeks were noted. Using the Kruskal-Wallis/Mann-Whitney *U* test and bivariate correlation, an association of manometric parameters with clinical variables and improvement in bowel function after surgery was identified.

■ **RESULTS:** Squeeze pressure (mean, 92.3 mm Hg) was lower and basal pressures (mean, 76.5 mm Hg) and sphincter pressures at defecation (mean, 92.3 mm Hg) and first sensation (mean, 48.2 mL) were found to be higher than normal. A significant correlation of pulmonary function test ( $P = 0.01$ )/uroflowmetry ( $P = 0.01$ ) parameters and the duration of symptoms ( $P = 0.02$ ) with manometric parameters was found. Improvement in constipation ( $P = 0.04$ ) and myelopathy ( $P = 0.007$ ) were also found to be associated with manometric parameters.

■ **CONCLUSIONS:** The findings of manometry help explain the cause of constipation in this subset of patients. There was a definite association of manometric parameters with clinical

and pulmonary function test/uroflowmetry variables. Few manometric variables were found to be associated with improvement in myelopathy and bowel function.

### INTRODUCTION

Bowel dysfunction is often neglected in patients with myelopathy. However, it is an important symptom from the patient's perspective. The reasons behind the development of this symptom have been defined in few of the available studies on myelopathy associated with spinal cord injury (SCI) as well as with multiple sclerosis (MS).<sup>1-4</sup> Specifically, although there have been a few studies involving rectal manometry in patients with SCI and MS, similar studies in patients with myelopathy from nontraumatic diseases and the factors affecting the changes, if any, are lacking. Rectal manometry provides an objective method of assessing anorectal function in patients with constipation. Among the manometric parameters, basal pressure is a marker of sympathetic tone, whereas squeeze pressure is a marker of corticospinal tract function. The purpose of this study is to determine the changes in anorectal physiology caused by myelopathy from nontraumatic spine diseases and to correlate these with other clinical features of myelopathy and improvement in myelopathy as well as bowel dysfunction after surgery.

### METHODS

From July 2014 to July 2015, after obtaining written and informed consent, we prospectively enrolled 28 consecutive patients (aged 18 years and older) admitted to a tertiary-care referral centre with cervical or dorsal myelopathy caused by extradural nontraumatic spine disease as evident on clinical examination and radiology.

#### Key words

- Anorectal physiology
- Myelopathy
- Rectal manometry

#### Abbreviations and Acronyms

- BSS:** Bristol Stool Scale
- FVC:** Forced vital capacity
- MS:** Multiple sclerosis
- PFT:** Pulmonary function test
- SCI:** Spinal cord injury
- SD:** Standard deviation

From the Departments of <sup>1</sup>Neurosurgery and <sup>2</sup>Gastroenterological Medicine, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, Uttar Pradesh, India

To whom correspondence should be addressed: Anant Mehrotra, M.Ch.  
[E-mail: dranantmehrotra@gmail.com]

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Standardized preoperative workup was performed in these patients, which included rectal manometry and balloon expulsion tests. A pulmonary function test (PFT) was also performed in the patient population, because myelopathy causes a restrictive pattern of pulmonary dysfunction as a result of spastic weakness of the respiratory muscles. Clinical preoperative evaluation included the Nurick grade and the Bristol Stool Scale (BSS). All patients were evaluated by a senior gastroenterologist to rule out intrinsic bowel disease, such as inflammatory bowel disease, infections of the bowel (eg, tuberculosis), or irritable bowel syndrome, which could affect the bowel symptoms irrespective of myelopathy. The degree of constipation was evaluated by using the BSS. The BSS is a graphic-descriptive representation of the consistency of stools that grades stools into 7 types. Types 1 and 2 denote constipation; types 3 and 4 are normal stools; and types 5–7 denote loose stools. BSS types were noted according to the most prevalent stool type in the last 15-day laxative-free period preceding the date of filling the pro forma. In cases of equal numbers of 2 types, the lower score was used. The Medical Research Council grading was used for quantification of weakness, with the Medical Research Council grade in the weakest muscle group being used for statistical analysis. The study was approved by the institutional ethics committee.

#### Exclusion Criteria

Exclusion criteria included 1) patients who had coexistent diseases such as intrinsic pulmonary disease (as evaluated by a pulmonologist), prostatomegaly on ultrasonographic examination, or intrinsic bowel disease (as evaluated by a gastroenterologist) and 2) patients who had craniovertebral junction disease.

#### Anorectal Manometry

norectal manometry was performed using a 16-channel water-perfused high-resolution manometry system (GS Hebbard, Mundubbera, Queensland, Australia). An anorectal manometry catheter of 4.2 mm in diameter and 16 radial ports with a balloon at its distal tip was used for measurement of pressure and sensory parameters. Anorectal manometry was performed in the left lateral position. After basal or resting sphincter pressure was evaluated (which denotes internal anal sphincter activity, chiefly caused by sympathetic tone), the patient was asked to squeeze the sphincter (which denotes external anal sphincter activity, chiefly mediated by the corticospinal tract). This was repeated twice and the average was considered to be the squeeze pressure. Subsequently, the balloon was inflated with an incremental volume of air (20, 40, and 60 mL and so on) and deflated each time after inflation. During balloon inflation, the patient was asked to report about the feel for the first time, urge (desire to defecate), and maximum tolerable limit. During balloon inflation, rectoanal inhibitory reflex was also evaluated. Manometry signals were analyzed using Trace 1.2.1 software from GS Hebbard.

#### Balloon Expulsion Test

A balloon expulsion test was performed in the left lateral position using an indigenously made device consisting of a condom tied at the end of an infant feeding tube according to a method described earlier,<sup>5</sup> with some modifications. The condom was inserted deep inside the rectum in a deflated state and lubricated with xylocaine jelly. After the condom was filled with 50 mL water, the patient

was asked to evacuate it; if the patient was not successful in 1–2 minutes, increasing weight (starting with 50 g and increasing up to 700 g) was added to a polythene bag tied at the hanging end of the infant feeding tube.<sup>5</sup> A normal person is supposed to be able to expel the balloon (condom) without additional weight or at most 200 g added weight.<sup>6</sup>

#### Follow-Up

Follow-up 6 weeks after surgery included laxative-free postoperative BSS type and Nurick grade. Data from 4 patients were not included in the analysis because of factors affecting postoperative changes in constipation. Of these 4 cases, 1 patient was discharged without surgery after evaluation when the clinical situation dictated a nonoperative course of management, 1 patient died soon after surgery of a cause unrelated to surgery, and 2 patients were lost to follow-up.

#### Statistical Analysis

Data were analyzed to identify the differences in rectal manometry parameters in our patient population from normal values (taken from Shah et al.<sup>7</sup>) and factors predicting worse/better rectal manometry parameters at presentation as well as manometry findings correlating with improvement in constipation after surgery.

The hypothesized factors affecting rectal manometry parameters were analyzed using nonparametric tests such as the independent samples Kruskal-Wallis test and Mann-Whitney U test for comparing distribution of continuous variables across categories, as applicable, to establish an association. Bivariate correlation was used for comparing 2 continuous variables, using the Pearson correlation for normally distributed data (or approximately normally distributed data [ie, standard deviation (SD) < mean]) and Spearman correlation for data that were not normally distributed. These tests were also used to establish the effect of rectal manometry parameters on improvement in constipation. The results were obtained by using statistical analysis software SPSS version 20 (IBM Corp., Armonk, New York, USA). A P value <0.05 was considered statistically significant.

## RESULTS

#### Demographics and Clinical Information

Of the 28 patients enrolled in the study, 26 (92.9%) had cervical myelopathy and 2 (7.1%) had dorsal level myelopathy. The mean age of the study population was 49.8 years (range, 18–70 years; SD, 13.9). Most of our patients had degenerative spine disease (24/28). There were a disproportionate number of males compared with females in our study (26 vs. 2), similar to a study by Yang et al.<sup>8</sup> The demographics of the study population and the spectrum of diseases responsible for myelopathy are given in **Tables 1** and **2**.

The mean duration of symptoms was 32.6 months (range, 2 months to 20 years). Most patients presented within 1 year of onset of symptoms. Weakness was the most prevalent symptom.

The distribution of Nurick grades at 6 weeks follow-up and surgeries performed are given in **Tables 3** and **4**, respectively.

#### Laboratory Investigations

Uroflowmetry data were available for 21 patients. Seven patients could not perform uroflowmetry (because of an inability to sit or

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