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Frequency and Risk Factors for Neurogenic Bowel and Bladder Following Basic Spine Procedures

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Abstract

Objective: To study the frequency and risk factors for constipation and urinary retention following basic spine procedures.

Study Setting: Neurosurgery department Khyber Teaching Hospital Peshawar Khyber Pakhtunkhwa.

Study Duration: March 2022 to March 2023.

Study Design: Cross-sectional study (descriptive).

Material and Methods: After taking approval from the hospitals ethical and research committee a single center review of the medical records of all patients who underwent common surgical procedures of the spine were collected and patients followed for short term post-operative outcomes. Data was analyzed by using the statistical software SPSS version 23.0 and the results were presented in the form of tables and charts.

Results: Among 360 patients that were included in the trial, 205 (56.9%) were males and 105 (43.1%) were females. The mean age of presentation was 40.87 ± 13.01 SD. It was observed that 78 patients developed constipation (21.7%) and 52 patients had urinary retention after surgery (14.4%). There was significant association between duration of the procedure and past history of gastrointestinal disorders with the risk of having neurogenic bowel disorder (NBD) in the post operative period (p -value < 0.001). Patients with higher BMIs had more chances to develop neurogenic bladder (NB) later on (p -value 0.003).

Conclusion: Despite improvements in post operative care and application of modern guidelines for enhanced recovery, NBD and NB is still observed in patients undergoing basic spine procedure.

Keywords: Neurogenic Bowel and Bladder, Laminectomy, Discectomy, Neurosurgery

Introduction

Globally speaking, spine diseases have affected over 70% of the elderly ^[1] population and spine surgeries have gained prominence over the years for their promising results ^[2-3]. Laminectomy and micro fenestration followed by discectomy are common procedures performed in the neurosurgery units for patients who present with spinal stenosis due to trauma and degenerative spine disease and prolapsed intervertebral discs. These procedures are performed through an open approach or through a minimally invasive approach ^[4] and the patient satisfaction rate is as high as 75% ^[5]. Despite being the most common procedures performed for various indications, they have their own set of postoperative complications.

Post-operative ileus secondary to neurogenic bowel dysfunction (NBD) and post-operative urinary retention secondary to neurogenic bladder (NB) are 2 major complications due to nerve root injury in spine surgeries ^[6]. The pathophysiology behind these adverse events, although under research for many years, is still not completely understood yet ^[7, 8]. Some of the predisposing factors for these conditions have been mentioned in literature which include previous gastrointestinal motility disorders, serum electrolyte disturbances, stress, intravenous opioids for pain management ⁹ and iatrogenic injuries to the bowel in anterior approaches to the spine ^[10].

Compared to obstetrical, gynecological, and orthopedic procedures, constipation and post operative urinary retention (POUR) are more common in the neurosurgical wards ^[11-14]. This puts financial pressure on both the patient and health authorities by

increasing hospital stay and treatment requirements. Hanson and franklin have reported an incidence of 80% bowel dysfunction and 46% similar related complications in male paraplegics and tetraplegics respectively [15]. Proper pre-operative and post-operative steps need to be taken to decrease the frequency of this problem specifically in the neurosurgery wards. This paper will further highlight the incidence of NBD and NB in a tertiary care unit and identify some risk factors for this condition that can be prevented in the future.

Methodology and Study Design

This following cross sectional study was conducted in department of neurosurgery Khyber teaching hospital Peshawar from March 2022 to March 2023 comprising of 360 patients selected through non probability consecutive sampling.

The hospital's ethics and scientific committee gave its clearance before the study could be carried out. Through OPD, all patients who met the inclusion requirements were added to the trial and then admitted to the ward for additional evaluation. All participants in the study had their goals and advantages outlined to them, and if they agreed, formal informed consent was obtained. All patients underwent thorough clinical and historical evaluations before undergoing the requisite preoperative baseline tests.

Data was recorded in a pre-designed proforma and transferred to Microsoft excel sheet for convenience. The following variables were considered which included age, gender, body mass index (BMI), perioperative use and dosage of opioids, surgery-related factors e.g., type and length of surgery, amount of laxative intake and any history of gastrointestinal pathologies that might affect gut motility. The association between these variables and post-surgery complications which included NBD and NB was analyzed by employing the chi square test and Pearson correlation test as appropriate. Results were shown in the form of description, tables and charts.

Data was analyzed by using the statistical software SPSS version 23.0. Quantitative variables were calculated as Means \pm Standard deviation and qualitative variables were calculated as frequencies and percentages. Measures of association were analyzed by using chi-square test followed by regression analysis. A p-value of ≤ 0.05 was considered significant and the results were presented in the form of tables and charts.

Results

Among 360 patients that were included in the trial, 205 (56.9%) were males and 105 (43.1%) were females. The mean age of presentation was 40.87 ± 13.01 SD. Majority of the patients presented with a prolapsed intervertebral disc at L4/L5 level (n=176, 48.9%) followed by L5/S1 (n= 118, 32.8%) and L3/L4 (n= 37, 10.3%), further details are given in Table 1. Laminectomies were done for 192 patents (53.3%) followed by fenestration with discectomy for 126 patients (35%) and laminectomy and discectomy for 42 patients (11.7%) as shown in Table 2. Looking at post-operative outcome it was observed that 78 patients developed constipation (21.7%) as part of neurogenic bowel disorder and about 52 patients had urinary retention (14.4%) as part of neurogenic bladder.

Some variables were recorded to determine their frequencies and measure their effect on post operative outcomes which included the usage of post operative analgesia in the form of opioids (tramal) or non-opioids (Toradol and paracetamol), body mass index (BMI), laxative use before surgery, duration of the spine procedures and any previous history of gastrointestinal surgery that may lead to post operative ileus as shown in Table 3. The mean BMI calculated was 24.01 ± 2.043 and the mean duration of surgery was 2.35 ± 0.782 hours.

Pearson chi square test was applied to analyze the association between these variables and post-surgery outcomes which included NBD and NB. According to the findings there was significant association between duration of the procedure and past history of gastrointestinal disorders with the risk of having NBD in the post operative period (p-value <0.001) and some correlation was also observed between constipation and type of analgesic usage (p-value 0.082) as well. Patients with higher BMIs had more chances to develop neurogenic bladder NB later on (p-value 0.003). The rest of the variables had insignificant association with any of the post operative outcomes as shown in Table 4.

Table 1: Type of procedure done

	Frequency	Percent	Valid Percent
Fenestration +discectomy	126	35.0	35.0
laminectomy	192	53.3	53.3
laminectomy + discectomy	42	11.7	11.7
Total	360	100.0	100.0

Table 2: PIVD level frequencies

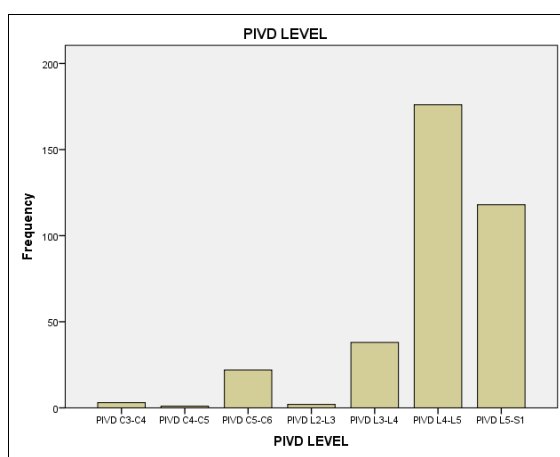
	Frequency	Percentage	Valid Percentage
PIVD C3-C4	3	.8	.8
PIVD C4-C5	1	.3	.3
PIVD C5-C6	22	6.1	6.1
PIVD L2-L3	2	.6	.6
PIVD L3-L4	37	10.3	10.3
PIVD L4-L5	176	48.9	48.9
PIVD L5-S1	118	32.8	32.8
Total	360	100.0	100.0

Table 3: Descriptive statistics of variables

Variable	Frequency	Percentage
1. BMI		
Below 18.5	6	1.7%
18.5-24.9	155	43%
25.0-29.9	199	55.3%
2. Constipation		
Yes	282	78.3%
No	78	21.7%
3. Urinary retention		
Yes	308	85.6%
No	52	14.4%
4. Analgesic		
Opioid	92	25.6%
Non-opioid	268	74.4%
5. Laxative use		
Yes	273	75.8%
No	87	24.2%
6. Past history of GIT Surgery		
Yes	292	81.1%
no	68	18.9%

Table 4: Correlation of post-operative outcome with variables (p-values)

Variable	Constipation	Urinary Retention
BMI	0.479	0.003
Age	0.158	0.956
Analgesic	0.082	0.431
Gender	0.714	0.469
Level of disease	0.707	0.021
Laxative use	0.521	0.369
Duration of surgery	<0.001	0.354
Past medical history of GIT	<0.001	0.652
Type of surgery/treatment	0.014	0.118



Discussion

Post-operative ileus leading to constipation and neurogenic bladder leading to urinary retention are relatively rare adverse events, affecting almost 5% of the patients undergoing various spine procedures [16]. This can prone patients to have significant morbidity by causing nausea, emesis, increasing infections, abdominal bloating, urethritis, cystitis and decreased nutritional intake [17] and also increasing the load on hospital resources [18]. Ensuring quick recovery of bowel and bladder function is significant in upgrading post-surgery outcomes and hospital expenditures. Even though multiple risk factors were taken into consideration, the present study demonstrates that patients who were overweight, had longer surgeries and had previously treated or untreated gut pathologies were the most prone to develop constipation and urinary retention in the post operative period. Steinen MN *et al.* and his colleagues declared constipation to be associated with longer operative times and a greater estimated blood loss [19]. A case report published in 2019 by Su-keon Lee and coworkers stated the diagnosis of Ogilvie’s syndrome in an elderly woman who had lumbar spine surgery for spinal stenosis [20]. However, some studies have reported rare instances of constipation in surgeries related to the cranium and spine [21-23]. These findings designate constipation to be a regular post-operative symptom more related to bed rest and immobilization rather than spine procedures. The following study also illustrates increased cases of urinary retention in patients who are overweight. However, this seems to be an incidental finding, more related to neuronal injury, since being overweight and obesity is considered to be a risk factor for urinary incontinence [24-25]. Post operative analgesia is one of the key factors for enhanced recovery in surgical patients. The present study depicts that opioids were slightly more responsible for post operative ileus as compared to NSAIDs and paracetamol.

According to Kurdula and Helmer, the incidence of opioid-induced constipation (OIC) varies greatly from 15% to as high as 81% [26]. Cost effective standardized regimens have been developed to counteract this problem with satisfying results [27]. Anton Emmanuel *et al* [28] declared the use of laxatives as ineffective in treating OIC and proved that proper mobilization is more beneficial in return of normal bowel function. David Altschul *et al* [29] studied 397 patients, who underwent lumbar spine surgeries, and found 35 patients (8.8%) developing post operative urinary retention. Finally, a previous abdominal surgery was significantly associated with the risk of developing constipation, in our study, synchronizing with the findings of previously published papers [30].

Conclusion

Post-operative ileus leading to constipation and urinary retention following various spine surgeries still remains a problem for both the patient and hospital authorities. Based on our study, some of the causative factors that can lead to neurogenic bowel disfunction and neurogenic bladder include BMI, duration of surgery and a past medical history of gastrointestinal surgery. Patients who had laminectomies were somewhat liable to develop constipation while procedures done at the L5/S1 level led to urinary retention in most of the patients. The rate of these complications is still noticeably high and a thorough assessment of the risk factors to decrease their occurrence, through further research, is quite necessary.

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Conflict of Interest

There was no conflict of interest among the authors.

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