

Poststroke constipation in the rehabilitation ward: incidence, clinical course and associated factors

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INTRODUCTION Constipation is a common poststroke complication. This study was designed to document the incidence and clinical course of poststroke constipation in a rehabilitation ward, as well as identify the factors independently associated with the condition.

METHODS This retrospective study involved patients who were admitted to the rehabilitation ward of our institute due to an acute stroke between 1 August 2010 and 31 July 2011. The main outcome measured was the incidence of poststroke constipation, defined as the use of laxative after stroke, fulfilment of the Rome II diagnostic criteria for functional constipation and/or stool impaction. The variables examined were basic demographic data, presence of impairment, degree of disability (evaluated using the Barthel index), walking ability, medications taken and medical complications.

RESULTS Out of the 155 patients who met the inclusion criteria, 123 (79.4%) had poststroke constipation. All 123 patients used oral laxatives; 56 received additional rectal medications and 13 discontinued their use of laxatives at discharge. Patients with poststroke constipation were more likely to have major medical complications ($p = 0.04$). Those who used rectal medications had a higher risk of major medical complications than those who used only oral laxatives ($p < 0.01$). Infratentorial lesions were an independent predictor of poststroke constipation ($p = 0.003$). More severe disability increased the severity of constipation, as indicated by the use of rectal medication.

CONCLUSION Poststroke constipation is a common complication during inpatient rehabilitation. Healthcare providers should be aware of the incidence of poststroke constipation. Further studies are required to establish standard guidelines for screening and managing bowel function in patients with stroke.

Keywords: constipation, incidence, medications, risk factors, stroke

INTRODUCTION

Bowel management is important in poststroke rehabilitation as constipation is the dominant gastrointestinal problem after stroke.⁽¹⁻³⁾ The prevalence of constipation in patients with stroke has been reported to range from 22.9% to 60%,⁽¹⁻⁴⁾ and the unpleasant symptoms of constipation are often distressing to both patients and their caregivers. It has a negative effect on the patients' quality of life and may limit social activities.^(5,6) A proactive approach toward treating constipation in patients with stroke is thus warranted, but few studies have focused on this topic. Furthermore, as the definitions of constipation and study designs varied in the few studies that focused on constipation in poststroke patients, it is difficult to compare their results.^(3,4,7) The diagnosis of constipation is also more complex in patients with stroke than in the general population. Patients with stroke may have poor verbal expression or cognition, which may result in undiagnosed or misdiagnosed constipation. To the best of our knowledge, there are no reports in the literature that specifically address the bowel function of patients who have difficulty expressing themselves. In addition, most studies on poststroke constipation were cross-sectional, and did not report information about the clinical course of constipation and the relevant interventions.^(4,7)

Since multiple factors can contribute to poststroke constipation, identifying these factors will be useful for early diagnosis and treatment. The classification of the severity of poststroke constipation, while not done in any previous study, would also be useful in the management of this condition. Unfortunately, while efforts have been made to identify the risk factors for poststroke constipation,^(3,4,7) none have been found for severe constipation. Thus, the aims of this study were to (a) document the incidence of poststroke constipation among patients in a rehabilitation ward, (b) examine the clinical course of poststroke constipation, and (c) identify the factors that are independently associated with general or severe poststroke constipation.

METHODS

We retrospectively reviewed the charts of all patients who had had an acute stroke and were admitted to the rehabilitation ward of a tertiary hospital over a 12-month period. The study was approved by the Ethics Research Committee of the hospital. Stroke diagnosis and localisation were confirmed using computed tomography or magnetic resonance imaging. Patients with a prior history of constipation before the stroke diagnosis and patients with subarachnoid haemorrhage

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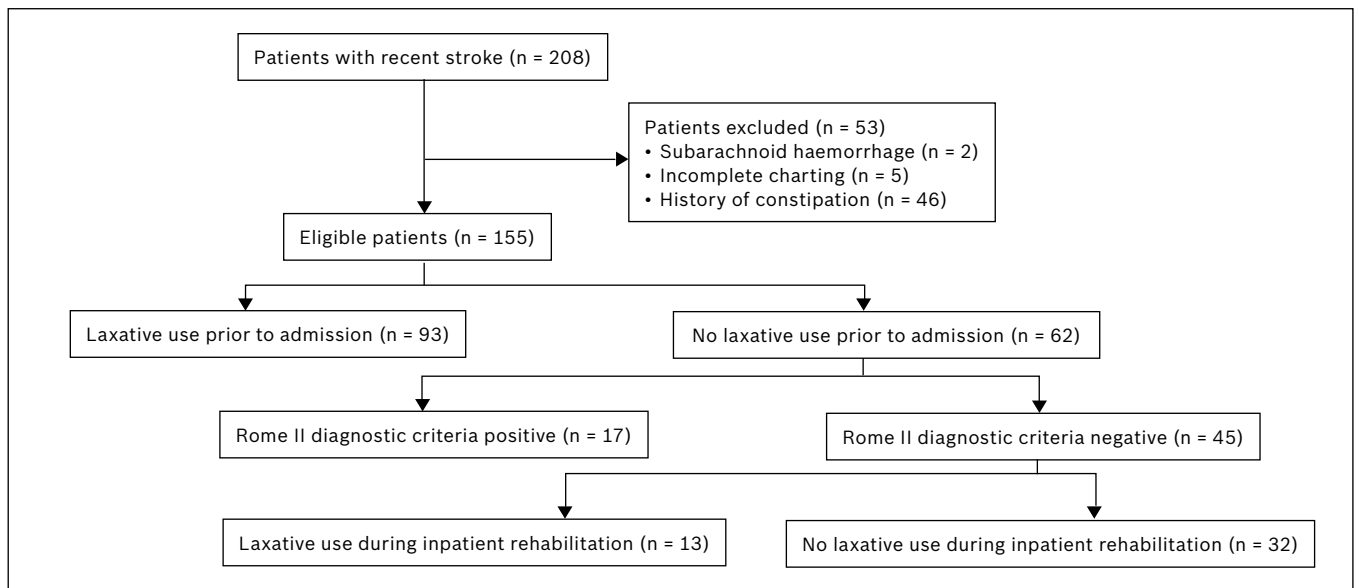


Fig. 1 Flow chart shows the screening process for poststroke constipation.

and incomplete charting were excluded. Patients who satisfied any of the following three criteria were categorised as having poststroke constipation: (a) used laxatives after stroke; (b) fulfilled the Rome II diagnostic criteria for functional constipation;⁽⁸⁾ and/or (c) stool impaction, confirmed using plain abdominal radiographs.^(9,10)

The Rome II diagnostic criteria are symptom-based diagnostic standards used for chronic functional constipation. The use of this criteria is known to be one of the most reliable methods for diagnosing constipation in clinical practice and research.^(3,4,11,12) In our study, the mean duration from stroke onset to admission into the rehabilitation ward was around two weeks. We therefore modified the symptom duration criterion of the Rome II diagnostic criteria for use in the present study. We required that symptoms be present for the last seven days before admission to the rehabilitation ward, while the Rome II diagnostic criteria specify that symptoms must be present for three months. When reliable answers could not be directly obtained from the patients due to cognitive impairment or communication difficulties, the information was obtained from family members or caregivers.

The medicines used by the patients, both oral and rectal, for treatment of constipation during inpatient rehabilitation were recorded. Use of rectal medication was considered an indication of severe constipation.⁽¹³⁾ We categorised patients with poststroke constipation into two groups – those using only oral laxatives and those using rectal medications in addition to oral laxatives. The following information was extracted from the patients' charts: (a) basic demographic data; (b) stroke type and location (supratentorial or infratentorial) based on imaging; (c) presence of impairment, including aphasia and need for nasogastric (NG) intubation or Foley catheter; (d) degree of disability, evaluated using the Barthel index (BI);⁽¹⁴⁾ (e) walking ability (patients who could move about independently with or without the help of a device were classified as ambulatory);

and (f) use of constipation-inducing drugs (e.g. analgesics, antidepressants, benzodiazepines, antihistamines and diuretics) at admission.^(15,16) Medical complications that occurred during inpatient rehabilitation were recorded. Pneumonia, urinary tract infection, upper gastrointestinal bleeding and recurrent stroke were considered major complications.

Statistical analyses were performed using the Statistical Package for the Social Sciences version 12.0 (SPSS Inc, Chicago, IL, USA). Descriptive data were presented as mean with standard deviation, and percentage distributions, as appropriate. Continuous variables were evaluated for normality using the Kolmogorov-Smirnov test. The data for each of the variables was normally distributed. The crude associations between presence of poststroke constipation and demographic, clinical and functional factors were examined using *t*-test and chi-square (or Fisher's exact) tests. Multivariate logistic regression analysis was performed to develop a clinically useful model for predicting poststroke constipation on rehabilitation admission. Variables with a *p*-value of < 0.3 on univariate analysis were entered into the multivariate analysis.⁽¹⁷⁾ The final model was chosen based on backward elimination. The same procedures were used to identify variables associated with severe poststroke constipation (defined as use of rectal medication for constipation) during inpatient rehabilitation. The α level was set at 0.05.

RESULTS

From 1 August 2010 to 31 July 2011, 208 patients with a recent diagnosis of stroke were admitted to the rehabilitation ward. Of these 208 patients, 155 met our inclusion criteria (Fig. 1). The mean age of these 155 patients was 60.3 years, 94 (60.6%) were male and 124 (80.0%) had an ischaemic stroke. The mean duration from the time of stroke onset to the time of admission into the rehabilitation ward was 19.18 ± 12.26 days, the mean length of stay in rehabilitation

Table I. Univariate analysis of factors associated with poststroke constipation.

Variable	No. of patients (%)		p-value
	Constipation present (n = 123)	Constipation absent (n = 32)	
Demographics			
Age* (yrs)	62.81 ± 12.99	64.44 ± 12.81	0.36
Female	47 (38.21)	14 (43.75)	0.57
Diabetes mellitus	54 (43.90)	10 (31.25)	0.20
Information on stroke			
Haemorrhagic	28 (22.76)	3 (9.38)	0.09
Infratentorial	40 (32.52)	2 (6.25)	< 0.01
Duration before admission into rehabilitation ward* (days)	19.58 ± 12.96	17.66 ± 9.06	0.43
LOS in rehabilitation ward* (days)	25.56 ± 7.93	24.00 ± 7.92	0.32
Impairment and disability			
Aphasia	21 (17.07)	6 (18.75)	0.82
NG tube use	35 (28.46)	7 (21.88)	0.46
Foley catheter use	12 (9.76)	1 (3.13)	0.23
Nonambulatory	84 (68.29)	16 (50.00)	0.05
BI at admission*	24.19 ± 22.58	35.16 ± 27.25	0.02
Constipation-inducing drugs	49 (39.84)	10 (31.25)	0.37

*Data is presented as mean ± standard deviation. BI: Barthel index; LOS: length of stay; NG: nasogastric

ward was 25.24 ± 7.92 days, and the mean BI score was 26.45 ± 23.95. Of the 155 patients, 93 (60.0%) were using laxatives after stroke, prior to their admission to the rehabilitation ward. Of the remaining 62 patients who were not using laxatives before admission, 17 were prescribed laxatives on admission because they met the Rome II diagnostic criteria, and 13 were prescribed laxatives during inpatient rehabilitation because they subsequently complained of constipation symptoms. As all 123 patients prescribed laxatives met the definition of poststroke constipation, the incidence of poststroke constipation in our study was 79.4%.

All 123 patients with constipation took oral laxatives (e.g. stool softeners such as magnesium oxide, colonic stimulants such as sennoside A+B and bisacodyl, bulking agents such as Normacol® plus granules [Norgine Ltd, Middlesex, UK], and osmotic agents such as lactulose). Sennoside A+B was used most frequently (82 [66.7%] patients), followed by magnesium oxide (56 [45.5%] patients). In addition to the oral laxatives, 56 (45.5%) patients received rectal medications, such as bisacodyl and Fleet® enema (Purzer Pharmaceutical Company Ltd, Taoyuan, Taiwan), during inpatient rehabilitation. The main reasons for prescribing rectal medication to these 56 patients were no stool passage for more than two days (32 [57.1%] patients), abdominal radiograph showing stool impaction (17 [30.4%] patients), hard stool (11 [19.6%] patients) and straining during defecation (11 [19.6%] patients).

Faecal incontinence due to faecal impaction (confirmed using plain abdominal radiography) was diagnosed in 15 of the 123 patients. Of these 15 patients, 13 (86.7%) had symptoms and signs of poststroke constipation before admission to the rehabilitation ward, while the remaining 2 (13.3%) patients developed symptoms and signs during their stay in the rehabilitation ward. Five patients were treated for acute diarrhoea, five were initially only treated with oral laxatives and three were not treated until admission to the rehabilitation ward. The mean BI score of the 15 patients was 13.3, 11 (73.3%)

had an NG tube and 7 (46.7%) had difficulty answering Rome II questions due to poor cognition or aphasia.

The complications experienced by the 155 patients in our study included pneumonia (n = 7), upper gastrointestinal bleeding (n = 10) and recurrent stroke during inpatient rehabilitation (n = 1). All patients who experienced the aforementioned complications also had poststroke constipation. Urinary tract infection was experienced by 12 patients, of which 10 had poststroke constipation. The risk of experiencing major complications was significantly higher in patients with poststroke constipation than those without (22.76% vs. 6.25%, p = 0.04). Patients with poststroke constipation who used rectal medications were more likely to have major complications than those who used only oral laxatives (33.9% vs. 13.4%, p < 0.01).

Of the 123 patients who used oral laxatives, 13 (10.6%) discontinued the use of laxatives at discharge. Patients aged less than 55 years were more likely to discontinue oral laxatives at discharge (p = 0.03). There was no significant difference in the degree of disability at discharge between patients who continued the use of laxatives and those who did not (BI scores: 41.05 ± 26.38 vs. 51.92 ± 28.54, p = 0.17).

The results of the univariate analysis of factors associated with poststroke constipation are presented in Table I. In terms of stroke location, patients with infratentorial lesions had a significantly higher risk of developing poststroke constipation (p = 0.003). Patients with lower BI scores on admission also had a higher rate of constipation (p = 0.02). While patients with haemorrhagic stroke were more likely to have poststroke constipation, this finding was not statistically significant. The constipation rate was also higher in patients who were unable to walk, but once again, the difference was not statistically significant.

Table II compares the demographics, stroke information, presence of impairment and disability severity of the group using rectal medications with the group using only oral laxatives.

Table II. Univariate analysis of factors associated with using rectal medications.

Variable	Rectal medication		p-value
	Yes (n = 56)	No (n = 67)	
Demographics			
Age* (yrs)	65.27 ± 12.33	60.66 ± 13.05	0.55
Female	20 (35.71)	27 (40.30)	0.60
Diabetes mellitus	30 (53.57)	24 (35.82)	0.05
Information on stroke			
Haemorrhagic	11 (19.64)	17 (25.37)	0.45
Infratentorial	17 (30.36)	23 (34.33)	0.64
Duration before admission into rehabilitation ward* (days)	18.29 ± 9.66	20.66 ± 15.17	0.31
LOS in rehabilitation ward* (days)	25.73 ± 6.59	25.41 ± 8.94	0.83
Impairment and disability			
Aphasia	12 (21.43)	9 (13.43)	0.24
NG tube use	21 (37.50)	14 (20.90)	0.04
Foley catheter use	9 (16.07)	3 (4.48)	0.03
Nonambulatory	44 (78.57)	40 (59.70)	0.03
BI at admission*	17.14 ± 18.46	31.72 ± 25.14	< 0.01
Constipation-inducing drugs			
	22 (39.29)	27 (40.30)	0.91

Data is presented as no. (%) unless otherwise indicated. *Data is presented as mean ± standard deviation. BI: Barthel index; LOS: length of stay; NG: nasogastric

Table III. Multivariate logistic regression analysis predicting clinically significant factors of poststroke constipation and rectal medication use.

Variable	OR (95% CI)	p-value
For poststroke constipation		
Diabetes mellitus	0.48 (0.19–1.17)	0.11
Haemorrhagic stroke	0.26 (0.07–0.99)	0.05
Infratentorial stroke	0.13 (0.03–0.60)	< 0.01
BI at admission	1.02 (1.00–1.03)	0.05
For rectal medication use		
Diabetes mellitus	0.48 (0.19–1.17)	0.11
BI at admission	1.02 (1.00–1.03)	0.05

BI: Barthel index; CI: confidence interval; OR: odds ratio

Patients using rectal medications were more likely to need NG tubes ($p = 0.04$) and Foley catheters ($p = 0.03$). They had lower BI scores ($p < 0.01$) and were less ambulatory ($p = 0.03$). Patients with diabetes mellitus were more likely to require rectal medication. Table III shows the results of the multiple regression analysis. Only infratentorial lesion was found to be an independent predictor for poststroke constipation; a more severe degree of disability increased the severity of constipation independently, as indicated by the use of rectal medication.

DISCUSSION

The incidence of poststroke constipation in this study was 79.4%. All patients with constipation ($n = 123$) used oral laxatives. Of the 123 patients with poststroke constipation, 56 patients required additional rectal medications and 15 presented with faecal incontinence. A total of 13 patients discontinued laxatives at discharge.

The incidence of poststroke constipation in our cohort of patients was greater than that previously reported.^(3,4,7) This may be due to different patient characteristics, diagnostic criteria, time points used and study design. As constipation in a patient with stroke is related to the patient's degree of disability,^(3,4,7) a longer observation period may provide more opportunities to identify a greater number of cases. The higher incidence of

poststroke constipation in our study may be due to the fact that our patients had a greater degree of disability and our observation period was longer than that in other studies.^(3,7) Furthermore, the incidence or prevalence of poststroke constipation is greatly affected by the criteria used for diagnosing constipation, which differed across the different studies.^(3,4,7) In our study, patients who were on laxatives at the time of admission to the rehabilitation ward were taken to have constipation. Since there was no standard guideline for the prescription of laxatives in our institute and some physicians at acute care units might have prescribed oral laxatives prophylactically to prevent constipation, this could have resulted in the high incidence of poststroke constipation in our study. However, we do not think that this possible overestimation was excessive as most patients who were on laxatives at the acute care setting did present with constipation-related symptoms. The modified Rome II diagnostic criteria used in our study was not validated and as such, our results should be noted with due reservation.

Constipation may lead to impaction and faecal incontinence. In our study, 15 patients presented with faecal incontinence due to faecal impaction. Among them, 7 (46.7%) had difficulty expressing themselves and answering questions because of poor cognition or aphasia. Poor verbal expression was identified in the present study to be a factor that favours progression of constipation to faecal impaction, a condition usually combined with overflow incontinence. Faecal incontinence due to faecal impaction is easily misdiagnosed as diarrhoea. In our study, 5 (33.3%) patients were first treated for diarrhoea, and 3 (20.0%) did not receive any treatment until they were admitted to the rehabilitation ward. Faecal incontinence, although treatable and preventable, is often overlooked. Good practice would dictate that patients with stroke presenting with poor verbal expression be invariably evaluated for the presence of constipation.

It is uncertain whether constipation is linked to some area of the central nervous system. Although Bracci et al⁽⁴⁾ stated that constipation is not related to the site of brain lesion, our finding that infratentorial lesion was significantly associated with poststroke constipation indicates otherwise. Lesions affecting the pontine defecation centre may disrupt the sequence of the sympathetic and parasympathetic components of defecation, as well as impair the coordination of the peristaltic wave, and the relaxation of the pelvic floor and external sphincter.^(18,19) This could explain the higher rate of poststroke constipation in patients with infratentorial lesions. Su et al⁽³⁾ showed that stroke type has no effect on the incidence of new-onset constipation in patients with stroke for the first time. In our study, however, patients with haemorrhagic stroke had a higher incidence of poststroke constipation. Further studies with larger sample sizes are needed to verify this finding.

In the general population, age and sex are important predictors of constipation.⁽²⁰⁻²²⁾ However, stroke severity is reported to be more important than age or sex in predicting constipation in stroke survivors.^(3,4,7) We found that a lower BI score on admission to the rehabilitation ward was associated with a higher likelihood of poststroke constipation, which is in line with the findings of a previous study.⁽³⁾ When we categorised the patients with constipation into those using only oral laxatives and those using rectal medications in addition to oral laxatives, low BI score on admission was found to be an independent predictor of rectal laxative use. This suggests a positive relationship between the severity of constipation and the severity of disability – a finding not previously reported. On univariate analysis, we found that patients in the rectal medicine group were more likely to be nonambulatory, as well as require the use of a NG tube and/or Foley catheter. Those variables, however, did not exist in the multivariate model. This may be due to their close association with low BI score.

Diabetes mellitus is a well-known cause of gastrointestinal dysmotility. The pathogenesis of diabetic gastroenteropathy is generally considered to be the result of autonomic neuropathy.⁽²³⁾ In the general population, reports of upper and lower gastrointestinal symptoms (e.g. constipation) are more frequent in people with diabetes mellitus than in those without.⁽²⁴⁾ Hence, it is not surprising that patients with stroke who have diabetes mellitus had a higher risk of poststroke constipation and that their constipation was more likely to be severe. While the use of certain medications may predispose patients to constipation, we did not find an association between constipation-inducing drugs and poststroke constipation. This may be due to the care exercised by our physicians in not prescribing constipation-inducing drugs to patients with stroke.

In our study, 28 (22.8%) of the 123 patients with poststroke constipation experienced major medical complications during inpatient rehabilitation. This rate is significantly

higher than that of patients without poststroke constipation (6.3%). Among the patients with poststroke constipation, those who used rectal medications were more likely to have major complications as compared with those who used only oral laxatives (33.9% vs. 13.4%). Most patients with poststroke constipation were identified the day they were transferred to the rehabilitation ward, with the medical complications occurring later. Hence, it is unlikely that the complications caused the constipation. In a previous study,⁽²⁵⁾ the incidence of medical complications among patients with stroke in a rehabilitation ward was found to be associated with the use of Foley catheter, the use of NG tube and low BI on admission. In our study, the prevalence of these factors as risk factors for medical complications was significantly higher in patients with poststroke constipation, especially in the group receiving rectal medications. When these variables (i.e. use of Foley catheter, use of NG tube and low BI) were included in the multivariate analysis, they reduced the strength of the associations between constipation and medical complications (data not shown). Therefore, we suggest that poststroke constipation is not an independent predictor of major medical complications; it is just associated with the risk factors of medical complications.

In our study, only 13 (10.7%) of the 123 patients with poststroke constipation who used laxatives discontinued the use of laxatives at discharge. This finding suggests that poststroke constipation is persistent and chronic. We also found that younger patients (aged < 55 years) were more likely to discontinue laxatives at discharge. Age was found to be an important predictor of constipation in the general population.^(11,12,16,20-22,26) However, while previous studies^(3,7) and the present study did not find age to be associated with poststroke constipation, the present study did find that younger patients with stroke tended to have transient, instead of chronic, constipation.

Our study had several limitations. The major limitation was the criteria used for defining patients who were constipated. In our study, all patients who were on laxatives were defined to have constipation, and the modified Rome II criteria used was not validated. The development of valid and reliable criteria to screen poststroke constipation is needed in future studies. As our study included a specific group of subjects (i.e. patients who had been admitted to the neurological ward with recent stroke and were transferred to the rehabilitation ward due to poststroke disabilities), our results cannot be generalised to all patients with stroke. Furthermore, since this study was a retrospective chart review study, recording bias was inevitable, and the recorded information was insufficient at times. We could not examine the relationship between some relevant clinical variables (e.g. diet, fluid intake and exactly mobility level) and poststroke constipation as that information was not available. The observation period in our study was also too short. A longer follow-up period after discharge would

provide more information regarding the long-term course of poststroke constipation.

In our study, we found that constipation was common among patients with stroke who were admitted to a rehabilitation ward, with an incidence as high as 79.4%. We observed that poststroke constipation was significantly related to infratentorial lesions, and severe disability had the potential to result in more severe constipation, requiring rectal medication in addition to oral laxatives. As individuals with poor verbal expression who have constipation will often have difficulty informing their physician or nurses about the symptoms, this can result in a missed diagnosis and hence, a worsening condition. The clinical implications of our findings are as follows: (a) healthcare providers should be alert to poststroke constipation, as onset may occur even at the subacute stage during inpatient rehabilitation. Screening for poststroke constipation should be routine practice in all stages after stroke, especially in patients who cannot express themselves adequately; (b) treatable causes of constipation, particularly functional difficulties, should be identified and managed; and (c) further studies to establish standard guidelines for screening and managing bowel function in patients with stroke are needed.

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