ORIGINAL ARTICLE

Sensation of defecation in patients with spinal cord injury

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Study design: For this study, a descriptive, explorative design was used.

Objectives: As a result of spinal cord injury (SCI) patients may have a partial or complete loss of the sensations of defecation. To compensate this impairment, nurses initiate bowel management programs. Therefore, they need information about sensations of defecation. Accordingly, the research questions explore which sensations of defecation are reported by patients with SCI and whether they can be used to improve bowel care.

Setting: The Gemeinschaftskrankenhaus Herdecke and the Berufsgenossenschaftlichen Kliniken Bergmannsheil in Bochum, Germany.

Methods: A convenience sample of 27 patients with SCI was interviewed using a semistructured questionnaire. For data analysis, the frequency of the reported sensations was counted.

Results: The results of the study show that the participants' defecation was indicated by abdominal sensations ($n=20$) or a prickling sensation ($n=11$) emerging mainly in the head. Additional signals comprised increased spasticity ($n=10$), cutis anserina ($n=8$) and sweating ($n=6$). Seventeen participants sensed actual defecation and 15 perceived its cessation. Six participants were able to initiate defecating according to their sensations.

Conclusions: The assessment of sensations of defecation in patients with SCI may indicate whether a bowel-management program with a consistent schedule for defecation is needed or if physiological defecation can be trained.

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Introduction

Spinal cord injury (SCI) has functional impacts on multiple organs including the bowel.¹ As a result of the SCI, there are different dysfunctions of the bowel, including changes in the sensation of bowel activities.² Some patients with SCI may have a partial or complete loss of the perception of stool in the rectum or they may not be able to initiate or delay defecation.^{2,3} A full rectum may not produce an urge to defecate⁴ and the conscious control over sphincter activity may be lost.^{5,6}

However, there are also patients with SCI who report physiological defecation and preserved sensations of bowel activities. Normal defecation has been found in 15% of 221 patients with SCI⁷ and in 46% of 353 patients.⁸ In one study, a normal desire to defecate was experienced by 19% of 424 patients, whereas 38% never felt any desire to defecate.⁹ In another study, 42% of 171 patients reported that they always knew when they were about to defecate and 12% were able to control or stop defecation.¹⁰ There are also patients with

SCI who are able to initiate defecation when they sense an urge. The size of this group was found to be 12% of 837 patients in one study¹¹ and 20% of 171 patients in another.¹⁰

There are also patients with SCI who perceive sensations of bowel activities associated with symptoms of an autonomic dysreflexia, visceral pain, non-painful sensations and phantom phenomena. Autonomic dysreflexia can be caused by bowel distension.¹² Such symptoms were reported by 17% of 48 patients¹³ and 6% of 213 patients with SCI.¹⁴ Visceral pain can be associated with bowel dysfunction.¹⁵ This has been identified by 5% of 100 patients¹⁶ and 6% of 463 patients.¹⁷ Non-painful sensations related to defecation were reported by 8% of 103 patients.¹⁸ Phantom phenomena in the rectum¹⁹ or phantom defecations are also known in patients with SCI.²⁰ Further sensations indicating an upcoming defecation in 51 patients with SCI were found to comprise passage of air ($n=3$), rectal distension ($n=7$), abdominal pain or pressure ($n=15$), mild signs of autonomic dysreflexia (headache, sweating, $n=17$) or unspecific sensations ($n=9$).²¹

When rehabilitating patients with SCI, nurses are responsible for bowel care. They are involved in designing and performing bowel-management programs for patients who have lost the ability to feel stool in the rectum or to initiate

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defecation. For that reason, nurses need to know whether patients perceive sensations of defecation. However, little is known about which sensations are felt, how they emerge and what they indicate. Therefore, the research questions explore what sensations of defecation are reported by patients with SCI and whether they can be used to improve bowel care.

Methods

For this study a descriptive, explorative design was used. Twenty-seven available inpatients as well as known discharged patients from two rehabilitation facilities in Germany, the Gemeinschaftskrankenhaus Herdecke and the Berufsgenossenschaftlichen Kliniken Bergmannsheil Bochum, were selected according to the inclusion criteria. The inclusion criteria consisted of sensations of defecation, a traumatic cause of SCI, duration of injury for more than half a year and good knowledge of the German language. For the interviews a semistructured questionnaire was developed (Table 1). The questions were derived from the function of physiological defecation as well as defecation of spinal injured patients with neurogenic bowel dysfunction.

The convenience sample consisted of 27 participants. The sample was not representative for patients with SCI. The interviews were conducted by the researcher at the participants' home from July until October 2005. Ethical approval for the study was given by the ethical committee of the Kanton Luzern, Switzerland, as well as by the local ethical committees of the participating facilities. Informed consent was obtained from each participant after they had been informed about the purpose of the study, the procedure and the confidentiality of the information given. For data analysis, the frequency of the reported sensations was counted and the sensations were tabulated into groups according to their similarities.

Results

The sample consisted of 20 male and 7 female participants with a median age of 43 years (range 24–68 years). The median duration of SCI was 13 years (range 1–40 years). The localization of the lesion was cervical in 12 participants, thoracic in 13 participants and lumbar in 2 participants. There were 17 with an incomplete injury of sensory function and 10 participants with a complete injury of sensory function.

The results of the study revealed different signals of an upcoming defecation: abdominal and prickling sensations, increased spasticity, vegetative symptoms and further sensations emerging in few participants (Table 2). The major signals indicating defecation comprised abdominal and prickling sensations, whereas the other sensations were found to be accompanying signals.

Abdominal sensations

Twenty participants reported abdominal sensations such as pressure, murmuring, feeling of tension or a solid feeling in the stomach. Fifteen of these participants referred to these signals as abdominal pressure. All of the latter had an

Table 1 : Questionnaire

Questions	Answers
Do you perceive an upcoming defecation?	☐ Yes ☐ No Description
How long is the duration of time between these sensations and the beginning of defecation?	Minutes
Do you perceive defecation itself?	☐ No ☐ Yes Description
Do you perceive the end of defecation?	☐ No ☐ Yes Description
Are there more sensations associated with defecation?	☐ No ☐ Yes Description
Are there factors influencing sensations of defecations?	☐ No ☐ Yes What factors

Table 2 Signals of an upcoming defecation

Signals	N	Incomplete SCI ^a	Complete SCI ^b
Sensations in the stomach	20		
Abdominal pressure (stomach/bowel)	15	15	0
Unspecific abdominal sensations (stomach/bowel)	5	0	5
Prickling sensation (head, stomach, upper arm, generalized)	11	5	6
Increased spasticity (legs)	10	6	4
Cutis anserina (arms, shoulders)	8	3	5
Sweating (head, upper part of the body)	6	1	5
Pain (stomach, pelvis, ribs)	3	1	2
Red spots (neck, thigh)	2	0	2
Restlessness	1	1	0
Flushing in the face	1	0	1
Voiding of the bladder	1	1	0
Cramping of the lower part of the bladder	1	0	1
Malaise	1	0	1
Additional vegetative symptoms in specific situations	10	8	2

Abbreviation: SCI, spinal cord injury.

Multiple answers possible.

^aIncomplete injury of sensory function.

^bComplete injury of sensory function.

incomplete injury of sensory function. Five participants with unspecific abdominal sensations had complete injury of sensory function (Table 2).

Some of the participants reported that the abdominal pressure expressed itself almost as it was before the onset of SCI. For other participants, it was somewhat dull compared to the time before and yet others could not remember their signals in the past.

Prickling sensations

Eleven participants perceived a prickling sensation indicating defecation, which appeared in five participants with an

incomplete injury of sensory function and in six participants with a complete injury of sensory function (Table 2). Participants with tetraplegia perceived the prickling sensation in the head or generalized ($n = 6$), whereas participants with paraplegia sensed it in the stomach ($n = 2$) or upper arm ($n = 1$). Two participants reported signals, which were classified as variations of this prickling sensation: a warm wave spreading about the head and upper part of the body (one participant with paraplegia) and a pressure in the face (one participant with tetraplegia).

The prickling sensation was described as a feeling like ants crawling over the skin. It was referred to as a reliable and homogenous sensation being independent of external influences such as stress, or other situations like being on holiday, for instance. The prickling sensation reported to emerge some seconds before the beginning of defecation, to increase and then to vanish at the moment in which defecation started. Some participants reported that the prickling sensation was also perceived when the bowel was digitally stimulated.

Spasticity

Ten participants reported increased spasticity, which appeared mainly in the legs. Six of these participants had an incomplete injury of sensory function, whereas four participants had a complete injury of sensory function (Table 2).

Vegetative symptoms

Eight participants sensed cutis anserina in the arms and shoulders, which appeared in seven participants together with the prickling sensation. Three of these eight participants with cutis anserina had an incomplete injury of sensory function, whereas five participants had a complete injury of sensory function (Table 2).

Six participants perceived head sweating and sweating on the upper part of the body. One of them had an incomplete injury of sensory function and 5 participants had complete injury of sensory function.

Ten participants reported additional vegetative symptoms emerging occasionally or in specific situations such as a long lasting process of defecation, a large amount of stool or stool of hard consistency: a metallic taste in the mouth, runny nose, lacrimation, headache, sweating, cutis anserina, flushing of the face, back pain, malaise and nausea. Eight of these participants had an incomplete injury of sensory function and 2 participants complete injury of sensory function (Table 2).

Duration between the signals of an upcoming defecation and its beginning

The duration of time between the signals of an upcoming defecation and the beginning of defecation lasted between a few seconds and 30 min. For 14 participants, the duration was less than 5 min (nine participants with an incomplete injury of sensory function and five with a complete injury of sensory function) and for 13 the duration was more than 5 min (eight participants with an incomplete injury of sensory function and five with a complete injury of sensory function) (Table 3).

In the group of participants with less than 5 min, nine perceived a prickling sensation in the head or in a generalized way (including seven participants with tetraplegia) or in the stomach (two participants with paraplegia). Five participants of this group reported about abdominal pressure (three participants with tetraplegia and two participants with paraplegia).

Eleven of the 13 participants with sensations lasting more than 5 min perceived signals in the stomach, mostly abdominal pressure (nine participants with paraplegia and two with tetraplegia) and one sensed a prickling sensation in the left upper arm (participant with paraplegia). Another participant neither had sensations in the stomach nor a prickling sensation but a cramping sensation in the lower part of bladder (participant with paraplegia).

Participants with paraplegia who sensed abdominal pressure indicating defecation had more time between this signal and the beginning of defecation than participants with tetraplegia perceiving a prickling sensation (Table 4).

Sensation of the actual defecation

Defecation was perceived by 17 of the participants (Table 5). Fifteen of these participants had an incomplete injury of sensory function and sensed defecation in the bowel, whereas two participants had complete injury. One of them reported a prickling sensation in the stomach and another cutis anserina in the left upper leg. Four participants mentioned that they only realized that they had a bowel movement if the consistency of stool was rather hard. Ten participants perceived signals of an upcoming defecation. They did, however, not feel the actual defecation.

Sensation of the end of defecation

The end of defecation was perceived by 15 of the participants (Table 5). Twelve of these participants had an incomplete injury of sensory function and perceived the end of

Table 3 Completeness of SCI and the duration between signals of an upcoming defecation and its beginning

Duration	n	Incomplete SCI ^a	Complete SCI ^b
< 5 min	14	9	5
> 5 min	13	8	5

Abbreviation: SCI, spinal cord injury.

^aIncomplete injury of sensory function.

^bcomplete injury of sensory function.

Table 4 Sensations, localization of SCI and the duration between signals of an upcoming defecation and its beginning

Sensations and localization of the SCI	< 5 min	> 5 min
<i>Participants with tetraplegia</i>		
Abdominal sensations	3	2
Prickling sensations	7	0
<i>Participants with paraplegia</i>		
Abdominal sensations	2	9
Prickling sensations	2	1

Abbreviation: SCI, spinal cord injury.

Table 5 Sensation of the actual defecations and its end as well as defecation according to sensations

Participants with sensations	n	Incomplete SCI ^a	Complete SCI ^b
Sensation of defecation	17	15	2
Sensations of the end of defecation	15	12	3
Defecation according to sensations	6	5	1

Abbreviation: SCI, spinal cord injury.

^aIncomplete injury of sensory function.

^bComplete injury of sensory function.

defecation mostly by the cessation of the abdominal pressure ($n=8$). Three participants had complete injury of sensory function and sensed the end by a decrease of the prickling sensation or cutis anserina.

Eleven participants had no perception of the end of defecation. To detect the appropriate time to terminate bowel care, they had learnt to assess the end according to different criteria like a soft consistency of the stool, its mucous character and the adequate duration for bowel care. One participant could not specify clearly about this issue.

Defecation according to sensations

Six participants were able to defecate according to sensations and did not have a consistent schedule for defecation (Table 5). Defecation was indicated by abdominal pressure in five participants with an incomplete injury of sensory and a cramping of the lower part of the bladder in one participant with complete injury of sensory function. Three conditions for defecation according to sensations could be analyzed: first, the duration between signals indicating defecation and its beginning needed to be at least 54 min in order to find an appropriate place for defecation. Second, the independency of the participants in performing bowel care marked another condition. The only participant with tetraplegia in this group was able to defecate according to sensations because the caregiver was present day and night. Third, unplanned defecations need to fit in with other daily activities such as work or family. Another two participants who fulfilled the first two conditions did not defecate according to sensations because they felt more secure in their job with a consistent schedule for defecation.

Discussion

Abdominal sensations

Twenty participants reported abdominal sensations, which were referred to an abdominal pressure by 15 participants with incomplete injury of sensory function. Five participants with unspecific abdominal sensations had complete injury of sensory function.

Nonspecific sensations, which emerged after inflation of a rectal balloon in patients with complete upper motor neuron lesion were found in another study.⁶ It can be assumed that these sensations are derived from afferent impulses of the sympathicus entering the thoracic spinal cord above the level of lesion. Nevertheless, similar sensations were also found in patients with complete cervical SCI, which does not

support this assumption.²² In another study, 'non-painful' sensations were found to be associated with defecation.²³

The abdominal pressure seems to have some similarities with the physiological urge of defecation. The fact that only participants with incomplete SCI reported abdominal pressure may support this assumption. Participants with complete SCI perceived rather unspecific sensations such as abdominal murmuring or feeling of tension. Similar results were found in a study in which rectal and colonic sensations were examined in healthy participants using balloon distension. After sacral parasympathetic nerves had been blocked by a low spinal anesthesia, colonic sensation was quite unaffected but rectal sensation was completely abolished.²⁴ It can be assumed that the abdominal pressure is caused by rectal distension in patients with incomplete SCI, indicating urge of defecation. Patients with complete SCI cannot perceive rectal distension because of the impaired sacral parasympathetic nerve. They sense, however, colonic distension, which causes more unspecific sensations.

Prickling sensation

Eleven participants reported a prickling sensation indicating an upcoming defecation. Reports about prickling sensations in patients with SCI are well known. However, the prickling sensation emerges in the paralyzed part of the body,²⁵ often associated with increased sensibility.²⁶ No reports could be found about a prickling sensation above the level of SCI.

The prickling sensation seems to be totally different from physiological sensations of defecation. It could be derived from an afferent impulse associated with neurogenic bowel dysfunction. It seems possible that this afferent impulse is caused by bowel distension. This assumption is supported by the fact that the prickle emerges immediately before defecation and can also be caused by digital manipulation in some cases.

Spasticity

Ten participants referred to increased spasticity mainly in the legs indicating an upcoming defecation. It is known that patients with SCI experience increased spasticity associated with bowel dysfunction.²⁷ An increased spasticity can be caused by noxious stimuli like bowel distension²⁸ or constipation.²⁹ Spasticity is a sensorimotor phenomenon which is a motor response to sensory input.³⁰

Vegetative symptoms

Eight participants reported about cutis anserina and 6 participants perceived sweating indicating an upcoming defecation. Additionally, 10 participants perceived vegetative symptoms such as a metallic taste in the mouth, a runny nose, lacrimation, headache, sweating, cutis anserina, flushing of the face, malaise and nausea, emerging occasionally or in specific situations.

Vegetative symptoms are often associated with the occurrence of autonomic dysreflexia. Cutis anserina is caused by norepinephrine, dopamine- β -hydrolase and dopamine. The release of these substances also results in severe

vasoconstriction and elevated blood pressure. The latter may cause headache.³¹ To compensate the elevated blood pressure, vasodilatation occurs as the result of an increase in sympathetic inhibitory outflow from the vasomotor centres above the lesion.^{28,32} The vasodilatation causes symptoms, such as skin flushing^{28,33}, headache³³, blurred vision^{28,32}, nasal congestion^{28,32–34}, cutis anserina²⁸, nausea³², restlessness²⁹ and sweating above the lesion.^{28,32,33}

The increase in blood pressure is an objective sign of autonomic dysreflexia.¹³ In this study, no measurement of blood pressure was taken. So it cannot be clarified whether these symptoms are associated with autonomic dysreflexia or not.

Vegetative symptoms like cutis anserina and sweating can be used as 'indications of a full bowel'. Patients can learn to identify their own particular signs in order to perform bowel care according to these indicators.³⁵ However, it has not been concluded whether the use of vegetative symptoms as a trigger for defecation is helpful. These symptoms may be indicators of fecal impaction and it is the aim of bowel management programs to avoid such complications.³⁶

Duration between the signals of an upcoming defecation and its beginning

Participants with paraplegia sensing abdominal pressure had more time between this signal and the beginning of defecation than participants with tetraplegia who perceived a prickling sensation.

These findings support the assumption that abdominal pressure has some similarities with the physiological urge of defecation: in most cases abdominal pressure was associated with duration of at least some minutes before defecation started. Eventually, abdominal pressure in combination with some minutes before the beginning of defecation emerged mostly in participants with paraplegia. For these participants, abdominal pressure seemed to be a helpful signal of defecation, which can be used for bowel care.

In contrast, the prickling sensation was found to be different from physiological sensations of defecation: it appeared mostly in the head or generalized and was associated with seconds before the beginning of defecation. The prickling sensations seemed not to be useful to improve on bowel care.

Sensation of the actual defecation and its end

Defecation was perceived by 17 of the participants and the end of defecation was sensed by another 15 of the participants. Sensation of defecation refers to the preserved sensitivity in the sacral segments of the spinal cord S4 and S5.³⁷ This perception is possibly mediated by visceral afferents from the sympathetic chain. It may be because of partial sacral sparing of anal afferents relayed through the spinal cord.³

Completeness of the SCI

The completeness of the SCI was suitable to differentiate sensations of defecation for participants with upper motor

neuron lesion. Participants with an incomplete injury of sensory function perceived an upcoming defecation most clearly by abdominal pressure with or without a prickling sensation in the head. Defecation was perceived by 17 of the participants. Fifteen of these participants had an incomplete injury of sensory function and sensed defecation in the bowel. The end of defecation was perceived by 15 of the participants. Twelve of these participants had an incomplete injury of sensory function and sensed the end of defecation mostly by the cessation of abdominal pressure ($n=8$). Finally, five of the six participants who were able to defecate according to sensations had an incomplete injury of sensory function.

Participants with incomplete SCI showed similarities to those of a physiological bowel evacuation: they perceived some urge to defecate and sensed the complete act of defecating. These sensations may show the ability of the autonomic nervous system to recover and reorganize after the onset of an incomplete SCI.

For participants with complete injury of sensory function defecation was mostly indicated by unspecific abdominal sensations or a prickling sensation in the head or otherwise generalized. Most of them did not perceive defecation or it was indicated by cutis anserina, prickling sensation or the cessation of those sensations ($n=2$). The end of defecation was neither sensed at all or it was perceived by a fading prickling sensation or the cutis anserina ($n=3$). The sensations of defecation of the participants with complete injury of sensory function were found to be totally different from a physiological defecation. There were deficits in sensation as well as afferent impulses, which might be the result of bowel dysfunction.

Limitations

In this study, a convenience sample of patients with SCI was interviewed on their sensations of defecation. The results cannot be attributed to all patients with SCI who report such sensations. The localization and completeness of SCI was not revised in this study but declared according to the records or the information given by the participants. Since there are changes over time, this information may not have been updated. The completeness of the SCI could not be presented according to the standard of the American Spinal Injury Association, because this standard is not practised in the facilities in which the SCI of the participants had been diagnosed after the onset of SCI. Finally, there were no medical examinations and diagnoses supporting the reports of the participants.

Conclusions

The results of this study provide conclusions for nursing. If patients with SCI report sensations of defecation, it may be useful to assess them systematically. Such an assessment may indicate if a bowel-management program with a consistent schedule for defecation is needed or physiological defecation can be trained.

The following criteria may suggest the possibility of a physiological defecation: incomplete injury of sensory

function, abdominal pressure accompanied by increased spasticity or other vegetative symptoms indicating an upcoming defecation, more than 5 min between these signals and the beginning of defecation, sensation of the actual defecation and its end, independency in performing bowel care (patients with paraplegia) and readiness to cope with unplanned defecations.

For patients with a complete injury of sensory function, prickling sensations in the head or generalized sensations indicating defecation, duration between signals of defecation and its beginning less than 5 min and dependency on care givers in performing bowel care (patients with tetraplegia), a bowel management program with a consistence schedule for defecation seems to be required.

The results of the study show that many participants were irritated by the sensations of defecation because they were not conscious of them before the onset of SCI. If nurses were to assess sensations of defecation and help patients to understand and interpret them, they would contribute to a better understanding of the changed body function.

An interdisciplinary study is needed to confirm the reported sensations of defecation through medical examinations and diagnostic treatments. Such results could fully clarify the correlation between sensations of defecation and the necessity of a bowel-management program. This clarification could improve nursing care of patients with SCI.

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