The Relation between the Bowel Management and the Urinary Tract Infection Rate in Patients with Spinal Cord Injuries
A Study from the Perspective of Nursing

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Introduction

Urinary tract infections (UTI) represent the most significant medical problem of patients with spinal cord injuries (SCI). SCI-patients suffer more frequently from UTIs than non-disabled persons. These urinary infections do not only lead to long and frequent stays in hospitals[1] but also limit the quality of life, and cause significant health costs. [2]

Nearly all UTIs are caused by bacteria that have their origin in the bowel. UTIs usually require antibiotic therapies, which are one the one hand applied to fight bacteria in the urinal system, but on the other also have a negative impact on the bacterial spectrum of the intestine. [3]

SCI-patients usually suffer from a delayed stool transport and consequently from a difficult, if not to say, non-existent defecation which goes along with constipation, flatulence and faecal incontinence. [4] Due to the lack of sensibility, which also depends on the grade of their injury, these patients do not feel the necessity of defecation. This is the reason why bowel management is essential for these patients. Without special efforts and attempts to defecate, a cycle of constipation and paradoxical diarrhoea is to follow. Bowel management is the responsibility of the nursing staff. Both the regulation of the bowel activity and the individualized bowel emptying are of utmost importance for the wellbeing of the patient.

The bacteria load reaches its highest level in the rectum. Therefore, the nursing staff has to ensure the regular and hygienic defecation and has to try to avoid any fecal incontinence. The time required for the defecation of SCI-patients is significantly higher than that of non-spinal cord injured persons.

Despite its importance, the role of the bowel management in the pathogenesis of urinary tract infections of SCI-patients is largely unknown. Anatomy and innervation suggest a close relationship between the two organic systems; but only few data exist about the functional relationship between the urinary bladder and the bowel.

Objektives

General Objective

The aim of this study is to investigate the influence of the bowel management on the urinary tract infections of patients with spinal cord injuries.

Reasons for the Selected Procedure

We believe that spinal cord injuries are an ostensive condition to elucidate the interrelationship between the bowel and the urine bladder for the below-mentioned reasons:

1. The type of the paralysis can be defined well, the classification models are mature.
2. Arbitrary and psychological influences on the bowel function are of secondary importance.
3. The nursing staff is experienced in dealing with problems of the bladder and bowel of SCI-patients.
4. The type of bladder and bowel dysfunction can be described accurately through urodynamic methods. These examinations are standardized.
5. German guidelines require microbiological analyses in cases of urinary tract infections of patients with SCI.
6. Laboratory analyses of stool samples with detection of the bacterial microflora (including friendly, pathogenic and imbalanced flora) and abnormal stool mycology are established and accepted.
7. The nursing staff is able to control and, if necessary, correct the applied concepts of emptying bowel and bladder.
8. SCI patients are well-informed about the significance and problems which may occur with regard to their bladder and bowel status. We therefore expect a high compliance from patients for the study.

Specific Objectives

1. To monitor bladder and bowel management with regard to safe handling in order to avoid any hygienic mistakes which might have a negative impact on the study
2. To investigate the differences in bowel management in patients with and without recurrent urinary tract infections.

3. To examine the dependence of the UTI-rate on the type of bladder dysfunction.
4. To evaluate the influence of different types of bowel emptying (enemas, laxatives, digital or nerve stimulation, manual evacuation) on the species and the amount of bacteria in the bladder.
5. To investigate the influence of a bowel management change (method and frequency) on the UTI-rate.

Literature Review

In literature there are various references to interrelations of bowel dysfunctions and increased urinary tract infections. For example, children with chronic disorders of the urinary tract often suffer from constipation, and an increase of the UTI- rate can be observed after colorectal operations, unless surgeries of higher intestinal parts were carried out.[5 6] Also, malfunction of lower intestinal tracts occur more often when patients (children as well as adults) suffer from urinary incontinence. [7] Systemic UTI-therapies have an influence on the intestinal flora.

It was also observed that the rectal bacterial spectrum of patients was shifted to grampositive species the longer they stayed in Intensive Care Units (ICUs). [8]

It is, however, still not clear whether a higher UTI-rate can be associated with any specific kind of bladder and bowel dysfunction, or whether particular combinations of them lead to a particular risk. [9 10] It is also unclear which kind of bowel functional diseases increase the risk of suffering from UTIs. In 2007, Löber demonstrated how important complete bowel emptying is for SCI-patients with recurrent UTIs. After replacing bowel emptying with irrigation, 15 of the 21 patients did no longer suffer from these recurrent infections. [11]

Saccharomyces are known to have a preventive effect with regard to diarrhea associated with antibiosis. [12] In 2003, Kontiokari et al. showed in a controlled study that dietary factors such as dairy products and berry juices can reduce the occurrence of recurrent UTIs. [13]

In 2012, a review analysed six studies comprising a total number of 386 patients with UTI and bowel dysfunction. Authors of the study concluded that further research was needed to achieve reliable results on the correlations between intestinal functions and UTIs. They demanded an

improved database of neurological and pathological aspects of these disorders as well as an exact assessment of the chronic diseases of bladder and bowel. [14]

Relevance to Urology Nursing

If this study demonstrated a relation between the kind of bowel management and the ratio of urine infections, a change in nursing targets and in scheduling of the nursing staff would be indicated. Bowel regulation measures, the time periods of defecation, the use of auxiliary means, and the different kinds of defecation measures would have to be put into question. The knowledge about the correlation between defecation management and urinal tract infections would have an impact not only on urological care of patients with SCI but also on paraplegiology in general.

Methodology

Type of Study Design

The study is a clinically prospective, controlled study, which exclusively includes patients with spinal cord injuries. The minimal follow-up time should not be shorter than 12 months.

Definitions

The following definitions are used:

1. Constipation (in agreement with the Rome Criteria[15])
   Functional constipation is defined as “a functional bowel disorder that presents persistently difficult, infrequent or seemingly incomplete defecation and does not meet irritable bowel syndrome (IBS) criteria. Criteria have to be fulfilled for the last 3 months with symptom onset at least 6 months prior to diagnosis”.
2. Diarrhoea[16]
   Functional faecal incontinence is defined as “an uncontrolled leakage of faecal material for at least 3 months of an individual over 4 years of age”. The criteria have to be fulfilled for the last 3 months with symptom onset at least 6 months prior to diagnosis.
3. UTI in patients with spinal cord injury[17]

A urinary tract infection has to meet two criteria: pyuria (urine specimen with ≥10^5 white blood cells/mL), and significant bacteriuria ≥10^5 colonies/mL in freshly specimen of urine.

4. Significant bacteriuria[18]
   Bacteriuria >10^2 colonies/mL in freshly specimen of urine.

Inclusion criteria

1. Patients have to be at least 18 years old.
2. The injury has to be older than 24 months.
3. The level of injury and the type of bladder and bowel dysfunction have to be classified.

Exclusion criteria

1. Patients who suffer from mental diseases.
2. Patients with any kind of carcinomas during the last 5 years.
3. Patients who underwent bowel surgery or suffer from Crohn´s disease.
4. Patients with a CDAD or a bowel infection with Shigella/Salmonella during the last 12 months.

Study Procedures

There is a special registration for each participant. The study starts with a stool protocol over a period of 14 days. It includes short results about the direct influence of different methods of emptying the bowel, bacteria count and the kind of bacteria before and immediately after the bowel emptying.

The examinations of the urine and stool samples will be carried out regularly two times a year and in case of urinary tract infection additionally three days after the antibiotic treatment. The urine sample will be sent to the bacteriological laboratory of the Werner-Wicker-Clinic. The stool sample will be tested in another specialized laboratory.

The study will comprise a period of 2 years, and will be continued with patients suffering from recurrent UTIs for another 12 months. Those patients will be divided into two groups: one without changing their bowel management and one with a change in the bowel management. The last

part of the study investigates whether a change in bowel management helps reducing the UTI-rate.

Outcome Measures

Our aim is to examine whether correlations exist between the type of bowel movements and the urinary tract infections, in particular, correlations between the bacterial composition of the stool and the species of bacteria in the urine.

Parameters to be analysed for basic examination are: the level of injury, age of injury, gender, and the age of the tested persons.
Parameters to be analysed for bowel management are: classification of neurogenic rectum dysfunction, the type of bowel movement (method, duration in hours, frequency of bowel movements per week).
Parameters to be analysed for bladder management are: classification of neurogenic bladder dysfunction, method of bladder emptying, use of medicaments to treat bladder dysfunction.
Parameters to be analysed for bacterial control: bacterial composition of the stool in the rectum, urine analyses (including microscopy), examination of the kind of bacteria and sensibility to antibiotic medication.

Statistical analysis

Data will be evaluated by using computer statistical analysis (Fischer-test, Mann-Whitney-test).

Sample Size

The first test group - patients without UTIs in the last two years – will comprise 30 patients.

The second test group - patients with recurrent UTIs in the last 6 to 12 months – will comprise 60 patients.

The study will continue to examine patients of the second test group for 12 months. These patients will be randomized in one group (30 patients) without changing the bowel management and in one group (30 patients) with changing the bowel management.

Feasibility

Timetable

Development of project plan:	August - November 2012
Development of questionnaire:	December 2012-January 2013
Project Presentation EAUN:	March 2013
Inclusion of patients:	April 2013 - October 2014
First statistical analysis and results:	November 2015- March 2016
Second statistical analysis and results after changing the bowel management:	October/November 2016

Budget

Administration expenses		500€
Statistical costs, presentation, writing article		1.000€
Additional laboratory tests for UTI (In addition to regular care)		250€
Lab tests of stool specimen		1.500€
	Total	**3.250€**

Conclusion

The role of the bowel management in the pathogenesis of urinary tract infections of SCI-patients is largely unknown. Anatomy and innervation suggest a close relation between the urinary bladder and the rectum. The study could prove a correlation between functional bowel diseases and UTIs. Such a result would lead to a reorientation of care planning and nursing goals. If the study also shows correlations between bowel management and urinary tract infections, the care of spinal cord injured patients would be positively influenced. Moreover, nursing could play a pivotal role in finding a solution to the medical problem of recurrent urinary tract infections.

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Conflicts of Interest

The authors declare no conflict of interest.