

<b>Author Year; Country Score Research Design Total Sample Size</b>	<b>Methods</b>	<b>Outcome</b>
<p><a href="#">Christensen et al. 2006</a> Denmark RCT Level 1 (PEDro = 7) N=87</p>	<p><b>Objective:</b> The aim of the present study was to compare transanal irrigation with conservative bowel management (best supportive bowel care without irrigation).</p> <p><b>Population:</b> 1) TAI group: ≥T9: 3 complete, 5 incomplete; T10-L2: 1 complete, 1 incomplete; L3-S1: 1 incomplete); Age: mean 47.5 yrs; 29M 13F. 2) Conservative bowel management (CBM) group: ≥T9: 22 complete, 11 incomplete; T10-L2: 1 complete, 3 incomplete; L3-S1, 8 incomplete Age: mean 50.6yrs; 33M 12F</p> <p><b>Treatment:</b> TAI (Peristeen Anal Irrigation system) or conservative bowel management (Paralyzed Veterans of America clinical practice guidelines) for 10 weeks.</p> <p><b>Outcome Measures:</b> Cleveland Clinic constipation scoring system (CCCSS), St. Mark's fecal incontinence grading scale (FIGS), American Society of Colon and Rectal Surgeons fecal incontinence score (symptom-related QOL scale), NBD score.</p>	<ol style="list-style-type: none"> <li>1. The TAI group had significantly improved scores over the CBM group for the following scales: CCCSS: TAI=10.3(4.4); CBM=13.2(3.4) FIGS: TAI= 5(4.6); CBM=7.3(4) NBD: TAI=10.4(6.8); CBM=13.3(6.4)</li> <li>2. TAI group scored non-significantly better on 2/4 domains of the symptom-related quality-of-life tool and significantly better on the domains coping/behaviour (TAI=2.8(0.8) vs CBM=2.4(0.7)) and embarrassment (TAI=3.2(0.8) vs CBM=2.8(0.9)).</li> <li>3. Improvement found in the TAI group as a whole was not confined to the more physically able patients.</li> <li>4. At weeks 7-10 participants had reduced time spent on bowel management each day, and reported being less dependent on help.</li> <li>5. The reported frequency of urinary tract infection during weeks 1-10 was lower in the TAI group (TAI=5.9%, CBM=15.5%).</li> </ol>
<p><b>Effect Sizes:</b> Forest plot of standardized mean differences (SMD ± 95%C.I.) as calculated from pre- and post-intervention data</p>		

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	<p style="text-align: center;"><b>Christensen et al. 2006; Transanal Irrigation (Peristeen)</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Outcome</th> <th>SMD (95% C.I.)</th> </tr> </thead> <tbody> <tr> <td>Cleveland Constipation Score</td> <td>0.90 (0.41, 1.40)</td> </tr> <tr> <td>St. Mark's Fecal Incontinence Grade</td> <td>0.65 (0.17, 1.13)</td> </tr> <tr> <td>NBD Score</td> <td>0.80 (0.32, 1.29)</td> </tr> <tr> <td>ASCRS FIS - Lifestyle</td> <td>0.26 (-0.21, 0.73)</td> </tr> <tr> <td>ASCRS FIS - Coping/Behaviour</td> <td>0.57 (0.09, 1.04)</td> </tr> <tr> <td>ASCRS FIS - Depression/Self-perception</td> <td>0.65 (0.17, 1.13)</td> </tr> <tr> <td>ASCRS FIS - Embarrassment</td> <td>-0.33 (-0.80, 0.14)</td> </tr> <tr> <td>NBS - Bowel Function</td> <td>0.90 (0.41, 1.38)</td> </tr> <tr> <td>NBS - Influence on Daily Activities</td> <td>0.41 (-0.06, 0.88)</td> </tr> <tr> <td>NBS - General Satisfaction</td> <td>1.01 (0.51, 1.50)</td> </tr> </tbody> </table> <p>ASCRS FIS = modified American Society of Colon and Rectal Surgeons Fecal Incontinence Score NBS = Numeric Box Scale</p>	Outcome	SMD (95% C.I.)	Cleveland Constipation Score	0.90 (0.41, 1.40)	St. Mark's Fecal Incontinence Grade	0.65 (0.17, 1.13)	NBD Score	0.80 (0.32, 1.29)	ASCRS FIS - Lifestyle	0.26 (-0.21, 0.73)	ASCRS FIS - Coping/Behaviour	0.57 (0.09, 1.04)	ASCRS FIS - Depression/Self-perception	0.65 (0.17, 1.13)	ASCRS FIS - Embarrassment	-0.33 (-0.80, 0.14)	NBS - Bowel Function	0.90 (0.41, 1.38)	NBS - Influence on Daily Activities	0.41 (-0.06, 0.88)	NBS - General Satisfaction	1.01 (0.51, 1.50)	
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<p><a href="#">Emmanuel et al. 2021</a> Europe Open, prospective efficacy study Level 2 N=89</p>	<p><b>Objective:</b> To investigate the short-term efficacy and safety of an electronic transanal irrigation system called Navina Smart in people with neurogenic bowel dysfunction</p> <p><b>Population:</b> N=89 Mean age: 48 y Female: 31% N: 52 in per protocol set Mean age: 47.6 years 23 ASIA A 7 ASIA B 8 ASIA C 13 ASIA D 1 missing data</p> <p><b>Treatment:</b> Transanal irrigation (TAI) system Navina smart</p> <p><b>Outcome Measures:</b> NBD score was measured at</p>	<ol style="list-style-type: none"> <li>Per protocol analysis on 52 participants showed significant decrease in mean NBD score from 17.8 to 10 (<math>p &lt; 0.00001</math>).</li> <li>Significant NBD score reduction after three months from <math>17.75 \pm 4.87</math> to <math>9.94 \pm 5.26</math> (<math>p &lt; 0.0001</math>).</li> <li>For those with severe symptoms and NBD score greater than or equal to 14, mean NBD scores decreased from 19.4 to 10.9 (<math>p &lt; 0.0001</math>).</li> <li>Baseline number of participants with severe symptoms decreased to 16 at the three month follow up (79% to 31%).</li> <li>Bowel management satisfaction increased from mean 1.85 at baseline to mean 3.67 after 3 months (<math>p &lt; 0.0001</math>).</li> </ol>																						

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	<p>baseline and 3 month follow-up. A 5-point scale measured subjective satisfaction with bowel management</p>	<ol style="list-style-type: none"> <li>6. Moderate correlation (correlation coefficient= 0.46) between NBD score and satisfaction with bowel management (p=0.0006).</li> <li>7. After 3 months of using Navina Smart, participants significantly reduced time spent on daily bowel management from mean 73.5 minutes to 46.4 minutes (range visit 1 0–360 min (±61.9), visit 2 10–120 (±20.5), p = 0.0007).</li> <li>8. Decrease in the need of other methods of bowel management besides transanal irrigation from a total of 225 at baseline to 158 at 3 months.</li> <li>9. Number of participants that required pads did not significantly decrease in participants with fecal incontinence (17 at baseline, 11 at 3 months).</li> </ol>
<p><a href="#">Kim et al. 2013</a> Korea Longitudinal Level 2 N=52</p>	<p><b>Objective:</b> To investigate the outcome of transanal irrigation (TAI) in patients with spinal cord injury (SCI) and to identify factors significantly related to clinical success. <b>Population:</b> Level of injury: 28 tetraplegics, 24 paraplegics; 41M 11F; Mean (SD) age: 44.5 (11.0) yrs; mean (SD) DOI: 92.9 (118.4) months <b>Treatment:</b> Transanal irrigation (TAI) <b>Outcome Measures:</b> Compliance rate, questionnaire on demographics, bowel care</p>	<ol style="list-style-type: none"> <li>1. Compliance with the use of TAI at 1, 3, and 6 months was 31/52 (59.6%), 25/52 (48.1%) and 18/52 (34.6%).</li> <li>2. At 6 months, the noncompliant group contained a higher proportion of tetraplegics than paraplegics and a higher need for assistance during bowel management. At 6 months, 6/28 (21.4%) of tetraplegia patients and 12/24 (50%) paraplegic patients were using TAI.</li> <li>3. In the compliant group, defecation time decreased from</li> </ol>

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	habits, frequency and time needed to defecate, intestinal symptoms, need for assistance during bowel management, participant satisfaction and quality of life, adverse events	baseline to 6 months and quality of life increased from baseline to 6 months.
<p> <a href="#">Smith &amp; Decter</a>            2015            USA            Prospective            Cohort            Level 2            N=17         </p>	<p> <b>Objective:</b> Patients with spinal cord injury (SCI) often suffer from severe constipation/fecal incontinence. The antegrade continence enema (ACE) procedure is often used to control these distressing symptoms when medical management fails. Improvement in the quality of life (QOL) following the ACE procedure has been demonstrated in patients with fecal incontinence of various etiologies. We assess the impact of the ACE procedure on QOL in patients with fecal incontinence due to SCI.         </p> <p> <b>Population:</b> N=17 (12M, 5F)            Mean (range) age at surgery 33 (6-49)            Mean (range) time post SCI at surgery 10 (1-30) years            Mean time from surgery to follow-up 56 (4-102) months            10 paraplegia, 7 tetraplegia            9 thoracic, 8 cervical            N=5 excluded due to completing pre-operative survey after surgery (N=12 remain for final analysis)         </p> <p> <b>Treatment:</b> Anterograde continence enema (ACE)         </p>	<p>           1. Significant increase in mean (SD) of all categories of FIQL after surgery:            Lifestyle:                2.3 (0.9) to 3.7 (0.5)            Coping/Behaviour:                2.2 (0.9) to 3.8 (0.3)            Depression/self-perception:                2.8 (0.9) to 3.8 (0.4)            Embarrassment:                2.2 (1.1) to 3.8 (0.3)         </p> <p>           2. Three patients developed stomal stenosis and one developed delayed small-bowel obstruction after surgery.         </p>

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	<b>Outcome Measures:</b> Fecal incontinence quality of life (FIQL) instrument	
<p><a href="#">Christensen et al. 2000</a> Denmark Case-control Level 3 N=29; 19 SCI</p>	<p><b>Objective:</b> To evaluate results of the Enema Continence Catheter (ECC) and the Malone Antegrade Continence Enema (MACE) applied in patients with severe neurogenic colorectal dysfunction.</p> <p><b>Population:</b> 1) TAI (enema continence catheter): N=21 participants (15/21 were SCI); 10M 11F; Age: mean (range) 39.9 (7-72) yrs; for SCI participants: Level of injury: 3 supraconal (T2 incomplete, T4 complete, T11 complete), 12 incomplete conal or cauda equina injuries; follow-up: mean (range) 16 (1-51) months 2) MACE: 8 patients, (4/8 were SCI); 3M 5F; Age: mean 32.8 years, range 15-66; 2 supraconal SCIs (C5-6 and T2, incomplete); mean follow-up 38 months, range 4-77</p> <p><b>Treatment:</b> TAI (enema continence catheter) vs. MACE (out of 8 MACE patients, 3 had tried ECC previously)</p> <p><b>Outcome Measures:</b> questionnaire on colorectal function, practical procedure, impact on daily living and quality of life, general</p>	<ol style="list-style-type: none"> <li>Overall success with TAI was found in 12/21 patients (57%). In patients with fecal incontinence, TAI was successful in 8/11 (73%), while 4/10 (40%) with constipation were successfully treated.</li> <li>Overall success with the MACE was found in 7/8 (87%) patients.</li> <li>Successful treatment with TAI or the MACE was followed by significant improvement in quality of life.</li> </ol>

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	satisfaction of the patient with the treatment	
<p data-bbox="212 1140 469 1171"><a href="#">Ethans et al. 2022</a></p> <p data-bbox="277 1178 404 1310">Canada Pre-post Level 4 N=12</p>	<p data-bbox="483 573 946 856"><b>Objective:</b> Neurologic bowel incontinence and dysfunction are common with Cauda Equina Syndrome (CES). The study objective was to evaluate the efficacy of Peristeen Anal Irrigation System (PAIS)<sup>TM</sup> in people with CES.</p> <p data-bbox="483 867 889 1077"><b>Population:</b> 12 participants with a mean age of 46.2 years (range 34–72 years, 4 females) with Cauda Equina Syndrome (CES)</p> <p data-bbox="483 1087 881 1157"><b>Treatment:</b> used PAISTM bowel routine for 10 weeks.</p> <p data-bbox="483 1167 930 1839"><b>Outcome Measures:</b> Change in Neurogenic Bowel Dysfunction Score (NBD) over 10 weeks relative to baseline. Secondary outcomes: Change in St. Mark's Fecal Incontinence score (SMFI), Cleveland Clinic Constipation score (CCC), and modified Rectal Surgeons Fecal Incontinence Quality of Life Score (QOL) at week 1, 2, 4, 6, 8 and 10 compared to baseline, and self-rating of bowel function at baseline and 10 weeks. Additionally, colonic transit times were assessed using the radioactive markers (Sitzmarks) method.</p>	<ol data-bbox="1036 583 1490 1108" style="list-style-type: none"> <li>1. Ten participants completed the study. Post-intervention primary outcome NBD score improved (<math>p &lt; 0.01</math>).</li> <li>2. Secondary outcomes also improved significantly, including SMFI (<math>p &lt; 0.01</math>), CCC (<math>p &lt; 0.01</math>), QOL (<math>p &lt; 0.01</math>), self-rating of bowel function (<math>p &lt; 0.01</math>), and transit time improved by 22% (<math>p &lt; 0.05</math>).</li> <li>3. No significant adverse effects were recorded.</li> </ol>

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<p><a href="#">Faaborg et al. 2009</a> Denmark Post-test Level 4 N=211</p>	<p><b>Objective:</b> Short-term results find transanal colonic irrigation (TAI) favourable in the treatment of neurogenic bowel dysfunction (NBD). Therefore, long-term results need to be described.</p> <p><b>Population:</b> 96M 115F with neurogenic bowel dysfunction; age: median 49yrs, range 7-81 yrs, who were introduced to transanal irrigation between 1994-2007. 74 traumatic SCI participants; 10 high complete, 12 high incomplete, 14 low complete, 38 low incomplete.</p> <p><b>Treatment:</b> TAI (Enema continence catheter; same as that used in <a href="#">Christensen et al. 2000</a>)</p> <p><b>Outcome Measures:</b> Rate of success (treatment was considered successful if the patient is currently using TAI, if the patient used TAI until he/she died, or if the patient's symptoms resolved while using TAI) as evaluated by a questionnaire, as well as the patient's medical records; incidence of bowel perforation and other side effects</p>	<ol style="list-style-type: none"> <li>1. Successful outcomes in 98 (46%) of participants after a mean follow-up of 19 months (range 1-114 months).</li> <li>2. Dropout rate of 20% in the first 3 months of using TAI.</li> <li>3. Success rate 3 years after introduction of TAI was 35%.</li> <li>4. The male gender, mixed symptoms (patients suffering from both constipation and fecal incontinence), and prolonged colorectal transit times were significantly correlated with successful outcomes.</li> <li>5. Chance One non-lethal bowel perforation occurred in approximately 50,000 irrigations (0.002%), whereas minor side effects were observed in 48%.</li> <li>6. Other minor side effects (such as abdominal pain, minor rectal bleeding, and general discomfort) were observed in 48% of participants.</li> </ol>
<p><a href="#">Puet et al. 1997</a> USA Case series Level 4 N=173</p>	<p><b>Objective:</b> To evaluate the efficacy of Pulsed Irrigation Evacuation (PIE) for the clearing of fecal impactions in</p>	<ol style="list-style-type: none"> <li>1. Successful in removing stool in all but three patients.</li> <li>2. 11 patients had multiple procedures.</li> </ol>

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	<p>patients with a neuropathic bowel.</p> <p><b>Population:</b> 15 complete tetraplegia, 28 incomplete tetraplegia, 35 complete paraplegia, 95 incomplete paraplegia; 31 patients with pulsed irrigation evacuation (PIE).</p> <p><b>Treatment:</b> Pulsed TAI: intermittent, rapid pulses of warm water to break up stool impactions and stimulate peristalsis.</p> <p><b>Outcome Measures:</b> Efficacy of technique (percentage success in removing stool), outpatient use</p>	<p>3. 162 procedures were performed on 4 outpatients on a regular basis because they otherwise could not develop an effective bowel routine with the standard digital stimulation, suppositories, or mini enemas.</p>
<p><a href="#">Worsoe et al. 2008</a> Denmark Case series Level 4 N=80</p>	<p><b>Objective:</b> Review long-term results in a large group of adult patients treated with antegrade colonic enema and antegrade colonic enema combined with a colostomy.</p> <p><b>Population:</b> 64F 16M; Age: mean (range) 51 (17-84) yrs. Main symptom was constipation for 48 participants, fecal incontinence for 20 and a combination of both in 12.</p> <p><b>Treatment:</b> Antegrade colonic enema (ACE), or ACE combined with colostomy</p> <p><b>Outcome Measures:</b> A 44-item questionnaire, including whether the patient is still using ACE and if not, why;</p>	<ol style="list-style-type: none"> <li>1. 69 participants were available for follow up, of whom 43 were still using ACE and 8 had their symptoms resolved; ACE success rate was 74%</li> <li>2. Complications occurred in 30 participants, including wound infection, urinary tract infection, stenosis of the appendicostomy, and problems with catheterization</li> <li>3. 34 of the 43 patients still using ACE were satisfied or very satisfied with the results; on a 0-100 scale, mean values for subjective bowel function was 12 before and improved to 81 after ACE</li> </ol>



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	functional results and side effects of ACE; overall satisfaction with bowel function and quality of life; success of treatment, defined as participants still using ACE or bowel symptoms resolved because of ACE	
<a href="#">Christensen et al. 2008</a> Europe Pre-post Level 4 N=62	<p><b>Objective:</b> To compare symptoms of neurogenic bowel dysfunction in patients with spinal cord injury (SCI) at baseline and after 10 weeks of treatment with transanal irrigation and to identify possible factors that could predict outcome of the treatment.</p> <p><b>Population:</b> 45M 17F; mean (SD) age: 47.5 (15.5) yrs; level of injury: supraconal for 61, conal/cauda equina (S2-S4) for 1. 55/62 completed the study</p> <p><b>Treatment:</b> TAI (Peristeen Anal Irrigation) for a 10-week period</p> <p><b>Outcome Measures:</b> Cleveland Clinic constipation scoring system (CCCSS), St Mark's fecal incontinence grading system (FIGS), Neurogenic bowel dysfunction (NBD) score (higher scores = worse outcomes)</p>	<ol style="list-style-type: none"> <li>1. Participants' CCCSS mean scores significantly improved from 13.5 to 10.2.</li> <li>2. Participants' FIGS mean scores significantly improved from 8.5 to 4.5.</li> <li>3. Participants' NBD mean scores significantly improved from 15.3 to 10.8.</li> <li>4. Peristeen Anal Irrigation significantly improved constipation, anal continence, and symptom-related quality of life in SCI participants</li> </ol>
<a href="#">Del Popolo et al. 2008</a>	<p><b>Objective:</b> To evaluate the effects of Peristeen Anal</p>	<ol style="list-style-type: none"> <li>1. Significant increase in the scores on the quality of life</li> </ol>

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<p>Italy Pre-post Level 4 N=36</p>	<p>Irrigation on NBD and patient quality of life (QoL).  <b>Population:</b> SCI patients with severe NBD and unsatisfactory bowel management; 32/36 completed the study. Cause of SCI: 42.4% trauma, 36.4% spina bifida, 6.1% MS, 3% surgery, 9.1% other, 3% not recorded. 39.4% sensory complete, 42.4% sensory incomplete, 18.2% not specified.  <b>Treatment:</b> TAI (Peristeen Anal Irrigation) for three weeks  <b>Outcome Measures:</b> Quality of life questionnaire (scale and nominal variables), participants' opinions on their intestinal functionality, use of pharmaceuticals, dependence on caregivers, incidence of incontinence and constipation, abdominal pain or discomfort</p>	<p>questionnaire, and on intestinal functionality opinion scores.</p> <ol style="list-style-type: none"> <li>2. Significant decrease in abdominal pain or discomfort. For the statement regarding abdominal pain or discomfort before or after evacuation, before: 9 answered never, 5 rarely, 6 occasionally, 6 often, 7 always; after: 24 never, 6 rarely, 3 occasionally.</li> <li>3. Significant decrease in incidence of fecal or gas incontinence. For the statement regarding gas incontinence, Before: 10 answered never, 9 rarely, 8 occasionally, 3 often, 2 always; After: 15 never, 11 rarely, 5 occasionally, 1 often, 1 always.</li> <li>4. Significant improvement of constipation (63% of participants experiencing constipation reported improvements). For the statement regarding difficult/painful exertion in connection with evacuation, Before: 5 answered never, 5 rarely, 4 occasionally, 10 often, 9 always; After: 21 never, 9 rarely, 3 occasionally, 1 often.</li> <li>5. 28.6% of participants reduced or eliminated their use of pharmaceuticals</li> </ol>
<p><a href="#">Teichman et al. 1998</a> USA</p>	<p><b>Objective:</b> To describe the outcomes of adults with neurogenic bowel disease who underwent a Malone</p>	<ol style="list-style-type: none"> <li>1. 3/4 SCI participants experienced fecal incontinence prior to the operation. All</li> </ol>

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Retrospective chart review Level 4 N=7; 4 SCI	antegrade continence enema procedure with or without concomitant urinary diversion. <b>Population:</b> N=4 SCI participants Level of injury: 2 C6, 1 C7, 1 T5; all males; Age: mean (range) 32.5 22-47yrs; Mean follow-up: 11 months <b>Treatment:</b> Malone antegrade continence enema (MACE) <b>Outcome Measures:</b> Number of fecal incontinence episodes per week, time for evacuation, bowel management episodes attempted	became continent as a result of the operation. 2. Pre-operatively, SCI participants' toileting times ranged from 1-4 hours as a result of their bowel status. Post-operatively, these participants were able to evacuate within 30 minutes or less. 3. Autonomic dysreflexia secondary to neurogenic bowel was resolved post-operatively.
<a href="#">Teichman et al. 2003</a> USA Retrospective chart review Level 4 N=6; 3 SCI	<b>Objective:</b> To determine the long-term outcomes from the Malone antegrade continence enema (ACE) procedure in adult neurogenic patients. <b>Population:</b> N=3 participants with SCI Level of injury: T5 complete, C6 complete, C7 incomplete; all males; Age: mean (range) 36 (29-47) yrs; <b>Treatment:</b> Malone antegrade continence enema (MACE) with mean follow-up 4.5 years <b>Outcome Measures:</b> Bowel incontinence; subjective patient satisfaction (patients were asked: "do you consider the surgical procedure beneficial to you" and "if you	1. 2/3 participants experienced fecal incontinence prior to the operation. Post-operatively, both these participants became continent. 2. All 3 participants were satisfied with their outcomes and rated their quality of life higher after their MACE procedure compared with beforehand. 3. 3 participants experienced prolonged toileting pre-operatively as a result of bowel status. Post-operatively, the group had a significant reduction in their toileting times (pre-ACE mean (SD) time: 190(45) vs post-ACE: 28(20) min).

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	could do the ACE procedure again, would you?)	