I . .......................... 1

II . .......................... 5
1. .......................... 5
2. .......................... 5
3. .......................... 6
4. .......................... 7
5. .......................... 8
6. .......................... 9
7. .......................... 10

III . .......................... 11
1. .......................... 11
2. .......................... 12
3. .......................... 13
4. .......................... 14
5. .......................... 15

- i -
6. 一部の目的地における特異な状況

IV. 一部の目的地における特異な状況

V. 一部の目的地における特異な状況

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I. 本}

...
39% 69% 4.5

Longo  Menardo

(time, CTT)

Longo  Menardo

(time, CTT)

Longo  Menardo

(time, CTT)

Lin  Kamm

(functional
magnetic stimulation)

Kamm  Lin

(functional
magnetic stimulation)

Kamm  Lin

(functional
magnetic stimulation)
II. 

1. 문제

문제 현상, 해결 방법, 분석 결과, 추론 등 서술,

2. 문제

문제 현상, 해결 방법, 분석 결과, 추론 등 서술,
Kolomarker™ (M.I.Tech., Korea) 1 2 3

1 2 3 4 5 6

1.2
Dantec Duet® [Dantec, Denmark] were used.

90° FEP tubing was used. The flow rate was 6 cm/s, and the temperature was 25°C.

4 mm was used for the flow rate. The temperature was 0.5 cm/s.

The distance between the two fibers was 10 cm.

The distance between the two fibers...
Figure 1. Measurement of anorectal angle.
Microstim (Medical Electronics, Hamburg, Germany) was used for the electrical stimulation. A bipolar electrode, 5 cm in width and 2 cm in length, with a 2 cm separation, was used (Figure 2). The stimulator delivered biphasic rectangular pulses, 500 ms wide, at a frequency of 20 Hz, with an on-time of 10 seconds and an off-time of 10 seconds. The intensity was palpable minimal anal contraction. The total stimulation time was 10 minutes (Table 1).

Table 1. Parameters of Electrical Stimulation

<table>
<thead>
<tr>
<th>Type of pulse</th>
<th>biphasic rectangular pulse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse width</td>
<td>500 ms</td>
</tr>
<tr>
<td>Pulse frequency</td>
<td>20 Hz</td>
</tr>
<tr>
<td>On-time</td>
<td>10 sec</td>
</tr>
<tr>
<td>Off-time</td>
<td>10 sec</td>
</tr>
<tr>
<td>Intensity</td>
<td>palpable minimal anal contraction</td>
</tr>
<tr>
<td>Total stimulation time</td>
<td>10 minutes</td>
</tr>
</tbody>
</table>

Figure 2. Rectal stimulator.
3. ผู้วิจัย

ผู้วิจัยใช้ SPSS 10.0 version ในการวิเคราะห์ข้อมูล พบว่า ผลจาก Wilcoxon signed ranks test, Mann-Whitney test และ Pearson correlation ชี้ว่ามีความสัมพันธ์ระหว่างตัวแปรต่าง ๆ ดังกล่าว แต่ผลไม่สอดคล้องกับทฤษฎี.
1. ๑ ๘ ๒ ๘ ๘ ๑ ๑ ๒ ๓ ๔ ๕ ๖ ๗ ๘ ๙ ๑๐ ๑๑ ๑๒

<table>
<thead>
<tr>
<th>No.</th>
<th>Sex</th>
<th>Age</th>
<th>Injury level</th>
<th>Duration from onset</th>
<th>Time for defecation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>31</td>
<td>C 5</td>
<td>11 months</td>
<td>60 minutes</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>20</td>
<td>C 8</td>
<td>6 months</td>
<td>90 minutes</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>38</td>
<td>C 5</td>
<td>60 months</td>
<td>60 minutes</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>63</td>
<td>C 7</td>
<td>6 months</td>
<td>30 minutes</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>40</td>
<td>C 7</td>
<td>13 months</td>
<td>120 minutes</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>45</td>
<td>T 4</td>
<td>8 months</td>
<td>120 minutes</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>55</td>
<td>C 6</td>
<td>12 months</td>
<td>20 minutes</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>26</td>
<td>T 10</td>
<td>12 months</td>
<td>70 minutes</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>35</td>
<td>C 8</td>
<td>9 months</td>
<td>100 minutes</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>20</td>
<td>T 8</td>
<td>12 months</td>
<td>60 minutes</td>
</tr>
<tr>
<td>11</td>
<td>M</td>
<td>39</td>
<td>T 10</td>
<td>15 months</td>
<td>30 minutes</td>
</tr>
<tr>
<td>12</td>
<td>F</td>
<td>51</td>
<td>T 8</td>
<td>8 months</td>
<td>70 minutes</td>
</tr>
</tbody>
</table>

Table 2. General Characteristics of the Subjects
2. 

<table>
<thead>
<tr>
<th>Segment</th>
<th>Colon Transit Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rt. segment</td>
<td>8.42±5.74</td>
</tr>
<tr>
<td>Lt. segment</td>
<td>20.33±7.95</td>
</tr>
<tr>
<td>Rectosigmoid segment</td>
<td>35.67±7.19</td>
</tr>
<tr>
<td>Total</td>
<td>64.58±9.39</td>
</tr>
</tbody>
</table>

Values are mean±standard deviation (hrs)

* p<0.05 (Table 3)
Table 4. Correlation between Pre-rectal Parameters and Segmental CTT

<table>
<thead>
<tr>
<th>Pre-rectal parameters</th>
<th>Rt. segment</th>
<th>Lt. segment</th>
<th>RS' segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-anorectal angle</td>
<td>0.456</td>
<td>0.90</td>
<td>-0.587</td>
</tr>
<tr>
<td>Pre-anal pressure</td>
<td>-0.136</td>
<td>0.475</td>
<td>-0.429</td>
</tr>
</tbody>
</table>

Value are correlation coefficients.

* p<0.05,

1 Colon Transit Time

2 Rectosigmoid
4. 

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre-stimulation</th>
<th>Post-stimulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anorectal angle (degree)</td>
<td>104.50 ± 17.29</td>
<td>111.58 ± 18.64*</td>
</tr>
<tr>
<td>Anal pressure (cm H₂O)</td>
<td>37.75 ± 9.31</td>
<td>23.92 ± 8.84*</td>
</tr>
</tbody>
</table>

Values are mean ± standard deviation.

* p < 0.05
5. アルコールとプロスタグランディンE2を用いた腸管収縮抑制の評価

Table 6. Correlation between ΔA, ΔP and Pre-rectal Parameters

<table>
<thead>
<tr>
<th>Pre-rectal parameter</th>
<th>ΔA</th>
<th>ΔP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-anorectal angle</td>
<td>-0.026</td>
<td>0.128</td>
</tr>
<tr>
<td>Pre-anal pressure</td>
<td>0.635*</td>
<td>0.467</td>
</tr>
</tbody>
</table>

1. *p < 0.05

1. Difference between pre-stimulation anorectal angle and post-stimulation anorectal angle.

2. Difference between pre-stimulation anal pressure and post-stimulation anal pressure.
Table 7. Comparison of ΔA and ΔP according to Lesion

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ΔA</th>
<th>ΔP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetraplegia</td>
<td>5.00±6.30</td>
<td>16.29±8.34</td>
</tr>
<tr>
<td>Paraplegia</td>
<td>10.00±8.57</td>
<td>10.40±5.22</td>
</tr>
</tbody>
</table>

Values are mean and standard deviation.

\( p > 0.05 \)

1. Difference between pre-stimulation anorectal angle and post-stimulation anorectal angle.

2. Difference between pre-stimulation anal pressure and post-stimulation anal pressure.
<table>
<thead>
<tr>
<th></th>
<th>62.5%</th>
<th>95%</th>
<th>43%</th>
<th>80%</th>
<th>6.3%</th>
<th>15%</th>
<th>42.1%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kirshblum</td>
<td>42%</td>
<td>45%</td>
<td>30%</td>
<td>60%</td>
<td>13%</td>
<td>5%</td>
<td>1%</td>
<td>45%</td>
</tr>
<tr>
<td>Glickman</td>
<td>65%</td>
<td>30%</td>
<td>69%</td>
<td>60%</td>
<td>5%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IV.

- 17 -
(p < 0.05), and several other studies have suggested that ... } 

- Varma et al. (2002) proposed 2, 3, 4 as possible 

- Frost et al. (2002) demonstrated that ... 

- Lin et al. (2010) suggested that functional magnetic stimulation 

- Kamm et al. (2011) further explored the potential of these methods.
(anorectal inhibitory reflex)\]

... (protective vesicoanal reflex)\]

... (rectorectal reflex)\]

... (rectorectal reflex)\]

- 19 -
V. 以下

1. 以下の項目をお読みください。
2. 以下の項目をお読みください。
3. 以下の項目をお読みください。
4. 以下の項目をお読みください。

- 22 -


Abstract

Effect of rectal electrical stimulation in patients with neurogenic bowel due to spinal cord injury

Hasuk Bae

Department of Medicine
The Graduate School, Yonsei University
(Directed by Professor Eun Sook Park)

Most of patients with spinal cord injury complain of constipation & fecal incontinence which are related to neurogenic bowel. Recently, many researchers suggested electrical stimulation & magnetic stimulation as therapeutic modality for neurogenic bowel in patients with spinal cord injury. They reported that the colon transit time was decreased but clinical usefulness of these methods for bowel emptying is not yet satisfactory. Therefore, this study was designed to investigate the effect of the rectal electrical stimulation in patients with neurogenic bowel due to spinal cord injury. Twelve patients with spinal cord injury who have the symptoms of neurogenic bowel were recruited as subjects. Before and after electrical stimulation, anorectal angle and anal pressure was measured.

The results were as follows :

1. There was a reverse correlation between pre-electrical stimulation anorectal angle and colon transit time in rectosigmoid segment(p<0.05).
2. Anal pressure of post-electrical stimulation was significantly decreased compared with that of pre-electrical stimulation (p<0.05).

3. Anorectal angle of post-electrical stimulation was significantly increased compared with that of pre-electrical stimulation (p<0.05).

4. Sixty-seven percent of the subjects showed gas passing during rectal electrical stimulation.

In conclusion, this study suggested that rectal electrical stimulation for neurogenic bowel in patients with spinal cord injury could be helpful defecation method for bowel emptying.

**Key Words**: neurogenic bowel, spinal cord, anorectal angle, anal pressure.