

– Abstract –

## Rectal Somatosensory Evoked Potential in Normal Subjects

Yeoun Seung Kang, M.D., Jae Ho Moon, M.D., Young Mu Na, M.D.\*, Kil Byung Lim, M.D.\*

*Department of Rehabilitation Medicine, Yong Dong Severance Hospital, Yonsei University College of Medicine  
Department of Rehabilitation Medicine, Il San Baik Hospital, Inje University College of Medicine\**

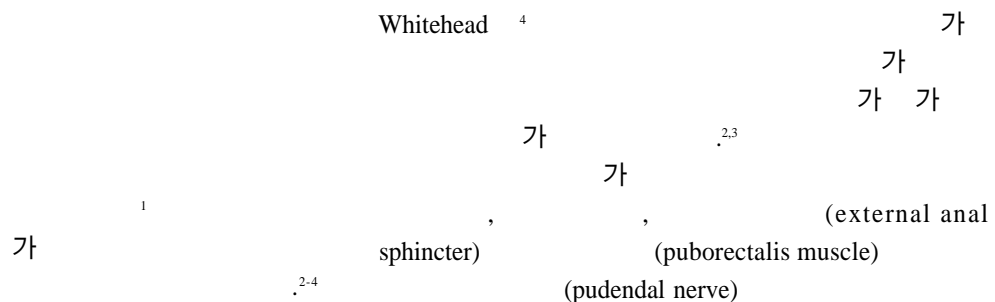
**Objectives** : To investigate the afferent pathways for signaling of visceral sensation in response to anorectal electrical stimulation.

**Methods** : The study population consisted of healthy 28 males and 22 females. The stimulus was applied via anal probe equipped with bipolar surface stimulating electrode, and the probe was positioned 10 cm above anus. Cerebral evoked response were recorded from 1 cm posterior to vertex (Cz', international 10~20 system) by needle electrode.

**Results** : We found recognizable and reproducible evoked potentials in 23 subjects. The 13 male and 10 female subjects had an series of successive peaks and troughs. The first component of response had negative peak potentials,  $97.2 \pm 4.2$  msec mean peak latency for men and mean peak latency of  $89.2 \pm 3.1$  msec for women.

**Conclusion** : We demonstrated the feasibility of methods to study visceral afferent nervous system from anorectum. There is some evidence that cortical evoked potentials may be obtained after electrical stimulation of anal canal.

**Key Words** : Visceral sensation, Anorectal electrical stimulation, Cortical evoked potentials



Address reprint requests to Yeoun Seung Kang, M.D.

Department of Rehabilitation Medicine, Yongdong Severance Hospital, Yonsei University College of Medicine,  
# 146-92 Dogok-dong, Kangnam-gu, Seoul, 135-270, Korea

Tel : 82-2-3497-3494, Fax : 82-2-3463-7585, e-mail : ys0403@yumc.yonsei.ac.kr

가 3 N N1, P1

가 N2, P2

가 5-7 Meunier (positive) SPSS unpaired t-test

8 36 msec (negative) , p 0.05

peak) 가 Loening- (peak latency) 가

Bauke 9

가 (reproducibility) anal probe 가 28

가 13 , 22 10

가 6.5 mA, 8.3 mA 5.9 mA, 9.1 mA 가 (Table 1).

(Fig. 1).

97.2±4.2 msec 89.2±3.1 msec

50 28 , 22

167.1±3.2 cm, 160.3±1.9 cm

32.3±1.2 40.3±2.4

Excel(Cadwell, USA) anal

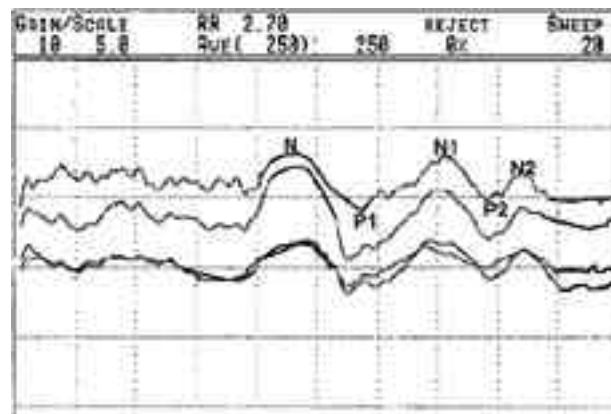
(bipolar stimulating electrode) probe(Dantec, Denmark)

10 cm

2.7 Hz International 10 to 20 Sys- tem (Fpz)

1 cm (Cz)

10 uV/division, 20 msec/division 250



**Fig. 1.** Repetitive pattern of rectal somatosensory evoked potentials

**Table 1.** Results according to Reproducibility, Age, Sensibility, and Stimulus Threshold

Sex	No. of reproducible recordings	Age(yr)	Sensibility threshold(mA)	Stimulus threshold(mA)
Male	13/28	32.3±1.2	6.5±3.2	8.3±2.9
Female	10/22	40.3±2.4	5.9±2.7	9.1±3.1
All	23/50	36.3±1.3	6.2±4.1	8.7±4.3

No. = Number

Values are mean±S.D.

**Table 2.** Peak Latency of Rectal Somatosensory Evoked Potential

Sex	Latency(msec)				
	N**	P1	N1	P2	N2
Male	97.2±4.2*	101.3±2.1	115.7±1.8	120.4±1.1	127.1±2.1
Female	89.2±3.1*	99.4±4.3	116.6±1.6	118.5±1.7	130.3±3.8

Values are mean±S.D.

N\*\* = First negative peak

\*p<0.05

**Table 3.** Peak Amplitude of Rectal Somatosensory Evoked Potential

Sex	Amplitude(uV)			
	N**/P1	P1/N1	N1/P2	P2/N2
Male	0.2±0.03	0.3±0.04	0.6±0.07	0.5±0.16
Female	0.5±0.19	0.2±0.11	0.3±0.12	0.3±0.09

Values are mean±S.D.

N\*\* = First negative peak

(pudendal nerve terminal motor latency)

가 (pelvic floor)  
가 (vagal afferents)

가 (spinal afferents) 가

가

가 (mechanical distention)

9

가 session

3 (stimulus intensity)

가 C (small unmyelinated C fiber) A delta

14 (myelinated A delta fiber) 15,16

6 Delechenault 5 (sensory nerve endings) (muscle spindle)

가 IA (IA fiber) 가

7 Speakman (gluteus maximus muscle)

(Table 2).

(Table 3).

Mayer Raybould<sup>10</sup>

(visceral afferents)

11-13

(encopresis),

가

100 V 가 가  
 ineum) Meunier<sup>8</sup>  
 (per-  
 ance) 가 (imped-  
 가 가  
 가  
 (sensitivity)  
 가  
 가  
 50 46% 23  
 (duration),  
 가

## REFERENCES

1. Duthie HL, Gairns FW: Sensory nerve endings and sensation in the anal region of man. *Br J Surg* 1960; 47: 585-594
2. Bannister JJ, Timms JM, Barfield LJ, Donnelly TC, Read NW: Physiological studies in young women with chronic constipation. *Int J Colorect Dis* 1986; 1: 175-182
3. Loening-Bauke V: Factors determining outcome in children with chronic constipation and fecal soiling. *Gut* 1989; 30: 999-1006
4. Whitehead WE, Holtkotter B, Enck P, Hoelzi R, Holmes KD, Anthony J, Shabsin HS, Schuster MM: Tolerance for rectosigmoid distribution in irritable bowel syndrome. *Gastroenterology* 1990; 98: 1187-1192
5. Delechenault P, Leori AM, Bruna T, Denis P, Weber J: Cerebral potentials evoked by electrical stimulation of the anal canal. *Dis Colon Rectum* 1993; 36: 55-60
6. Frieling T, Enck P, Wienbeck M: Cerebral responses evoked by electrical stimulation of rectosigmoid in normal subjects. *Dig Dis Sci* 1989; 34: 202-205
7. Speakman CTM, Kamm MA, Swash M: Rectal sensory evoked potentials: an assessment of their clinical value. *Int J Colorect Dis* 1993; 8: 23-28
8. Meunier P, Collet L, Duclaux R: Enorectal cerebral evoked potentials in human. *Int J Neurosci* 1987; 37: 193-196
9. Loening-Bauke V, Read NW, Yamada T: Cerebral evoked potentials after rectal stimulation. *Electroenceph Clin Neurophysiol* 1991; 80: 490-495
10. Mayer EA, Raybould HE: Role of visceral afferent mechanism in functional bowel disorders. *Gastroenterology* 1990; 99: 1688-1704
11. Kirsner JB, Palmer WL: The irritable colon. *Gastroenterology* 1958; 34: 491-501
12. Swarbrick ET, Hegarty JE, Bat L, William CB: Site of pain from the irritable bowel. *Lancet* 1980; 443-446
13. Whorwell PJ, McCallum M, Creed FH, Robert CT: Non-colonic features of irritable bowel syndrome. *Gut* 1986; 27: 37-40
14. Loening-Bauke V, Yamada T: Cerebral potentials evoked by rectal distention in humans. *Electroenceph Clin Neurophysiol* 1993; 88: 447-452
15. Applebaum AE, Vance WH, Coggeshall RE: Segmental localization of sensory cells that innervate the bladder. *J Comp Neurol* 1980; 192: 203-209
16. Donker PJ: A study of the myelinated fibers in the branches of the pelvic plexus. *Neurorol Urodyn* 1980; 5: 185-202