

## Clinical Study on Childhood Enuresis

소아기 유뇨증에 대한 임상적 연구

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### INTRODUCTION

Enuresis is primarily a childhood problem that has concerned parents and physicians since biblical times. To our knowledge, the earliest recorded treatment approach using a combination of juniper, cyprus and beer appeared in 1550 B.C. (Glicklich, 1951). Various factors considered to be of etiological importance for enuresis have been described in the literature.

Proposed etiologies are 1) genetic factors (Hallgren, 1960; Bakwin, 1961), 2) disorders of genito-urinary tract (Mahony et al, 1971; Jones et al, 1972), 3) disorders arising from disturbances of early life, such as bladder training (Brazelton, 1962), 4) disorders due to stressful life events in early childhood (Heisel et al, 1973), 5) disorders of sleep or central nervous maturity (Campbell et al, 1966; Ritvo et al 1969; Petersen et al, 1970), 6) psychological or psychosocial factors (Hallgren, 1956; Werry and Cohrssen, 1965; Archenbach and Lewis, 1971). According to these etiological hypotheses, the site of lesion in enuresis has been placed in the psyche, brain stem, genito-urinary system itself, or the socio-familial environment.

Yet enuresis is still far from being fully understood in its causation, but among the many

proposed etiological theories, the most popular concept seems to be that enuresis is a cardinal sign of an underlying emotional problem.

The history of treatment approach to this disorder reflects the early development of medicine as a whole. Superstition, magic potions, humoral therapy, primitive mechanical inhibitors, and virtually every class of drugs have been employed over the years. In recent years, the methods of treatment have been also much variable. The applied methods are 1) night lifting and fluid restriction before bedtime (Hagglund, 1965), 2) day-time training (Paschalis et al, 1972) 3) surgical treatment, 4) drug treatment (MacLean, 1960; Maxwell and Selstrup, 1971; Blackwell and Currah, 1973), 5) night-waking using bed-buzzer (Mowrer and Mowrer, 1938; DeLeon and Mandell, 1966). But the attempts at therapy are largely empirical, and the results are often contradictory.

Although it has been recognized that enuresis is a major childhood problem, there have been no systematic studies on childhood enuresis in Korea, except for the Hong's epidemiological study using parental questionnaire in 1984 (to be published).

In the current study, the enuresis is defined according to the diagnostic criteria of DSM-III.

Diagnostic criteria for enuresis are, 1) repeated involuntary voiding of urine by day or by night, 2) at least two such events per month for children between the ages of five and six, and at least one event per month for older children

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and 3) not due to a physical disorder, such as diabetes or seizure disorder. And enuresis is classified into primary and secondary types, with the former referring to children who have never achieved urinary continence and the latter to children who achieved continence for at least one year and lost it.

The purposes of this study are, firstly to obtain basic clinical data in children with enuresis such as sex distribution and the ratio of primary versus secondary enuresis, secondly to test the hypothesis that enuresis is related with central nervous system immaturity, through sedated electroencephalographic recordings and checking for soft neurological signs, thirdly to test the hypothesis that enuresis is a sign of underlying emotional disturbance using parental questionnaire revised by Hong and Hong (1983), and finally to investigate the effect of imipramine in children with enuresis and to find any characteristic clinical marker to predict the response of imipramine.

## SUBJECTS AND METHODS

### Subjects:

The study subjects were selected at the out-patient clinic of child psychiatry of Seoul National University Hospital from November '83 to September '84.

The total number of children who visited with enuresis to this clinic during this study period was 48. Among these enuretic children, 2 severe psychotics, 2 mental retardations, 1

pervasive developmental disorder, and 1 cerebral palsy were excluded from this study. And other 6 children were dropped out during the study. Therefore the final number of children was 36 between the ages of 6 and 15 years. 22 were boys and 14 were girls.

The control group consisted of pediatric patients of pediatric out-patient clinic of Seoul National University Hospital. Age and parental education were matched each other (Table. 1).

### Methods:

The clinical evaluation included detailed history taking, psychiatric interview of the child, physical and neurologic examination, urinalysis, lumbo-sacral spine X-ray. In addition to the routine neurologic examination, the 44-item Physical and Neurological Examination for Soft Signs (PANESS) was completed. Parents completed 60 items of parental questionnaire revised by Hong and Hong (1983). Sedated electroencephalographic recordings were also performed. After evaluation, imipramine was administered for the treatment. The initial dose began from 25mg per day and the dose was increased by 25mg at weekly intervals. The maximal dose administered was 100mg per day. During medication, the parents were advised not to awaken their children during sleep. The effect of imipramine was evaluated after one month of medication. The number of bed-wetting in the first month of the therapeutic trial was expressed as a percentage of the previous monthly frequency of bed-wetting. And following Breger(1962) five categories of therapeutic responses were delin-

Table 1. Subjects characteristics

	Child Psychiatry	Pediatrics	t-value
No. of children	36 (M : 22 F : 14)	35 (M : 20 F : 15)	
Mean age (M <sub>0</sub> )	115.39±33.18	113.20±30.09	0.29 N.S.
Parental education (yrs)	•		
Father	14.03±2.41	13.91±2.75	0.23 N.S.
Mother	13.12±2.29	12.93±1.93	0.38 N.S.

eated.

- 1) 0% : cure
- 2) 1~ 35% : greatly improved
- 3) 36~ 69% : moderately improved
- 4) 70~100% : unchanged
- 5) 100% ↑ : aggravated

## RESULTS

The mean ages of the enuretics were 115.39 ± 33.18 (months). 22 were boys and 14 were girls, slightly more prominent in boys (1.6 : 1). 25 enuretics (69.4%) were considered to be primary and 11 enuretics (30.6%) were secondary according to the criteria of DSM-III. Mean frequencies of nocturnal urination were 5.58 ±

1.87 per week. 9 children (25%) were associated with diurnal enuresis in addition to nocturnal enuresis.

When nocturnal enuretics were compared with nocturnal enuretics with diurnal enuresis, there were no differences on psychopathology (Table 2).

19 children (19/36) were associated with familial loading, significantly higher than control group (5/35) ( $\chi^2=11.74$ ,  $df=1$ ,  $P<0.005$ ).

When primary enuretics were compared with secondary enuretics in familial loading, the former (15/25) was significantly higher than the latter (4/11) ( $\chi^2=1.71$ ,  $df=1$ ,  $P<0.01$ ).

On psychopathology using Parental Questionnaire for Child Behavior Symptom (Hong and Hong, 1983), enuretic group was higher in total

**Table 2.** Comparison of psychopathology for nocturnal enuretics and nocturnal enuretics with diurnal enuresis

Cluster	Group	Nocturnal enuretics (N=27)	Nocturnal enuretics with diurnal enuresis (N=9)	t-value, df(34)	P-value
anxious, obsessive		7.67 ± 3.58	7.00 ± 1.94	0.71	P > 0.10
somatic complaints		5.26 ± 2.12	5.44 ± 2.24	0.32	P > 0.10
schizoid		2.52 ± 1.16	2.22 ± 1.09	0.70	P > 0.10
depressed, withdrawl		6.63 ± 3.75	8.44 ± 3.97	1.20	P > 0.10
immature, hyperactive		6.93 ± 3.54	5.67 ± 3.39	0.95	P > 0.10
delinquent		5.26 ± 2.52	7.22 ± 3.56	1.53	P > 0.10
aggressive		5.96 ± 3.55	6.11 ± 2.89	0.13	P > 0.10
cruel		2.67 ± 1.78	2.67 ± 1.87	0	P > 0.10
total		43.11 ± 9.33	44.78 ± 7.66	0.54	P > 0.10

Mean ± S.D.

**Table 3.** Comparison of psychopathology for subjects and control group

Cluster	Group	Subjects (N=36)	Control (N=35)	t-value, df(69)	P-value
anxious, obsessive		*7.50 ± 3.24	5.23 ± 2.18	3.81	P < 0.005
somatic complaints		5.31 ± 2.12	*6.57 ± 2.77	2.15	P < 0.05
schizoid		2.44 ± 1.13	2.03 ± 1.18	1.49	P > 0.10
depressed, withdrawl		*7.08 ± 3.83	5.09 ± 2.39	2.63	P < 0.025
immature, hyperactive		6.61 ± 3.50	6.00 ± 3.08	0.78	P > 0.10
delinquent		5.75 ± 2.89	5.43 ± 2.73	0.48	P > 0.10
aggressive		9.00 ± 3.36	5.31 ± 2.17	1.03	P > 0.10
cruel		2.67 ± 1.77	2.54 ± 1.70	0.32	P > 0.10
total		*43.53 ± 8.87	38.20 ± 6.02	2.97	P < 0.025

Mean ± S.D.

**Table 4.** Comparison of psychopathology for primary enuresis and secondary enuresis

Cluster	Group	Primary enuresis (N=25)	Secondary enuresis (N=11)	t-value, df(34)	P-value
anxious, obsessive		7.32±3.12	7.92±3.62	0.47	P>0.10
somatic complaints		5.24±2.07	5.45±2.34	0.26	P>0.10
schizoid		2.60±1.08	2.09±1.22	1.20	P>0.10
depressed, withdrawl		6.64±2.96	8.09±5.38	0.84	P>0.10
immature, hyperactive		6.64±3.55	6.55±3.56	0.07	P>0.10
delinquent		5.46±2.93	6.79±2.43	1.41	P>0.10
aggressive		6.28±3.53	5.36±2.98	0.81	P>0.10
cruel		2.76±1.69	2.45±2.02	0.44	P>0.10
total		42.88±9.47	45.00±7.52	0.72	P>0.10
Mean±S.D.					

**Table 5.** Mean scores of PANESS in subjects and control group

Group	Cluster	Synergy	Graph-esthesia (Rt)	Graph-esthesia (Lt)	Stereo-gnosis (Rt)	Stereo-gnosis (Lt)	Gait	Topognosis
Subjects(N=36)		10.20±2.45	5.78±2.11	5.75±1.50	2.86±1.10	3.00±0.83	3.94±1.91	3.17±1.73
Control (N=35)		10.26±2.23	5.97±2.01	5.74±1.93	2.94±1.21	2.71±0.79	3.91±1.27	3.00±1.03
t-value (df=69)		0.11	0.39	0.02	0.29	1.51	0.08	0.51
P-value		P>0.10	P>0.10	P>0.10	P>0.10	P>0.10	P>0.10	P>0.10

Group	Cluster	Persistence	Rapid movement (Lt)	Rapid movement (Rt)	String(Lt)	String(Rt)	Total
Subjects(N=36)		8.92±2.08	11.67±2.78	12.78±3.54	2.56±0.77	2.78±0.90	73.36±9.10
Control (N=35)		8.69±2.41	11.51±2.55	12.03±1.89	2.46±0.66	2.51±0.66	71.74±9.04
t-value (df=69)		0.43	0.25	1.12	0.59	0.64	0.75
P-value		P>0.10	P>0.10	P>0.10	P>0.10	P>0.10	P>0.10

Mean±S.D.

PANESS: Physical and Neurological Examination for Soft Signs

scores than control group (t=2.97, df=69, P <0.005).

When the individualized symptom categories were compared, "anxious, obsessive" and "depressed, withdrawl" categories showed significantly higher score in enuretic group(Table 3).

While "somatic complaints" category was significantly higher in control group (t=2.15, df=69, p<0.05).

But other symptom categories such as "schizoid", "immature, hyperactive", "delinquent", "aggressive" and "cruel" did not show any sign-

ificant differences between the groups (Table 3).

When primary enuretics were compared with secondary enuretics on psychopathology, it was noted that there were no differences between them both in total scores and individualized symptom categories (Table 4).

On Physical and Neurological Examination for Soft Signs (PANESS), the enuretic group did not differ from control group both in total scores and clusters (Table 5).

Sedated electroencephalographic recordings showed abnormal findings in 7 enuretic children

**Table 6.** Comparison of psychopathology for respondents and nonrespondents to imipramine treatment

Cluster	Group	respondents(N=27)	non-respondents(N=9)	t-value df(34)	P-value
anxious, obsessive		7.81±3.28	6.56±3.09	1.03	P>0.10
somatic complaints		4.96±2.05	6.30±2.12	1.63	P>0.10
schizoid		2.41±1.08	2.56±1.33	0.31	P>0.10
depressed, withdrawl		7.48±3.74	5.89±4.11	1.03	P>0.10
immature, hyperactive		6.26±2.85	7.67±5.05	0.80	P>0.10
delinquent		5.41±2.87	6.78±2.86	1.25	P>0.10
aggressive		5.48±2.94	7.56±4.19	1.38	P>0.10
cruel		2.81±1.86	2.56±1.51	0.40	P>0.10
total		42.85±8.47	45.56±10.21	0.72	P>0.10

Mean±S.D.

(19.4%). The major findings were irregular slow waves, ill-defined sharp waves, and isolated spikes. But none of the children have suffered from clinical seizure attack. When imipramine was administered, 27 children (75%) revealed above moderate improvement according to the criteria of Breger. Among these children, 19 were primary enuretics and 8 were secondary enuretics. After treatment with imipramine, the mean frequencies of bed-wetting in respondents and nonrespondents were  $1.07 \pm 0.95$ ,  $5.44 \pm 0.73$ , per week respectively. 7 children (19.4%) stopped bed-wetting completely. 10 (27.8%) improved greatly and 10 (27.8) improved moderately. 9 children remained unchanged. Among these 9 children, 6 did not respond at all, but 3 showed initial improvement, soon bed-wetting reappeared and in spite of continuous increase in dosage, they did not show any improvement in frequencies of bed-wetting.

When the primary enuretics were compared with secondary enuretics in response to imipramine, they did not show any significant differences ( $\chi^2=0.30$ ,  $df=1$ ,  $P<0.10$ ).

Respondents and nonrespondents did not differ either in total scores or symptom categories in the analysis of psychopathology according to the parental questionnaire revised by Hong and Hong (1983).

## DISCUSSION

Enuresis is one of the most frequent and at the same time, one of the most annoying disorders of childhood. According to the epidemiological study, the prevalence rate of enuresis in Korea is reported to be about 6.2%, more predominantly in boys than in girls (Hong, 1984—to be published) and the survey at out-patient department of child psychiatry of Seoul National University Hospital demonstrated that enuresis occupied about 5% of all patients (Hong, 1982).

It is generally accepted that the prevalence rate of functional enuresis is roughly at age 5, 7% for boys, and 3% for girls and at age 10, 3% for boys and 2% for girls, and that the disorder is more common in boys than in girls (DSM-III). The greater prevalence in boys is considered to be a consequence both of their increased susceptibility to relapse after earlier dryness and to their slow rate of spontaneous cure (Rutter, 1977). Among the many etiological factors of enuresis, genetic factor has been regarded as one of the important factors. Bakwin (1961) reported that approximately 70% of all enuretics had a first-degree relative who had been afflicted with the enuresis. He also studied 338 same-sex twins and found a concordance rate

of 68% in monozygotic as opposed to 36% in dizygotic twins. In the current study, 19 children (52.8%) were found to have a history of enuresis in their families and the rate of this familial loading was significantly higher than control group (14.3%) ( $\chi^2=11.74$ ,  $df=1$ ,  $P<0.05$ ). The familial loading was greater in primary enuretics than secondary ( $\chi^2=1.71$ ,  $df=1$ ,  $P<0.01$ ). This result is consistent with other genetic studies and supports that genetic factor may play a role in the genesis of enuresis. 9 children (25%) were associated with diurnal wetting as well as nocturnal wetting in this study. Generally, day wetting without night-wetting is unusual. Forsythe and Redmond (1974) reported that 13% of their series was combined both day and night wetting, and Halgren (1956) reported that psychiatric disturbance was more common in children who wet during the day as well as at night, and he insisted that nervous tension, from whatever cause, exaggerated the urgency characteristic of enuresis and in this way might lead to wetting during the day-time.

The result of this study showed that the rate of coexistence of diurnal enuresis was higher than formerly reported, but the psychopathologic findings could not differentiate the nocturnal enuretics from nocturnal enuretics combined with diurnal enuresis (Table 2).

On sedated EEG study, 7 children (19.4%) revealed abnormal findings. The major abnormal findings were irregular mixed slow waves, ill-defined sharp waves, and isolated spikes. But none of them have suffered from clinical seizure attacks. There have been enormous studies on EEG finding in enuretics, and the relationship between dream and enuresis. Some authors measured all-night sleep recording, (Ritvo et al, 1969; Mikkelsen et al, 1980) and others recorded simple sedated EEG finding (Campbell, 1966; Poussaint, 1967). Pierce et al. (1961) reported

that enuretic episode almost always preceded dreams usually by 2 hr, and he concluded that enuresis was "dream equivalent". Ritvo et al (1969) reported through his all-night EEGs findings in enuretics that enuretics could be divided into 3 categories, namely awake enuresis, nocturnal enuresis, and arousal enuresis, and suggested that arousal enuretics (those occurring in sleep stage 1-2) were more apt to be associated with psychopathology. But Mikkelsen et al (1980) reported that enuretic events were not associated with a particular sleep stage, rather enuretic episodes occurred in all sleep stages but most commonly in stage 3 and 4.

Campbell and Young (1966) found that of their 133 patients studied, 42% demonstrated significant EEG abnormalities during sleep.

These disturbances represented various forms of paroxysmal dysrhythmia, the predominant form being the 6 and 14 per second, positive spike variety. Takayasu et al (1963) also reported that 38.6% of their subjects showed EEG abnormalities. They concluded that enuresis in a large percentage of children might represent an "epileptic equivalent". However, Poussaint et al (1967) in their EEG study reported that only 10% were read as abnormal, and Ditman and Blinn (1955) found that there was no evidence of an observed seizure in the patient and no seizure discharges in the EEG recordings at the time of wetting. They concluded that there was no foundation to the view that enuresis was an "epileptic equivalent". As we can see, there are marked contradictory findings about the relationship among the sleep, epilepsy and enuresis.

In this study, only the sedated EEG recordings were checked. The incidence of abnormal EEG findings in this study was between those of Campbell, Takayasu and Poussaint, but even when compared with those supernormal population of Petersen and Eeg-Oloffson (1972), this result showed higher rate of abnormal EEG

findings. The major abnormal findings were irregular mixed slow waves, ill-defined sharp waves and isolated spikes which were compatible with the findings of Poussaint (1967), but 6 and 14 activities which were reported by Campbell and Young (1966) were not found.

The EEG findings in this study do not give any clue on the relationship among the sleep, epilepsy and enuresis, because all-night sleep recordings were not performed. However, it is the author's interpretation that the higher rate of abnormal EEG findings suggest the existence of immaturity of the central nervous system which might play an important role in the genesis of enuresis.

Many authors have regarded enuresis as a disorder arising from disturbances in early life, stressful life events in early childhood or psychiatric or psychosocial disorder. After Freud (1905) stated flatly that "nocturnal enuresis, unless it represents an epileptic fit, corresponds to a nocturnal emission", psychoanalysts concluded that the underlying cause of enuresis was a disturbance in personality and character.

Despert (1944) found that toilet training was started later in enuretic children than in children who had become dry, but Klackenberg (1955) found that no association between the age at which toilet training was started and subsequent bed-wetting. Bostock and Schackelton (1951) found that a higher proportion of mothers of enuretics recalled using coercive toilet training methods than controls. Douglas (1973) has examined the relationship between certain stressful life events and subsequent enuresis. A child who had experienced stressful life events, such as family break-up through death or divorce, temporary separation from mother for at least a month, birth of a younger sibling, moving home, admission to hospital etc., were twice as likely to be an enuretic as a child who had experienced none. Weinberg et al (1973) suggested that

depressive mood might cause the enuresis. Besides, certain personality traits in enuretics have been studied. They were reported to be more retiring, more acquiescent, and less confident (Stein and Susser, 1965, Archenbach and Lewis, 1971). These clinical findings and speculations suggest that enuresis may be associated with some emotional or certain personality problems.

In this study, the results showed that enuretic children revealed higher than control group in total scores of psychopathology ( $t=2.97$ ,  $df=69$ ,  $P<0.025$ ), and in symptom categories, two symptom clusters, "anxious, obsessive" and "depressive, withdrawal", were significantly higher than control group (Table 3). This finding is largely consistent with some of the above mentioned author's reports. The finding that the "somatic complaints" category was significantly higher in control group than in enuresis, seems to be only natural because most of the outpatients of pediatric department visited pediatric clinic because of somatic complaints.

Contrary to the author's expectation, the primary enuretics did not differ from secondary enuretics both in total scores of psychopathology and individualized symptom categories (Table 4).

This does not support a long held view that secondary enuretics might be more closely related to the emotional problems than primary enuretics. Rather, primary enuretics could also be strongly associated with emotional problems, probably due to secondary problems, because the long standing untreated enuresis may lead the children to chronic anxiety, impaired peer relationship and lowered self-esteem. However, most of the parents of secondary enuretics in this study reported clear precipitating factors, such as divorce, birth of a younger sibling, reprimand from parents, school entrance and separation from parents before onset of enuresis. Then it could be that while emotional factors play an etiological role in secondary enuretics, emotional

problems do occur as the result of enuresis in primary enuresis.

What we can definitely state is that there is a close relationship between enuresis and emotional problems, and emotional factors could be causal, reactive or coincidental.

As previously mentioned in introduction, various methods of treatment in enuresis have been applied. Among them, imipramine has been considered to be one of the most effective treatment methods (Mac-Lean, 1960, Schaffer, 1968).

Although its exact mechanism of action has never been explained as yet, suggested mechanisms of imipramine are due to 1) anticholinergic action, 2) cocaine-like action, blocking the uptake of norepinephrine and thereby stimulating the beta receptors of the detrusor muscle, 3) local direct action on the muscle by abolishing all contractile activity 4) antidepressant action 5) a change in the level of sleep, 6) placebo effect. But none of the pharmacological action described can explain satisfactorily the clinical efficacy of imipramine in enuresis. The methods of prescribing imipramine in enuretics vary widely with contradictory recommendations for dosages, the time of administration and the duration of treatment (Wiener, 1977). Clinically the dose range has been limited to 25 to 100mg per day.

The clinical responses to imipramine have varied from study to study (10~20%, Blackwell and Currah, 1973; 85%, Schaffer, 1968). In this study, imipramine was administered at dosages from 25 to 100mg per day, and after medication of one month, the effect of imipramine was evaluated by the criteria of Breger. 27 children (75%) responded well to the imipramine treatment. 9 children (25%) remained unchanged. Among these children, 3 children responded initially, soon bed-wetting reappeared, and never responded in spite of the continuous increase in dose. The overall response rate seems to be fairly good. The reason of good

response could be due to the fact that the follow-up period was relatively short and that not only complete cessation of bed-wetting but also decreases in frequencies were considered a successful response. The enuretics can be divided into three groups, namely respondents, transient respondents and nonrespondents according to the pattern of response to imipramine. Since the respondents were not different from the nonrespondents both in total scores of psychopathology and in individualized symptom categories, we failed to demonstrate any clinical marker which could predict the response to imipramine.

It should be mentioned that there are some limitations in this study. First, the follow-up period was rather short, therefore this study can not address to the possibility that some respondents may have relapsed after the medication was discontinued, so longterm follow-up period may be required. Second, the evaluation of imipramine effect was not controlled, so the placebo effect could not be excluded. Third, the complete organic study for genito-urinary system was not performed, although many of the patients had visited urology clinic prior to coming to child psychiatric clinic. Many authors, especially urologists have reported that considerable number of enuresis had disorders in genito-urinary system (Starfield et al, 1967; Mahony et al, 1971; Pompeius 1971; Troup et al, 1971; Hinman et al, 1973; Kirby et al, 1983). For complete exclusion for organic enuresis, further detailed organic study is desirable.

## CONCLUSION

To investigate the clinical characteristics of childhood enuresis, detailed history taking, psychiatric interview of the child, physical and neurologic examination, urinalysis, lumbo-sacral spine X-ray and sedated EEG recording were performed. In addition, the 44-item Physical and



Neurologic Examination for Soft Signs and 60-item of Parental Questionnaire for Child Behaviour Symptom were completed. For the treatment, imipramine was administered.

The results were as follows:

1. The sex ratio indicated that boys were predominant compared with girls (1.6:1), and the ratio of primary and secondary enuresis was 2.3:1.

2. 9 children (25%) were associated with diurnal enuresis with nocturnal enuresis. However, there were no differences on psychopathology between the nocturnal enuretics and nocturnal enuretics with diurnal enuresis.

3. 19 children (52.8%) were associated with family history of enuresis and primary enuretics were more closely related with familial loading than secondary enuretics.

4. On psychopathology, enuretics were significantly higher than control group in total scores, especially in "anxious, obsessive" and "depressed, withdrawal" categories. However, no significant difference between primary and secondary enuretics in psychopathology was noted.

5. 7 children (19.4%) showed abnormal sedated EEG findings, although none of them manifested clinical seizure. The major findings were irregular slow waves, ill-defined sharp waves and isolated spikes.

6. When imipramine was administered to enuretic children, respondents and nonrespondents did not show any significant difference on psychopathology.

These findings suggest that genetic factor and immaturity of central nervous system may play roles in the genesis of enuresis and some emotional factors may be strongly related with childhood enuresis, either as an etiological agent or as the consequences of enuresis. And the therapeutic responses to imipramine turned out to be fairly good in secondary enuresis as well as in primary enuresis.

—국문초록—

소아기유뇨증에 대한 임상적 연구

서울대학교 의과대학 신경정신과학교실

조 수 철

유뇨증에 대한 기록의 역사는 아주 오래되고, 이에 대한 원인, 치료에 대하여도 많은 연구들이 있어 왔으나 아직도 많은 이견을 보이고 있다. 이에 저자는 서울대학병원 소아정신과를 방문한 유뇨증 환자 36명을 대상으로 조사, 분석한 결과 다음과 같은 결과를 얻었다.

1. 남·녀의 비율은 1.6:1로 남자 아이들에게서 더 많이 나타났으며, 일차성 유뇨증과 이차성 유뇨증의 비는 2.3:1로 일차성 유뇨증이 더 흔히 발견되었다.

2. 25%(9/36)에서 야뇨증 뿐 아니라 주간에도 유뇨 증상이 나타났으나, 정신병리상으로는 야뇨증군과 비교하여 의미있는 차이는 없었다.

3. 52.8%(19/36)에서 가족력에서 유뇨증이 있었고 보고되었으나, 일차성 유뇨증에서 더욱 더 가족력과 밀접한 관계가 있었다.

4. 정신병리상으로, 유뇨증군에서 대조군보다 더욱 밀접하게 관계가 있었으며 특히 "불안, 강박", "우울"이 밀접하게 관계가 있었다. 그러나 일차성 유뇨증과 이차성 유뇨증은 정신병리상 의미있는 차이는 없었다.

5. 수면뇌파 검사에서는 19.4%(7/36)에서 이상소견이 발견되었다.

6. Imipramine이 투여되었을 때 전체 유뇨증의 75%(27/36)에서 호전이 되었다. 그러나 반응을 보인 군과 보이지 않은 군 간에는 정신 병리상의 의미 있는 차이는 없었다.

이상의 결과로 미루어 "유전적인 요소", "증추신경계의 발달미숙"이 유뇨증의 원인적인 요소로 작용하였을 가능성이 있다고 추측되며, 일차성 유뇨증, 이차성 유뇨증 모두 감정적인 문제와 밀접한 관계가 있다고 할 수 있다. Imipramine에 대한 효과는 일차성 유뇨증, 이차성 야뇨증 모두에서 양호한 반응을 보였다고 할 수 있다. 따라서 치료적인 면에 있어서는 약물의 투여와 동반된 감정적인 문제를 함께 치료를 해주는 것이 가장효과적인 치료 방법이라고 할 수 있다.

REFERENCES

American Psychiatric Association: *Diagnostic and Statistical Manual of Mental Disorders, 3rd ed.*,

- Washington, D.C., Amer. Psychiat. Assoc., 1980.
- Bakwin, H.: *Enuresis in children*. *J. Pediatrics*, 58: 806-819, 1961.
- Behrle, F.C., Elkin, M.T. and Laybourne, P.C.: *Evaluation of a conditioning device in the treatment of nocturnal enuresis*. *Pediatrics*, 17:849-856, 1956.
- Blackwell, B. and Currah, J.: *The psychopharmacology of nocturnal enuresis*. In Kolvin I., MacKeith R.C. and Meadow, S.R. (Eds): *Bladder Control and Enuresis*, Philadelphia: J.B. Lippincott, Co. pp. 231-257, 1973.
- Booth, C.M. and Gosling, J.A.: *Histological and urodynamic study of the bladder in enuretic children*. *Brit. J. Urology*, 55:367-370, 1983.
- Bostock, J. and Shackelton, M.G.: *Enuresis and toilet training*. *Med. J. Aust.*, 2:110-113, 1971.
- Brazelton, T.B.: *A child-oriented approach to toilet training*, *Pediatrics*, 29:121-128, 1962.
- Breger, E.: *Hydroxyzine hydrochloride in the management of enuresis*. *J. Pediatrics*, 61:443, 1962.
- Campbell, E.W. and Young, J.D.: *Enuresis and its relationship to electroencephalic disturbances*. *J. Urology*, 96:947-949, 1966.
- Cohen, D.L.: *Nocturnal enuresis in the adult male: A urologic study*. *J. Urology*, 57:331-337, 1947.
- Despert, J.L.: *Urinary control and enuresis*. *Psychosom. Med.*, 6:294-307, 1944.
- DeLeon, G. and Mandell, W.: *A comparison of conditioning and psychotherapy in the treatment of functional enuresis*. *J. Clin. Psychol.* 22:326-330, 1966.
- Ditman, K.W. and Blinn, K.A.: *Sleep levels in enuresis*, *Am. J. Psychiat.*, 111:913-919, 1955.
- Dodge, W.F., West, E.F., Bridgeforth, E.B. et al: *Nocturnal enuresis in 6 to 10 year-old children*. *Amer. J. Dis. Child*, 120:32-35, 1970.
- Douglas, J.W.B.: *Early disturbing events and later enuresis*. In Kolvin, I., MacKeith, R.C. and Meadow S.R. (Eds): *Bladder control and Enuresis*, Philadelphia: J.B. Lippincott, 48-49, 1973.
- Esman, A.H.: *Nocturnal enuresis: Some current concepts*. *J. Amer. Acad. Child Psychiat.*, 16:150-158, 1977.
- Forsythe, W.I. and Redmond, A.: *Enuresis and spontaneous cure rate: Study of 1129 enuretics*. *Arch. Dis. Child*, 49:257-263, 1974.
- Fritz, G.K. and Armburst, J.: *Enuresis and encopresis*. *Pediat. Clin. of North America*, 5:283-296.
- Glicklich, L.B.: *An historical account of enuresis*. *Pediatrics*, 8:859-876, 1951.
- Hagglund, T.B.: *Enuretic children treated with fluid restriction or forced drinking. A clinical and cystometric study*. *Ann. Pediat. Fenn.*, 11:84-90, 1965.
- Hallgren, B.: *Nocturnal enuresis in twins*. *Acta. Psych. Neuro. Scand.*, 35:73-90, 1960.
- Hallgren, B.: *Enuresis. II A study with reference to certain physical, mental, and social factor possibly associated with enuresis*, *Acta. Psych. Neuro. Scand.*, 31:405-436, 1956.
- Heisel, J.S. Ream, S., Raitz, T. and Coddington, D.: *The significance of life events as contributory events in the diseases of children*. *J. Pediatrics*, 83:119-123, 1973.
- Hinman, F. and Baumann, W.: *Vesical and ureteral damage from voiding dysfunction in boys without neurologic or obstructive disease*. *J. Urology*, 109: 727-732, 1973.
- Holmes, D.M., Stone, A.R., Bary, P.R., Richards, C. J. and Stephenson, T.P.: *Bladder training-3 years on*. *Brit. J. Urology*, 55:660-664, 1983.
- Hong, K.E.M.: *Developing Child Psychiatry in Korea*, *Neuropsychiatry*, 21:2, 183-193, 1982.
- Hong, K.E.M. and Hong, K.J.M.: *Child behaviour symptom questionnaire and child psychiatric diagnoses*. *Neuropsychiatry*, 22:3, 366-374, 1983.
- Jones, B. Gerrard, J.W., Shokeier, M.K. and Houston, C.S.: *Recurrent urinary infection in girls: relation to enuresis*. *Canad. Med. Assoc. J.*, 106:127-130, 1972.
- Kirby, R.S. Fowler, C., Gilpin, S.A. et al: *Non-obstructive detrusor failure. A urodynamic, electromyographic, neurohistochemical and autonomic study*. *Brit. J. Urology*, 55:652-659, 1983.
- Klackenburg, G.: *Primary enuresis, when is a child dry at night?* *Acta. Ped. Scand.*, 44:513-518, 1955.
- Labay, P. and Boyarsky, S.: *The action of imipramine on the bladder musculature*. *J. Urology*, 109: 385-386, 1973.
- Linderman, P.C., Wasserman, D.H. et al: *Desipramine in the treatment of enuresis*. *J. Urology*, 101:

- 314-316, 1969.
- MacLean, R.E.G.: *Imipramine hydrochloride and enuresis*, *Am. J. Psychiat.*, 117:551, 1960.
- Mahony, D.T.: *Studies of enuresis I. Incidence of obstructive lesions and pathophysiology of enuresis*. *J. Urology*, 106:951-958, 1971.
- Maxwell, C. and Seldrup, J.: *Imipramine in the treatment of childhood enuresis*. *The Practitioner*, 107:809-814, 1971.
- Mikkelsen, E.J., Rapoport, J.L., Nee, L. et al: *Childhood enuresis I. Sleep patterns and psychopathology*. *Arch. Gen. Psychiat.*, 37:1139-1144, 1980.
- Mowrer, O.H. and Mowrer, W.M.: *Enuresis; a method for its study and treatment*. *Am. J. Orthopsychiat.*, 8:436-459, 1938.
- Paschalis, A.P., Kimmel, H.D. and Kimmel, E.: *Further study of diurnal instrumental conditioning in the treatment of enuresis nocturna*. *J. Behav. Res. Exp. Psychiat.*, 3:253-256, 1972.
- Petersen, I. and Eeg-Olofsson, O.: *The development of the electroencephalogram in normal children from the age of 1 through 15 years. Non-paroxysmal activity*. *Neuropädiatrie*, 2:247-304, 1971.
- Petersen, K.E. Andersen, O.O. and Hensen, T.: *Mode of action and relative value of imipramine and similar drugs in the treatment of enuresis*. *Eur. J. Clin., Pharma.*, 7:187-194, 1974.
- Physical and neurological assessment for soft signs, in Gug W (ed): *ECEDU Assessment manual for psychopharmacology*, Rockville, Md. National Institute of Mental Health, pp. 383-393, 1976.
- Pierce, C.M., Whitman, R.M., J.W., and Gay, M.L.: *Enuresis and Dreaming*. *Arch. Gen. Psychiat.*, 4: 166-170, 1961.
- Pompeius, R.: *Cystometry in pediatric enuresis*. *Scan. J. Urol. Nephrol.*, 5:222-228, 1971.
- Koegler, R.R., Riehl, J.L.R. and Poussaint, A.: *Enuresis, epilepsy and the electroencephalogram*. *Am. J. Psych. Psychiat.*, 123:1294-1295, 1967.
- Raport, J.L. Mikkelsen, E.J. et al: *Childhood enuresis II Psychopathology, tricyclic concentration in plasma and antienuretic effect*. *Arch. Gen. Psychiat.*, 37: 1146-1152, 1980.
- Ritvo, E.R., Ornitz, E.M., Gottlieb, F. et al: *Arousal and nonarousal enuretic events*. *Am. J. Psychiat.*, 126:77-84, 1969.
- Rutter, M. and Hersov, L.: *Child Psychiatry. Modern approaches. 1st ed. Blackwell scientific pub. pp. 581-612, 1977.*
- Schaffer, D., Costello, A.J. and Hill, I.D.: *Control of enuresis with imipramine*. *Arch. Dis. Child*, 43:665-671, 1968.
- Silberstein, R.M. and Blackman, S.: *Differential diagnosis and treatment of enuresis*. *Am. J. Psychiat.*, 121:1204-1206, 1965.
- Starfield, B.: *Functional bladder capacity in enuretic and noneuretic children*. *J. Pediatrics*, 70:777-781, 1967.
- Stein, Z.A., and Susser, M.W.: *Socio-medical study of enuresis among delinquent boys*. *Brit. J. Prev. Soc. Med.*, 19:174-181, 1965.
- Takayasu, H., Sato, S., Hirokawa, L. and Shibuya, M.: *Electroencephalogram findings in 140 enuretic patients*. *Urol. Int.*, 15:171-190, 1963.
- Troup, C.W. and Hodgson, N. B.: *Nocturnal functional capacity in enuretic children*. *Pediat. Urology*, 105:129-132, 1971.
- Umphress, A. and Murphy, S., Nickols, J. and Hammer, S.: *Adolescent enuresis—A sociological study of family interaction*. *Arch. Gen. Psychiat.*, 22: 237-244, 1970.
- Weinberg, W., Rutman, J., Sullivan, L. et al: *Depression in children referred to an educational diagnostic center: Diagnosis and treatment*. *J. Pediatrics*, 83:1065-1072, 1973.
- Werry, J. and Cohrssen, J.: *Enuresis: An etiologic and therapeutic study*. *J. Pediatrics*, 67:423-431, 1965.
- Wiener, J.M.: *Psychopharmacology in childhood and adolescence. 1st ed. New York., Basic Book Inc. Pub. 1977.*