

Some Aspects of Human Sparganosis in Korea

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INTRODUCTION

The first authentic case of human sparganosis in Korea was incidentally found by Uemura (1917) in muscle fascia during amputation of lower extremity of a 36-year-old Korean farmer and this case was described in 1924 with 3 additional Japanese cases by Doi & Boku. In 1924, another case was described by Kikkawa in 23-year-old merchant having right eye lid swelling. Thereafter many Korean indigenous cases of sparganosis were recorded by both Korean and Japanese physicians until 1941 (Lee, 1930; Shin, 1933; Yoon, 1935 and others). A series of reports of Kobayashi (1925 & 1928) and the contributing paper of Weinstein et al. (1954) disclosed and summarized the characters of human sparganosis in Korea during that period. Recently more and more human cases with interesting features of clinical manifestations have been experienced by Korean authors and about 2 cases were on record annually in 1960's in Korean literatures.

Human sparganosis itself has complicating features in aspects of sources and modes of

infection, clinical manifestations and pathology of the lesion. And these features were somewhat different between races and countries because of traditional custom of native inhabitants and different environmental situations and many other factors.

In this paper, the authors present their experiences on 5 human cases of sparganosis in Korea since 1968. Though these cases were not studied fully on their histories and clinical courses, each of the cases will be warranted by their own characteristic features representing the peculiarity of modes of infection in Korea. And by comprehensive review of records of human cases in Korean literatures, some aspects of human sparganosis were discussed chiefly on the epidemiological and clinical point of view.

PRESENTATION OF CASES

Case 1: A white ribbon-like structure was the subject of consultation to the Department of Parasitology, S.N.U. on November 1968. This was extracted by the pathologist, Dr. H.S. Park from a dense fibrous mass already fixed with 10% formalin. This mass was cons-

ulted to her from a local clinic under the impression of granulomatous mass with fibrous band. This was measured 9.9×0.2 cm. When it was stained with Semichon's acetocarmine, showed no formed organs within the band except definite organ of scolex and integument. It was diagnosed as *Sparganum mansonii* (Fig. 1).

The patient was 65-year old male merchant who had been in Pusan and visited the clinic because of epigastric discomfort and palpable mass deeply on that region. Under the impression of malignancy of stomach, exploratory laparotomy was undertaken and a mass situated at the lesser omentum along the lesser curvature of stomach was observed. Larger parts of greater omentum migrated to the mass and two white, glistening, motile, band-like structures were intermingled with omental tissues and pad of fat. This mass was removed in toto. The post-operative course of the patient was not eventful.



Fig. 1. *Sparganum mansonii*, fractured during staining with acetocarmine from Case 1.

The past history of the patient revealed that he had eaten many of raw snakes during past 3 years to treat joint pain following the recommendations of neighborhood.

Case 2: A 45-year-old government official was admitted to Seoul National University Hospital because of acute abdomen on October 1969 to the Department of Surgery. Under the impression of acute appendicitis, McBurney incision was inserted. Before the exposure of peritoneum,

a white glistening and ribbon-like worm was found and easily extracted from subcutaneous fat tissue. This worm was actively motile in warm saline and tentatively diagnosed as *Sparganum mansonii* by the attending physician, Dr. W.R. Lee. The worm was sent to Department of Parasitology to confirm the diagnosis. It measured 12.5 cm in length and 3 mm in maximum breadth and actively motile with pseudosegmentation formation and scolex part with repeated extension and retraction. Formed structures such as suckers or hooklets were not found under dissecting microscope. To confirm the diagnosis and to collect adult stage, it was fed to dog, but failed to collect adult.

When the patient participated the Korean War as ROK Army officer, he had consumed snakes sometimes in the battlefield of mountainous part of Kangwon Do (=Province). Otherwisely he denied any exposure to the possible infection sources of sparganosis such as raw frogs, pork and snakes and drinking of untreated water thereafter.

Case 3: A 38-year-old farmer who had lived in E-Chun, Kyunggi Do Province since the birth visited Out-Patient-Clinic of the Department of Surgery, Seoul National University Hospital on January 1971, because of a thumb-sized mass on mid-epigastric region. On palpation the mass was about 3×3 cm in size and soft in consistency. Exploratory incision was undertaken to obtain the biopsy material. On the incision of skin and subcutaneous fat tissue, white, worm-like creature was crawling over the margin of incision. Careful removal of worm from the mass revealed two worms were resided in the mass. One of these in the worms, actively motile in saline was sent to Department of Parasitology (Fig. 2).

It measured 21 cm in length and 3 mm in width and actively motile with active protrusion and retraction of anterior portion and formation

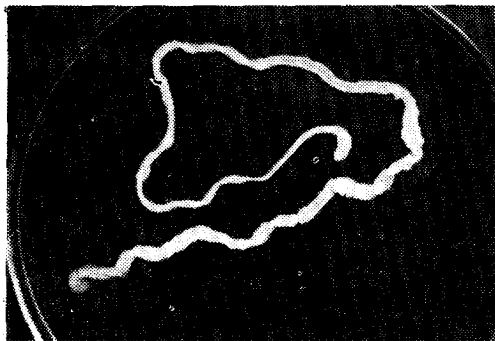


Fig. 2. *Sparganum mansoni*, actively motile in warm physiological saline, from Case 3.

of pseudosegmentation of body portion. This larval worm was infected to previously non-infected dog under the impression of *Sparganum mansoni* to collect the adult worm. One month later adult *Diphyllbothrium mansoni* was found in the intestine of experimentally infected dog.

The past history of the patient revealed that he had been fond of eating snakes which were caught during the farming of rice paddy in summer season, for several years in the belief that snake is beneficial for man.

Case 4: A 34-year-old male business man had a mass on the left abdominal wall and visited Department of Dermatology, Eastern Municipal Hospital of Seoul on August 1974. The worm referred for diagnosis was fixed in 10% formalin and measures $3 \times 0.8 \times 0.2$ cm and transversely wrinkled (Fig. 3). The acetocarmine staining revealed the scolex portion without any formed organ or the presence of integument. No

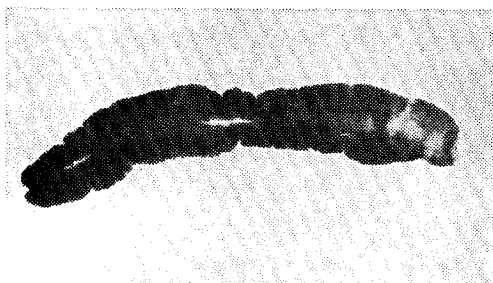


Fig. 3. *Sparganum mansoni* collected from Case 4. Stained with acetocarmine.

further informations on this case was obtained.

Case 5: The case named Kim was a 38-years-old male merchant. This case was found by medical student of Seoul National University during his extracurricular activities on October 1974. The patient said he found pieces of white, worm-like structures appearing at urethral orifice during urination consecutively 4 times during past 3 month (Fig. 4). He said

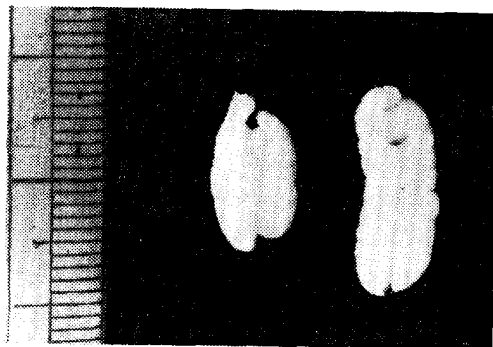


Fig. 4. 2 pieces of *Sparganum mansoni* collected by patient (Case 5). Alcohol fixed.

he could fix the structures in alcoholic beverage because he was an illegal merchant handling anthelmintics and had experiences of making some demonstration samples of parasites in alcohol. Before the appearance of the worm in the urine a soft scrotal mass was present for past 3 years but disappeared recently. Dysuria occurred thereafter on every urination, followed by appearance of a worm at orifice for four times.

The past history revealed that he consumed raw meat of snakes about 30 times during past 10 years when he had been in Pusan. He said he discontinued the habit of eating 3 years ago when the patient was surgically treated the mass on thigh apparently of sparganosis origin.

REVIEW OF KOREAN CASES

Since Kobayashi(1925) introduced the human cases of sparganosis hitherto reported in Korea

in his review article "On the animal parasites in Korea" i.e., the cases recorded by Doi and Boku(1924), by Kikkawa(1924) and a case experienced by Inaba, cases continued on the records of medical literatures annually, summing up to 63 cases including present cases until 1974. All of these cases were ascertained by removal of live parasites from patient, and usually identified by trained parasitologist.

Table 1. Decennial distribution of human sparganosis reported in Korea

Periods	No. of cases
1924—1933	9
1934—1943	8
1944—1953	0*
1954—1963	12
1964—1974	34
Total	63

* During the period from 1941 to 1955, the medical record keeping activity in Korea was in chaos because of Pacific War (1941—1945), Post-War Military Government (1945—1948) and Korean War (1950—1953) and records were not available or not accessible even if present.

The increasing tendency of cases recorded were plotted decennially in Table 1. Remarkable increase of cases in recent decade, 34 cases might mean the activity of medical recording and developed status of medical care in Korea. Whether the human infection of *Sparganum mansoni* are, in fact, increased, could not be definitively stated. But more reasonable statement must be that the human contact with the sources of sparganosis infection never decreased even in recent period in Korea.

Geographical distribution of cases were dotted on the map of Korea where the most probably the infection was contracted (Fig. 5). The cases in northern half of Korea were that detected before 1945 and those in southern half

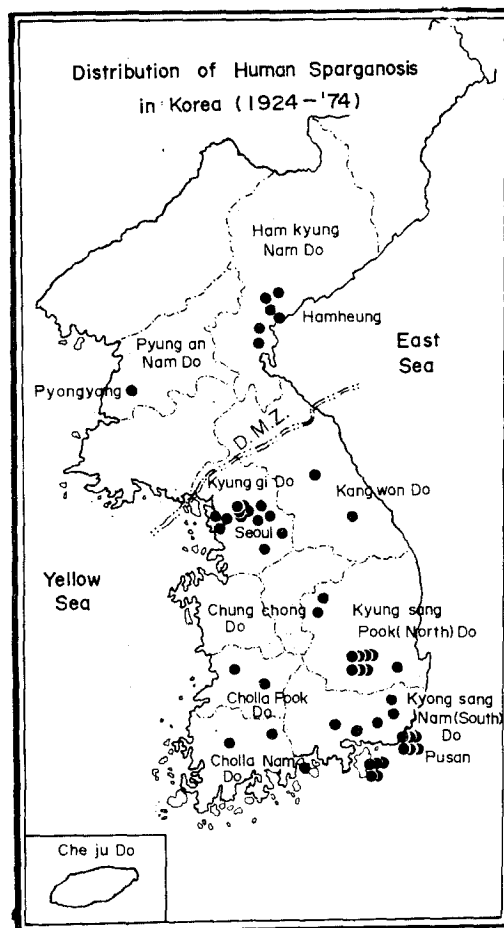


Fig. 5. Geographical distribution of reported Korean cases. One dot represents one reported case.

were from 1974. Three main endemic foci could be figured out by this type of mapping, i.e., mid-Korean Province, Kyunggi Do, southern Kyungsang Do Provinces and northern Province Hamkyung Nam Do. The significance of this map could be a subject of dispute, because at the center of heavily dotted areas have been present the major medical centers of Korea, Seoul, Taegu, Pusan and Hamheung. Because of the experienced medical doctors recognize and record on the medical literatures frequently, the case detection and identification might be facilitated by their juniors, in those regions.

Table 2. Age and sex distribution of Korean cases reported

Age group	Male	Female	Total
Pre-school ages (0—6)	1	3	4*
Childhood and adolescence (7—18)	5	0	5
Young adult (19—29)	8	3	11
Adult (30—49)	26	4	30
Senile (50 & over)	8	0	8**
Total	48	10	58***

*The youngest case was 2½ year-old female reported by Yoshida, F. (1938).

**The oldest case was 72 year-old male reported by Kum, D.P.(1959).

***Five cases reported were without description.

As shown in Table 2, the age and sex distribution of Korean cases were not evenly distributed. Sex ratio of male to female was 48:10 with dominant male preference. Age distribution of cases revealed that the majority of cases were in their adulthood. But a considerable number of cases were in their preschool age to adolescence. These kinds of age and sex distribution are by far different from that of other endemic areas of sparganosis of the world.

Table 3. The occupation of Korean cases

Occupations	No. of cases
Farmer	11
Military personnels	11*
Merchants	7
Unskilled laborer	5
Business officials	3
Government officials	2
Fisherman	1
School teacher	1
Nun (Catholic sister)	1
Housewives	5
Children	8
Total	55**

*Include three cases of POW of Korean War described by Weinstein et al. (1954).

As shown in Table 3, the occupations of the infected cases were largely farmers and military personnels, who must live in rural area and thus contact snakes frequently. The above two kinds of occupation consisted 40% of all cases recorded. Although the most of cases were in the class of lower economic and educational background, some of them are well educated and in middle or higher economic status.

Table 4. Eating habits of raw flesh of animals and untreated water with causal relations of sparganosis in Korea among 45 verified cases

Most probable source of infection	Childhood	Adult male	Adult female	Total
Drinking of untreated water	3	3	4	10
Eye dropping of frog muscle emulsion	1	0	0	1
Frog, raw eating	1	4	1	6
Snakes, raw eating	0	29	1	30
Other kinds of raw flesh	0	9	0	9
Total	5	45	6	56*

* Many patients have histories eating many kinds of flesh, thus exceed the number of cases.

The habits of proved cases contacting with possible sources of infection were presented among verified 45 cases (Table 4). Many of the cases contacted two or three kinds of possible sources listed. Among them, raw eating of snakes ranks first consisting about 50% of all cases. And raw eating of frogs(6 cases) or other kinds of flesh such as pork, horse or beef (9 cases) was common but none of fowl.

Habitual consumption of untreated cold water in rural Korea was common practice and as much as 10 cases of sparganosis among 45 were considered to be contracted the infection by this kind of mode especially in women and children who absolutely denied the contact with any kinds of raw flesh. The habits practicing poultice of animal skin over inflamed part of the body was never known in Korea. But a

child gave the history of dropping of frog muscle emulsion on the diseased eye from other cause (Shin, J.T. and Koh, 1958).

Table 5. Reasons of eating raw flesh of frogs, snakes and other kinds of fleshes in patients of sparganosis in Korea

Reasons	Kinds of fleshes			Sex of patients	
	Frog	Snake	Others	Male	Female
Favorite eating itself	1	3	5	7	1
For therapy of diseases	2	8	0	7	2
Tuberculosis	1	1	0	1	1
Syphilis	0	1	0	1	0
Joint pain	1	6	0	5	1
For potentiation of masculine activity	1	9	3	9	0
Belief of special nutrition	1	7	1	7	0
For survival in combat field (including training)	1	3	0	3	0

The practice of raw eating of snakes, frogs and other kinds of flesh was the most important cause of human sparganosis in Korea. The reasons of consuming raw flesh in Korea was analysed and presented Table 5. Most of infected adult male would like to eat the snakes, first of all, to enhance and potentiate masculine activity (9 cases) and by the belief that snakes or others are of special nutritional value exceeding beef (7 cases).

Some of the cases learn the method of capturing and eating wild animals, frogs or snakes as early as childhood, and habitually favoured in later life. Im et al. (1974) reported a girl aged 6 years contracted by eating frogs captured at rice paddy with her elder brothers. In particular, many of human cases contracted infection because of eating snakes or frogs for the treatment of diseases, such as tuberculosis or joint pain, a counterpart of poultice in southern China.

The incubation period of sparganosis seems not definitely stated because of the inapparent time of contraction of infection in Korean cases. Weinstein et al. (1954) reported cases infected showed the development of symptom as early as two months, but in this report the present authors described a case whose incubation period was approximately 17 years and still in asymptomatic stage.

The symptoms of clinical cases varied in degree of severity by some factors; location of worm inhabited, pathological stages of the lesion and probably virulence of infected parasite.

Table 6. Location of *Sparganum* found in 58 Korean cases

Location	No. of cases
Subcutaneous and Fascial	54
Neck	1
Thoracic wall	9
Abdominal wall	17
Inguinal region	3
Scrotum	14
Lower extremity	10
Submucosal	1
Retropharyngeal	1
Orbital	6
Eyelid	2
Bulbar conjunctiva	3
Unkown	1
Body cavities	7
Pleural	1*
Abdominal	4
Vertebral canal	2
Urinary tract	2
Ureter	1
Urethra	1
Total	70**

* Cited from review of Lee, K.T. (1970).

** Exceed the number of cases because of multiple locations.

The location of *Sparganum mansoni* found in

Korean cases were presented in Table 6. Most of them were found in subcutaneous tissue or intermuscular fascia, 53 out of 70 locations of 58 cases. The distribution of *Sparganum* found in subcutaneous tissue were most frequent in abdominal wall and next in scrotum, lower extremity, chestwall, in that order. Orbital cases were met in Korea though the practice of poultice were not undertaken. Body cavities, such as pleural, abdominal or vertebral canal were also involved by *Sparganum* in 7 cases out of 70 locations from 58 cases.

Table 7. Clinical manifestations of 31 subcutaneous of fascial infestation of 31 subcutaneous or fascial infestation of *Sparganum*, except scrotal cases

Clinical manifestations	No. of cases
Mass, palpable	27
Migrating	8
Fixed	19
Indolent	6
Reddening, itching, tenderness	7
Abscess formation	2
Subcutaneous hemorrhage	2
No mass palpable	4
Symptomatic	2
Incidentally found	2

Table 8. Clinical manifestations of 12 cases of sparganosis with scrotal involvement

Clinical manifestations	No. of cases
Mass, palpable	11
Indolent	3
Discomfort	3
Pain, severe	2
Acute haemorrhage (Haematocele)	2
Urinary frequency	1
No mass but incidentally found	1

Subcutaneous sparganosis were invariably manifested by presence of mass, except a small number of cases, whether they were migratory or

fixed, and soft and/or crepitant on palpation. In majority of cases, the mass were accompanied by inflammatory signs of overlying skin; redness, tenderness or itching sensation, at the time seeking medical care. Commonly they were not painful. The mass could be complicated by abscess formation or subcutaneous hemorrhage as recorded in 2 Korean cases respectively (Table

Table 9. List of manifestations of sparganosis involving other than subcutaneous tissue

Location and reporter	Clinical manifestations
Submucosal tissue	
Yoshida, F. (1938)	Retropharyngeal abscess
Orbital	
Kikkawa, T. (1924)	Migratory mass with conjunctitis
Takamoto, S. (1931)	Unknown
Yoon, B.H. (1935)	Unknown
Shin et Koh (1958)	Mass with chemosis and ptosis
Chu et Huh (1960)	Mass in eyelid, exophthalmos and restricted eye movement
Lee, C.W. et al. (1971)	Mass in eyelid, chemosis, ocular pain, restricted eye movement
Pleural cavity	
Hong (Cited from Lee, K.T. 1970)	Unknown
Abdominal cavity	
Takida, S. (1940)	Local peritonitis
Lee, Y.H. et al. (1965)	Acute abdomen due to haemorrhage in peritoneal cavity
Chun et al. (1965)	Haemorrhage in peritoneal cavity with shock
The first case of present report	Epigastric discomfort with palpable mass
Vertebral canal	
Lee, C.W. & Sohn (1965)	Acute chest pain, paraplegia, loss of sensation up to T ₅ , urinary incontinence
Park, S.H. et al. (1972)	Paraplegia, urinary incontinence, tingling sensation in upper extremity
Urinary tract	
Kim, H.W. & Kim (1970)	Right flank pain and colic, hematuria, ureter involvement with stone
Present authors' fifth case	Discharged during urination with dysuria

7). Scrotal sparganosis were very similar in manifestations to that of other subcutaneous locations but different from them because of the particular anatomic location (Table 8). They were more liable to be complicated by hemorrhage (2 cases out of 14 cases) and more severe discomforts could be presented. A case sought medical care because of urinary frequency in whom the mass was situated just below urethra (Miyazaki, M. 1941).

The sparganosis cases involved other than subcutaneous tissue reported in Korea were listed and summarized in Table 9. Those cases were manifested usually with severe complications of sparganosis. For example, cases with abdominal sparganosis were frequently complicated by intra-abdominal hemorrhage and in state of shock or acute abdomen, although the causal relation with sparganosis is uncertain.

Table 10. Number of *Sparganum mansoni* recovered from 60 Korean cases

No. of worms	No. of cases		Total
	Single lesion	Multiple lesion	
1	42	2*	44
2	6	—	6
3	4	—	4
4	2	1	3
5	—	1	1
6	—	1	1
12	—	1	1

* Multiple lesions in these cases are granuloma caused by migration.

As shown in Table 10, the number of worms recovered from human cases were analysed. Almost all of the cases were manifested by single lesion with single worm infestation. The maximum number of worm recovered was reported by Lee, S.K. et al. (1967) with recovery of 12 worms from 6 lesions. Although all of the worms recovered from Korean cases were not precisely observed and examined, it seems

reasonable that there is still no even single reported experience of *Sparganum proliferum*. There is no description of worm with branched larva recovered both from animal and human in Korea yet. Thus the larval worm hitherto recorded could be identified tentatively *Sparganum mansoni*, until the taxonomy on this larva were settled down.

DISCUSSION

Recently Swartzwelder et al. (1964) stated in the comment of increasing tendency of sparganosis in the United States, "Some of the infections were asymptomatic and were detected fortuitously. In some instances the larvae were dead and being absorbed. These factors would reduce the possibility of detection of the infection and would suggest that in a number of cases, especially during the earlier periods, medical care possibly was not sought. On the other hand, having in the mind the desirability of early detection of cancer, people in recent years may be more inclined to seek a diagnosis of an otherwise tolerable conditions." It appeared same opinion could be applied to the incidence of sparganosis in other developed or developing countries.

The actual chance of contracting infection of *Sparganum mansoni* would be, at least, not decreased and the advanced medical care system uncovered this relatively rare condition in every corners of the world rather frequently. The number of human cases detected in Japan was approximately triplicated during past 30 years from about 80 cases (Ando, 1941) upto over 200 (Ishii, 1973). The same pattern of recent increment also found in other endemic foci such as Africa and South-East Asia (Khamboonruang et al., 1974; Nelson et al., 1965).

Yokogawa and Kobayashi (1930) suggested the infection modes of *Sparganum mansoni* in

human cases to be as follows: 1) By swallowing *Cyclops* harbouring its full grown procercoids when one drinks or by eating uncooked foods, 2) By eating raw certain kinds of its second intermediate hosts infested with spargana, 3) By the application to an abscess or wounded skin of a poultice with the flesh of infected animals such as frogs, snakes or any other vertebrates as was the custom with some Chinese.

The most important and frequent way of this larval infection in the world must be drinking of untreated water. Mueller et al. (1963) reported a case of sparganosis probably due to drinking natural stream water during hunting trips. The sources of infection of sparganosis presented by Swartzwelder et al. (1964) were probably from drinking of water. Nelson et al. (1965) examined wild animals distributed in Kenya and could not find out *Sparganum* larvae which were frequently found in human being. A postulation that human infection must be contracted by drinking of untreated water and hyena harvoured adult *Spirometra* by attacking infected human corpse, in turn hyena contaminated water with ova of *Spirometra*, was presented to explain the endemicity. But it must be considered in postulation whether hyena contaminated only the water source for human being. In rural areas, many farmers were accustomed to drink untreated cold water routinely. And the chance of procercoid infection has been present although being rare. This is why children and adults who were not contacted with second intermediate hosts contracted sparganosis in Korea. Lee, Y.B. et al. (1972) record a case of sparganosis who was a Catholic sister probably infected by this mode of infection.

The infection by consuming second intermediate hosts has been known in various parts of the world, but the most frequent and important in Far East nations, Japan and Korea. Yokogawa and Kobayashi (1930) and Ando (1940) proposed

the most important way of infection of sparganosis in Kyoto and Osaka areas of Japan must be attributable to the consumption of raw fowl meat of inhabitants. Because the raw fowl flesh had been considered to be effective in good nourishment of weak child and potentiation of masculine activity of adult and because many Japanese workers reported the presence of spargana in the flesh of fowl (Yamada, 1921; Ando, 1922 and others), this mode of infection must be important at least in heavy endemic area of Japan. Although Kim et Kim (1973) reported the recovery of spargana from domestic fowl in Seoul, the importance in Korea seems negligible because raw eating of fowl flesh has never practiced.

Snakes are very important as sources of human sparganosis both in Korea and Japan. It was anticipated in Korea by Kobayashi (1925) because of high infection rate of terrestrial snakes with spargana in various parts of Korea. And later he added the frogs as source of infection because *Sparganum mansoni* infected in this host was verified by some authors (Takamoto, 1931; Yoshida, 1938). Weinstein et al. (1954) clearly proved and documented the importance of snakes as sources of infection in Korea from three prisoners-of-war who consumed snakes during work outside the POW compound. They commented on the habits of eating snakes "it was a common belief among Koreans that snakes had special nutritive value which was particularly effective in combatting illness.....Most of these individuals did not eat consistently, but would only do so during a period of illness for the nutritional and medicinal effect. A few relished snake as a delicacy, one having eaten about thirty during the previous year alone....." As presented in previous section, a very limited group of Korean like to eat raw snakes for various kinds of reasons although it is not prevalent in general population. It could be considered that the basic deficiency of protein

diet in rural mountainous part of Korea get the availability from snakes captured around them. Rationalization of the habits was succeeded by the traditional postulation that these animals were very effective in certain situations. Cheju Island where marine fishes are abundant throughout the year, and the necessity of snakes are negligible, no human case of sparganosis were known yet.

Good interrelationships between neighbourhood in Korean rural population seems another basic principle of spreading of sparganosis in Korea. They would like to advice some good remedies of easy availability for ill persons of neighbour. And the advised ill man tried the practice especially that from elderly neighbours before seeking modern medicare. Among those advices, eating raw snakes for tuberculosis or joint pain are common cause of sparganosis. In case of eating snakes for treatment, they consume a rather large amount of snakes over 200. And *Sparganum* found in those cases are rather numerous than other cases. These kinds of infection is more frequently practiced in Kyungsang Do (Province) where endemicity were established. As another mode of contact with snakes, Cho et al.(1974) reported two cases of sparganosis infected by eating snakes and frogs during ranger and survival training in Army, in that situation no edible commodities were never supplied.

Another important source of sparganosis infection, the second intermediate host, hog played important role world-widely. Railliet & Henry (1911) recorded the natural infection of pork with *Sparganum mansoni* in Vietnam and von Ratz (1913) collected the plerocercoid larvae from Budapest abattoir from pigs and nominated *Sparganum raillieti*. Later Miyakawa(1935) in Japan, Beurup(1953) in Australia respectively recorded the pigs as paratenic host of this larval infection.

Sandars (1954) reported a Queensland woman infected with this larva probably seemed to be infected during processing of feral pig. Bruining et De Jongh (1960) reported a case of sparganosis in Liberia probably due to this kind of source. Corkum(1966) experimentally proved the plerocercoid larvae established the infection in pigs. Jang (1964) collected *Sparganum mansoni* from domestic pigs slaughtered in abattoir of Seoul and Kyunggi Do, Korea and proved that the larvae could be developed as adult *Spirometra* in dog. Domestic pigs reared in rural parts of Korea might be infected with considerably high percentage with *Sparganum*, because some of the farmers feed pigs with collected snakes and frogs especially in the summer season. Considering the pork-borne *Taenia solium* infection prevalent in Korea, the infection of *Sparganum* through raw eating of pork would share a considerable proportion in contracting sparganosis.

The significance of other many kinds of wild animals in aspects of sources of human sparganosis might be variable by regional and racial differences.

The practice of poultice of wounded or abscess with animal skin was rarely known in Korea whereas in southern parts of China it had been a main cause of sparganosis in that area in pre-antibiotics era. Campbell et al. (1936) described that "The custom of applying split frogs and swallowing live ones is very common in this area (=Foochow). The latter procedure is said to be effective against scabies and maybe an origin of sparganosis....." As well documented, the inhabitants of Tongkin area of Vietnam practice poultice of animal skin over eye troubles resulting in retrobulbar sparganosis (Houdemer et al., 1934). Tsuyugi (1928) proved that spargana could penetrate through mucous membrane of anus, urethra and vagina of vertebrate hosts. Shin et Koh (1958) reported a child of ocular

sparganosis who practiced the poultice of crushed frog muscle in Kwangju, Cholla Nam Do and this case might be a clue that revealed the possibility of sparganosis of this cause in this part of Korea.

Yokogawa and Kobayashi (1930) demonstrated experimentally collected proceroid larvae could penetrate the normal human skin by human experiment of the latter author. And this kind of infection mode is considered to be unsettled practically in actual human infection. Leon et al. (1972) listed as second possibility that lodgement of *Cyclops* in the conjunctival sac during swimming and releasing the proceroid to affect entry to orbit causing ocular sparganosis in Ecuador. Yokogawa (1930) himself said in reply to the question of Bonne that proceroid naturally do not escape from the first intermediate host but if infected *Cyclops* could be crushed on the skin of human being the larvae will be freed from and penetrate into the skin that need a rather complicated process. As have been considered in Orient Lee, C.W. et al. (1971) reported a case of ocular sparganosis probably due to eating raw snakes and suggested that the migration of *Sparganum* larvae after the passage of alimentary canal upto orbit seems more reasonable explanation in his case.

The age and sex distribution of sparganosis cases of a country apparently are paralleled with the epidemiological characteristics of contacting with infective forms. In the United States, the infected persons were adults of 16 females and 7 males in the series of Swartzwelder et al. (1964). In Vietnam almost all of the cases detected were under 30-years of age and mostly in their childhood or adolescence of either sex (Houdemer et al., 1934). In Japan Ando (1940) summarized the age and sex distribution of Japanese cases and sex ratio was 66 males to 24 female and 63 out of 86 cases were in the

age bracket from 21 to 50. The preference of a certain age group in the cases definitely correlated with the modes of contacts with sources of infection as discussed before.

The geographical aggregation of cases in a country seems common finding and coincided with the local habits of inhabitants and environmental situations. In the United States, Swartzwelder et al. (1964) commented that 25 out of 35 autochthonous infection occurred in southern parts of United States, Louisiana and adjoining states and rarely in New York (Muller et al., 1963). Yogore and Tangco (1953) reported a Catholic sister infected with *Sparganum* and stated that she must be infected in Mindanao where she had been and another Filipino case was already reported. In Australia 4 human cases reported were found in New South Wales in three times and one time in Queensland (Sandars, 1954). Sir Patrick Manson's original description of human sparganosis (1881) and followed reports were found all in southern parts of China, Fukien (Forman Memorial Hospital, 1933; Campbell et al., 1936), Kwangtung (Lutz, 1930), Kweichow (Hsü, 1944), Hong Kong (Huang and Kirk, 1962; Wong et Huang, 1970) and Taiwan (Wang et Cross, 1974). Although the heaviest endemic foci of sparganosis in Japan has been known to be Kyoto and Osaka Prefectures (Koizumi, 1927), scattered cases were reported in every corners of Japan in recent time. In Korea it may be more reasonable to presume that the possibility of occurrence of cases was present all over the country but more endemic in Kyungsang Do and Kyunggi Do by reviewing the reported cases.

Ando (1940) described and summarized the clinical manifestations of Japanese cases recorded from 1881 as follows: 6 cases discharged worm from urethral orifice, 18 cases involved subcutaneous tissue of lower abdominal wall,

inguinal and perineal region, 2 cases of neck and submental region, 21 cases of femoral region, 1 case from humeral region, 1 case from external surface of tibial region, 10 from thoracic wall, 1 autopsy case from outer surface of pericardium, 1 case expectorated sparganum during hemoptysis, 20 cases from abdominal wall, 8 orbital cases and 8 unknown out of 97 Japanese cases. In 73 cases out of 97 cases, the larvae were found in subcutaneous or muscle fascia. These distributions of worm were generally coincided with that of Korean cases.

Most of the cases detected around the world were found to be subcutaneous cases, abdominal and chest wall, breast and lower extremities. American cases were frequently involved in upper extremities (Brooks et al., 1960; Short et Lewis, 1964; Swartzwelder et al., 1964; Ali-Khan et al., 1973) which is very rare site of involvement in Orient. No Korean cases ever reported to be found at that foci.

Some of the very interesting human cases were recorded. Miyazaki, I.(1960) presented a photograph who died of encephalitis and infected with *Sparganum* at intracerebral location. Pradatsundarasar et al.(1971) reported a case, 46-year-old female, showing neurological symptoms were infected with *Sparganum*-like worm in subarachnoid space, and died of subarachnoid hemorrhage. Involvement of central nervous system were very rare in sparganosis, and two Korean cases involving extradural space of vertebral canal with granuloma formation were manifested by pressure symptom of spinal cord and peripheral nerves (Lee et Sohn, 1965; Park et al., 1971). Intracavitary location of abdomen or thorax of this larva was also not common manifestation. Takayashu(1908) experienced a Japanese case of sparganosis of abdominal wall muscle with severe bleeding both in abdominal and urinary bladder wall, resulting in death. Manson's original description was

said that larva worms were present at perirenal tissue. In Korea, intraabdominal infection with bleeding were found two times by Lee, Y.H. et al. (1965) and Chun et al. (1965). The both of cases were reported to be complicated by bleeding, shock and tender abdomen. The exact etiological relationship between larval infection and bleeding could not be definitely stated. Considering the possibility of bleeding in other site of infection (Park, Y.S. et al., 1964), relationship must be taken accounted. Khamboonruang et al. (1974) reported a Thai female, infected intra-abdominally without granuloma formation and not correlated with patient's complaints. Bonne and Lie(1940) report an autopsy case in whom the *Sparganum* was found at the wall of small intestine of insane male Malayan. Intraabdominal infection usually not associated with granuloma around the worm but in the first case of present report, granuloma was the primary problem of the patient.

The appearance of *Sparganum* through urethral orifice signaled by various kinds of urological symptoms and was described since Scheube's case (1881) who was a prisoner lived in Kyoto, Japan. Consecutively 5 more cases were on the record with similar manifestations signaled by scrotal mass, hematuria and dysuria and subsequent appearance of worm. Von Römer (1910) described a sparganosis case of Royal Dutch Marine officer in Ambon found during urinary catheterization. Thereafter no more clinical cases of this manifestation were on the record world-widely. The fifth case of present report experienced a mass in scrotum for three years and it was disappeared about three months ago. Dysuria and hematuria preceeded the appearance of worm through urethral orifice four times in recent three months and the patient could anticipated the appearances in latter two times.

SUMMARY

Human sparganosis in Korea was discussed on the bases of five human cases experienced by the present authors and 58 case records already reported by many previous authors, in aspects of epidemiology and clinical features.

Sparganosis is not infrequent tissue helminthiasis now in Korea and the incidence has been evidently increased during past 10 years. It might be interpreted that improved medical delivery system and health care exposed the hidden but prevalent disease.

The distribution of sparganosis in Korea is apparently subdivided into three major endemic areas; Kyunggi Do, Kyungsang Do and Hamkyung Nam Do. Although scanty in other areas of Korea, the distribution of this disease is presumably throughout the whole peninsula of Korea except Cheju Do.

The majority of human cases of sparganosis in Korea has revealed raw consuming of snakes for treatment of tuberculosis, syphilis and joint pain, for tonics and for the belief of special nutrition among very limited group of Korean population. Because of this kinds of mode of infection, comprising four fifths of all cases, the majority of cases detected were male adult consisting of about 70% of total cases.

And drinking of untreated water in rural area where no protective, sanitary measures for water sources were provided in the past, seems another important causes of infection especially in women and children in Korea. Thus it may be concluded that sparganosis in Korea is contracted by eating of infective stages per os voluntarily or involuntarily, but not through the direct invasion.

Clinically, subcutaneous mass or lump was the most frequent problem in those patients and those masses were associated with inflam-

matory signs. By the anatomical location of the lesion, some peculiar manifestations could be developed as in orbital, abdominal, urethral, ureteral and vertebral cases. And the lesions could be complicated by haemorrhage or abscess formations,

The larval worms hitherto collected in Korea has been identified tentatively as *Sparganum mansoni* because neither branched larvae nor *Sparganum proliferum* were ever reported.

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＝國文抄錄＝

韓國人 스파가눔症例의 몇가지 特徵

—— 症例報告 및 文獻考察 ——

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韓國에서 스파가눔症은 드문 질환이 아니며 우리生活에서 흔히 行하는 몇가지 習慣의인 行爲로 因하여 많은 症例들이 續出하고 있다. 이제 스파가눔症은 有鉤囊尾虫症 및 肺吸虫의 異所寄生例과 더불어 韓國에서 흔히 經驗할 수 있는 組織寄生蠕虫症이 되고 있다고 하겠다.

著者등은 1968년부터 1974년까지 서울大學校 醫科大學 寄生蟲學教室로 診斷依賴되었던 5例에 對하여 記述하고 1924年以來 文獻에 나타났던 韓國人 症例 58例를 土臺로 韓國人에 있어서의 스파가눔症의 特徵을 찾아 보려 하였다.

著者등이 經驗하였던 第1例은 65歲男子로서 釜山에 居住하는 商人이었는데 胃小灣部에서 2匹의 虫體를 摘出하였던 例로서 神經痛 治療를 目的으로 蠐螬을 먹는 일이 있었던 例이다.

第2例은 1950年代 江原道 산악지방 戰鬪에 參加하였던 將校出身의 관리로서 급성충수염 治療를 위하여 剖腹절개도중 충체가 발견되었던 症例이다.

第3例은 36歲 男子농부로서 농사중 잡은 蠐螬을 자주 먹어왔었다고 한다. 上腹部 皮下腫塊를 切開하여 2匹의 虫體를 發見하였던 症例이다.

第4例은 34歲 남자, 회사事務員으로 左側 腹壁에서 摘出된 虫體를 市立東部病院에서 診斷依賴하였던 例이다.

第5例은 小便을 보는 도중 尿道口에서 흰색의 虫體가 기어나오는 것을 모아 4匹中 2匹을 보관하였던 症例이다. 환자는 과거 10년간 蠐螬을 수없이 먹었다고 하는 症例였다.

韓國人 症例들의 文獻考察結果 韓國에는 最近 10年間 症例가 急速히 增加된 狀態이며 地域적으로는 서울近郊 및 京畿道地方, 慶尙南北道地方 및 咸鏡南道地方에 特別 많이 報告되어 있으나 分布는 全國的인 것 같다.

韓國人 症例들의 感染源은 蠐螬의 生食이 가장 重要한 듯 하며 다른 종류의 고기를 生食하는 習慣 및 冷水를 끓이지 않고 마시는 習慣도 아주 重要的 것 같다. 따라서 모든 症例가 蠐螬을 生食하여 感染된다고 생각하여서는

안될것 같다. 뱀의 生食은 몇가지 질환의 藥用으로 또는 補身, 補陽用으로 먹는 것이 大部分의 理由이다.

이러한 感染上의 特徵으로 因하여 韓國人 症例는 5:1의 比率로 男子에 많으며 주로 30~40代에서 發見된다. 뱀을 많이 接觸할수 있는 農夫나 軍人에서 症例가 제일 많이 發見되었으나 敎育받은 사람에서도 感染은 發見된다. 따라서 韓國人에서의 感染樣式은 입을 통한 것이 大部分이며 傷處나 皮膚를 뚫고 들어가 감염되는 예는 없는 듯하다.

感染된 虫體가 發見된 위치는 3/4의 境遇 皮下組織으로 特히 腹壁, 陰囊, 下肢 및 胸壁의 順이었다. 其他 咽喉壁眼窩, 胸腔, 腹腔, 尿路 및 脊椎腔에서 發見되며 이러한 境遇에는 大部分 重篤한 症狀을 나타내고 있었다.

韓國人 症例에서 發見된 虫體의 數는 약 70%에서 單數寄生이지만 많은 數의 幼虫이 發見된 例도 많다. 勿論 危險한 假定이겠으나 虫體가 分枝 또는 發芽하는 樣相을 보이며 아주 많은 수의 虫體가 發見된 例가 없는 것으로 보아 우리나라에서 *Sparganum proliferum* 의 症例는 없고 多數寄生例들도 感染源에 繼續暴露된 結果라고 생각하는 것이 옳은 것 같다.