

Professors Kitamura and Hasegawa were lightly wounded. Professor Koyano was slightly wounded. The only one uninjured was Professor Shirabe.

The day of the bombing, Professors Kageura, Takase, and Sano were absent. They came back intact, actively working under Acting Dean Koyano. The families of students and employees came to join the search. There was great confusion.

The captain gave the order to make a list dividing the people into four categories : survivors, dead, wounded, and missing. He set up a poster with this command on each school and department. The military troops and police force were mobilized and started to clean up, collect corpses, and accommodate the wounded. There were several hundred refugees on Mt. Kompira. We could not guess the exact number. In the ruins of the medical school, the charred bones of students lay in rows.

The corps got permission to set up the Mitsuyama Relief Team with Professor Koyano in charge. Shirabe Surgery also opened up a relief station at Nameshi.

At 6 :00 p.m. all members carrying medicine, surgical supplies, and rice, departed from the university and got into Ueno-machi, the chief's house being on the way.

The home of my family* was found in the ruins. I saw the bones of my family and cremated them. I then ate supper. The roads were impassable because of the corpses, collapsed houses and trees. The sun finally set. All members of the rescue team slept in the air-raid shelter of the ruins.

SECTION 3

Mitsuyama Relief Team

Geographical features

The reason for setting up an aid station at Mitsuyama was as follows. The towns of Mitsuyama-machi and Kawabira-machi, in the valley along the river, start from Mt. Mitsuyama in the eastern half of the Nishi Urakami area. These towns are named after those areas incorporated into the city.

Actually these areas are just a few scattered houses which comprise farm villages : Azebetto, Kawadoko, Tobita, Ohtoge, Inutsugi, Koba, Kodani, Rokumaita, Fujinoo, etc. These villages make up the town of Mitsuyama -machi. Kawabira, Akamizu, Toppomizu, Uchibira, Menoto... these villages make up the town of Kawabira-machi.

The length of the main valley in the Mitsuyama area is 8 kilometers

*Translator's Note : Although Nagai uses the word "family," he is only referring to his wife, Midori. His mother-in-law and two children had already evacuated to Mitsuyama and were not present in Urakami the day of the atomic bombing.

long, and the few branching valleys create a width approximately one kilometer wide. These valleys extend from the north of the hypocenter and turn to the east. Therefore, many of the wounded must have taken refuge there. These areas were shaded from the hypocenter by the high grounds of Mt. Kompira and Mt. Tenjiku. Also this area was not touched by downwinds, therefore the patients who took refuge there were not affected by residual radiation. The area must be in good condition for observation.

These farming villages had plentiful food supplies, and the markets which would have bought from them had had most likely collapsed; therefore, food was in good supply and satisfied the needs of our patients' nutritional requirement. The biggest reason to have been in the Rokumaiita Village is that it has gushing mineral springs-the best treatment for burns since ancient times. Mineral treatment should be tried for these patients.

In this present situation, we of the Radiation Therapy Department had to perform our duties. There was no other way.

Moving

On the fourth day, August 12, we left Urakami in the early morning. There were corpses on the road. We heard groaning voices from the roadside cave shelters. An offensive smell greeted our noses. Enemy planes often passed over our heads. Many of the people whom we met on the way were bandaged. Everybody carried his or her belongings.

When we got to Mitsuyama Valley, the scenery totally changed. The contrast of the gray desolate hypocenter area with the greenery of the mountain here impressed us. Everybody stopped stiffly and took a deep breath. We felt our bodies becoming refreshed every time we took a breath.

There was an isolated house on the site of an old gold mine company in the Fujinoo of Koba Village. We decided to set up headquarters for two months here. I went through the woods below the house, down the stream, and took a bath. I found several wounds when I took off my clothes. As I noticed them, I began to feel pain. My legs under the trousers were bloody. I washed away the dirt of war with clean water, then lay in a stream with a rock for a pillow and looked up at the sky, the blue sky lying between the wooded mountains of summer on both sides, and the white clouds passing. I felt alive for the first time.

I came back to the house, lay down on a tatami mat and fell into a deep sleep.

Patient care begins

At 4 : 00 p.m., patient care began. We attended to the neighborhood leader ; he was already wounded, lying on the bed, and saying, "There are many patients. I don't know where they are." I decided to go around from house -to-house.

First, Kawabira Elementary School was assigned to be used as our aid station, but this place was also damaged and it could not be used. Because enemy planes constantly kept reconnaissance, gathering many people in one place would be dangerous.

For environmental therapy, we decided to let patients rest in their own homes. We members of the Relief Team decided we would make house calls. We visited a row of houses. In every house there were wounded people. Certainly, there were patients in the rooms hanging mosquito nets to protect themselves from flies.

All of the relief team members were active irrigating wounds, performing surgeries, bandaging, recording, giving nursing instruction, etc. We were not finished at Inutsugi Village until 10 :00 p.m.

On August 13, the summer heat and enemy planes disturbed our rounds as usual. We had to hide every time we heard a buzzing sound.

From Rokumaiita to Kawabira, the area is eight kilometers long. The surgical supplies ran out in the middle of treatment. The head nurse and Tsubakiyama went back to the university for supplies. Nurse Oishi came back and joined us.

That day, Kozasa was absent. He was severely wounded in his house. We were told he was in a serious condition. Nurse Kama's family visited us. We cremated Kama and gave the family her ashes. At 10 : 00 p.m., the day was finished.

A miserable group

How could you have described the walking figures of our relief team? A group of poor gypsies pushed out by fire with no house, no boarding house, no dormitory... The clothes we had were only what we were wearing on our bodies. We barely escaped with life.

Look at him... the captain... with a bandage wound around his head, holding a cane with his right hand, his left hand leaning on Tsubakiyama's shoulder, walking awkwardly ! Instructor Seiki was breathing hard due to the chest pain he got when he was buried alive. He was holding a long cane. Deputy Shi was cyanotic. The head nurse, Hashimoto, Tsubakiyama, all short, wore blood soaked pants and carried baskets made by leaves of reed. This was the house call bag. Technician Shi was exhausted. Medical student Nagai was in good spirits, with a white headband and a rolled up sleeve. Tsutsumi had lost his eyeglasses, so his activities were unsteady.

Everybody wore any kind of footwear they could get. Feet were injured by sharp objects such as nails and they jumped up every time they stepped on pebbles. We were a pathetic group, we had no handkerchiefs. We sweated and had to wait for our perspiration to dry itself.

"Oh, a bomber plane. Hide... It passed overhead, let's go." We lay down, hiding on the rocks, then ran. We could not go forward as planned.

August 14, we made the rounds of the upper valley area, Azebetto, Kawadoko, and Tobita. This time, returning in the setting sun, we were

hungry, tired, and sick with radiation. We had to walk in pairs, supporting each other with arms over each other's shoulders.

Up the mountain road, then down again, it was a hard slog. When we visited a patient, not only was the patient pleased, but also their whole family. Their fear disappeared at the end of our visits. We went from house-to-house, climbing the mountain road, feeling satisfied.

From that day till October 8, 58 days, the Mitsuyama Relief Team continued its operations. The patient care area was further expanded to other villages. Of course, we were busy at the beginning. Later, the number of the patients decreased, prognosis stabilized, new patients became fewer, the work became less troublesome.

The team members also alternately reported to the university headquarters. When the headquarters was located in Urakami in the early stage, there was a day less than when ten people, including nurses, reported to work under the Acting President Koyano.

One team member stayed in one of the ruined rooms of the Shirabe Surgical Department and worked on anything. Sometimes we went to Unzen to get medical supplies, another day we would help transfer patients. The relief team was always in Mitsuyama.

The team members collapse one by one

All of the team members had been in the hypocenter and were injured. We received relatively mild injuries due to the fact we were in the room with concrete walls, but we developed radiation injury symptoms : stomatitis, decreased white blood cells, hair loss, high fever, diarrhea, etc.

Some team members could not move due to wound infections. These members fell into sick beds one-by-one. The team members came back from the rounds, took care of the colleagues the whole night and went out for rounds the next morning. The work mates who had collapsed recovered.

Around that time, nursing colleagues took turns getting sick ; take care... be taken care of... give injections to each other. Mentally and physically, we worked together. He, the captain, became critically ill due to high fever and bleeding. Once it seemed that the situation was totally hopeless, but he recovered due to the sleepless care of team members, night and day. At night, we prayed that the dead mate's souls rest in peace under the light of the lantern. Cremated bones were given to each family.

To think of our dead compatriots made our difficulties as the living survivors appear as nothing.

Employee Kozasa finally died. Umezu barely survived, but recovered. After two months of legally designated medical relief, we completed our duty as a medical establishment. The Relief Team was dissolved on October 8. I will describe the results of this period in the next chapter.

CHAPTER 4

Symptoms Shown by the Patients at This Time

SECTION 1

Classification of symptoms

Characteristics of symptoms

The human body is injured by the atomic bomb in two ways : by the blast of air pressure and by radiation. The difference from an ordinary gunpowder bomb is that in an atomic explosion there are no fragment wounds, but there are radiation injuries. Also the gunpowder bomb has effects only at the time of bombing. The atomic bomb exhibits great power not only at the moment of bombing, but afterwards with the continuous ejection of secondary radiation, which causes prolonged radiation damage. This is a specific feature of injury by the atomic bomb. Also, there are many symptoms of instant onset, but radiation injuries also have a latent period. The appearance of late symptoms is also a specific feature of atomic bomb injuries.

Direct injuries and indirect injuries

The symptoms were many and variable. We observed these from each angle and classified the following. Functional source injuries were divided into direct injuries and indirect injuries. The former is the direct injury by the atomic bomb, the latter is a little different. Some people developed eczema of the skin by handling the grass irradiated by the atomic bomb. Also, injury resulted from eating irradiated vegetables.

People lost their bodily resistance from the bomb and easily developed suppurative papula from mosquito or flea bite.

Primary injuries and secondary injuries

Also, radiation injuries could be classified as primary and secondary.

Injury by the bomb explosion is a primary injury. The effect of long term residual radiation around the hypocenter resulted in secondary type injuries.

Some people living in the shelter at the site after receiving primary injuries, also developed complications of the secondary type. Some people developed secondary injuries only because they came to the site to clean up after the bombing. All secondary injuries are caused by radiation.

Classification by onset

Classifying injury symptoms by onset can be as follows : instant, early, late and delayed. Injuries received at the time of explosion were

instantaneous : i.e. sudden death, radiation burns, external wounds, mental abnormality, and radiation sickness. The symptoms of early onset began usually within a week. In some cases on the following day there was suppurative papula of the mouth and lips, stomatitis, enteritis of digestive organ disorder, epistaxis (nose bleeding), hematemesis (vomiting blood), hemorrhagic stool, blood disorder of coagulation factors and anemia. These symptoms were serious, progressed rapidly, and turned deadly within a week.

After the third week, subcutaneous bleeding spots, gingival bleeding, nasopharyngeal ulcer, high fever, depilation (hair loss) developed and became critical in general. Also, suppurative papula of mosquito or flea bite like lesions developed around this time.

Some people started to show symptoms of kidney atrophy. These symptoms were hard to call late onset. The delayed onset symptoms took place after more than one year, some developed after several decades : skin ulcers, skin cancer, or birth defects due to reproductive organ damage.

SECTION 2

Each symptom in detail

As you know, we lost all instruments and had only one surgical instrument bag and set of emergency aid supplies. We will describe our observations of these symptoms, but we could not carry even carry out very simple blood tests. Therefore, we cannot say our observations are academically accurate.

(A) Sudden death

Instant death, blast pressure death

Within one kilometer of the hypocenter, on the roads, farm fields, gardens and rooftops, people whose whole bodies were exposed died instantly or within a short time. The majority of these instantaneous death victims were estimated to have died as a direct result of the blast. Exploded eyeballs and abdominal wall rupture were also seen. These symptoms must have been from the pressure of the explosion.

Some victims were knocked down onto the ground. Some were blown away and hit objects. There were many observations of skull fractures, organ rupture, and internal hemorrhaging in the corpses.

Thermal death

Was there anything such as the so-called thermal death or burning death by heat wave? I don't know, because I didn't see the corpses in the hypocenter. The face of our department's Nurse Yamashita, who died 700 meters away from the hypocenter, was charred black, but her hair was not charred or frizzled. She was not wearing a hood. Of course, the skin of the

whole body was separated from the flesh. A wide range of whole body skin injuries due to radiation was one of the causes of death, but blast pressure must have been the main reason.

Crushing death, burning death

And burial deaths due to fallen, collapsed houses and burning deaths are included in this instant death category. Our Head Nurse Hisamatsu choked due to the thick gas, which developed from the explosion, and she had to gargle her mouth with water. Perhaps there was asphyxiation death by the gas.

(B) Pseudo-burns

Burns

Skin exposed to the bomb within three kilometers showed a special kind of injury. In general, it was called a burn injury because the skin received strong heat rays, which developed into a burn injury. But, we think something other than heat rays added to the injury. My impression of the skin condition of many patients rescued immediately after bombing gave me an impression that their injury was different from a thermal burn.

Stripped/separated skin burn injury due to blast pressure

We believe that the negative vacuum pressure caused by the bomb explosion stripped skin off. At first, we speculated that it was the powerful vacuum pressure of the blast wind alone, which did this, as well as finely tear up and blow off clothes. But, we were mistaken. If this were the case, not only the side facing the explosion, but the whole body would have shown this had it happened.

We must consider two factors, thermal heat as well as the negative blast wind or pressure. This means that thermal rays came first, causing burns on the outside of the skin, which made the skin fragile. Next, the powerful blast arrived and acted on the skin. The healthy part of the skin remained intact, burned parts were stripped off. Thus, skin injury resulted from the combination of thermal burns and blast pressure.

Black part-strong reaction

Thermal rays were reflected by the white part of an object and absorbed into the black part. For example, we examined our Nurse Inouye's corpse. She died with both eyes open. The white part-the conjunctiva - was normal ; the black part-the cornea with iris-was burned and perforated. She was a brave person for she must have been looking directly at the enemy plane when it came and received thermal rays afterward.

We also saw a person whose burn patterns matched those of his clothes.

Condition of hair

Hair burning occurs at extremely high temperatures. So, why did we not see curly hair burned? Was burned curly hair blown out by the blast? Even so, everybody still had long hair. Since the hairs were black, they should have had a stronger reaction than the skin. So, why was the hairy part of the skin not damaged and the hair in good condition? How can we explain this?

Conditions of skin injury

Now, I will describe the condition of skin injuries. The face was irregularly lacerated. The limbs were torn longitudinally in several strips, attached only at the joints or hanging with one end shorter than another.

These skin strips were separated from the base, just like par-boiled shark skin. They were shortened, hanging shredded rags. The separated skin bled. The color of the skin surface changed to purple like the other parts of the body, but the hanging skin strips were not particularly congested by blood. The skin blisters were almost invisible at first.

No patients ever complained that it was "hot." However, everybody uniformly cried, "Cold, cold!" For them, it was chilly at midday in midsummer. Are not these symptoms different from those of ordinary burns?

Secondary atomic explosion

Now, what was the cause of the following symptoms? There was the phenomenon of a secondary atomic explosion of the skin and subcutaneous tissue. For example, the particulate group, the neutrons from the bomb, were projected with great speed, collided with human skin, and infiltrated deep into the tissue at the subcutaneous tissue level. The speeding neutrons continued on to collide with atoms of the tissue and caused a secondary explosion there. Or, its energy was changed to other types of injury, which destroyed the tissue.

These processes stripped the fragile skin damaged by the preceding thermal rays that had arrived a little earlier. This hypothesis is totally our speculation. I would like to have a critique of this theory from my peers.

In any case, we recognized that this kind of skin injury was more than a simple thermal burn, I would not simply call it a burn; I would call it a "pseudo-burn."

Burns by the particle group

Also, there was one very special case where a particular burn was said to have been caused by two drops of fire matter from the blast. The size of the drops seemed to be about the tip of a thumb. Looking at the wound, we saw that the skin was widely damaged around the center where the fire drop struck it. With continuous treatment, the peripheral portion of the area was healed quickly, but the spot where the drop of fire touched could not heal easily.

What was this drop of fire? A piece of hot radioactive fragment?

Then it should have developed into an ulcer by radiation. Was it a simple bomb fragment or did the enemy plane drop incendiary material at the same time?

The feeling of receiving a burn injury, our member Shi explained, was like being hit by a stick. Even so, the size of the injury on his left upper arm was only four square centimeters. Instead of thinking this feeling was caused by electromagnetic waves of thermal rays, he likes to believe it was caused by the collision of a solid substance of the particle group.

There were also ordinary burns by fire.

(C) External wound

The majority of external wounds happened to people buried under collapsed houses or fallen equipment and cut by pieces of glass. Because there were almost no rescues of the severely injured, only the mildly injured managed to escape and receive help at the aid station. Almost all of the severely injured were burned to death by the overwhelming wave of fire. Therefore, there were very few severely wounded in the atomic bomb attack as compared to the numbers in a conventional gunpowder bombing raid. There were fewer people wounded by glass than in a gunpowder bombing raid as well. The penetration power of pieces of glass was relatively more powerful in this atomic bomb attack.

(D) Mental derangement

Immediately after the bombing, in the middle of the confusion, there was a nurse staggering around the corridor. She would not respond to my patting her on the shoulder. She had vacant eyes and keep stumbling around. There was a naked old woman sitting stiffly on the passing road, muttering, "My children, children" for three days. At Junshin Girls School, a naked young woman sat on the handrail of the school's altar house before the emperor's portrait. She waved and sang continuously in a beautiful voice. In general, the people's activities slowed down. Their fighting spirit markedly diminished. Many apathetic people were seen.

(E) Whole body symptoms

One hour after the bombing, one's whole body felt limp, a sense of detachment and exhaustion. The sensory nerves system of the whole body must have stopped functioning properly. These symptoms got worse as time passed. Everybody was just lying, like living corpses. The next day they lost their energy. There was insomnia and loss of appetite.

It was like mild radiation sickness after one receives X-ray irradiation.

One of the changes to the people's bodily functions was decreased urinary output. This was remarkable. Thirsty mouths complained quite often.

Were the salivary glands damaged? Sweating decreased that day and the next day.

(F) Early onset digestive organ disorders

These symptoms appeared in the people who been buried by collapsed houses, but rescued after a few hours and enjoying their safety. Their symptoms deteriorated rapidly and turned deadly during the second week. Namely, within one or two days after the bombing, a few to as many as ten pustulous vesicles the size of a soybean developed in the mouth and on the lips. Around the following day, the symptoms developed to stomatitis. Gradually, their body temperature rose due to mouth sores and eating disorders, but they felt fine due to mild whole body symptoms. Soon, symptoms of appetite loss and abdominal pain appeared and they developed diarrhea in the end. This diarrhea was watery, sometimes mixed with mucous, rarely mixed with blood.

The symptoms of severe tenesmus presented the problem of frequent defecation. The patients' body temperature ranged between 40 to 42 degrees Celsius. Debilitation in patients became progressively more severe. Most of the patients died within a week to 10 days after the onset.

All treatment effort was in vain ; therefore the mortality rate was 100%.

These main symptoms of radiation illness were progressive, from the mouth and the lips and inflammation of digestive organs mucosa, went down to the rectum (the large intestine). Alternatively, entire mucosa was inflamed at the same time, but the onset of symptoms was delayed.

Fatal doses of radiation

At the beginning, eating pumpkins from the contaminated premier hypocenter was believed to be the cause of these symptoms. We think that this resulted in the whole body receiving lethal doses of radiation.

Only symptoms of digestive organ mucosa appeared markedly (of course it resulted nutritional disorder which sped the victim's death). Thus, the people buried under collapsed houses for long hours received a lethal dose of secondary radiation from the fallen houses. Their symptoms appeared after a short latent period. Even that was called a fatal dose of radiation, radiation injury by electromagnetic waves must absolutely have a latent period ; therefore, there were no instantaneous deaths. Also, if there was more than a lethal dose of radiation, I would like to state that any treatment was of no use. These symptoms were seen with people who were uninjured or injured. These phenomena happened to people buried by fallen houses near the hypocenter.

(G) Early onset blood disorder

There may be a different opinion regarding the classification of the symptoms of blood disorders into early onset and late onset. Either way, it resulted in damage of the hematopoetic system (blood cells forming organ). Some people may say that this category should be omitted, yet clinically all late onset symptoms should be included. But, clinically, the symptoms of early onset showed marked severe bleeding, it appeared even before the end of the chaotic period of the bombing. Then, the situation