Nationwide Epidemiologic Survey of Idiopathic Osteonecrosis of the Femoral Head

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Abstract

Background Although numerous studies describe the clinical characteristics of idiopathic osteonecrosis of the femoral head (ONFH) in specific study populations, these have not been confirmed in countrywide studies.

Questions/purposes We therefore determined: (1) the annual number of patients seeking medical care and number of patients newly diagnosed; and (2) the distribution of the age and gender of the patients, potential causative factors, severity of the disease, and operative procedures performed.

Patients and Methods We conducted a nationwide epidemiologic survey in 2005. The survey included all orthopaedic departments in Japan by stratified random sampling according to the number of beds.

Results The number of patients who sought medical care for idiopathic ONFH during 2004 was estimated to be 11,400 (95% confidence interval, 10,100–12,800). We obtained clinical information from 1502 of these patients. The peak in age distribution occurred in the 40s. Potential causative factors were systemic steroid administration (51%) and habitual alcohol use (31%). Hip replacement was the most frequently performed procedure (65%). Among patients with a history of systemic steroid administration, systemic lupus erythematosus was reported most frequently (31%) as the underlying disease. Among patients younger than 40 years, steroid use was the most prominent potential causative factor (60%), and hip replacement frequently was performed (45%). A greater
proportion of patients with no history of steroid or alcohol use was observed among patients 65 years or older (41%).

Conclusions In addition to the disease burden of idiopathic ONFH in Japan, our results confirmed the importance of developing preventive and treatment strategies, especially among the younger population.

Level of Evidence Level IV, prognostic study. See Guidelines for Authors for a complete description of levels of evidence.

Introduction

ONFH is not a specific disease entity, but rather the final common pathway of a series of conditions leading to impairment of the blood supply to the bone [12, 15]. Numerous studies have revealed the clinical characteristics of idiopathic ONFH in specific study populations, including for pregnant women and patients with rheumatoid arthritis, cancer, or multifocal osteonecrosis [4, 5, 11, 16, 21, 24]. Although these findings document potential causative factors, they have not been confirmed on a countrywide basis. Knowing the frequency of causative factors might be useful for developing preventive measures. Information regarding age distribution would help to establish appropriate treatment strategies for different age groups.

In Japan, the Ministry of Health and Welfare (later, the Ministry of Health, Labor and Welfare) established special measures against so-called “intractable diseases” in 1972. These are defined as a rare disease whose cause has yet to be determined, and for which there is no established therapy. The program includes promoting research activities, eliminating patients’ copayments for medical expenditures, and developing the necessary medical facilities. Under this program, the Research Committee on Idiopathic Avascular Necrosis of the Femoral Head was established in 1975 (after 1982, the Research Committee on Idiopathic Osteonecrosis of the Femoral Head), and nationwide surveys regarding descriptive epidemiology of idiopathic ONFH were conducted four times previously [1, 8, 14, 18, 19]. However, we believed these findings needed to be updated to reflect the most recent epidemiology of the disease and to confirm previous findings. Thus, a fifth nationwide survey was conducted to clarify the descriptive epidemiology of idiopathic ONFH during 2004; the study was performed cooperatively by the Research Committee on Idiopathic Osteonecrosis of the Femoral Head and the Research Committee on Epidemiology of Intractable Diseases.

We sought to determine: (1) the annual number of patients seeking medical care and number of patients newly diagnosed; and (2) the distribution of the age and gender of the patients, potential causative factors, severity of the disease, and operative procedures performed.

Patients and Methods

The survey consisted of two queries; the first query estimated the number of patients seeking medical care, and the second query revealed their demographic and clinical features. We performed the survey according to the standardized procedure proposed by the Research Committee on Epidemiology of Intractable Diseases in Japan. The overall method was described previously [17]. The study protocol was approved by the ethics committee of the Graduate School of Medical Science, Kyoto Prefectural University of Medicine as representative, which was the affiliation of the chair of the Research Committee on Idiopathic Osteonecrosis of the Femoral Head in 2005.

We selected the survey targets from all the orthopaedic departments in Japan by stratified random sampling. Two hospital lists were used as the sampling frame: Byoin-Yohran (primary use), and Iikukikan-Meibo (supplementary use) in Japanese. The lists are widely available in electronic database forms and list all the hospitals from north to south in Japan. Stratification was conducted according to the number of hospital beds. Sampling fractions were as follows: general hospitals with 99 or fewer beds (5%); 100 to 199 beds (10%); 200 to 299 beds (20%); 300 to 399 beds (40%); 400 to 499 beds (80%); 500 or more beds (100%); and university hospitals (100%). For example, regarding a strata of general hospitals with 200 to 299 beds, we randomly selected one orthopaedic department and then selected the next one by a five-department interval, yielding 20% of the sampling fraction. Forty-six departments that treated a large number of patients with idiopathic ONFH were included by 100% of sampling fractions.

We began the first query in January 2005. The selected departments for survey targets were asked by mail to report the total number and gender of patients who visited for idiopathic ONFH from January 1 to December 31, 2004. Because we did not collect information other than the total number and gender of patients seen in the department, informed consent was not obtained in the first query. In the first query, 999 departments were sampled as survey targets from 4722 intended departments in Japan, and 577 departments (58%) responded. We received reports for 5612 patients with idiopathic ONFH from 327 departments that confirmed they had a patient(s).

The diagnosis of idiopathic ONFH was based on the revised criteria proposed by the Research Committee on Idiopathic Osteonecrosis of the Femoral Head in Japan [22]. Briefly, the criteria comprise five findings: (1) collapse of the femoral head (including crescent sign) without joint...
space narrowing or acetabular abnormality on radiographic images; (2) demarcating sclerosis in the femoral head without joint space narrowing or acetabular abnormality; (3) “cold in hot” on bone scans; (4) low-intensity band on T1-weighted MRI (band-like pattern); and (5) trabecular and marrow necrosis on histology. Idiopathic ONFH was diagnosed if the patient fulfilled two of these five findings and did not have bone tumors or dysplasia. These criteria for diagnosis had 91% sensitivity and 99% specificity when histologic diagnosis was used as the gold standard [23]. Although steroids and alcohol are known risk factors, we regarded steroid-induced osteonecrosis and alcohol-induced osteonecrosis as idiopathic ONFH in our survey because their causal mechanisms have not been fully established. A reminder letter was sent in March to departments that had not returned answers.

Accounting for the selection rate and response rate to the survey, we estimated the total number of patients seeking medical care according to the following formula: the estimated total numbers of patients = reported number of patients/(selection rate × response rate) = reported number of patients/(number of reporting departments/number of total departments). Additionally, the 95% confidence interval (CI) was calculated with an assumption of multinominal hypergeometric distribution [6, 7, 17].

If a department responded that it had a patient(s) in the first query, we sent a second query consisting of structured questionnaire (Appendix 1, English translation of the original form; Appendix 2, in Japanese as the original form) to collect data regarding clinical characteristics of each patient. The questionnaire consisted of the following items: gender, date of birth, date of disease onset, date of disease diagnosis, presence of abnormal findings at the time of diagnosis (hip radiograph, bone scintigram, MRI, bone biopsy), type and stage of disease, potential causative factors (history of systemic steroid administration, history of habitual alcohol drinking, both histories, neither of the histories), underlying illness for which the patient received steroid therapy (in case of a positive history of systemic steroid administration), date of operation, and operative procedure. To reduce the efforts of physicians in each of the departments, and to sample approximately 50% of total cases, we asked for information for patients born in odd months. In the second query, of the 327 departments that confirmed they had a patient(s) in the first query, 178 departments (46%) provided detailed data for 1616 patients. Patients with even-numbered birth months (n = 31), whose first visit to a department was in 2005 (n = 18), who were regarded as having secondary ONFH based on information from the questionnaire (n = 55), whose last visit was in 2003 or earlier (n = 8), and for whom there was a later request for exclusion from the participating departments (n = 2), also were excluded. Consequently, we obtained detailed clinical characteristics for 1502 subjects in the second query.

The working group of the Research Committee on Idiopathic Osteonecrosis of the Femoral Head in Japan proposed the revised classification of disease types and stages in 2002, which has been widely used in Japan since its introduction (Table 1) [22]. Thus, we asked physicians in each of the departments to apply the new classification even if the diagnosis was established earlier than 2002. Briefly, necrotic lesions were classified into four types (A, B, C-1, and C-2) based on their location on T1-weighted MRI or radiographic findings. Staging (1, 2, 3A, 3B, and 4) was defined by AP and lateral views of the femoral head on radiographic images such as demarcating sclerosis, collapse of the femoral head (including crescent sign), or osteoarthritic changes.

In the second query, we also sent reminder letters to departments that had not responded. Additionally, we asked the departments that had responded to confirm or revise fill-ins if the previously returned questionnaire had missing information or lacked consistency. Although detailed information regarding clinical characteristics was collected in the second query, informed consent was not obtained from each patient because anonymity was maintained throughout the second query. Only the department, and not the investigators, could identify the patient if they were asked to confirm or revise fill-ins. If there were missing data even after confirmation or revision, the data were considered as “not filled-in”.

Results

Based on the results from the first query, we estimated that the number of patients who sought medical care during 2004 was 11,400 (95% CI: 10,100–12,800). Of the 1408 patients with available information on the date of diagnosis in the second query, 275 (19.5%) were newly diagnosed during 2004. If these patients were regarded as new patients, the number of new patients per year was estimated to be 2200 (11,400 × 0.195), taking into account the results of the first query.

Among 1502 subjects whose detailed information was obtained in the second query, the peak in age distribution occurred in the 40s (Fig. 1). The gender ratio (male/female) was 1.4 (820/582). In male subjects, the peak in age distribution also occurred in the 40s, whereas in females, the peak occurred in the 30s. The potential causative factors of ONFH were: systemic steroid administration (steroid-induced) (51%); habitual alcohol use (alcohol-induced) (31%); steroid and alcohol use (3%); and neither steroid nor alcohol use (15%) (Table 2). The frequency of steroid-induced ONFH was lower among males than females (34%
vs 76%), whereas the frequency of alcohol-induced ONFH was greater among males than females (47% vs 6%). Stratification by age group (< 40, 40-64, or ≥ 65 years at diagnosis) indicated a higher frequency of systemic steroid administration in patients younger than 40 years (60%). However, patients with no history of steroid or alcohol use were frequently elderly (41%). Distribution of disease types and stages showed that the most frequent type was C-2 and the most frequent stage was 2 or 3A (Table 3). There was no remarkable fluctuation after stratification by gender or age group, except for a relatively higher frequency of Stage 4 in the elderly. Of the 1323 joints with operations, hip replacement was the most frequently performed, followed by osteotomy (Table 4). Among patients younger than 40 years, a relatively greater number received an osteotomy (38%). However, hip replacement also was performed for 45% of patients in this age group. Systemic lupus erythematosus (SLE) was the most frequent underlying illnesses for the patients with steroid-induced ONFH (Table 5).

### Discussion

We believe it is important to track and update the epidemiology of a disease throughout a country, because such observations may provide information for better understanding of the disease. We therefore determined: (1) the annual number of patients seeking medical care and number of patients newly diagnosed; and (2) the distribution of the age and gender of the patients, potential causative factors, severity of the disease, and operative procedures performed.

Several limitations of this study should be considered before interpreting the results. First, larger teaching institutions represented higher percentages of the survey targets, as these institutions were likely to have more

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**Table 1.** Classification of types and stages of idiopathic ONFH

| Type* | Description |
|-------|-------------|
| A     | Necrotic lesions occupying the medial one-third or less of the weightbearing portion. |
| B     | Necrotic lesions occupying the medial two-thirds or less of the weightbearing portion. |
| C-1   | Necrotic lesions occupying more than the medial two-thirds of the weightbearing portion but not extending laterally to the acetabular edge. |
| C-2   | Necrotic lesions occupying more than the medial two-thirds of the weightbearing portion and extending laterally to the acetabular edge. |

| Stage** | Description |
|---------|-------------|
| 1       | The period when there are no specific findings of osteonecrosis on x-ray images, although specific findings are observed on MRI, bone scintigram, or histology. |
| 2       | The period when demarcating sclerosis is observed without collapse of the femoral head. |
| 3A      | The period when collapse of the femoral head, including crescent sign, is observed without joint-space narrowing. |
| 3B      | The period when collapse of the femoral head, including crescent sign, is observed without joint-space narrowing. The collapse of the femoral head is 3 mm or greater. |
| 4       | The period when osteoarthritic changes are observed. |

ONFH, osteonecrosis of the femoral head; *based on the central coronal section of the femoral head on T1-weighted images or AP view. The weightbearing portion is defined as the area lateral to the midvertical line of the line through the acetabular edge and the teardrop bottom; **based on AP and lateral views of the femoral head on radiographs. (Published with permission from the Japanese Orthopaedic Association from Sugano N, Atsumi T, Ohzono K, Kubo T, Hotokebuchi T, Takaoka K. The 2001 revised criteria for diagnosis, classification, and staging of idiopathic osteonecrosis of the femoral head. J Orthop Sci. 2002;7:601–605.)
Table 2. Distribution of potential causative factors

| Variables                      | All patients (n = 1502) | Stratified by gender* | Stratified by age (years) at diagnosis* |
|--------------------------------|-------------------------|-----------------------|----------------------------------------|
|                                | n (%)                   | Male (n = 885)        | Female (n = 612)                       | < 40 (n = 548) | 40–64 (n = 706) | ≥ 65 (n = 153) |
| Systemic steroid administration| 760 (51)                | 295 (34)              | 462 (76)                               | 325 (60)      | 340 (48)       | 58 (38)       |
| Habitual alcohol use           | 456 (31)                | 415 (47)              | 39 (6)                                 | 146 (27)      | 253 (36)       | 26 (17)       |
| Both                           | 47 (3)                  | 39 (4)                | 8 (1)                                  | 16 (3)        | 24 (3)         | 6 (4)         |
| Neither                        | 225 (15)                | 127 (15)              | 98 (16)                                | 59 (11)       | 85 (12)        | 62 (41)       |
| Unknown / Not filled-in        | 14                      | 9                     | 5                                      | 2             | 4              | 1             |

Some totals of “%” do not equal 100% attributable to rounding; *There was no available information regarding gender for five patients and for age at diagnosis for 95.

Table 3. Distribution of clinical types and stages at diagnosis

| Variables                      | All subjects (n = 2203) | Stratified by gender* | Stratified by age (years) at diagnosis* |
|--------------------------------|-------------------------|-----------------------|----------------------------------------|
|                                | n (%)                   | Male (n = 1273)       | Female (n = 923)                       | < 40 (n = 856) | 40–64 (n = 1066) | ≥ 65 (n = 195) |
| Type A                         | 110 (5)                 | 46 (4)                | 63 (7)                                 | 31 (4)        | 64 (6)         | 14 (7)        |
| B                              | 217 (10)                | 98 (8)                | 118 (13)                               | 89 (10)       | 105 (10)       | 12 (6)        |
| C-1                            | 734 (33)                | 415 (33)              | 317 (34)                               | 303 (35)      | 343 (32)       | 60 (31)       |
| C-2                            | 1142 (52)               | 714 (56)              | 425 (46)                               | 433 (51)      | 554 (52)       | 109 (56)      |
| Stage 1                        | 270 (12)                | 137 (11)              | 132 (14)                               | 101 (12)      | 148 (14)       | 18 (9)        |
| 2                              | 607 (28)                | 338 (27)              | 269 (29)                               | 272 (32)      | 272 (26)       | 41 (21)       |
| 3A                             | 554 (25)                | 322 (25)              | 230 (25)                               | 234 (27)      | 261 (24)       | 35 (18)       |
| 3B                             | 408 (19)                | 266 (21)              | 142 (15)                               | 147 (17)      | 211 (20)       | 36 (18)       |
| 4                              | 364 (17)                | 210 (17)              | 150 (16)                               | 102 (12)      | 174 (16)       | 65 (33)       |

n = number of involved joints with description of clinical type and stage in the questionnaire. Some % totals do not equal 100% owing to rounding; *There was no available information regarding gender for five patients and age at diagnosis for 60 patients.

Table 4. Characteristics related to operations and type of procedure

| Variables                      | All subjects (n = 2203) | Stratified by gender* | Stratified by age (years) at diagnosis* |
|--------------------------------|-------------------------|-----------------------|----------------------------------------|
|                                | n (%)                   | Male (n = 1273)       | Female (n = 923)                       | < 40 (n = 856) | 40–64 (n = 1066) | ≥ 65 (n = 195) |
| Operation                      |                         |                      |                                        |               |                 |               |
| No                             | 870 (40)                | 433 (34)              | 435 (47)                               | 331 (39)      | 439 (41)       | 75 (39)       |
| Yes                            | 1323 (60)               | 836 (66)              | 482 (53)                               | 522 (61)      | 622 (59)       | 118 (61)      |
| Unknown / not filled-in        | 10                      | 4                     | 6                                      | 3             | 5              | 2             |
| Operative procedure (if any)   |                         |                      |                                        |               |                 |               |
| Osteotomy                      | 330 (25)                | 233 (28)              | 97 (20)                                | 197 (38)      | 121 (20)       | 3 (3)         |
| Bone transplantation           | 106 (8)                 | 67 (8)                | 39 (8)                                 | 70 (14)       | 30 (5)         | 0 (0)         |
| Hip replacement                | 848 (65)                | 508 (62)              | 335 (70)                               | 232 (45)      | 459 (74)       | 115 (97)      |
| Others                         | 27 (2)                  | 18 (2)                | 9 (2)                                  | 14 (3)        | 9 (1)          | 0 (0)         |
| Unknown / not filled-in        | 12                      | 10                    | 2                                      | 9             | 3              | 0             |

n = number of involved joints with description of clinical type and stage in the questionnaire. Some % totals do not equal 100% owing to rounding; *There was no available information regarding gender for five patients and age at diagnosis for 60 patients.
Fourth, the patients included in our survey were prevalent cases (new and old patients), not incident cases (new patients), because the reported subjects were patients seeking medical care during one year previous. Together, with the speculation that patients with collagen disease tend to seek medical treatment without interruption, these factors make it possible to overestimate the frequency of so-called steroid-induced ONFH. Finally, complications of osteonecrosis other than of the femoral head were a concern [4]. We could not assess this possibility because diagnostic imaging for detecting another site of osteonecrosis was not obtained in 42% of the subjects. However, the prevalence of multifocal osteonecrosis among patients with osteonecrosis was reportedly 3% [11]. Thus, the impact of this complication on the estimates likely would be small.

The first query of this survey provided an estimation of the annual number of patients seeking medical care (11,400; 95% CI: 10,100–12,800) and the number of new patients per year (2200) during 2004. These estimates indicated the current disease burden of idiopathic ONFH in Japan. To the best of our knowledge, no similar investigation has been reported for other countries. Although in one study the number of new cases in the United States has been estimated to be 10,000 to 20,000 per year, this estimate was based on the number of total joint arthroplasties performed annually [13]. A previous nationwide epidemiologic survey in Japan estimated the annual number of patients seeking medical care during 1994 as 7400 (95% CI: 6700–8200) [1], which suggested a substantial increase of ONFH. Moreover, the impact of this complication on the estimates likely would be small.

Table 5. Underlying illness for which patients with steroid-induced ONFH received steroid therapy

| Underlying illness | Number (%) |
|--------------------|------------|
| Systemic lupus erythematosus | 236 (31.2) |
| Rheumatoid arthritis | 7 (0.9) |
| Polymyositis/dermatomyositis | 37 (4.9) |
| Mixed connective tissue disease | 20 (2.6) |
| Sjögren syndrome | 8 (1.1) |
| Other type of collagen disease | 21 (2.8) |
| Nephrotic syndrome | 48 (6.3) |
| Nephritis | 19 (2.5) |
| Renal transplantation | 27 (3.6) |
| Other organ transplantation | 10 (1.3) |
| Thrombocytopenic purpura | 33 (4.4) |
| Aplastic anemia | 13 (1.7) |
| Hepatitis | 6 (0.8) |
| Bronchial asthma | 34 (4.5) |
| Pulseless disease | 1 (0.1) |
| Skin disease | 19 (2.5) |
| Eye disease | 32 (4.2) |
| Other disease | 186 (24.6) |

ONFH, osteonecrosis of the femoral head; analysis is based on 760 subjects with history of systemic steroid administration.
commonly reported underlying disease among patients with a history of systemic steroid administration. The peak in age distribution was almost identical to previous findings [1, 3, 15]. Additionally, our surveys suggested patients younger than 40 years accounted for one-third of all subjects. Among this age group, steroid use was the most prominent causative factor, and hip replacement was still frequently performed. These findings confirm the importance of preventive strategies among the younger population, with focus on the method of steroid administration, especially for SLE. Treatment strategies in relation to joint preservation should be developed as well, because current hip prostheses are unlikely to function sufficiently through the remaining life expectancy of younger patients [15]. A higher proportion of patients with no history of steroid or alcohol use was observed among those 65 years or older. Exploring other causative factors would contribute to understanding the etiology of the disease. Finally, our findings indicated that gender distribution would reflect the potential causative factors of ONFH, to some extent. Together with the fact that there currently is no universal definition of steroid-induced or alcohol-induced ONFH, simple stratification by gender may be an efficient way to handle the variability of the potential causative factors among different study populations.

This survey provides an estimate of the disease burden in Japan. Our results confirmed the importance of developing preventive and treatment strategies, especially among the younger population. Large epidemiologic surveys in other countries would allow comparison with our observations.

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Appendix 1. The questionnaire for the second query (English translation of the original form in Japanese)

Personal Questionnaire for the Second Query

Health and Labour Sciences Research Grants, Research on Intractable Diseases
The Research Committee on Idiopathic Osteonecrosis of the Femoral Head
The Research Committee on Epidemiology of Intractable Diseases

Address of your facility

Name of your facility: __________________________ Name of describer: ____________________________
Department: 1. Orthopedic surgery 2. Other (________) Date of description (year/month/day): 2005 / / 
This questionnaire is used only for investigation and private information is strictly secured.

Please be kind to select an appropriate number(s) or fill out.

| Number of subject to be investigated (Please refer to a separate index sheet) | Gender | 1. Male | 2. Female | Birth date (year/month) | Present age: (____) years | Location of residence | Unknown | Date of the first visit to your facility (year/month): / | Unknown |
|---|---|---|---|---|---|---|---|---|---|
| Estimated date of onset | / | / | Unknown | Date of diagnosis (year/month): / | Unknown |
| Medical facility that made a diagnosis | 1. Your facility | 2. Other facility | 3. Unknown | Date of diagnosis (year/month): / | Unknown |

| Finding at the time of diagnosis | Right | Left |
|---|---|---|
| Hip joint X-ray | 1. Normal | 2. Borderline | 3. Abnormal | 4. Not done |
| Bone scintigram | 1. Normal | 2. Borderline | 3. Abnormal | 4. Not done |
| MRI | 1. Normal | 2. Borderline | 3. Abnormal | 4. Not done |
| Bone biopsy | 1. Normal | 2. Borderline | 3. Abnormal | 4. Not done |
| Disease type | 1. Type A | 2. Type B | 3. Type C-1 | 4. Type C-2 | 5. Normal |
| Disease stage | 1. Stage 1 | 2. Stage 2 | 3. Stage 3A | 4. Stage 3B | 5. Stage 4 | 6. Normal |
| Operation | 1. Not yet done | 2. Performed |
| Operation procedure(s) | 1. Osteotomy | 2. Bone transplantation | 3. Hip replacement | 4. Other procedure(s): |
| Osteonecrosis other than femoral head as detected by image diagnosis | 1. No | 2. Yes (site: a. Shoulder joint b. Knee joint c. Ankle joint d. Others (________)) | 3. Unknown |
| Steroid/alcohol | 1. History of systemic steroid administration | 2. History of habitual alcohol drinking | 3. Both histories | 4. None of histories |
| In case of a positive history of systemic steroid administration: please mark underlying illness(es) that underwent steroid therapy | 1. Systemic lupus erythematosus | 2. Rheumatoid arthritis | 3. Polymyositis / dermatomyositis | 4. Mixed Connective Tissue Disease (MCTD) | 5. Sjögren syndrome | 6. Other type of collagen disease (_________) | 7. Nephrotic syndrome | 8. Nephritis | 9. Renal transplantation | 10. Other organ transplantation (_________) | 11. Thrombocytopenic purpura |

Among the above underlying diseases, please mark ones which were definitely diagnosed at earliest time.

Disease number: select from the above numbers (____) Year when a diagnosis was established: (____) Year when a diagnosis was established: (____) Year when a diagnosis was established: (____)

In case of no history of systemic steroid administration: please mark an inducing factor for this disease (only one that was most important)

1. Habitual alcohol drinking 2. Trauma of hip joint (femoral neck fracture, traumatic dislocation of hip joint, etc.) 3. Slipped capital femoral epiphysis 4. Perthes disease 5. Blood diseases (sickle cell disease, polycythemia vera, etc.) 6. Gaucher disease 7. Decompression sickness 8. Exposure to radiation 9. Metaphyseal dysplasia 10. Osteoporosis 11. Others (________)

| Public expenditure for medical charge | 1. No | 2. Yes | 3. Unknown |
|---|---|---|---|
| a. Therapeutic research expenditure for intractable disease | [disease name: 1. Idiopathic osteonecrosis of the femoral head 2. Others (________)] | b. Medical bill for the elderly | c. People with disabilities | d. Welfare recipient | e. Others (________)

| Therapeutic situation (for the last 1 year) | 1. Primarily hospitalization | 2. Primarily outpatient care | 3. Both hospitalization and outpatient |
|---|---|---|---|
| 4. Changed hospital | 5. Unknown |

| Current conditions (*compared to the time of diagnosis) | 1. Cured | 2. Better | 3. Unchanged | 4. Worse | 5. Died |
|---|---|---|---|---|---|
| [date of death (year/month/day): / / ; cause of death: (________)] | Date of the last visit (year/month/day): / / |

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Appendix 2. The questionnaire for the second query (the original form in Japanese)

特発性大腸骨頭壊死症調査個人票

| 診断対象者番号 | 性別 | 生年月 | 唯一記載番号年月 | 唯一診断年月 | 確定診断年月 |
|----------------|------|--------|------------------|--------------|--------------|
| 1. 男 | 1 (1. 明 2. 大 3. 昭 4. 平) | 年 | 月 | 不明 | 1 (1. 明 2. 大 3. 昭 4. 平) | 年 | 月 | 不明 |
| 2. 女 | 2 (1. 明 2. 大 3. 昭 4. 平) | 年 | 月 | 不明 | 2 (1. 明 2. 大 3. 昭 4. 平) | 年 | 月 | 不明 |

診断年月

| 診断日 | 年 | 月 | 不明 |
|--------|----|----|------|
| 1 (1. 明 2. 大 3. 昭 4. 平) | 年 | 月 | 不明 |

治療経歴

| 手術 | 1. 未施行 | 2. 行術施行日 | 年 | 月 |
|-------|------------|----------------|----|----|
| 術式 | 1. 骨切り術 | 2. 骨移植術 | 3. 人工骨頭・人工関節置換術 | 4. その他 ( ) |

画像診断による大腸骨頭以外の骨穿刺

| なし | 2. あり (部位: a. 腹部 b. 腰部 c. 足関節 d. その他 ( ) ) | 3. 不明 |

ステロイド・飲食品

| なし | 2. あり (a. ステロイド全身投与あり b. アルコール飲酒あり c. 吸否あり) | 3. あり |

歴史的診断

| なし | 2. あり (a. 原発病名 b. 原発疾患診断 c. その他 ( ) ) | 3. 不明 |

受診状況 (最近1年間)

| なし | 2. あり | 3. 不明 |

現在の状態

| なし | 2. あり | 3. 不明 |


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