Sonographic Findings of Arthralgia in Children with Henoch-Schönlein Purpura

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Research article

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Abstract

Background

Arthralgia is a common manifestation in children with Henoch–Schönlein purpura (HSP). No ultrasonographic (US) findings of arthralgia in patients with HSP have been reported. We therefore investigated these findings in affected joints of children with HSP.

Methods

The medical records of patients with HSP and arthralgia at Gyeongsang National University Hospital from 2014 to 2018 were reviewed for clinical data about arthralgia, anatomic location, US findings, treatment, and duration of improvement.

Results

Thirty-one patients underwent joint US imaging. Sixteen patients (51.6%) were aged 2–5 y, 10 (32.3%) were aged 6–10 y, and 5 (16.1%) were aged 11–17 y. Nineteen (61.3%) were boys and 12 (38.7%) were girls. The joint most commonly affected was the ankle (n = 25), followed by the knee (n = 6) and the foot or elbow. Four patients complained of knee and ankle pain simultaneously. Swelling, limited range of motion, tenderness, erythema, and febrile sensation in affected joints were observed in 22 patients (71.0%), 9 (29.0%), 21 (67.7%), 25 (80.6%), and 6 (19.4%), respectively. US images showed no visible joint effusion and no evidence of arthritis or synovitis, but it did show subcutaneous swelling with increased echo around affected joints. Arthralgia improved spontaneously in 6 patients and with corticosteroids in 25. Improvement in arthralgia lasted a mean of 1.9 ± 1.8 days.

Conclusion

US images showed subcutaneous edema around joints with neither joint effusion nor synovial inflammation.

Background

Henoch–Schönlein purpura (HSP) is the most common vasculitis in children worldwide. Children younger than 10 years are frequently affected, and the mean age at onset is 4 to 6 years.[1] The diagnosis of HSP is determined by the presence of typical purpura, which occurs predominantly on the lower limbs but also affects one or more of the small vessels of the gastrointestinal tract, joints, and kidneys. Gastrointestinal and renal manifestations are related to the morbidity and mortality from HSP.[1–3]

Arthralgia and arthritis have become the common manifestations of HSP in children.[4,5] According to pediatric textbook, arthritis and arthralgia were observed in 50–80% of patients in HSP.[6] In a Greek study, transient arthritis manifested in 68 (91.9%) of 74 children under 9 years old.[7] In two studies in Turkey, the rates of arthralgia or arthritis were 59.2% among 264 patients and 58.1% among 420 patients.[8,9]

Joint involvement in HSP is usually oligoarticular, and large joints of the lower extremities (knee, ankle, and hip) are commonly affected.[1] A wide variety of manifestations involving joints have been described in children with HSP; the involvement is considered arthritis if the joint exhibits painful swelling and as arthralgia in the absence of such swelling. If the involved joint is swollen, its range of motion is limited, but erythema and febrile sensation are rare.[1] Because arthritis and arthralgia in children with HSP are transient and responsive to steroid therapy, and no complications are expected. Studies of clinical evaluations such as imaging studies or arthrocentesis to identify true arthritis in children with HSP and arthritis have not been conducted.

Most children with arthralgia complain of “inability to walk.” A history being unable to bear weight with the affected joint is a reliable clinical sign of arthritis and transient synovitis in children.[10,11] Arthralgia is the common symptom of acute septic arthritis, synovitis, and HSP. Septic arthritis in children is an emergency because it can lead to serious adverse outcomes, and it is highly prevalent in patients younger than 5 years.[12,13] Hips, knees, and ankles are the joints most frequent involved in children because they are more physically active than adults.[10, 13, 14] Early differential diagnosis of septic arthritis, synovitis, and HSP-related arthritis or arthralgia will help physicians make treatment decisions. US is a useful, noninvasive, and cost-effective tool for diagnosis of arthritis or synovitis and is the most sensitive test for detecting joint effusion.[15]

Not all patients with HSP require diagnostic imaging studies, which are generally reserved for children with severe abdominal pain in whom intussusception is suspected.[1] In children with HSP, arthritis is nondeforming and heals without chronic damage within a few weeks; this may be the reason why the radiologic findings of arthritis or arthralgia in HSP have not been studied. We investigated the US findings, treatment, and improved duration of treatment in the involved joints of children with HSP.

Methods

The medical records of children with HSP at the Gyeongsang National University Hospital (GNUH) from June 1, 2014, to May 31, 2018, were reviewed after approval of the study by the Institutional Review Board of the ethics committee of GNUH (2020-07-019). Of the children with HSP who had pain and swelling in the joints, those who underwent ultrasonography of the joint were included in the study. The following clinical data were obtained for all patients: age, sex, year and month of hospitalization, presence of arthralgia, presence of abdominal pain, and US findings. Data on arthralgia, location, treatment, and duration of improvement were also collected. The US studies were performed by a pediatric radiologist. The findings of joint US were reviewed by two radiologists.

Statistical analysis

SPSS Statistics software (IBM Corporation, Armonk, NY, USA) was used to evaluate the data. Continuous data were calculated as means and standard deviations, medians, and minimum and maximum values, and categorical variables were calculated as percentages. Categorical variables were compared in the chi-square test as appropriate. A *P* value of less than 0.05 was considered to indicate statistical significance.

Results

From June 1, 2014, to May 31, 2018, 96 patients were hospitalized with a diagnosis of HSP in the Department of Pediatrics, GNUH, Jinju, Korea. Of those patients, 33 (34.4%) had arthralgia, and 31 of those underwent joint US. Painful subcutaneous edema was observed in 19 patients (61.3%).

Table 1 lists the demographic and clinical characteristics of the 31 patients who underwent US. The age distribution of cases was as follows: 16 children (51.6%) were 2–5 y of age, 10 (32.3%) were aged 6–10 y, and 5 (16.1%) were aged 11–17 y (Fig. 1). The younger the child was, the more arthralgia was present, but this correlation was not significant ($P = 0.240$). Of the patients, 19 (61.3%) were boys and 12 (38.7%) were girls; thus boys were predominantly affected (male-to-female ratio: 1.58:1). Of the patients, 4 (12.9%) were treated in 2016, 13 (41.9%) in 2017, and 14 (45.2%) in 2018. The number of patients in 2016 was low because joint US was not commonly used until later. The number of patients with HSP and arthralgia was highest in spring ($n = 14$ [45.2%]). From the time of hospitalization, 12 patients had joint pain; an increasing number of patients experienced joint pain during hospitalization, and 9 patients had abdominal pain during hospitalization. Twelve patients (38.7%) had a history of previous upper respiratory tract infection, and 3 (9.7%) had a history of HSP.

Table 1
Demographic and Clinical Features of Henoch-Schönlein Purpura in 31 Patients Who Underwent Ultrasonography

	Number of patients
Age group	
2–5 y	16 (51.6%)
6–10 y11-17 y	5 (16.1)%)
11–17 y	5 (16.1%)
Gender	
Male	19 (61.3%)
Female	12 (38.7%)
Site of arthralgia	
Knee	2 (6.5%)
Ankle	21 (67.7%)
Knee and ankle Others	(12.94 (12.9)%)
Others	4 (12.9%)
Signs of arthritis	
Swelling	22 (71.0%)
Limitation of range of motion Febrile sensation	6 (19.4)%)
Tenderness	21 (67.7%)
Erythema	25 (80.6%)
Febrile sensation	6 (19.4%)

The joint most commonly affected was the ankle ($n = 25$), followed by the knee ($n = 6$) and the foot ($n = 2$) or the elbow ($n = 2$). Four patients complained of knee and ankle pain simultaneously. Of the involved joints, 75% were ankles and knees. With regard to symptoms and signs of arthritis, 22 patients (71.0%) had swelling, 9 (29.0%) had limited range of motion, 21 (67.7%) had tenderness, 25 (80.6%) had erythema, and 6 (19.4%) had febrile sensation in the joint (Table 1).

Joint US showed no visible joint effusion, some subcutaneous swelling with increased echo in subcutaneous areas (Fig. 2A-C), and no evidence of arthritis or synovitis in any patient.

Arthralgia improved spontaneously or with corticosteroids. In 6 patients, arthralgia improved spontaneously with hydration and bed rest. In 25 patients, oral or intravenous steroids (1–2 mg/kg) were

prescribed to manage arthralgia. Five patients who no record about improvement in arthralgia. Among the other 26 patients, the mean duration of improvement in arthralgia was 1.9 ± 1.8 days (range: 1–5 days; Fig. 3). In 14 patients (53.8%), arthralgia improved within 24 hours (1 day). HSP recurred in 3 patients during the study period, but only 1 had arthralgia at relapse.

Discussion

In the joints of children with HSP, US revealed no fluid collection in the joint space and no evidence of synovitis or intra-articular inflammation, but it did show subcutaneous swelling around the joint. This finding suggested that painful joint swelling in HSP is an indication of painful subcutaneous edema (angioedema), not arthritis. Arthralgia in patients with HSP is probably caused by swelling and edema of subcutaneous tissues around joints. The prognosis of children with HSP-related arthritis is therefore good because the arthritis is nondeforming and, in our patients, healed spontaneously or with steroids,[1–3] in comparison with septic arthritis or synovitis, which necessitate treatments and last longer.

Because of this good prognosis, no studies of imaging findings in arthralgia or arthritis in HSP have been conducted. However, the frequency of arthralgia or arthritis in patients with HSP has been studied clinicially. Accompanying arthralgia or arthritis was reported up to 91.9% of patients with HSP in Turkey.[7] In Korea, younger children are more at risk of developing arthritis, according to a nationwide population-based study,[3] and affected children younger than 7 years had frequent joint symptoms.[2] Our results also demonstrated that the rate of arthralgia was highest among children aged 2–5 years (51.6%) and decreased with age (32.3% of patients aged 6–10 years and 16.1% of those aged 11–17 years).

Periarticular swelling, tenderness, and pain are prominent in HSP-related arthralgia and arthritis, but erythema and joint effusion are rare.[1] In our study, erythema (80.6%), swelling (71.0%), and tenderness (67.7%) were common. The high frequency of joint erythema might be related to extensive and multiple areas of purpura around joints. In septic arthritis and synovitis, which are also common in children younger than 5 years, erythema, swelling, and tenderness are observed,[12,13] but arthralgia with joint swelling is not. Purpura on the lower legs is evidence of HSP. Therefore, thorough physical examination is helpful in the diagnosis of arthralgia in patients with HSP.

Among patients with HSP, the risk of developing arthritis was reported to be highest in children up to 7 years of age,[2] as in our study. A pronounced gender predominance for HSP occurrence was not reported in other studies,[1,2,7] whereas in our study, arthralgia was slightly more predominant among boys.

Joint involvement in HSP is usually oligoarticular, and large joints of the lower extremities (knee, ankle, and hip) are most commonly affected.[1] According to our results, 75% of the involved joints were ankles and knees.

Subcutaneous edema is the other prominent sign of HSP, with an overall frequency of 38.8–51.3%.[7,8,16,17] It an indication for corticosteroid therapy in patients with HSP.[1] In previous studies, the majority of

subcutaneous edema was located in the extremities, followed by the head and neck[8] and back.[18] In a study of 163 Turkish children with HSP and subcutaneous edema, the majority (143 [87.7%]) had subcutaneous edema in the extremities, 33 (20.2%) had periorbital or scalp edema, and only 8 (4.9%) of them had scrotal involvement.[8] Skin biopsies of subcutaneous edema were performed in 18 patients with HSP but without purpura to confirm the clinical diagnosis. All biopsy specimens showed leukocytoclastic vasculitis, with immunoglobulin A deposits in two and C3 deposits in one.[19]

Joint involvement and subcutaneous edema in the extremities were less frequent in patients with severe gastrointestinal involvement. Karadağ et al. speculated that arthralgia and subcutaneous edema could be negative predictive factors for severe gastrointestinal involvement in patients with HSP.[8] In our study, abdominal pain was present in 9 patients with arthralgia. One of them had hematochezia and endoscopy revealed severe duodenal ulcer before arthralgia appeared.

Prednisone decreased both the prevalence of purpura during the first month after onset and the patient-reported severity and duration of joint pain.[20,21] In one study, children with HSP-related arthritis received steroid therapy more frequently than those without HSP-related arthritis (77.4% vs. 56.5%, $P < 0.001$).[2] In our study, steroids for managing the arthralgia were administered in 80.6% of patients. In the other patients, arthralgia spontaneously resolved with supportive care. Recurrences often differ to some extent from the initial episode, in that arthritis is less common with relapses.[6] In our study, recurrence was observed in 3 patients during the study period, and 1 had recurrent arthralgia.

This study had some limitations: It was conducted in a single center, the study period was short, and only US findings were reviewed; the pathogenesis was not investigated. Pain in joints might have been related to subcutaneous swelling around the joint. It is not known why the immunoglobulin A immune complex was deposited in the blood vessels around the joint in a previous study; it may be related to the slow blood flow in the small vessels around the joints in children.

Conclusion

This is the first study of imaging findings of arthritis and arthralgia in patients with HSP. The US findings of affected joints in these patients showed subcutaneous edema around joints without joint effusion and inflammation of synovium. Therefore, arthralgia might be the result of subcutaneous edema that is caused by vasculitis of small vessels around the joints, mainly in lower extremities, which also manifests in purpura, in HSP.

Abbreviations

GNUH
Gyeongsang National University Hospital
HSP
Henoch–Schönlein purpura

US
ultrasonography

Declarations

Ethics approval: This study was reviewed after approval of the study by the Institutional Review Board of the ethics committee of GNUH (2020-07-019).

Consent for publication: Not applicable.

Availability of data and materials: All data generated or analyzed during this study are included in this article. Please contact first author (Seo JH) for data request.

Competing interest: The authors have no conflicts of interest relevant to this article to disclose.

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Authors' contributors

Drs. Seo JH and Kim MJ conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised manuscript, equally.

Drs. Cho JM and Na JB reviewed and interpreted the data, carried out the initial analysis, and reviewed and revised the manuscript.

Dr. Kim JS supervised data collection, and critically reviewed the manuscript for important content.

Dr. Youn HS conceptualized the study, designed the data collection instruments, and reviewed and revised manuscript.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Figures

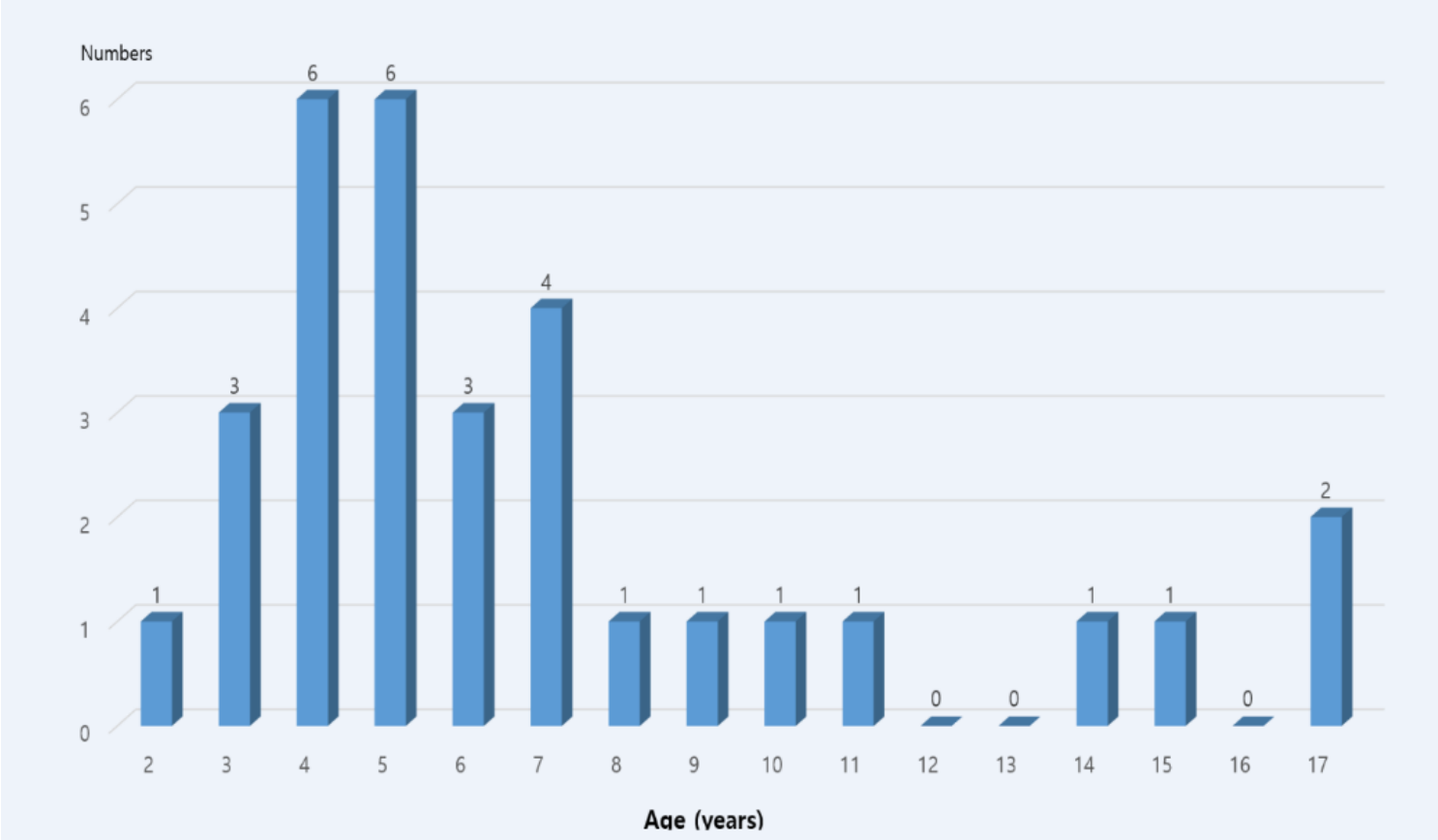

Figure 1

Age distribution of cases with arthralgia

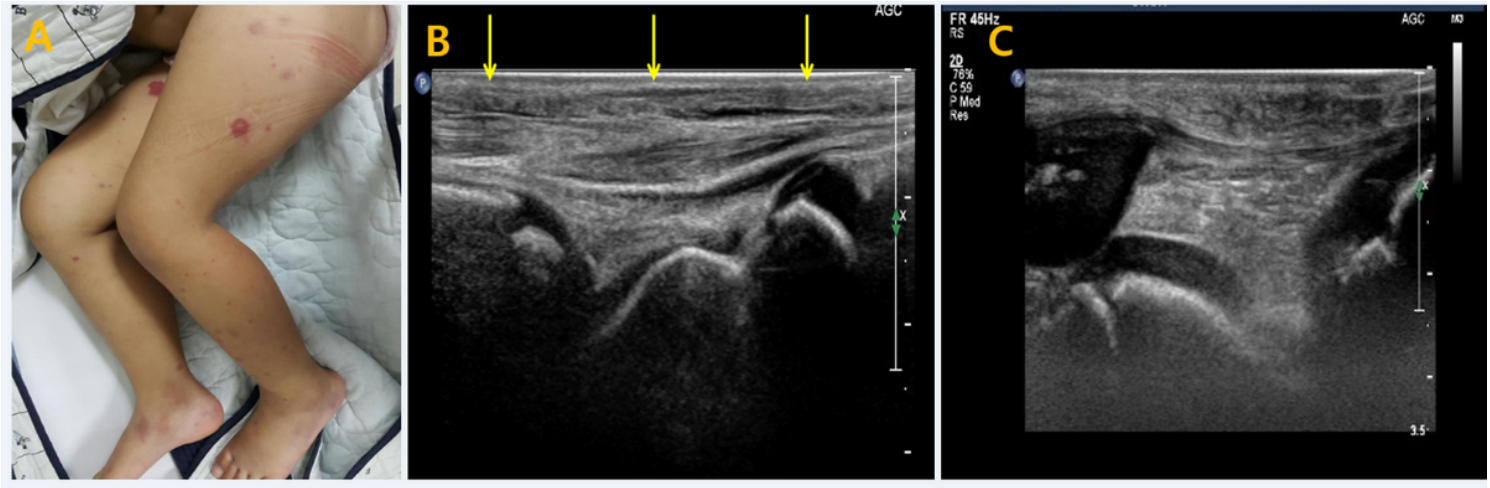

Figure 2

Sagittal USG of ankle and Knee joints of 5-year-old boy who had both knee and ankle pain A. The picture of the child's legs B. No evidence of joint effusion at ankle joint. Diffuse swelling with increased echogenicity at subcutaneous area. C. Subcutaneous swelling with increased echogenicity at infra-patella area

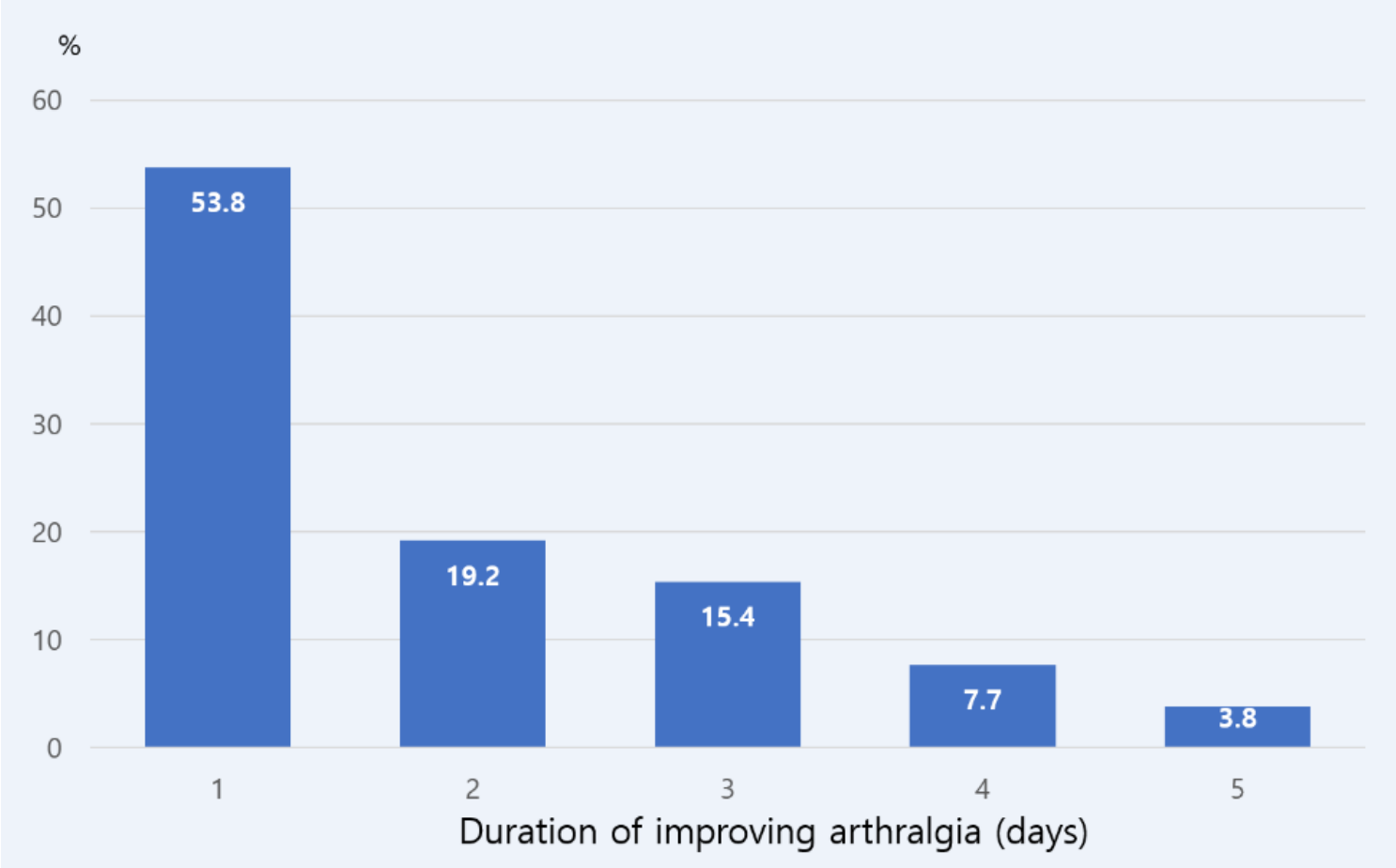

Figure 3

Number of patients according to the duration of improving arthralgia (days)