

**ORIGINAL****Prevalence of childhood and adolescent soccer-related overuse injuries**

Naoto Suzue<sup>1</sup>, Tetsuya Matsuura<sup>1</sup>, Toshiyuki Iwame<sup>2</sup>, Daisuke Hamada<sup>1</sup>,  
Tomohiro Goto<sup>1</sup>, Yoichiro Takata<sup>1</sup>, Takenobu Iwase<sup>3</sup>, and Koichi Sairyo<sup>1</sup>

<sup>1</sup>Department of Orthopedics, the University of Tokushima, Tokushima, Japan, <sup>2</sup>Department of Orthopaedic Surgery, Tokushima Prefectural Central Hospital, Tokushima, Japan, <sup>3</sup>Department of Orthopaedic Surgery, Tokushima National Hospital, Tokushima, Japan

**Abstract : Objective :** To investigate the prevalence of osteochondrosis in children and adolescent soccer players. **Materials and Methods :** A questionnaire was distributed to players of all 113 junior soccer teams participating in a regional summer championship in August 2012 inquiring about pain in the body during or after training or a match. Physical examination of the lumbar spine or legs was recommended to players who complained of pain on the questionnaire, and for those who had positive findings on the physical examination, radiographic or ultrasonic examination at our hospital was recommended. **Results :** Questionnaires were collected from 1162 players of 97 teams, and 547 players (47.1%) complained of pain in the lumbar spine or legs. Physical examination was performed on 494 players, 394 of whom were referred for physical examination (79.8%). Of these 494 players, 20 (4.0%) had positive lumbar spine findings, 26 (5.3%) had hip findings, 198 (40.1%) had knee findings, 117 (23.7%) had ankle findings, 226 (45.7%) had heel findings, and 90 had findings in other parts of foot (18.2%). Radiographic or ultrasonic examination was performed in 106 (26.9%) players at our hospital and 80 (75.5%) players were diagnosed with osteochondrosis. Sever's disease was diagnosed in 49 players, Osgood-Schlatter disease in 13, bipartite patella was in 12, Sinding-Larsen-Johansson disease in 10, osteochondritis dissecans of the distal femur in 1, and spondylolysis in 3. **Conclusions :** The majority of players who had experienced pain and were found to have osteochondrosis had severe injuries such as osteochondritis dissecans or lumbar spondylolysis. We suggest many of the players involved in this study receive further radiographic or ultrasonic examination. **J. Med. Invest. 61 : 369-373, August, 2014**

**Keywords :** Childhood and adolescent, soccer, overuse injury, osteochondrosis

**INTRODUCTION**

Soccer is one of the most popular sports in the world. In Japan, it is enjoyed by the young and old

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Address correspondence and reprint requests to Naoto Suzue, MD, PhD, Department of Orthopedics, the University of Tokushima, 3-18-15 Kuramoto, Tokushima 770-8503, Japan and Fax : +81-88-633-0178.

alike, and most players are involved at the amateur and recreational levels. Soccer players occasionally suffer injuries from contact or non-contact plays, but more often pain is caused by an overuse injury. The latter injuries tend to occur in the lower parts of the body, such as knees, ankles, heels, and feet, and particularly at mechanically weak points. In adults, overuse injuries occur commonly in tendons, muscles, and ligaments because they are relatively weaker than bone ; in children, overuse injuries

occur mainly in the osteochondral region (1, 2). The epiphyses of immature skeletal structures are mechanically weak, so mechanical forces such as compression, shear, and traction frequently cause osteochondrosis. The aim of this study was to investigate the prevalence of osteochondrosis in young soccer players.

## MATERIALS AND METHODS

This study was approved by the Institutional Review Board of Tokushima University Hospital, and all parents and coaches provided informed consent for young soccer players to participate in this study.

Questionnaires were distributed to team coaches of 113 junior soccer teams about 1 month before they were due to participate in a regional summer championship in August 2012 in Japan. The questionnaires were completed before the championship by the young soccer players with assistance from their coaches or parents. Subjects were asked whether they had experienced any episodes of pain in their body during or after training or a match. The first author (N.S.) reviewed the questionnaires with each subject to increase the players' understanding of the questions asked and to confirm the accuracy of the responses provided.

Physical examination of the lumbar spine or legs was recommended to players who complained of pain on the questionnaire. Furthermore, the sites where players reported experiencing pain were examined physically. Range of motion, tenderness, and manual stress tests were included in the physical examination. Limitation of the range of motion and positive signs of tenderness and manual tests were regarded as abnormal signs.

Radiographic or ultrasonic examination, or both, were recommended to players who had positive findings on the physical examination. Diagnosis was made based on the radiographic and/or ultrasonic and physical findings.

## RESULTS

From among the 1162 players of 97 teams who completed a questionnaire, 547 (47.1%) complained of pain in the lumbar spine or legs. The remaining 615 players reported no episodes of pain.

The 547 players reported pain at the following sites: lumbar spine (n=35), hip joint (n=51), knee

(n=190), ankle (n=116), heel (n=236), and foot other than the heel (n=68) (Table 1).

Table 1. Answer of Questionnaire

	n	%
Total	1162	
Pain (+)	547	47.1
Lumbar	35	3.0
Hip	51	4.4
Knee	190	16.4
Lower leg	14	1.2
Ankle	116	10.0
Foot	68	5.9
Heel	236	20.3
Other	79	6.8
Pain (-)	615	52.9

Physical examination undertaken in 494 players (77 teams) revealed positive findings in the lumbar spine (n=20, 4.0%), hip (n=26, 5.3%), knee (n=198, 40.1%), ankle (n=117, 23.7%), heel (n=226, 45.7%), and other parts of the foot (n=90, 18.2%). Some players had multiple sources of pain and these 394 (79.8%) players were referred to our hospital for a consult (Table 2).

Table 2. Result of Physical Examination

	n	%
Total	494	
Positive Findings (+)	394	79.8
Lumbar	20	4.0
Hip	26	5.3
Knee	198	40.1
Lower leg	31	6.3
Ankle	117	23.7
Foot	90	18.2
Heel	226	45.7
Other	132	26.7
Positive Findings (-)	100	20.2

Radiographic and/or ultrasonic examination was undertaken in 106 (26.9%) players who visited the hospital and 80 (75.5%) of them were diagnosed with osteochondrosis. Among them, most players (n=49) were diagnosed as having Sever's disease, followed by Osgood-Schlatter disease (n=13), bipartite patella (n=12), and Sinding-Larsen-Johansson disease (n=10). Osteochondritis dissecans of the

distal femur was detected in only 1 player. In the lumbar spine, spondylolysis was diagnosed in 3 players. In the pelvis, Van-Neck disease and osteochondrosis of the pubis were detected in 1 player each. Symptomatic accessory navicular, a disorder of the navicular tuberosity, was diagnosed in 3 players (Table 3).

**Table 3.** Results of Radiographic and/or Ultrasonic Examination

	n
Sever's disease	49
Osgood-Schlatter disease	13
Bipartite patella	12
Sinding-Larsen-Johansson disease	10
Spondylolysis	3
Symptomatic accessory navicular	3
Van-Neck disease	1
Osteochondritis dissecans of distal femur	1
Arthritis of knee	12
Achilles tendinitis	11
Arthritis of ankle	9
Jumper's knee	3
Shin splint	3

Soft tissue disorders were detected in 38 (35.8%) players. Arthritis of the knee joint, such as medial patella-femoral synovitis, was detected in 12 cases and synovitis in ankle joint in 9 cases. Achilles tendinitis was diagnosed in 11 players (Table 2).

## DISCUSSION

Load on an immature skeletal system is typically the cause of the sports-related overuse injuries seen in the pediatric population (2). The mechanical forces of traction, shear, and compression are therefore more likely to cause osteochondrosis than soft-tissue injuries. In this study, 47.1% of young soccer players experienced pain somewhere in their body, most often in the lumbar spine or lower extremity. This seems to be consistent with the nature of the game in that they use the lower part of the body preferentially in the sport.

Physical examination showed the same trends as the questionnaire results. The most commonly affected area was the heel (45.7%), followed by the knee. Many players with heel pain had tenderness on the medial aspect of the calcaneus and pain after

training, whereas there were no cases of strong pain such that players could not play. Of the 494 players identified to have pain on the screening, 198 had tenderness, pain during passive motion, limited range of motion, or a positive manual stress test in the knee (40.1%) on further examination. Of these, 117 (23.7%) had a positive sign in the ankle and 90 (18.2%) had a positive sign in a part of the foot other than the heel. A total of 394 players had a positive sign on physical examination, which amounted to about 80% of the whole. Nevertheless, only 106 (26.9%) of the players underwent radiographic or ultrasonic examination at the hospital. One of the reasons for this may be the time and cost of consulting a hospital-based provider. On the other hand, physical examinations can be received free on the field. Decreased pain with rest after the competition may have also reduced the incentive to consult the hospital.

In this study, about 75% of players among those who underwent radiographic or ultrasonic examination were diagnosed with osteochondrosis, a higher than expected rate. The most common diagnosis (49/80) was Sever's disease at the calcaneal apophysitis. The injury causes heel pain during or directly after activity in children and adolescent athletes (3-5). Although the occurrence of this injury was high, the prognosis is generally good and few patients would have residual physical impediments.

Osgood-Schlatter disease, Sinding-Larsen-Johansson disease, and bipartite patella are injuries of the anterior knee (2, 6-9). The causes are thought to be secondary to the tractional pull of the tibial tuberosity, inferior pole of patella, and superolateral part of patella, respectively. In particular, Osgood-Schlatter disease is one of the most common osteochondrosis injuries. Those players that have severe pain in the tibial tuberosity occasionally feel inconvenienced not only in their sporting life but also in daily life also. Most will benefit from conservative therapies such as bracing, resting, stretching, and NSAIDs; only rarely do intractable cases require surgery.

Osteochondritis dissecans is one of the most severe osteochondrosis injuries among juvenile athletes (10, 11). In soccer players, we mostly see involvement of the femoral condyle. The patients have little pain during the early stage, but if the injury progresses to an advanced stage when the osteochondral fragments detach, surgical treatment is necessary. In this study, osteochondritis dissecans was detected in only 1 player, in an early stage.

Lumbar spondylolysis is another severe injury in childhood. The disorder is often detected in junior high school or high school athletes, and only rarely in primary school players (12). These players have immature skeletal systems, and this may cause the slippage of the superior vertebra to progress quickly to a terminal stage. In this study, the 3 players with this injury were in an early stage. All 4 cases of these potential severe injuries were probably curable with conservative therapy because they were caught early.

We are concerned that 73.1% of players recommended to undergo radiographic and/or ultrasonic examinations did not do so. Their reasons for not consulting the hospital are likely varied, but we extrapolate that some of them must have osteochondrosis (Figure 1). If there are patients with osteochondritis dissecans or spondylolysis among those 73.1% players, they possibly need surgical intervention.

There are two limitations of our study. First, the physical examinations were carried out by several staff members and therefore the detection of positive signs may have varied due to inter-observer differences. Second, disorders without subjective symptoms were not examined because of the limited timeframe available. The players who had early stage injuries and did not report subjective pain may have shown tenderness or positive signs on physical examination. Consequently, they might not have been detected on physical examination in this study.

CONCLUSIONS

Soccer-related overuse injuries in childhood and adolescence were examined in this study. About half of the players (47.1%) complained of pain in the lumbar spine or legs. Physical examination revealed a large number of players had heel and anterior knee pain, yet only 26.9% of them chose to have an imaging examination. Osteochondrosis was detected in 75% of these players who did undergo imaging, and we did see some cases of severe injuries such as osteochondritis dissecans and lumbar spondylolysis. We remain concerned that the other players who did not undergo imaging might have some level of injury, and therefore we suggest they undergo further evaluation by appropriate imaging.

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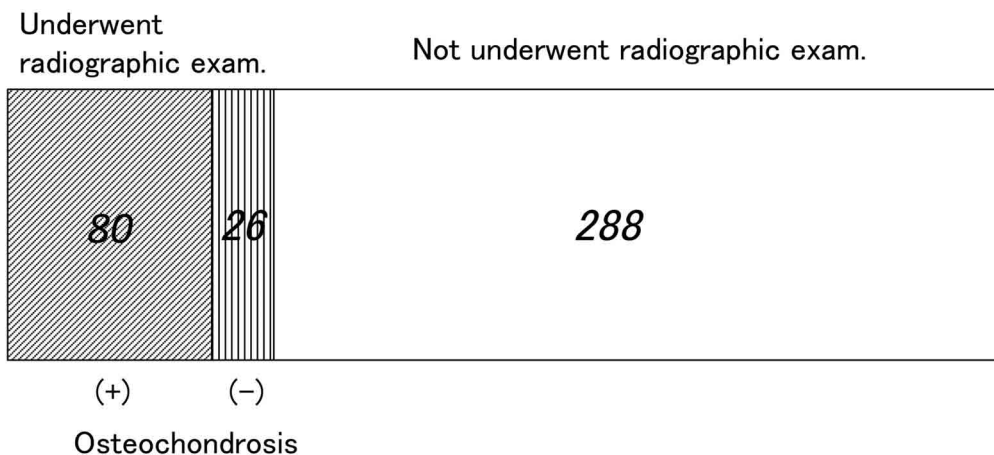


Figure 1. Outcomes of Physical Examination Positive Players  
 Total 394 physical examination positive players were recommended to receive radiographic and/or ultrasonic examination in hospital.  
 (+) : Osteochondrosis was detected by radiographic and/or ultrasonic examination. (-) : Osteochondrosis was not detected by radiographic and/or ultrasonic examination.

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