Incidence and Union Rate of Avulsion Fracture at the Tip of the Fibula for Ankle Sprain in Children: Prospective Study

Presenting Author:
Satoshi Yamaguchi, MD, PhD

Additional Authors:
Ryuichiro Akagi, MD, PhD, Jun Endo, Yohei Yamamoto, MD, Ryosuke Nakagawa, MD, Takahisa Sasho, Kazuhisa Takahashi

Category: Sports

Keywords: ankle sprain, children, avulsion fracture, os subfibulare

Introduction/Purpose: Although ankle sprain in children is traditionally diagnosed as Salter-Harris type 1 epiphyseal injury because of negative radiographic findings, recent studies have reported that avulsion fracture at the tip of the fibula may be common. If the fracture remains ununited, it will become os subfibulare, and can cause pain and instability. Therefore recognition of the avulsion fracture is clinically important. However, incidence and radiographic result of the fracture is not well studied. The purposes of this study was 1) to clarify the incidence of avulsion fracture at the tip of the fibula for ankle sprain in children, 2) to assess the utility of the ATFL view proposed by Haraguchi for detection of the avulsion fracture, and 3) to clarify the union rate of the fracture.

Methods: Patients who presented four local orthopaedic clinics were prospectively examined. Patients with a first-time inversion sprain, aged from six to twelve years, and visiting to the clinics within forty-eight hours after injury, were included. Patients underwent anteroposterior and lateral radiographs, and the ATFL view (Figure) proposed by Haraguchi at the first visit. Patients with avulsion fracture underwent follow-up radiographs 8 weeks after injury. Incidence of avulsion fracture was assessed using the radiographs at the first visit. If the fracture is visible in at least one of the three images, we diagnosed as fracture. Sensitivity of fracture detection for the standard anteroposterior and lateral view, as well as that of the ATFL view, were also evaluated. Union rate of the avulsion fracture was assessed using the radiographs at 8 weeks. The treatment was not standardized, and ranged from elastic bandage to non-weightbearing cast for 6 weeks.

Results: From April 2014 to August 2015, 98 ankles of 98 patients (35 female and 63 male) with a mean age of 8.7 years were included. Overall incidence of avulsion fracture at the tip of the fibula was 61% (61/98 ankles). Fifty-nine avulsion fractures out of 61 were visible in the ATFL view.
(sensitivity, 98%), while only 28 fractures were visible in the anteroposterior and/or lateral views (sensitivity, 46%). Of the 61 ankles with fractures, 50 ankles underwent radiographs at 8 weeks. The overall union rate was 20% (10/50 ankles). When the patients received casting for 4 weeks or more, the union rate was 40%. When the patients received casting less than 4 weeks the union rate was lower, and 10%.

Conclusion: Avulsion fracture at the tip of the fibula was surprisingly common after ankle sprain in children. More than half of the fractures were not detected in standard radiographs of the ankle, and the ATFL view should be taken routinely to detect avulsion fracture. Otherwise the fracture can be overlooked, and a misdiagnosis of Salter-Harris I injury will result. Only 20% of the fractures united after 8 weeks of injury. Although clinical significance of the avulsion fracture is yet to be determined further, the results of this study provide baseline data with which optimal treatment can be studied.