Clinical manifestations of neurofibromatosis type-1 (NF-1), also known as von Recklinghausen disease, are commonly known to present as a broad spectrum of abnormalities of the skin, soft tissues, nervous tissue, and bones. A conclusive diagnosis of NF-1 is made when two of seven criteria have been established as defined by the National Institutes of Health Consensus Development Conference (Table 1). The literature documents most orthopaedic characteristics encompassing spinal deformation, congenital tibial dysplasia, and features of excessive osseous and soft tissue growth as recognized in children. The purpose of this paper is to report fibular involvement in an adult patient presenting with ankle pain.

Neurofibromatosis type 1 exhibits musculoskeletal involvement most commonly as spinal deformity, congenital tibial dysplasia, including bowing and pseudoarthrosis, and bone and soft tissue overgrowth. For children, the essential objective is early recognition. For adults, notably from 36 to 50 years, the literature acknowledges 75 percent of clinical concern is more often related to malignancy. In our case report, we recount a woman with neurofibromatosis type 1 presenting with debilitating ankle pain secondary to isolated fibular involvement, which to our knowledge has not been previously recorded in the literature.

Case
A 42-year-old female presented with a complaint of right ankle pain exacerbated with prolonged standing and ambulation, admitting to minimal relief with rest. Her only known past medical history is significant for type 1 neurofibromatosis and a surgical history significant for resection of a neurofibromal soft tissue mass of her left leg. On physical examination, the right lower extremity revealed a normal neurologic and vascular examination with intact motor function from level L2 to S1. She was tender to palpation about the anteromedial and anterolateral aspects of the ankle and within the sinus tarsi region. The ankle was in equinus, with Achilles tendon tightness, and had limitation in ankle range of motion of 5 degrees of dorsiflexion and 5 degrees of plantarflexion. There was an increased fixed valgus of the subtalar joint. The patient was unable to perform an independent heel rise. The back, abdomen and extremities revealed multiple flat, smooth bordered, brown skin lesions, and there was evidence of axillary freckling.

Radiographs of the right lower extremity revealed evidence of significant cortical thinning to that of a twisted ribbon or “penciling” and pseudoarthrosis of the distal fibula with severe valgus malalignment of the tibiotalar articulation. There was no evidence of
tibial bowing (Figures 1-3). Magnetic resonance imaging of the right ankle demonstrated no evidence of neurofibroma or mass within the soft tissues about the ankle.

Consideration for nonoperative treatment including bracing was presented and may have been a more viable option with earlier recognition of the condition. Surgical treatment was explained with design of a calcaneal osteotomy, ankle and subtalar arthrodesis and Achilles tendon lengthening. The patient chose to proceed with the operative intervention, managed initially postoperatively with non-weightbearing of the right lower extremity for six weeks. Images revealed evidence of healing ankle and subtalar arthrodesis (Figures 4-5). She was converted subsequently to a short leg walking cast for an additional six weeks.

Discussion

The first description of neurofibromatosis is credited to Tilesius von Tilenau in 1793. In 1882, the German pathologist Dr. Friedrich Daniel von Recklinghausen became the first to correlate the origin of the condition with tumorous cells arising from the sheaths of nerves.

Neurofibromatosis is the most common single gene disorder found in humans. It has an autosomal dominant trait with variable penetrance and thus there are multiple forms of the disorder with a numbered classification scheme developed by the National Institutes of Health. Neurofibromatosis 1 (NF-1), previously known as von Recklinghausen disease, is the most common form, affecting one in 3,500 individuals. The gene mutation is located on the long arm of chromosome 17q11.2, affecting neurofibromin—a regulatory protein of cellular growth.1,2,5

Conclusive diagnosis is confirmed upon the established presence of two of seven criteria as denoted by the National Institutes of Health Consensus Development Conference (Table 1).2

There is a vast range of involvement particularly observed at the largest children’s hospital database (Cincinnati Children’s Hospital Neurofibromatosis Center), with pediatric recognition as plexiform neurofibromas, spinal deformity, limb-length inequality, congenital tibial dysplasia, pectus deformity, and hemihypertrophy (Table 2).4

Neurofibromatosis 2 (NF-2), previously known as bilateral acoustic neurofibromatosis or central neurofibromatosis, occurs in about one in 50,000 persons with its gene defect found on the long arm of chromosome 22.3 The characteristic finding is acoustic nerve tumors, but interspinal and intercranial pathology is common, as well. Neurofibromatosis 3, known as segmental neurofibromatosis, is thought to be a somatic mosaic of NF-1, linking components of NF-1 with additional involvement of a single body segment. Recently there has been description of a fourth type, schwannomatosis, believed to be a mosaic form of NF-2 involving multiple deep painful schwannomas.4

Although manifestations of NF-1 vary from one individual to another, the genetic penetrance of the NF-1 gene is close to 100 percent.5 The clinical picture besides apparent skin changes includes skeletal features of scoliosis dysplasia, penciling or twisted ribbon appearance of ribs, scalloping of vertebral
bodies, hypertrophy of part or all of a limb, bowing of a long bone, cortical bone cysts, and pseudoarthrosis.

Current literature accounts one case of spontaneous pseudoarthrosis of the tibia of an adult, however in a thorough search of our literature there is no mention of isolated fibular deformity in child or adult. Discussion of fibular involvement is reported solely in relation to congenital tibial dysplasia in children classifying the diverse forms by radiographic or pathologic criteria for prognostic value and adequate treatment. Isolated description of pseudoarthrosis of the fibula to our knowledge remains undocumented. Such incidence and standard of treatment, moreover, are also unknown, which designates our case unique in diagnosis and distinguishing in treatment.

Conclusion
The patient recorded here had distinctive deformation of her right ankle for most of her life. Upon evaluation by the orthopaedist, exclusive fibular involvement was found to have progressed to warrant surgical correction for functional ambulation and definitive pain relief. This case report demonstrates increased understanding and awareness of the clinical spectrum of the adult population with neurofibromatosis is essential for the timely diagnosis and ultimate success in treatment of individuals with this condition.

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