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Case Report

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A congenital fibular notch synostosis of the left distal leg: a case report

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Abstract

***Background & Aims*:** Tibiofibular synostosis is an infrequent, limb malformation that is non-syndromic and illustrated by the union of the proximal or distal tibia and union of the proximal or distal tibial and fibular metaphysis and/ or diaphysis. Congenital tibiofibular synostosis is a very rare anomaly and if there are no related syndromes or distortions, the cause may be unknown or acquired. The case presented here shows a fusion of the tibia and fibula at the fibular notch which is not secondary to a fracture, hematoma, or any procedure done to fix the distal tibiofibular joint, as shown by the x-ray radiograph. Among other factors, calcification of bleeding into the surrounding tissue may result in the fusion of the tibia and fibula.

***Case Presentation*:** After macerating the bone of a 56-year-old Nigerian male cadaver in the Anatomy Program, Bowen University, Nigeria, a dried adult left tibia and fibula with ossification at the distal end of both bones were observed. Anteriorly, a nutrient foramen was present where the anterior tibial vessels pass, while a number of grooves were observed posteriorly at the fused end. Thorough observation showed fusion of the distal tibiofibular syndesmosis joint with the absence of callus formation and /or a fracture. A bone specimen of distal tibiofibular synostosis and its medical importance are hereby highlighted.

***Conclusion*:** Cases of congenital distal tibiofibular synostosis are rare. When present in a living person, this should be suggestive to the physician who may be treating a patient who complains of ankle pain of unknown etiology. This is known to be a common reason for pain in the anterior leg compartment, usually associated with sports activities which may present with ankle pain as a result of abnormal ankle function.

***Keywords*:** Acquired, Case report, Congenital, Synostosis, Tibiofibular

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Introduction

Tibiofibular synostosis (TFS) is a rare anatomical condition that is incidentally observed on radiographs or following bone maceration. The location of tibiofibular synostosis can be proximal, middle, or distal (1). Most cases of tibiofibular synostosis are confined to the proximal tibiofibular joints. Congenital distal tibiofibular synostosis is an uncommon anomaly observed between the tibia and fibula. Congenital lesions are often located at the proximal or distal tibiofibular joint and are typically associated with osteochondromata in individuals with multiple hereditary exostoses (2). Synostosis between two straight bones, such as the radius and ulna or the tibia and fibula, is relatively common (3). Distal synostosis is a rare complication, with limited literature addressing its impact on athletes (4), skeletally immature patients, or as a consequence of bone surgery techniques (3).

Tibiofibular synostosis can have various causes and is an infrequent source of anterior shin pain in sports injuries, where ossification of aponeurotic fibers occurs within the tibiofibular membrane (5). The tibiofibular membrane is situated on either side of the interosseous crests of the tibia and fibula, separating the anterior compartment of the leg from the posterior compartment. The lower portion of this membrane contains openings through which the anterior tibial vessels pass (5). According to available reports, proximal synostosis is typically congenital, whereas its distal counterpart is often acquired (6, 7). We report a case of congenital distal tibiofibular synostosis with no identified etiology and no evidence of fracture. Trauma is the most common cause of distal tibiofibular synostosis, though few case reports exist on this condition (6). Congenital cases may result from infection, prenatal trauma, local inflammation, joint cavitation followed by developmental arrest, iatrogenic factors, or pre-existing conditions (6).

Many instances of distal tibiofibular synostosis are not congenital and occur as a result of ankle fractures (8), which may be observed within less than a year following an ankle sprain with eversion and disruption of the interosseous membrane (8, 9). It may also develop after open reduction and internal fixation of an ankle fracture (10) or as a consequence of suture button syndesmosis fixation (11). Using both traditional and advanced imaging techniques, synostosis appears as a bony bridge connecting the two bones, with or without deformity. Imaging serves as a valuable preoperative tool to rule out prior neoplastic and non-neoplastic conditions, such as congenital causes or metabolic disorders like scurvy and fluorosis (6). Other conditions to exclude include neoplastic entities such as osteochondroma and ossifying parosteal osteosarcoma (12, 13).

Case Report

After macerating the bones of a 56-year-old Nigerian male cadaver in the Anatomy Program, Bowen University, Iwo, a dried left tibia and fibula with an ossified tibiofibular membrane were spotted (Figures 1a and 1b).

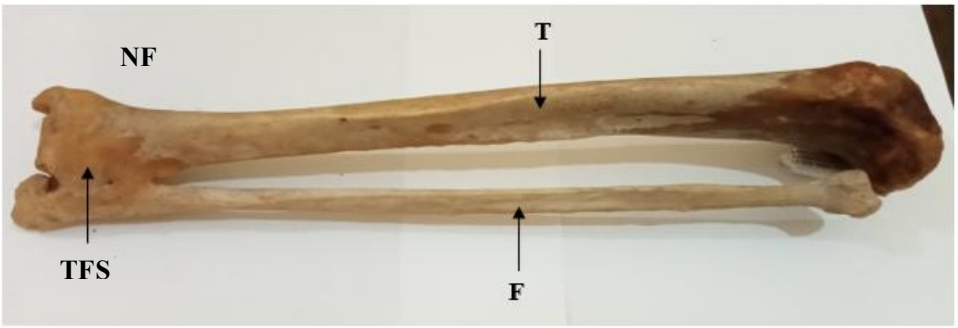

Fig. 1. a. Ventral view of the left tibia and fibula indicating synostosis at the distal part. T- Tibia, F- Fibula, TFS- Tibiofibular synostosis, NF – Nutrient Foramen

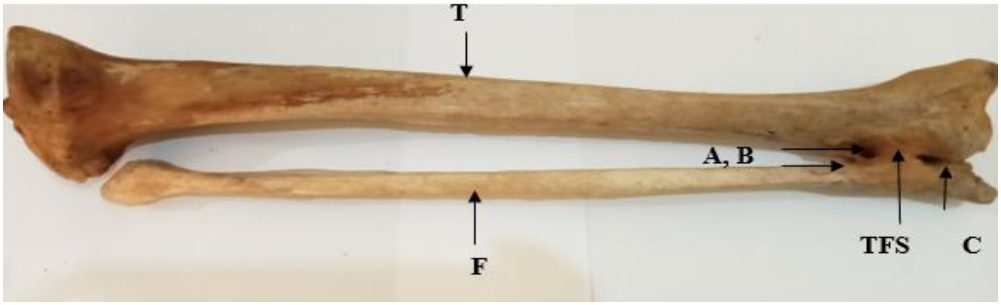

Fig. 1. b. Dorsal view of the left tibia and fibula indicating synostosis at the distal part. T- Tibia, F- Fibula, TFS- Tibiofibular synostosis, A, B are grooves superior to the synostosis, while C is a groove inferior to it

The distal ends of the tibia and fibula were united by osseous tissue, and an elongation was found at the lower part of the shaft of the tibia which fuses with the fibula. The dimensions of the specimen were taken using a sliding vernier caliper and a tape rule. Several quantitative values of the bones taken were: the lengths of the tibia and fibula as 41.3cm and 39.1cm, respectively; the length of the anterior ossified part was 46.1mm, and the length of the posterior ossified part was 33.6mm. The maximum breadth of the ossified part measured 24.6mm, with the thickness of the ossified part being 29.1mm. Depth of grooves A and B superior to synostosis are 73.0mm and 37.4mm, respectively, while the depth of groove C, inferior to synostosis measured 16.6mm.

There was no physical sign of any malformation on the shaft of both bones. Both proximal and distal tibiofibular joints were regular in position. Digital X-ray imaging radiographs showed no breakage but callosity at the distal end of the tibia and fibula. The ossified membrane did not show a medullary cavity shadow (Figures 2A and 2B).

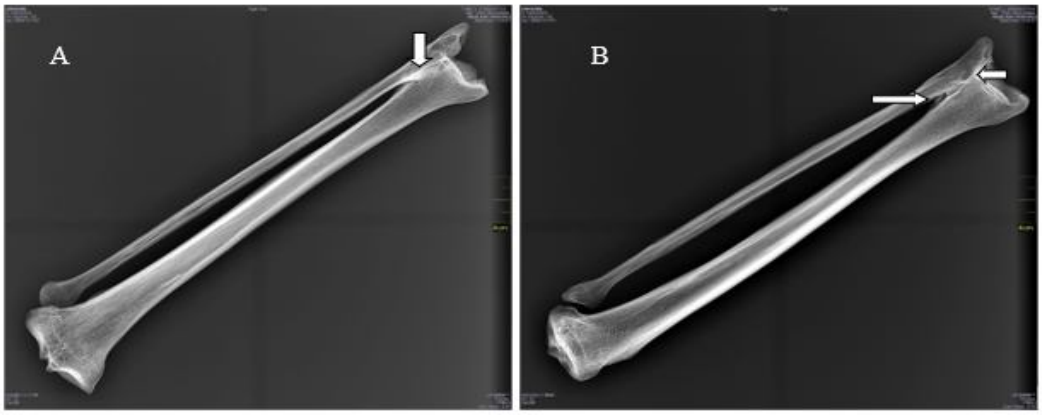

Fig. 2. a. Anterior view of a radiograph of the left tibia and fibula illustrating the presence of no fracture at the TFS. **b.** Lateral view of a radiograph of the left tibia and fibula with arrows illustrating grooves superior and inferior to the tibiofibular synostosis

Discussion

Synostosis refers to the fusion of adjacent bones or parts of a single bone through ossified cartilage or fibrous tissue (14). Tibiofibular synostosis may occur following a tibial fracture or osteotomy (3). In this case, we describe a congenital distal tibiofibular synostosis, which is rare. There was no evidence of a stress fracture or ligamentous sprain of the interosseous membrane that

would have left a mark; the only visible feature was a groove leading to the nutrient foramen. Synostosis between the tibia and fibula restricts tibial extorsion and limits ankle dorsiflexion and plantarflexion (15). Few cases of congenital distal tibiofibular synostosis have been reported, which may present with prominence, deformity, or vague discomfort (16).

Dorsiflexion of the synostotic ankle was reduced compared to the contralateral ankle, with minimal impact on plantarflexion. Distal tibiofibular synostosis may compress the anterior fibular vasculature, which passes through apertures in the inferior part of the tibiofibular membrane (17). Symptoms are often minimal and may not require specific treatment following surgical management of distal tibiofibular synostosis in ankle fractures. The functional impact of distal tibiofibular synostosis on the ankle after surgery for ankle or distal tibia and fibula fractures is rarely documented. The management of distal tibiofibular synostosis, whether conservative or surgical, remains debated (15).

Possible mechanisms of distal tibiofibular synostosis include ossification and hematoma absorption following disruption of the interosseous membrane between the distal tibia and fibula. Damage to the interosseous tissue may result from Kirschner wires or screws (15). It has been suggested that fixing the distal tibiofibular joint with cancellous screws may induce synostosis (18). Soft tissue injury and periosteal stripping during surgery also contribute to synostosis. Resection of the synostosis along with adjacent pathological bones may be a treatment option for posttraumatic distal tibiofibular synostosis (4).

Conclusion

Understanding congenital distal TFS is essential for managing chronic leg pain of unknown origin. Its role in identifying causes of ankle distortions is significant, facilitating X-ray interpretation and improving the management of posttraumatic TFS patients. This congenital condition is valuable for anatomists, radiologists, and orthopedic surgeons dealing with patients experiencing lower leg pain of unclear etiology.

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Ethical statement

Not applicable.

Data availability

Raw data is available with the authors and can be made available on request.

Conflict of interest

The authors have no conflicts of interest to declare.

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Author contributions

Olubunmi Balogun and Oladayo Oyedun conducted conceptualization, methodology, visualization, endorsement, and wrote the original draft, reviewed, and edited. Olaniyan Morakinyo, Akinola Ajeleti, Gideon Ojo, and Olubintan Abayomi conducted the visualization and endorsement. Olaleye Olabiyi conducted conceptualization, visualization, endorsement, reviewed, and edited.

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