# The Adult Tillaux Fracture: Report of Four Cases with Associated Fractures and Review of Literature

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## Statement of Purpose

While juvenile Tillaux fractures are well described in the literature, reports of these injuries in adult populations remain scarce. Therefore, the management of adult Tillaux fractures as well as the pattern of associated injuries deserves further exploration. **Here we report on four adult patients who suffered Tillaux fractures in addition to other lower extremity injuries.**

## Literature Review

First described by Cooper and later attributed to Tillaux, avulsion of the anterior tubercle of the distal tibia is caused by an external rotation mechanism through the ankle joint (1). As the fibula externally rotates, tension through the anterior inferior tibiofibular ligament may lead to this fracture pattern. This most commonly occurs as a transitional fracture in juvenile patients, although it has also been reported as a rare finding in adults. This adult fracture has multiple names, including “adult Tillaux,” “Tillaux-Chaput,” and “Chaput” fractures. Until recently, only small case reports described this phenomenon.

Due to scarcity in reported outcomes, the significance of adult Tillaux fractures is poorly understood. However, these fractures are intraarticular and it is recommended that ≥2mm displacement deserves surgical repair (2). In fact, among adult patients with tibial pilon fractures undergoing ORIF, those with missed Tillaux fractures are at higher risk of post-traumatic arthritis. This is likely due to associated syndesmotic instability, and it suggests the need to evaluate syndesmotic integrity when treating Tillaux fractures (3).

Miller published the first report of arthroscopic reduction for an adult Tillaux fracture (4). His single patient went on to complete recovery. Feng et al. recently expanded on this mode of treatment and published on the largest cohort of adult Tillaux fractures to date (5). Their report included 19 patients (17 above age 18) undergoing arthroscopic reduction and internal fixation of Tillaux fractures. Apart from three patients with associated proximal fibula fractures, all injuries occurred in isolation. It is unclear from their report how many of the isolated injuries occurred in adult patients. The authors reported good-to-excellent AOFAS ankle-hindfoot scores in all patients at final follow up (mean 19 months).

The majority of adult Tillaux fractures occur in isolation. In our review of the literature, we found 12 case reports prior to the study by Feng et al. (1, 3, 4, 6–11). Eight of these 12 patients sustained isolated Tillaux fractures. Injury patterns among the four patients with additional fractures include: lateral malleolus, posterior malleolus, PITFL avulsion, medial malleolus, and deltoid avulsion. A posterior malleolus fracture (or PITFL avulsion) was present in all four cases. Only two patients were successfully treated with conservative measures.

## Case Series

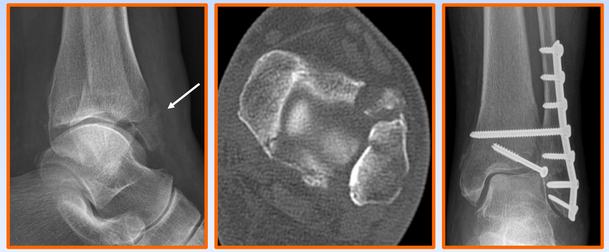
We present four adult female patients aged 23–61 who suffered Tillaux fractures. These fractures were displaced and treated surgically. All patients also had concomitant fractures, which are detailed below with each patient’s imaging.

Malleolar injury was common in our patient population. Every patient had either an associated malleolar fracture or equivalent ligamentous injury (i.e. deltoid ligament avulsion).

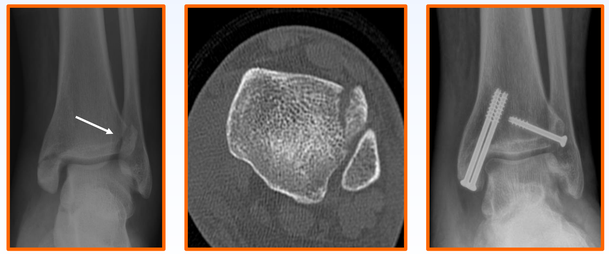
In all cases, the Tillaux fragment was directly fixated with a single lag screw. Additional fractures and ligamentous injuries were either stabilized directly with plate/screw fixation or indirectly via syndesmotic stabilization when appropriate.

All four of our patients went on to successful union of their fractures. To date, no patients have sought hardware removal.

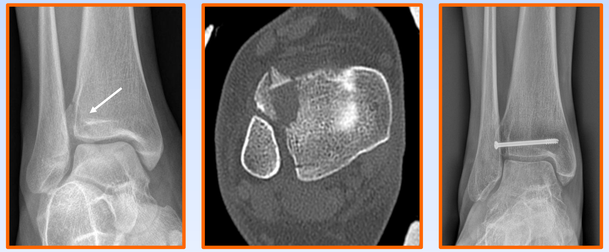
Patient 1. Comminuted Tillaux fragment, Weber B fibula fracture, posterior malleolus shell fracture, unstable syndesmosis.



Patient 2. Displaced Tillaux fragment, medial malleolus fracture.



Patient 3. Comminuted Tillaux fragment, nondisplaced posterior malleolus fracture. Nondisplaced medial cuneiform fracture without Lisfranc instability, treated nonoperatively.



Patient 4. Displaced Tillaux fragment, weber B fibula fracture, deltoid avulsion.

No financial conflict of interest

## Analysis & Discussion

Adult Tillaux fractures are rare. We found only 29 cases documented in the English literature; more than half of these came from a single case series. Seven of these 29 patients suffered concomitant fractures. Here we present four additional adult patients, each with different injury patterns associated with Tillaux fractures. Additionally, we present the first case of an associated midfoot fracture.

Evaluation with advanced imaging (i.e. CT scan) is recommended to fully evaluate these injuries. Prior research suggests a high rate of misdiagnosis, and plain radiographs are 50% sensitive for Tillaux fractures (12). In addition, Tillaux fractures with ≥2mm intraarticular displacement should be surgically reduced and stabilized due to the high risk of post-traumatic arthritis (2). For the subtle Tillaux fracture identified on plain radiographs, CT imaging can help to determine whether surgical or conservative treatment is warranted (13).

Comminution of the Tillaux fragment was identified in two of our four patients, and intraarticular displacement ranged from 3–14mm (mean: 7.9mm). After fixation of the Tillaux and amenable malleolar fractures, syndesmotic fixation was only necessary in a single patient. All patients recovered from their injuries uneventfully. In our experience with this small series, surgical management of adult Tillaux fractures effectively restores articular congruity, and intraoperative testing of the syndesmosis is recommended.

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