

# The Management of Weber B Ankle Fractures: What Have We Learnt Since the CROSSBAT Trial?

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## ABSTRACT

Weber B fractures account for about 50% of all fractures at the ankle joint. Despite being a common injury, there is clinical equipoise in the management of an isolated lateral malleolar fracture with presumed medial ligamentous injury. The Combined Randomized and Observational Study of Surgery for type B Ankle fracture Treatment (CROSSBAT) study was a multicenter randomized control trial that also had an observational cohort arm. It showed that non-operative management of Weber B fractures produced equivalent functional results at 1 year and avoided risks and complications that are associated with operative treatment. Other studies have shown similar results in short to mid-term follow-ups. The key to decision-making in ankle fracture is evaluating the stability of the ankle mortise. Weight-bearing radiographs are gaining popularity in this assessment as we understand the important role of the deep deltoid ligament. A lateral malleolar fracture with a medial ligamentous injury that is deemed to be stable by weight-bearing X-rays can be safely managed non-operatively. Long-term studies are needed to calculate the relative risk of developing post-traumatic arthrosis in these patients compared to those who underwent fixation.

**Keywords:** Ankle stability, Combined randomized and observational study of surgery for type B ankle fracture treatment, Non-operative management, Post-traumatic arthrosis, Weber B ankle fracture, Weight-bearing radiograph.

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## BACKGROUND

As with any branch of medicine, orthopedic trauma management has been evolving as we gain more understanding of various fracture patterns and their natural history. Our surgical fixation techniques have improved with significant advances in implant technology. Conversely, it has encouraged surgeons to operate on fractures that otherwise would have previously been managed non-operatively.

Ankle fractures are the most commonly sustained injuries in 20–65-year-olds with an incidence of 900,000 per year.<sup>1</sup> About half of these injuries are isolated fractures of the lateral malleolus at the level of the syndesmosis (Weber B) with or without concomitant ligamentous injury.<sup>2,3</sup> These injuries are also classified as supination external rotation as per the Lauge–Hansen system. Treatment options vary from walker boot to internal fixation. The management decision depends on various factors such as patient comorbidities, fracture pattern, resource availability, and surgeon preference.

Historically, Weber B fractures have been treated with internal fixation, following AO principles.<sup>4</sup> Integrity of the lateral column of the ankle was thought to be the key to ankle stability. Surgical management ensures the fracture will be anatomically reduced and fixed which in turn, decreases the chance of displacement and malunion. However, surgery is not without its own risks and complication rates of 20% have been reported in the literature.<sup>5</sup>

There is clinical equipoise with regards to the management of these injuries and there is wide variation in practice among orthopedic trauma surgeons.<sup>6,7</sup> The combined randomized and observational study of surgery for type B ankle fracture treatment (CROSSBAT) trial<sup>8</sup> was set up to provide an evidence-based approach to management decision.

## CROSSBAT Trial<sup>8</sup>

This pragmatic trial was carried out by Mittal et al. across 22 centers in Australia and New Zealand in 2010. One hundred and

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sixty patients who had Weber B fractures with minimal talar shift were recruited into the randomized control trial (RCT) arm and 276 patients in the observational arm of the study over 3 years. They were followed up with the American Academy of Orthopaedic Surgeons Foot and Ankle Outcomes Questionnaire (FAOQ) and SF-12v2 General Health Survey at 3, 6, and 12 months.

At the final 12-month follow-up, the non-operative group had better FAOQ scores which were statistically significant but not relevant clinically. There was no difference in the SF-12v2 scores between the groups. The surgical group was associated with more adverse events. In the short-term, non-operative treatment provides equivalent results as a surgical outcome. Interestingly, the surgical group in the observational arm of the trial was significantly younger but their scores were less than the non-surgical patients at all points of follow-up.

It was a well-designed single-blind study with a low rate of cross-over and loss to follow-up. However, the follow-up period was only 1 year, and it can take many years for symptomatic ankle arthrosis to develop.

### Systematic Reviews

A Cochrane review by Donken et al.<sup>2</sup> in 2012 analyzed 4 RCTs with 292 patients. There was no difference between the surgical and nonsurgical groups; however, it was not possible to pool the data together due to the lack of homogeneity between the trials. The longest follow-up was 7 years. It concluded that there are insufficient data to recommend one treatment over the other.

A systematic review by Julian et al.<sup>5</sup> in 2020 included 22 studies involving 2523 patients with Weber B ankle fractures. There were 5 RCTs, 4 prospective, and 13 retrospective cohort studies. The follow-up period varied from 6 months to 21 years. Three studies found no difference in the functional scores between the groups. More complications had been reported in the surgical groups as expected. However, one study<sup>9</sup> reported a delayed radiological union rate of about 20% at 3 months in the conservatively managed group. The authors did not specify whether it was clinically relevant. This review provides weak evidence that conservative management is equivalent to surgical outcomes but without complications.

### Ankle Stability

The key to decision-making in ankle fracture is evaluating the stability of the ankle mortise. Weber A fractures are proven to be stable and are managed non-operatively. Weber C fractures are usually managed surgically due to disruption of the syndesmosis. Weber B fractures need close evaluation to identify associated injuries to the distal tibia, deltoid ligament, and syndesmosis ligament complex.

Isolated undisplaced lateral malleolar fractures without any medial injury are inherently stable. Therefore, they should be managed with bracing and early mobilization.

Orthopedic surgeons were traditionally taught that all Weber B fractures with medial or posterior malleolar fractures require internal fixation due to disruption of the bony stabilizers of the ankle

mortise. However, the Ankle Injury Management (AIM) trial in 2016 has challenged this belief and has shown that closed contact casting can produce equivalent short-term results for these unstable injuries without the need for internal metalwork in patients over the age of 60.<sup>10,11</sup> We still await to see the long-term data.

Clinical equipoise arises when a patient presents with isolated lateral malleolar fracture and medial soft tissue injury. It is difficult to quantify the extent of the medial injury clinically or radiologically at the initial presentation. Therefore, an isolated lateral malleolar fracture with presumed medial injury, with any amount of talar shift will be managed surgically by most surgeons.

The role of the deep deltoid ligament in ankle stability has been examined in cadaveric studies and published two decades ago but until recently, it has not been translated into clinical studies.<sup>12</sup>

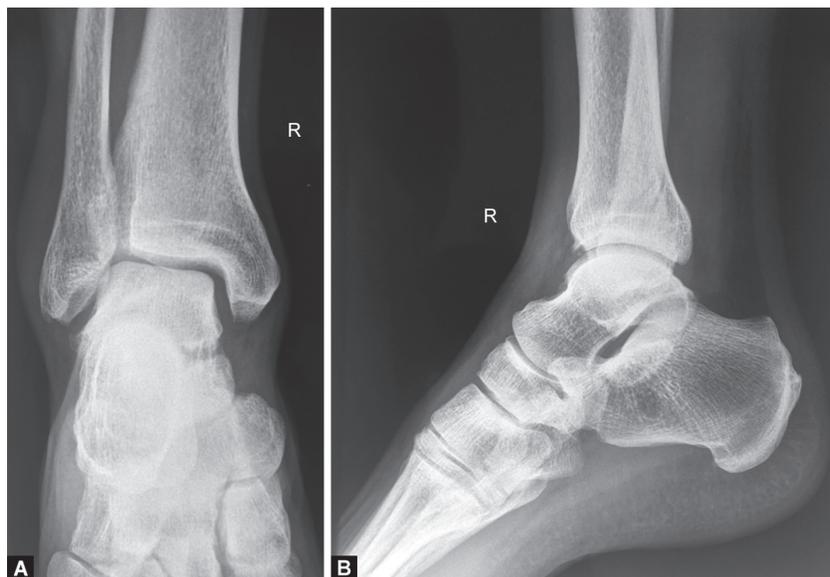
### Imaging

Surgeons have used various methods to assess the degree of medial soft tissue damage. One procedure is to assess the stability under anesthesia, but it is expensive and not practical in most healthcare systems. Another technique is the use of gravity-assisted stress view, however, it has been shown to overestimate the medial injury and increase the rate of operative intervention.<sup>13-16</sup>

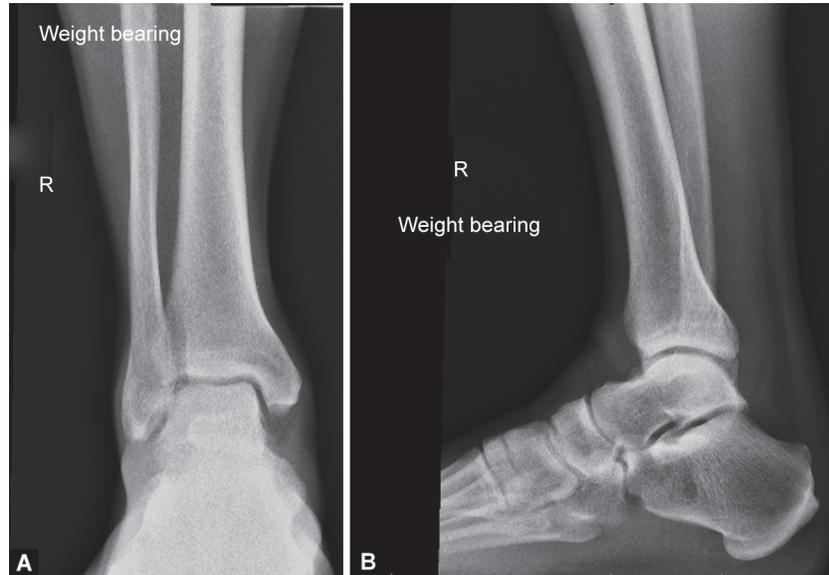
Weight-bearing radiographs are gaining popularity with more evidence being published on their utility in ankle fracture assessment. The radiograph at the initial presentation of the patient is usually taken with the ankle in plantarflexion as it is the most comfortable resting position for patients (Fig. 1). It brings the narrowest part of the talar dome into the profile and the posterior part of the deep deltoid ligament is lax in this position. A combination of these factors shows an artificially increased talar shift.<sup>16-18</sup>

In fractures with an intact deep deltoid ligament, the ankle will be congruent when it is plantigrade (Fig. 2). It is ideal if the weight-bearing radiograph is obtained within a few days after the injury once the patient can stand without much pain.

Gougoulias and Sakellariou<sup>19</sup> reported on their clinical practice which involves weight-bearing radiographs in their fracture clinic. Since the introduction of this system, only 3.7% of these injuries



**Figs 1A and B:** Initial radiograph of a Weber B fracture showing slight medial widening. Note the position of the foot which is in plantar flexion on the lateral view



**Figs 2A and B:** Weight-bearing radiographs at week 1 of the same ankle as Figure 1 shows an anatomically congruent joint

needed internal fixation. None of the conservatively managed fractures needed subsequent fixation.

### Post-traumatic Arthritis

This is the main concern for surgeons when they manage these injuries non-operatively. Even though radiological malunion does not necessarily equate to clinical symptoms, surgeons feel uneasy when there is malalignment and feel obliged to operate.

Lübbecke et al.<sup>20</sup> published a retrospective cohort study with 18 years of follow-up of all ankle fractures who underwent fixation. About 30% of all Weber B fractures showed advanced arthritic radiographic changes but only half of these patients were symptomatic. Weber C fractures, associated medial malleolar fracture, fracture-dislocation, increasing body mass index, and age of over 30 years were identified as risk factors for symptomatic arthritis. The results were similar to previous short to mid-term follow-up studies on ankle fractures that had been managed surgically.<sup>21,22</sup>

Rooney et al.<sup>23</sup> presented their results on non-operatively managed Weber B ankle fractures. Despite the small cohort of 51 patients, there were excellent functional results at 6.8 years. They also showed that a weight-bearing radiograph is a very useful tool in the management of these injuries. There are not many other studies on long-term outcomes of conservatively managed ankle fractures.

### CONCLUSION

Surgeons should practice by the Hippocratic oath of first do not harm. In Weber B fracture management, stable injuries can be well-managed non-operatively and avoid exposing them unduly to anesthetic and surgical complications. Stability can generally be assessed well with weight-bearing radiographs although careful follow-up is recommended.

Most surgeons will choose to operate on younger patients to avoid possible future harm, in terms of arthritis. Apart from some small studies, there are not any long-term studies, especially on conservatively managed ankle fractures. A large-scale prospective cohort study is needed to truly understand the natural history of managing these injuries non-operatively.

It is safe to treat these injuries non-operatively as long as the patients and their treating surgeons have weighed up the risks and benefits and come to an agreement on the management plan.

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