

Forensic Biomechanics/Functional Anatomy/Physiology -An Analysis of Foot/Ankle of Injuries: A Retail Store Defense Case

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Editorial

In forensic biomechanics, as experts we appreciate unusual cases and new challenges outside the box of auto accidents. This specific case involved the defense of a retail store in a claim of bilateral ankle/foot injuries involving a middle aged obese woman who reported that an end cap metal member holding rolls of carpet fell and impacted both of her feet. Importantly, this case illustrates why the biomechanist should also have a strong educational background in human structural/functional anatomy and human physiology in addition to Newtonian mechanics [1].

The plaintiff was in a department store shopping and stated in deposition that she needed to move the seven-foot rolls of rugs by reaching in between the two bars (i.e., supporting end caps). No surveillance recording was available and there were no independent witnesses. The plaintiff indicated that in order to lift a roll of carpet, you had to grab it and pull up ([reference to lifting the carpet roll by reaching in between the lower and upper support members]). She described that as she was attempting to lift the carpet roll to pull up, the whole display fell on her feet. She was wearing flip-flops at the time of this accident. The plaintiff described both end cap members dropping on her feet. However, photographic evidence taken at the scene only indicated that the lower long metal member had dislodged and dropped approximately 11 inches. The entire display did not fall, and the carpet rolls remained upright. In deposition testimony she indicated that it (end caps) hit and bounced off and went to the ground leaving a contusion on the top of her foot. However, in a previous audio recorded statement, the plaintiff stated that: "And, it was so painful that you can hear the very loud metal pieces falling and an employee, while I was unfortunately cursing because it hurt so bad and the metal pieces were still on my feet". This comment by the plaintiff indicated that the bar (i.e., end cap) stayed on top of her feet consistent with her feet not moving immediately after the impact. Therefore, this was consistent and argued for the plaintiff keeping her feet flat on the floor after the impact(s) to one or both feet [2].

Eight days later, the plaintiff went to an urgent care medical facility. Bilateral ankle/foot radiographs were unremarkable with respect to acute or subacute injury with an absence of fracture, soft tissue swelling, intramedullary lesions or calcifications. Bilateral inversion and eversion were normal for both the subtalar joints upon examination and all testing was negative for acute trauma to the ATF (anterior talofibular) and CF (calcaneofibular) ligaments. These ligaments resist excessive inversion motion of the foot-ankle complex. However, there was a 1cm by 1cm bruise on the dorsum (top) of her left foot near the distal end of her 3rd and 4th metatarsal areas (i.e., near her mid-foot toes). This was consistent with a metal end cap member weighing 4.5 lbs. dropping 11 inches to the top of her left forefoot.

At approximately seven weeks after this incident, the plaintiff saw an orthopedic specialist who found what he termed chronic lateral ankle laxity of the ATF and CF ligaments in the right ankle/foot along with a longstanding nonunion bone fragment at the distal right fibula.

The plaintiff indicated to her physician that she probably had some ankle sprains to both ankles during her early childhood but had not experienced any ankle sprains or other trauma to her ankles or feet since she was about five years old until the ankle trauma that occurred in the store some two months previous. The plaintiff was prescribed physical therapy to address this lateral-anterior ligament laxity [3].

After failing conservative treatment, the plaintiff had arthroscopic surgery some five months later to repair her right ankle-foot laxity. She was written a prescription for physical therapy for both ankles post-surgery. Her left ankle-foot was now also painful. It was noted in our medical chart review of this case matter that during the initial evaluation at physical therapy post-surgery, the plaintiff indicated to the physical therapist that she had broken her right ankle several years ago and tore several ligaments. She was unaware of exactly when this incident had occurred, but she indicated that x-rays showed an old fracture.

My approach in this matter was to examine the plaintiff's statements regarding her actions during this incident and perform an Injury Causation Analysis to examine the mechanism, of lack thereof, regarding the alleged injury to the right and left ankle-foot complex. There was no dispute regarding a drop of a metal member to her distal left foot and possibly to both of her feet. My analysis pointed out that such an event will not produce damage to the ATF and CF ligaments of the right or the left ankle-foot. This pathology (i.e., ankle-foot laxity) is not the result of an impact injury to the foot or to the ankle. Rather, it is the result of a tension load resulting primarily from excessive subtalar joint inversion leading to a significant strain or frank rupture of the ATF and/or CF ligaments. Her treating physician agreed on this point in deposition testimony. However, her treating physician opined that her reaction to the pain may have initiated reflexive motions that could have resulted in bilateral inversion ankle sprains. I pointed out during my deposition testimony that the flexor withdrawal reflex (FWR) and the contralateral crossed extensor reflex (CER) would not be expected to operate in such a way so as to result in coincident bilateral inversion ankle sprains. Furthermore, the plaintiff's audio recorded statement soon after this subject incident indicated that the "metal pieces" stayed on top of her feet after the impact. Her statement argued for stationary feet and in my view, precluded bilateral ankle-foot inversion trauma [4].

Finally, clearly in this matter, a careful and comprehensive

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medical chart review of the plaintiff's history by the biomechanics/functional anatomy expert was very important and contradicted what at first seemed to be reasonable "temporal correctness" in the plaintiff's advocate.

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