American Journal of Emergency Medicine 37 (2019) 1807.e5–1807.e7

Contents lists available at ScienceDirect

American Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/ajem

Case Report

Sharing the sidewalk: A case of *E*-scooter related pedestrian injury

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ARTICLE INFO

Article history:
Received 29 May 2019
Received in revised form 3 June 2019
Accepted 6 June 2019

Keywords:
Electric scooter
E-scooter
Pedestrian
Personal mobility device
Emergency department

ABSTRACT

The popularity of rideshare electric scooters is due to their availability, accessibility, and low cost. The recent increase in electric scooter use has raised concerns regarding the safety of both riders and pedestrians. Previous studies characterize the incidence and pattern of injury for riders, but there is a lack of literature concerning electric scooters' impact on pedestrians. Pedestrians injured by electric scooters face potential financial burdens from hospitalization costs, medical interventions, taking time off from work, and rehabilitation therapies. Based on prior studies, pedestrians who are most prone to injuries sustained by pedestrian transportation include individuals with vision and/or hearing impairment, young children, the elderly, and people distracted by mobile devices. We present a case involving a sixty-year-old female pedestrian who presented to the emergency department with an acute lumbar compression fracture after a collision with an electric scooter. This study highlights the safety risks and incidence of injuries for pedestrians associated with electric scooters, which can help shape public policy to ensure the safety of both riders and pedestrians.

Pedestrian vehicles such as the Segway ™, electric bike, and electric scooters have grown in popularity since their introduction in the early 2000s [1-3]. There are several benefits to their use including faster transit times than their conventional counterparts, reduced traffic congestion, and a more environmentally friendly alternative to motor vehicles [4]. However, there have also been concerns regarding the safety of riders and the impacts these vehicles have on those who share roads and sidewalks with them [5]. Given their popularity, availability, low cost, convenience, and usability, it is important to determine whether electric scooters have a serious impact on riders and pedestrians safety.

Several studies have examined the incidence and pattern of injury for riders, but few have reported on the injuries suffered by pedestrians due to use of Segways™, electric bikes, and electric scooters [6,7]. Trivedi et al. reported 249 patients who presented to the emergency department (ED) with electric scooter-related injuries, 8.4% of whom were pedestrians. Eleven were struck by a scooter, 5 tripped over a parked scooter, and 5 were injured while trying to lift or carry a scooter not in use [2]. A Swedish study analyzed the electric bicycling behaviors of twelve riders who completed 410 trips. Critical events, defined as crashes or near-crashes, involved pedestrians 31% of the time. This was more frequent than the involvement of any other group including motor vehicles, other bicycles, infrastructure, and animals [8]. A smaller case series of 44 Segway-related ED visits reported 4.5% pedestrian injuries [7].

There is a lack of literature detailing the injuries sustained by pedestrians of electric scooters. We present a case of a pedestrian struck by an electric scooter while walking on the sidewalk with multiple injuries and requiring hospital admission.

A 60-year-old female with a past medical history of celiac disease presented to the ED after being struck by an electric scooter while on the side walk on her way to work. She did not report any loss of consciousness or head trauma, but she endorsed bilateral lower abdominal pain and bilateral back pain along the iliac crests. She attributed the back pain to strike from the fall and the abdominal pain to strike from the handle bar of the scooter. The patient did not report chest pain, shortness of breath, or joint pain aside from mild left wrist pain. She denied weakness, paresthesia, and urinary/bowel incontinence.

Her vital signs were: BP: 115/66, HR: 85, RR: 16, T: 97.9, O2 Sat: 99% on Room Air. The abdominal exam revealed a soft abdomen with bilateral lower abdominal tenderness to palpation and otherwise was nontender throughout. She had tenderness throughout her back along the thoracic and lumbar spine. Her neurologic exam was unremarkable and the rest of her physical exam was normal.

At that time, the patient was sent to the radiology department. Computed tomography (CT) scan of the lumbar spine showed an acute compression fracture deformity of the superior end plate of L1 with mild (<20%) height loss of the vertebral body. The patient required neurosurgery consultation, and due to her pain, neurosurgery offered kyphoplasty versus a thoracic lumbar sacral orthosis (TLSO) brace. The patient initially asked for the brace but later changed her mind due to significant pain. She had a kyphoplasty without any complications.

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https://doi.org/10.1016/j.ajem.2019.06.017
0735-6757/

Table 1
Sampling of electric scooter use policies by jurisdiction

	Riding on sidewalk permitted	Helmet requirement	Minimum age (years)	Maximum speed (mph)
District of Columbia [13]	Permitted only outside of the central business district	No	16	15[a]
Arlington, VA [14]	Not permitted	Yes, if ≤14 years old	Abide by corporate policy	10
Los Angeles, CA [15]	Not permitted	Yes	18	15
State of California [16]	Not permitted	Yes, if ≤18 years old	–	15
State of Texas[a] [17]	Not permitted	Yes	16	15
State of Utah[a] [18]	Permitted	No	8	12.5
State of Massachusetts [19]	Permitted	Yes, if ≤16 years old	–	20
State of Delaware [20]	Not permitted	Yes, if ≤16 years old	–	Not specified
State of Minnesota [21]	Not permitted	Yes, if ≤18 years old	12	15
State of New Jersey [22]	Not permitted	Yes	–	19
State of Oregon [23]	Not permitted	Yes	16	15

[a] Legislation currently pending.

The patient was discharged on the third day after admission and had follow up with the neurosurgical team as an outpatient without further complications.

This case illustrates several important points in the discussion of the safety of personal electric vehicles, specifically electric scooters, and their impact on public health. It is important to consider the safety of not only the rider but also pedestrians.

Few studies have examined the pattern of injuries sustained by pedestrians in accidents involving electric scooters. In a retrospective analysis by Siman-Tov et al., a total of 795 patients were admitted for electric bike– and scooter-related injuries. Of those patients, 8.4% were pedestrians. Seventy-five percent of pedestrians were between ages 0–14 or older than 60. Most injuries were mild to moderate in severity, and the most commonly injured body parts were the extremities (64.2%) and head, face, and neck (53.7%). Several patients required advanced care including 32.8% who had surgery, and 10.5% who were admitted to the intensive care unit [9]. In fact, pedestrians were more severely injured; compared to electric scooter riders and electric bike riders, pedestrians have higher rates of head, face, and neck injuries; traumatic brain injuries; and hospital stays lasting more than a week [9].

Another factor to consider is the potential financial burden of pedestrian injuries. In the case presented here, the patient required hospitalization and a neurosurgery consult. The hospital costs alone may pose a financial burden to the patient, in addition to time required off from work or from caring for loved ones during and after her hospital stay. Patients may also require prolonged rehabilitation therapies and medical interventions following discharge. Particular groups that might face a higher risk of injury by personal mobility devices include people with vision and/or hearing impairment, young children, the elderly, and pedestrians distracted by mobile devices while walking [10].

Many electric scooter riders in urban areas ride on sidewalks shared with pedestrians, compared to bicycles which may have their own lanes or travel more frequently in the street with motor vehicles. Locally, electric scooters are considered to be “personal mobility devices” along with Segways™. Local law states that electric scooters are allowed on sidewalks outside of the central business district, but are forbidden from sidewalks within the central business district (Table 1). The downtown area and central business district are popular places to use electric scooters, and many riders are likely unaware of this regulation and ride inappropriately on the sidewalk. Although rideshare companies require users to park the scooters in a safe place on the sidewalk, some electric scooters are casually dispersed along the walkway, posing a risk for pedestrians. This implies that the self-enforced rules mandated by rideshare electric scooter companies are insufficient [2].

A standardized national policy does not exist outlining the requirements to use a rideshare electric scooter; laws differ between states and cities, with many areas outlawing electric scooter use on sidewalks and mandating riders to wear helmets [2]. However, even with the increasing popularity of this transportation option, only ten states had defined scooters in statutes, and eight of those had regulations in place at the end of 2018 [11]. It is important to keep in mind that the diversity in local legislation and corporate policies make it difficult to determine appropriate use of electric scooters on a larger scale. Table 1 outlines electric scooter policies in the eight states mentioned above that had laws regarding electric scooter use in place at the end of 2018. For an example, Table 2 describes the corporate policies of the six electric scooter operators in the District of Columbia. Furthermore, liability in cases involving electric scooters has yet to be fully established [6]. Depending on the circumstance and the location of the accident, either the rideshare company, the scooter rider, the local government, or insurers may be held liable [12].

Future studies should include all pedestrian injuries from various jurisdictions. It would be interesting to see how local laws affect customers' use of electric scooters and whether there is an impact on pedestrian injuries. Ultimately, these studies can inform future policy proposals for regulating these modes of transportation and keeping both riders and pedestrians safe.

Financial support

This is a non-funded study, with no compensation or honoraria for conducting the study.

Declaration of Competing Interest

The authors do NOT have a financial interest or relationship to disclose regarding this research project.

Table 2
Electric scooter providers and their policies regarding appropriate use

Company	Maximum speed	Helmet requirements	Where to ride	Age limit	Driver's license
Lyft [24]	15 mph	Recommended	Bike lanes or road	≥18 years old	Required
Jump [25]	18 mph	Recommended	Bike lanes or road	≥18 years old	Required
Skip [26]	18 mph	Required	Bike lanes or road	≥18 years old	Required
Bird [27]	15 mph	Recommended	Bike lanes or road	≥18 years old	Required
Lime [28]	14.8 mph	Required	Bike lanes or road	≥18 years old; ≥16 years old if supervised	Required
Spin [29]	15 mph	Recommended	Bike lanes or road	≥18 years old	Required

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