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Oral and maxillofacial injuries from electric scooters in Bristol; a retrospective observational study

Abstract

The ‘Voi’ (Voi technology, Stockholm, Sweden) electric scooter (e-scooter) pilot scheme was initiated in Bristol, Bath and parts of the Southwest on October 29th 2020. The trial was started by West of England Combined Authority in partnership with Bath & North East Somerset Council, Bristol City Council and South Gloucestershire Council. The pilot scheme operates on a short term rental basis, with speed limits set in certain areas. However, a number of studies have reported an increasing number of e-scooter related injuries referred to specialties such as Oral and Maxillofacial Surgery, placing strain on already overstretched health resources.

Keywords:

Electric, scooter, trauma, OMFS, Bristol, accident

Aim

The aim of this study was to describe the patient demographic and patterns of oral and maxillofacial injuries related to the use of e-scooters in the Bristol area, in order to target public safety interventions at high-risk groups.

Method
Data were collected retrospectively from patients attending Bristol Royal Infirmary (BRI) Emergency Department (ED) over a 6 month period, from October 29th 2020 (the first day of the e-scooter pilot scheme), to May 31st 2021. The Medway (System C, Maidstone, UK) medical records system was used to identify all patients who presented to ED over the last six months, by searching for the term 'scooter' in their presenting complaint. Referrals to Oral and Maxillofacial Surgery were distinguished using the departmental trauma logbook. Baseline patient characteristics were collected for all patients, including age and sex, in addition to their level of intoxication (from recreational drugs or alcohol) and whether or not they wore a helmet. These data were reported using median and range for continuous data, alongside counts and percentages for categorical data. The number of admissions, acquired oral and maxillofacial injuries, alongside any other injuries sustained were reported as proportions.

**Results**

A total of 42 patients attending ED had the search term ‘scooter’ in their initial presenting complaint. Of these 33 were male and only 9 were female, with a median age of 26 years. Almost half of all presentations reported injuries in the oral and maxillofacial region. The most common mechanism of injury was falling from an e-scooter. The proportion of patients who were intoxicated and not wearing a helmet were approximately one third and slightly less than one third respectively. The majority of patients (n= 35) were discharged from ED without follow-up, with only n= 7 requiring admission. The total number of Oral and Maxillofacial Surgery admissions over this 6 month period was n= 3.
Conclusions

Due to the rise in popularity of e-scooters, trauma injuries associated with their use is increasing. This study highlights the high proportion of injuries involving the oral and maxillofacial region and the high percentage of people who are either intoxicated or not wearing helmets. The majority of injured users in this pilot scheme appeared to be young males. Understanding the local epidemiology of e-scooter injuries will help authorities to target public safety interventions at high-risk groups. The results of this study will be shared with the West of England Combined Authority, in order to improve future e-scooter policy making and safety implementation in this region.
Introduction

The Swedish micromobility company launched an electric scooter (e-scooter) pilot scheme with Voi technology (Stockholm, Sweden) on the 29th of October in the Bristol area as part of a trial led by the West of England Combined Authority. This was part of a larger government investment of £90 million to trial e-scooters in four areas around the United Kingdom, which have been designated as ‘future transport zones’ 1. The pilot scheme was initiated for 12 months, as a carbon neutral alternative to public transport 2. The popularity of e-scooters has risen, with flexible, easy access via smartphone application and low cost premiums. To improve the safety of the e-scooter use, their use on footpaths is prohibited and privately owned electric scooters remain illegal. Furthermore, global positioning system (GPS) technology is used to restrict speeds and access in certain zones. Those who hire e-scooters must hold a valid driving licence and be over 18 years of age 3.

A number of previous studies have already reported an increasing number of e-scooter related injuries referred to specialties such as Oral and Maxillofacial Surgery, placing strain on already overstretched health resources 4-5. E-scooter riding can result in injury due to falls or collision with other vehicles. The risk of injury has been reported to be associated with a variety of factors ranging from the ergonomics to intoxication 5-9. We collected data over a 6 month period of the ‘Voi’ pilot scheme in from the Bristol Royal Infirmary (BRI) which is a large University teaching hospital, providing level 2 trauma and accident and emergency services to the population of Bristol (estimated to be ~ 465,900) 10. The aim of this study was to describe the patient demographic and patterns of oral and maxillofacial injuries related to the use of e-scooters in the Bristol area, in order to target public safety interventions at high-risk
groups. The data from this study will then be shared with WECA to improve policy around safety of the ‘Voi’ electric scooters especially targeting higher risk groups.

**Method**

Data were collected retrospectively from patients attending Bristol Royal Infirmary (BRI) Emergency Department (ED) over a 6 month period, from October 29th 2020 (the first day of the e-scooter pilot scheme), to May 31st 2021. The Medway (System C, Maidstone, UK) medical records system was used to identify all patients who presented to ED over the last six months, by searching for the term ‘scooter’ in their presenting complaint. Referrals to Oral and Maxillofacial Surgery were distinguished from these using the departmental trauma logbook and admissions, discharges or self-discharges were documented. Our definition of an oral and maxillofacial injury was any soft tissue sustained on the head and neck, and/or any bony fracture to the skull or facial bones, and/or diagnosis of head injury.

Baseline patient characteristics were collected for all patients, including age and sex, in addition to their level of intoxication (from recreational drugs or alcohol) and whether or not they wore a helmet. These data were reported using median and range for continuous data, alongside counts and percentages for categorical data. The numbers of Oral and Maxillofacial Surgery admissions, acquired oral and maxillofacial injuries, alongside any other injuries sustained were reported as proportions.
Results

A total of 42 patients attending ED had the search term ‘scooter’ in their initial presenting complaint. Of these 33 were male and only 9 were female, with a ratio of approximately 4:1. Patient age ranged from 17 – 62 years old, with a median age of 26. Almost half (43%) of all presentations reported injuries in the oral and maxillofacial region (n= 18). Head injuries were sustained in 13 patients with 11 patients having a computerised tomograph (CT) head scan. The most common mechanism of injury was falling from an e-scooter, followed by collision with a car, other obstacle or pedestrian  (Fig. 1). There was an increasing trend in the number of patients presenting with e-scooter injuries over the course of the 6 month pilot scheme (Fig. 2).

**Figure 1.** A pie chart illustrating the mechanism of e-scooter injury.
Over one third of patients were intoxicated on presentation to ED. Only 2 patients were reported to be wearing a helmet at the time of injury, versus one fifth not wearing one. However, just over half of records failed to document whether a helmet was worn or not. The majority of patients (n= 35) were discharged from ED without follow-up, with only n= 7 requiring admission for neurology observations or orthopaedic trauma. The total number of Oral and Maxillofacial Surgery admissions over this 6 month period was n= 3. Of those admitted under Oral and Maxillofacial Surgery, all three were male with an age range of 21 – 28 years. Injuries sustained included two parasymphysial fractures, both in combination with condylar fractures, which required open reduction and internal fixation. Both cases also presented with chin lacerations which required debridement and suturing. One patient had a frontal sinus depression injury, also requiring open reduction and internal fixation, via bicoronal flap access.
Discussion

E-scooters were first introduced in 2017 and are now a common feature of urban cities worldwide. The use of electric scooters is rapidly growing as a replacement for short distance transport, while policy makers struggle to enforce safety surrounding their use. They compete with pedestrians, motor vehicles and bicycles, being under same jurisdiction of the Highway Code, adding a level of complexity to transport. Other similar modes of transport such as the Segway (Segway Inc., Beford, USA) have not been as widely accepted and therefore fewer accidents have been reported with their use over the past two decades.

This study is the first in the Southwest England region to highlight a number of safety concerns and serious breaches of local e-scooter regulations. Firstly, there were injured riders under the age of 18 (age range from 17 – 62), which suggests older persons with a valid licence may be hiring the scooters for younger people. More worryingly, a high proportion of injured users were intoxicated (33%). This figure is at the upper end of current estimates, with the prevalence of e-scooter injuries related to alcohol, thought to be between 5 – 33%. Finally, although a small proportion, injuries involving pedestrians in the mechanism of injury, which suggests a risk to others crossing roads or the use of e-scooters on pavements. Going forward, Bristol e-scooters are to be fitted with cameras to stop people riding on pavements which could help prevent such activity.

A study by Kobayashi et al. investigating e-scooter related injuries at three level 1 trauma centres in the USA, found facial fractures were the second most common injury at 26%, with the third being intercranial haemorrhage at 18%. Several other recent studies have cited the
oral and maxillofacial region as frequently involved in e-scooter injuries, with proportions ranging from 20 – 58% 4, 7, 15, 16. Our study confirms this, with just under half of all cases presenting to ED having injuries in the oral and maxillofacial region. Trivedi et al. found that fall was by far the most common mechanism of injury at 80%, which again is in keeping with our results 6. More work may need to be done to improve the ergonomic design of e-scooters in order to prevent falls, something which manufacturers will need to take into consideration for future models.

There are a number of limitations in this study. Given the data were collected retrospectively, there may be inherent selection bias as only patient triage notes which recorded ‘scooter’ in the presenting complaint were included. Therefore, we may have underestimated the number of e-scooter injuries in this region during this period. As we were accessing medical records, they did not contain high-level detail about the scooter use, which may have been interesting from an epidemiological perspective. For example, whether or not the patient was riding ‘Voi’ or an illegal scooter could be collected in future studies, to determine if illegal e-scooter use is the cause of more injuries than regulated e-scooters. Further sanctions on illegal e-scooter activity could potentially help reduce injuries. Similarly, it would be interesting to know the timing of when injuries presented e.g., if alcohol was a factor from people drunk driving home after a night out or if the rider was wearing headphones or experienced any other distraction which may have led to the injury. Going forward, it would also be useful to evaluate the injury incidence prospectively over a longer period of time to determine if the same patterns hold true and to compare e-scooter injury in the context of other road traffic accidents using e.g., bicycles, cars, motorbikes etc...
Conclusion

Due to the rise in popularity of e-scooters, trauma injuries associated with their use is increasing. This study highlights the increasing proportion of injuries involving the oral and maxillofacial region. Therefore, the specialty must prepare for a rise in the number of trauma cases as a result of injury from e-scooters, which will be higher in regions which have piloted and now adopted their use. Of concern, is the large number of people who attended ED either intoxicated or not wearing helmets. More enforcement by the appropriate authorities is required to prevent this recurring. We can learn from previous successful public safety messages and legal action e.g., for seatbelt wearing 17 and drink driving 18, to implement similar strategies for e-scooters. The majority of injured users in this pilot scheme appeared to be young males. Understanding the local epidemiology of e-scooter injuries will help authorities to better target public safety interventions at these high-risk groups. The results of this study will be shared with the West of England Combined Authority, in order to improve future e-scooter policy making and safety implementation in this region.

Conflicts of interest:

The authors declare no conflicts of interest.

Author contributions

FA, GC and PS collected the data from and analysed the data and wrote the initial draft of the paper. MG helped to interpret the data, editing drafts and final version of the publication. SJT
supervised this project and edited drafts. All authors agreed on the final version of this paper for publication.

References


