

Oral and maxillofacial injuries associated with e-scooter use at Broomfield Hospital: a cohort study of 24 months of data since e-scooter legalisation in the UK

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Key points

Looks at referral rates to oral and maxillofacial surgery (OMFS) from patients sustaining e-scooter injuries since legalisation in the UK.

Examines demographic data, associated factors and management required of OMFS patients using e-scooters.

Discusses how the use of alcohol increases the complexity of injury, requiring referral to dual specialities.

Abstract

Introduction Rental electronic scooters (e-scooters) were legalised in July 2020 in the UK for use on public roads. This has led to higher numbers of emergency department (ED) attendances for head and neck injuries managed by the oral and maxillofacial surgical (OMFS) department.

Aim The aim of this research is to assess the increase in e-scooter injuries requiring OMFS input and analyse factors and management associated.

Method Data were collected over a 24-month period. A total of 212 e-scooter-related ED presentations were recorded, with 34 patients requiring input from the OMFS department. For the patients referred to OMFS, numerical and categorical factors used independent T-tests and one-way Analysis of Variance tests, respectively, to determine statistical significance at the 5% confidence level ($p < 0.05$).

Results The mean age was 32.8 years (SD = 15.9) in a predominately male cohort (79.4%). Alcohol intoxication was observed in 55.8% of accidents. Injuries were most common on Saturdays (41.2%). Soft tissue injuries were present in 64.7% of patients, bony injuries in 38.2% of patients and dental injuries in 11.8% of patients. Imaging was required for 76.5% of patients. In total, 44% of patients required surgical treatment, 5.9% required major surgery and 38.2% required minor surgery.

Conclusion This research supports the literature suggesting significant growth in e-scooter-related injuries and their associated burden of conditions managed by the OMFS department.

Introduction

Electronic scooters (e-scooters) were first introduced in California, USA, in 2012 and trialled rental use was legalised on 4 July 2020 for use on UK public roads. Implementation

by the UK Government was expedited in response to the COVID-19 pandemic as they allow for social distancing as opposed to other forms of transport.^{1,2}

At the time of writing, e-scooter UK trials are still ongoing, surpassing the original deadline of November 2021, whereby regulatory changes may be imposed upon review.³

At our oral and maxillofacial surgery (OMFS) unit, we have seen an increase in facial injuries related to this form of transportation. The aim of this paper was to assess the increase in number of referrals to the OMFS service at Broomfield Hospital as a direct result of e-scooter use since their legalisation in July 2020. This paper also further reports on the type and severity of injuries incurred and management required.

Materials and methods

Data collection methods

This was a double cohort study. Data collection was prospectively for a six-month period from 1 January 2022 to 30 June 2022 and retrospectively over an 18-month period from 1 July 2020 to 31 December 2021.

Inclusion criteria included patients sustaining e-scooter-related injuries referred to the OMFS team. Multiple sources were utilised for data collection: the emergency department database, daily OMFS handover documents and OMFS bleep trackers, which are used 24/7 by the on-call OMFS team. Patients of all ages were included in the study.

Data collection recorded:

- Patient demographics – age, sex
- Date of injury

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- How patient travelled to hospital – self or ambulance
- Mechanism of injury – if alcohol involved/involved others (road traffic collision/pedestrians)
- Environment – leisure/commuting
- Safety precautions taken – helmet
- Injuries – soft tissue ± hard tissue
- Associated injuries – orthopaedic
- Investigations – x-rays/computerised tomography (CT) scan
- Management – treat and discharge, conservative, surgical operative, admission required.

Basic descriptive analysis was performed for the patients referred to OMFS. Numerical and categorical factors used independent T-tests and one-way Analysis of Variance tests, respectively to determine statistical significance at the 5% confidence level ($p < 0.05$).

Results

A total of 212 e-scooter-related Accident and Emergency (A&E) presentations were recorded, with 34 patients requiring management by the maxillofacial service (Table 1).

Retrospective data

Over an 18-month period, there were 97 e-scooter-related A&E presentations at Broomfield Hospital, with 20 referrals made to the OMFS team.

Prospective data

For a six-month period, there were 115 e-scooter-related A&E presentations at Broomfield Hospital, with 14 referrals made to the OMFS team.

Year comparison of referrals to OMFS for e-scooter-related injuries

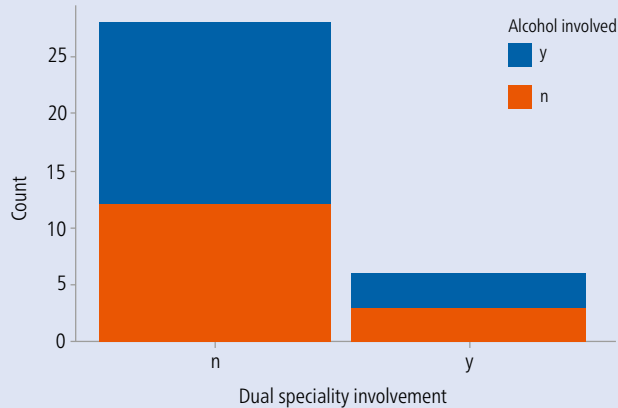
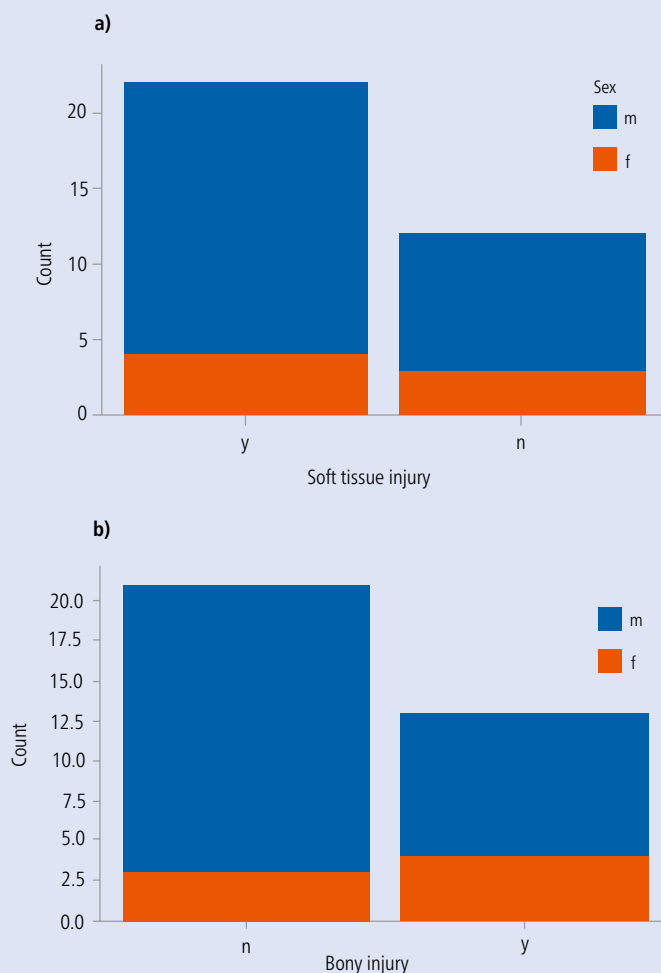
For the period of July 2020 to July 2021, a total of nine patients were referred. For the period of July 2021 to July 2022, 25 patients were referred to OMFS.

Descriptive analysis

The majority (47.1%) of patients were aged between 10–29 years. The mean age was 32.8 years and the median age 30.0 years, with a standard deviation of 15.9. The average age for a woman was 25.6 years; for men, this was 34.7 years. Over two-thirds of the patients were men (79.4%). In total, 19 patients (55.8%) reported having consumed alcohol before the e-scooter

Table 1 Absolute numbers of patients in observed feature groups with corresponding proportions in percentage

Feature	Number of patients	Percentage of total patients (%)
Age (years)		
0–17	3	9
18–64	30	68
65 and over	1	3
Sex		
Male	27	79
Female	7	21
Day of the week		
Monday	3	9
Tuesday	2	8
Wednesday	3	9
Thursday	2	8
Friday	5	14
Saturday	13	38
Sunday	6	18
Mechanism of injury		
Fall	33	97
Road traffic accident	1	3
Helmet worn		
Yes	0	0
No	28	82
Not stated	6	18
Soft tissue injury		
Yes	22	65
No	12	35
Bony injury		
Yes	13	62
No	21	38
Dental injury		
Yes	4	12
No	30	88
Dual speciality involvement		
Yes	6	18
No	28	82
Imaging required		
Yes	26	76
No	8	24
Imaging modality		
X-ray	26	76
CT	17	50
Management type		
Conservative	19	56
Minor surgery	13	38
Major surgery	2	6
Admission		
Yes	3	9
No	31	91

Fig. 1 Number of patients requiring dual speciality involvement and involvement of alcohol**Fig. 2** Number and gender of patients sustaining a) soft tissue and b) bony injuries

incident. There were no patients reported as wearing a helmet at the time of injury.

The majority (70%) of patients presented over the weekend; the most frequent day

of presentation was a Saturday. In the retrospective study, summer months (June, July and August) had the greatest frequency of attendances.

All of the patients were the drivers of the e-scooter at the time. All patients were using e-scooters for leisure as opposed to commuting and ten patients were brought in by ambulance.

Imaging was required for 76.5% of patients. Soft tissue injuries were present in 64.7% of patients, bony injuries in 38.2% of patients and dental injuries in 11.8% of patients.

The most common injury was facial lacerations (21 patients), with 13 of these requiring suturing, while other injuries included facial fractures (nine patients), dental injuries (three patients) and temporomandibular joint effusion (one patient).

Overall, 44% of patients required surgical treatment, 5.9% required major surgery, 38.2% required minor surgery and 50% of patients required maxillofacial follow-up.

Non-facial injuries were reported in five patients, of which involved a C1 spinal injury and fractures of the clavicle, elbow, wrist and radius.

In addition to univariate analysis, bivariate analysis showed: Patients that consume alcohol are more likely to require dual speciality involvement ($p < 0.05$) (Fig. 1). Men are more likely to sustain soft tissue and bony injuries ($p < 0.05$) (Fig. 2).

Discussion

Broomfield Hospital serves a population of 1.3 million, as part of the Mid and South Essex NHS Foundation Trust, which is the second busiest hospital trust in England. The OMFS on-call service operates 24/7. Our results are from a regional trauma centre serving the majority of the county of Essex, but we believe the findings are extrapolatable to other counties in the UK, as not all patients sustaining injuries may have been captured. Included in this study are patients referred to the OMFS service, so does not capture patients with minor facial trauma, such as isolated lacerations that may have been managed by emergency department doctors or referred to other services. Some patients may have presented to general dental/medical clinics and managed and finally, some patients may not present at all.⁴

The first national lockdown was on 23 March 2020 whereby non-essential businesses were closed and people ordered to stay at home, permitted to leave for essential purposes only. This restriction on leaving home was lifted on 1 June 2020, permitting people only to meet outside in groups of up to six people. On 4 July

2020, hospitality reopened but were instructed to shut between 10 pm and 6 am. On 14 October 2020, the government introduced a three-tier system which continued similar restrictions to the previous national rules, with Essex being placed into tier 4 (highest restrictions advising to stay at home) on 23 December 2020. This continued as the government set out a 'road map' to easing restrictions gradually over a six-month period until 21 June 2021.⁵ Lockdowns may have contributed to the lower numbers of injuries in this time, as the year July 2020 to July 2021 found nine e-scooter-related injuries, whereas July 2021 to July 2022 showed 25 patients with e-scooter-related injuries.

The data presented in this paper confirms the frequency of referrals for e-scooter related injuries has increased by 50% compared with the same period in the preceding year based on the comparable data – emergency department referrals. It is notable that not only are the number of patients requiring maxillofacial input increasing, but the demographics and environment in which these injuries are frequent is parallel to internationally published literature from countries including New Zealand, Australia, USA, Denmark, the Netherlands, Lithuania, Vienna, Singapore and Columbia.^{6,7,8,9,10,11,12}

The data found that 44% of patients required surgical treatment, 5.9% required major surgery and 38.2% required minor surgery. Surgical treatment required by patients was classified as major or minor surgery; major surgery was defined by the requirement of general anaesthetic and consisted of reduction of facial fractures, while minor surgery involved soft tissue laceration closures under local anaesthetic.

Statistically, and similarly to other research in this area, weekend injuries are most common, with a significant proportion of patients sustaining injuries on a Saturday. Men are more likely to sustain injuries, including both soft tissue and facial bone fractures. Imaging is likely to be required and the management type is most commonly minor surgery. Furthermore, on assessment of two factors, patients that had consumed alcohol were more likely to require dual speciality involvement, such as orthoptics and orthopaedics. Alcohol is known to impair cognitive function, particularly in tasks related to attention, memory, logical reasoning and visual perception.^{13,14}

It has been well-documented in the literature that the most common injuries when

sustaining an e-scooter injury are to the head and face¹⁵ and intoxication is a common factor. All patients were riders rather than colliding with e-scooters, echoed in literature.¹⁶ It may be the case that alcohol use is underestimated, as this is only noted if the patient discloses it and so may be omitted.

E-scooters are desirable as they are a fast and environmentally clean way to travel, easing the burden on transport networks. In the UK, only rental e-scooters are permitted on public roads, as they have a speed limit of 15.5 mph and in populated cities, there are 'go-slow' areas whereby the limit is 8 mph to keep pedestrians safe.¹⁷

Privately owned scooters can exceed speeds of 30 mph and do not have the same safety features as rental scooters, such as signalling ability or lights. Although illegal, it is common to see privately owned scooters on public roads.¹⁸

In 2021, the UK Government included e-scooters within Section 5 of the Road Traffic Act 1988 to prohibit alcohol use before use; however, placement of e-scooter docks seems ever popular outside public houses and social hubs, encouraging use when under the influence.¹⁹ There is currently no legislation stating helmet use or protective clothing is required when using e-scooters in the UK.

Limitations

While this is the first study, to our knowledge, of maxillofacial trauma associated with electric scooter use to provide data on a full 18 months of emergency department visits, these control data are retrospective, therefore limited to available emergency department software data in contrast to the prospective data. The prospective data were captured via handovers, bleep trackers and the emergency department software, hence this may underrepresent the number of injuries in the control group.

It can be stipulated that the regional and local lockdowns due to COVID-19 may play a role in the lower numbers of incidences in 2020–2021 period.

Conclusions and clinical relevance

E-scooters are a rapidly expanding form of transportation that have the ability to reduce traffic congestion, reduce emissions and allow individuals of all incomes affordable travel. It is clear from this study that e-scooter-related maxillofacial injury represents a modern mechanism of injury associated with significant

facial trauma. Many of these patients required urgent radiology imaging, further specialist consultation and management. This results in a treatment cost that adds a significant burden on the NHS.

As our findings demonstrate, use of alcohol increases the complexity of injuries requiring dual speciality involvement. This aligns with previous studies on the negative impact of alcohol on cognitive abilities and increases the risk for a road trauma accident requiring hospitalisation.²⁰

As all patients in this study received a head or face injury and 82% of patients were not reported to be wearing a helmet, the logical safety modification would make wearing helmets mandatory for all riders of e-scooters. A challenge is faced whereby most patients are usually intoxicated and compliance is likely to be low.

Legislation is urgently needed and we recommend that: riders have a full UK driving licence as opposed to a provisional; riders must use helmets; and it should be encouraged to use e-scooters without alcohol, by moving docks to leisure locations rather than city centres on busy roads and in close proximity to bars and pubs. This would hope to encourage safe use with a lower risk of morbidity and less pressure on NHS services.

Ethics declaration

The authors declare no conflicts of interest. Ethical approval was not sought as this is not required for a retrospective observational study. Ethical approval is only required for research purposes which is not in the remit of this data or study. This has been confirmed by the audit department at Broomfield Hospital.

Author contributions

Kate Jones: initial idea of study, liaised with audit department at Mid Essex Trust for data, drafting article and submission of manuscript. James Parkin: utilised expertise in data analysis and statistical tests to approve hypothesis. Neelam Rathod: provided guidance in study design, data to collect and how to apply relevant data to draw conclusions. Vyomesh Bhatt: mentor through project, advice on data collection necessary and submission of abstracts.

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