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## Introduction

Electronic cigarettes (e-cigarettes) are a fairly recent invention which substitutes conventional cigarettes. The use of e-cigarettes is on the rise as these devices are often marketed as being a safer alternative to cigarettes. The dangers of injury from explosions are often not specified. E-cigarette battery explosions have been reported to cause burn injuries of varying severity and even death. Several case series, including systematic reviews have been published. We present the largest case series so far to our knowledge treated at Mersey Burn Centre.

**Aim:** to evaluate e-cigarette burns treated at Whiston Hospital and identify any salient issues and points of potential intervention to reduce injury.



## Figures



## Methods

A retrospective study was conducted by reviewing electronic records of e-cigarette burns in the patient database at Mersey burns centre. A total of 33 burns related to e-cigarette explosions were identified between 2015 and 2020.

Several key data were collected in relation to the injuries, including:

- **Demographics:** age, sex, co-morbidities
- **Features of Burn:** location, size, depth, mechanism, whether or not the device exploded while in use
- **Management:** first aid, time taken to reach hospital, hospital admission, type of treatment, complications
- **Follow Up:** time to complete healing, outcome

## Results

- A total of **32** patients were included
  - One patient excluded because of insufficient data.
- Age range: 22 -73 years.
- The majority of cases (88%) were male. (Fig. 1)
- 41% of victims had co-morbidities at the time of their injury. (Fig. 2)
- The majority explosions (87.5%) occurred while the e-cigarettes were not in use. (Fig. 3)
  - mostly when stored in pocket
- The commonest body part injured was the thigh (60%). Hands were the second commonest injuries with 34% of patients sustaining hand injuries .
- Most cases presented with mixed depth burns (40.6%). Partial thickness burns were next most common presentation (34.4%). (Fig. 4)
- The mean TBSA of burn was 1.99%, (median 1.5%). The largest TBSA was 7.5%.
- The majority of patients (61.3%) healed with no complications. (Fig. 5) For those that had complications, infection was the commonest cause. (Fig. 6).
- 6 patients required surgery in the form of excision and grafting while the rest were managed conservatively.
- The mean time for healing of injuries was 5 weeks.

## Discussion

The injuries sustained by our patients impacted them in various ways including time spent in hospital and off work, pain and scarring. Common themes observed in our case series were reports of e-cigarette devices or batteries being in contact with keys or loose change in the pockets suggesting short-circuiting as one cause for explosions. This information is not well publicised. There are no safety design features we are aware of that protects against this. We recommend future design of e-cigarettes is undertaken in such a way as to mitigate this risk – ideally becoming a mandatory requirement.

## Conclusions

We have demonstrated numerous injuries to patients from use of these devices. Furthermore, there is a need to raise awareness on the dangers of e-cigarettes, and in particular the potential for short-circuit due to contact of batteries with keys or loose change. This is not a well-recognised or publicised danger, and our study shines a new light on this particular issue. Manufacturers in particular can do more to improve the design and safety of e-cigarettes, and raise public awareness.

### RECOMMENDATIONS

1. Addition of a protective layer to the device or cases for the batteries.
2. Design of a secure case that can be attached to trouser belts to avoid storage of devices in pockets where they could come into contact with metal objects.
3. A need to increase public awareness of the dangers of these devices, especially risk of short-circuit of batteries and how to avoid this.

## References

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