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Tram-related injuries in Sheffield

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Abstract

The aim of this study was to identify the nubmer of accidents and types of injury related to the Supertram system in Sheffield. Data was collected prospectively over an 18 month period, commencing in April 1994, on all patients attending the Accident and Emergency department at the Royal Hallamshire Hospital whose injuries were related to the tram system. Ninety patients were included in the study, 54 males and 36 females with a median age of 39 years (range 16–82), representing approximately 0.13% of the patients attending the department during the study period. Forty one patients were cyclists, twenty three pedestrians, twelve were motorists or motorcyclists and fourteen sustained injuries due to ongoing construction work.

Thirty one patients sustained fractures, most commonly involving the upper limb/shoulder girdle (63%), with cyclists suffering 83% of these seriuos upper limb injuries. Following assessment 38 patients were discharged, 29 patients were referred to fracture clinic, 12 were sent for physiotherapy and 11 admitted to hospital. Eight patients required a total of 13 operations during the study period.

We have demonstrated a significnat number of injuries in this study related to the tram system in Sheffield. Cyclists appear to be the group at highest risk, followed by pedestrians and motor vehicle users.

1. Introduction

The city of Sheffield thought it had seen the end of the tram era when the last of the old style tramcars completed its final journey on the 8th October 1960 [1]. However, during the last two decades urban light rail systems have become increasingly popular across Europe and North America due to their excellent record regarding passenger safety, environmental protection and relief of traffic congestion. As the volume of traffic in Sheffield increased exponentially from the late 1970s to the mid 1980s, it became apparent that buses alone could not provide the answer to the city's public transport requirements. The construction of the Sheffield Supertram was commenced in 1991and the first line became operational in March 1994. During the final decade of the old Sheffield tram system there were an average of 60 serious tram-related accidents per year, and recent reports have highlighted the dangers to both pedestrians, cyclists and motorists posed by modern light rail systems [2,3]. We decided therefore, to conduct a prospective evaluation of tram-related injuries in Sheffield following the introduction of the Supertram system.

1.1. Methods

Patients attending the Accident and Emergency Department at the Royal Hallamshire Hospital (approximately 45 000 new patients seen anually) between April 1994 and November 1995, whose injuries were related to the new tram system, were identified. In each case the date, time and mechanism of the accident were recorded. Particular attention was paid to the outcome after hospital attendance, the injuries sustained and their subsequent management.

2. Results

A total of 90 patients attended with injuries related to the Supertram, of whom 54 were male and 36

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female, with a median age of 39 years (range 16–82). During the 18 months of this study a total of approximately 67 500 new patients attended the Accident and Emergency Department at the Royal Hallamshire Hospital, and patients with tram-related injuries therefore made up 0.13% of the workload. Forty-one cyclists sustained tram-related injury during the study and they formed the largest group of patients. Twenty-three patients were pedestrians involved in accidents related to the trams or tracks. This group comprised pedestrians being injured by direct contact with a tram ($n = 7$) and those falling over the tracks when crossing them ($n = 16$). Most of these injuries occurred in the evening and alcohol consumption was suspected to have played a part in 10 of these accidents. Twelve people were involved in motor vehicle accidents, of whom seven were car drivers or passengers and five were motorcyclists. All drivers described a sensation of losing control of their vehicle as their wheels ran over or along the tram tracks. The vehicles collided with the kerb in five cases, roadside signs or bollards in four cases, other vehicles in two cases, and in one case with a stationary tram. Eight of the drivers (five car and three motorcyclists) implicated wet conditions as a contributing factor in the accident.The remaining patients sustained injuries related to the construction works. The timing and aetiology of these injuries in consecutive three month periods is shown in Fig. 1. Following their initial assessment in the Accident and Emergency Department patients were either discharged from any follow-up, referred to fracture clinic, sent for physiotherapy or admitted to hospital. The outcome following hospital attendance with a tram-related injury is shown in Fig. 2.

The injuries sustained were classified into one of the following categories: minor soft tissue (defined as those requiring no further treatment after initial assessment), major soft tissue (those requiring further treatment, e.g. physiotherapy, or assessment in fracture clinic), fractures and head injuries. The percentages of the injuries sustained falling into each category are shown in Fig. 3. The anatomical site of the 31 fractures is shown in Table 1. The upper limb/shoulder girdle was the most common site of fracture (63%) and cyclists were involved in 83% of these cases. The anatomical distribution of soft tissue injuries was more even with 25 injuries involving the upper limb, 22 of the lower limb, six head and neck and two of the torso.

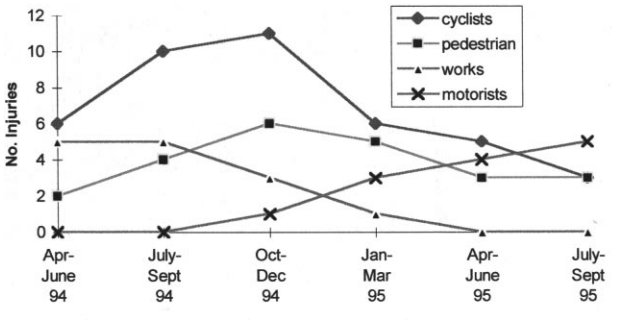

Fig. 1. Timing and aetiology of tram-related accidents.

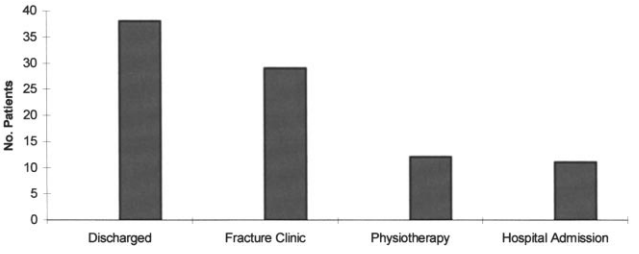

Fig. 2. Outcome following attendance with tram-related injury.

Eleven patients were admitted to hospital, with six undergoing an operation at this admission. Two further patients, seen initially in the fracture clinic, underwent surgery at a later date. Of the eight patients who underwent surgery, two required further surgery, one eventually having five operations. In total these patients required 18 hospital admissions with a mean duration of 7.5 days (range 1–38), and a total of 13 operations. Thirty-eight patients were seen in fracture clinic and in total 168 clinic appointments were used (mean 4.28: range 1–22) during the three year follow-up period.

3. Discussion

Light rail systems have become increasingly popular in the last 20 years as a method of urban transport. The system in Sheffield, however, was the first in the UK to fully integrate trams, cars, other vehicles and cyclists in certain areas. The highest number of accidents were amongst cyclists, with the most commonly described scenario being one where the cycle wheels became stuck in the tram tracks resulting in loss of control of the cycle. Initially there were a large number of cyclists sustaining injuries but, following a period of local

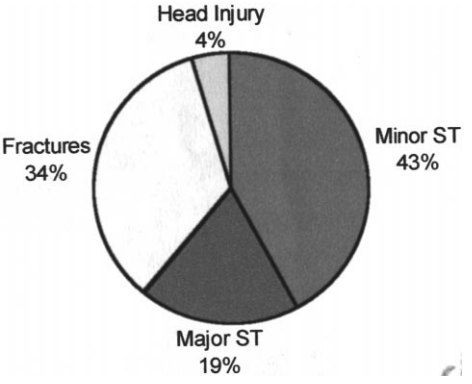

Fig. 3. Type of injury sustained.

Table 1
Fracture site distribution

Anatomical site	No. fractures
Hand/finger	4
Wrist	6
Elbow	5
Humerus/clavicle	5
Foot/ankle	8
Hip	2
Ribs	1

media attention to this particular problem, the level of cycling accidents fell sharply. This group consisted predominantly of young males (median age 31 years) and only six accidents involved female cyclists. There were, however, a significant number of serious injuries in cyclists especially upper limb fractures ($n = 15$). In addition, five cyclists sustained lower limb fractures and one a significant head injury requiring hospitalisation. Overall, 20 of the 31 one fractures included in this study (65%) occurred in cyclists, highlighting the dangers that tram tracks pose to this group of people.

Throughout the time period studied there was a steady rate of injuries amongst pedestrians from both the tracks and trams themselves. More female pedestrians ($n = 13$) than males ($n = 10$) were injured and the previously described pattern of these injuries predominantly occurring in middle-aged males [2] was not repeated in this study. The consumption of excess alcohol was believed to have played a part in ten of these accidents (40%), a figure which is less than those previously reported for both tram- and train-related injuries [2,4].

In the second half of the study, coinciding with the opening of stretches of tram tracks incorporated into roads, accidents involving motor vehicles, both cars and motorcycles, started to be reported. In the majority of cases the accident occurred due to loss of control of the motor vehicle on the tram track, with wet conditions being partly to blame according to the drivers in eight out of 12 cases. Studies conducted in Amsterdam have shown that identifying accident "blackspots" and separating trams from other vehicles and bicycles in these areas, can lead to a significant reduction in accidernts [3]. However, the Sheffield system was built in full knowledge that in certain areas there was no alternative other than to have tram tracks running along the road surface used by other motor vehicles. In this situation therefore, it is difficult to address this problem other than advising motorists to avoid driving along the tracks and reducing the speed limit in proven accident areas.

This study demonstrates a significant number of accidents occurring in the city of Sheffield following the opening of the Supertram system. Cyclists were the most at risk group, often sustaining serious injuries, followed by pedestrians and then motorists, including motorcyclists. This data however, does not include people who attended either of the other two Accident and Emergency Departments in Sheffield at the Children's Hospital and the Northern General Hospital, and therefore the actual number of patients sustaining tram-related injuries is likely to be significantly higher than we have described.

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