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British Association of Oral and Maxillofacial Surgeons' National Facial Injury Surveys: hard tissue facial injuries presenting to UK emergency departments

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Abstract

The British Association of Oral and Maxillofacial Surgeons (BAOMS) and Saving Faces undertook two national prospective surveys 11 years apart. They recorded the facial injuries treated in UK emergency departments and collected data on 14 872 patients. In this paper, which aims to act as a feasibility study for a third national survey of facial injuries, we have reviewed hard-tissue injuries and specifically focused on temporal changes in their morphology. The two sets of directly comparable, categorical, unpaired, cross-sectional data were evaluated independently for statistical significance. In 1997, there were 1977 hard-tissue facial injuries (33%) but in 2008 this had decreased to 1899 (22%) ($p < 0.05$). In 1997, there were 1315 fractures (22%) and 662 dental injuries (11%) compared with 1462 (17%) fractures and 438 (5%) dental injuries in 2008 ($p < 0.05$). There were proportional increases in orbital (21%), nasal (139%), and cranial fractures (340%) ($p < 0.05$). The data showed a small reduction in the total number of hard-tissue injuries, but this was a considerable reduction as a proportion of the total injuries. Analysis of the type and subtype of injury generally pointed towards a reduction in their energy and severity, and to likely changes in mechanism. The project has proved the feasibility of a third national survey of facial injury.
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Keywords: facial injuries; facial trauma; facial fractures; dental trauma; BAOMS; UK emergency departments

Introduction

Facial injuries are estimated to account for roughly 5%–10% of all attendances at emergency departments in the UK.[1–8] Over 10 000 maxillofacial fractures occur each year in the UK, and maxillofacial injuries are seen concomitantly in 15%–34% of all cases of major trauma.[9,10] The annual incidence of dental injury is estimated to be between 1% and 3%, and about 25% of children and 33% of adults will have these injuries during their lives.[2,10–12]

A large body of work has looked at the assessment, diagnosis, and management of oral and maxillofacial injuries in emergency departments,[13,14] and epidemiological studies have focused on facial injuries over the last 30 years. However, because of the complex multifactorial variables involved (demographics, culture, socioeconomics, laws, and population density), direct comparison of epidemiological data is difficult and the findings cannot always be generalised.[15] Published papers agree that the site and severity of facial injuries to some extent reflect the cause,[15–17] but despite the body of evidence, epidemiological studies on the types

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of injury treated in emergency departments in the UK, are limited.

National surveys

In 1997, the British Association of Oral and Maxillofacial Surgeons (BAOMS) began a national survey of facial injuries.[5–7] The project was led by two consultants, Patrick Magennis and Professor Iain Hutchison, with the BAOMS information subcommittee. They worked in conjunction with the Royal College of Emergency Medicine to develop a national facial injury survey that would be completed in the emergency departments at all NHS units in the UK. It was, to our knowledge, the first national collection of this type of prospective data ever completed. The survey consisted of a specifically designed pro forma that was coded numerically to record every patient who presented to the department with a facial injury (Supplemental data: Surveys 1 and 2). The first paper on this survey focused on aetiology, particularly the association between facial injuries and alcohol.[7]

The first survey, done during one week in September 1997 (from 09:00 am on 12 September to 08:59 am on 19 September), collected data from 137 emergency departments on 6058 patients. The second, funded by Saving Faces, followed 11 years later. It was designed in the same way, with the same partners (BAOMS and the Royal College of Emergency Medicine), and the pro formas were based on those used in the first with some minor changes in wording and format. Data on 8676 patients were collected during the same week in September 2008 (Supplemental data: Surveys 1 and 2). In total, the two surveys included data on 14 872 patients. Of these, 138 did not have facial injuries, or the forms were not filled in correctly or were spoiled.

A third national facial injury survey is being imminently planned and will follow the same design. The analysis described in this paper is to act as a feasibility study and provide the background data for subsequent comparison. Once complete, it will represent a 20+ year dataset of facial injuries treated in UK emergency departments.

Material and methods

The data chosen for this paper were extracted from the questions on hard-tissue injuries in both surveys (Fig. 1), and tabulated. The sum of all hard-tissue injuries (all dental injuries and all facial fractures) was calculated together with individual sums of all dental injuries and all facial fractures. These two groups were named “Injury types” to allow for comparison. Individual injuries such as dental avulsions or orbital fractures were named “Injury subtypes”. The categorisation is more fully described in Supplemental data Appendix 2: data group categorisation.

Each injury was placed in a tissue group and injury group to allow for easier analysis and comparison - for example, the “injury subtype” of a fracture of the maxilla appeared in both the “facial fractures” and “hard tissue” groups. The nomenclature and grouping are more fully described in Supplemental data Appendix 3: data nomenclature. The raw numbers were converted into percentages in four forms: percentages of the total injuries, type of tissue, and type and subtype of injury.

The data extraction and calculation process was the same for both surveys and, because the structure of the questions in both was near identical, it created two sets that were directly comparable.

Comparison of the data

The temporal change was calculated in three forms: the percentage change in the raw numbers; proportional changes in the percentages of the tissue and injury groups of the total injuries; and the proportional change in the percentage of each injury within its respective tissue and injury group.

Statistical analysis

The structure of the surveys and analytical process created two sets of directly comparable, categorical, unpaired, temporal data. Pearson’s chi squared test was used to test for the significance of differences. Analyses were done with the help of IBM SPSS Statistics for Mac version 21 (IBM Corp), and probabilities of less than 0.05 were considered significant.

Results

Total injuries

In total, 14 872 results were recorded. Of these, 14 734 were facial injuries (6058 in 1997 and 8676 in 2008); this represented an increase of 43% (n = 2618) ($p < 0.05$). In 1997, a total of 1977 hard-tissue facial injuries were recorded (33%) but in 2008 this had decreased to 1899 (22%) ($p < 0.05$), which was a reduction of 33% as a proportion of the total injuries, and a 4% reduction as a raw number (Fig. 2).

Type of injury

Of the total injuries in 1997, 22% (n = 1315) were facial fractures, and 11% (n = 662) dental injuries. However, in 2008, facial fractures accounted for 17% (n = 1462) of the total injuries, and dental injuries 5% (n = 438) ($p < 0.05$) (Fig. 2).

Of the hard-tissue injuries recorded in 1997, 67% (n = 1315) were facial fractures and 34% (n = 662) dental injuries. In 2008, 77% (n = 1462) were facial fractures and 23% (n = 438) dental injuries ($p < 0.05$) (Figs. 2 and 3). Of the total injuries, this was a reduction of 22% in facial fractures and 54% in dental injuries. Of the hard-tissue injuries it was an increase of 16% in facial fractures and a reduction of 31% in dental injuries.

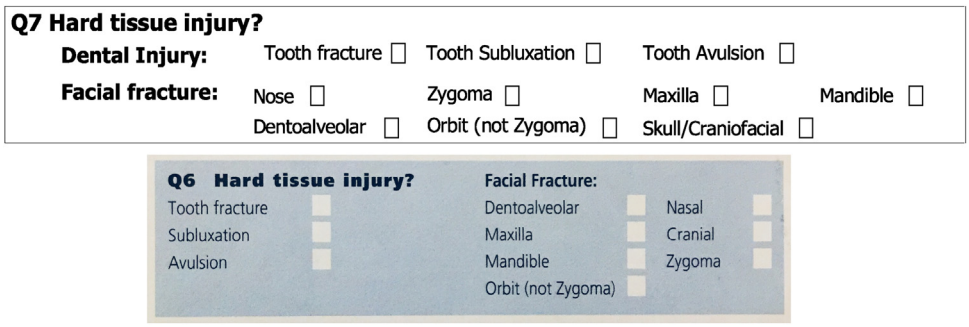

Fig. 1. Images of the survey questions from 1997 and 2008 (above and below, respectively) used to record hard-tissue injuries.

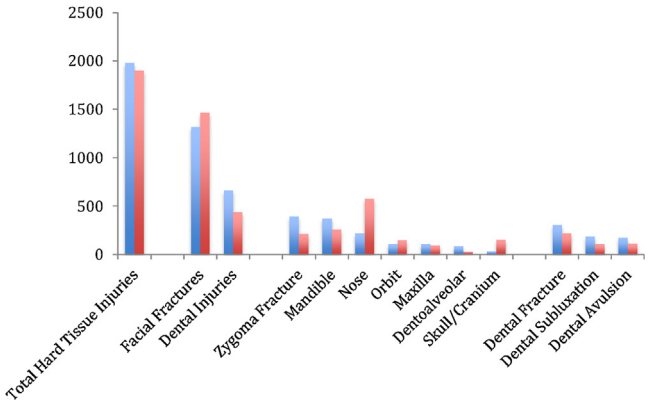

Fig. 2. Chart showing the total number of all subtypes of injury between the two surveys (blue = 1997, red = 2008).

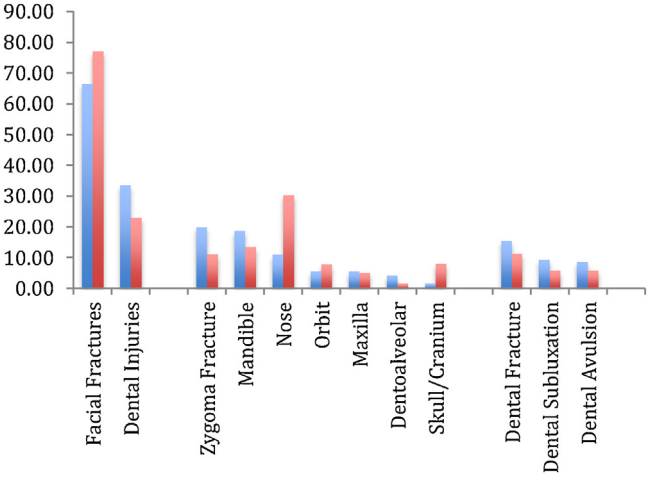

Fig. 3. Chart showing the percentage of facial fractures, dental injuries, and the type of injury as a percentage of total hard tissue injuries (blue = 1997, red = 2008).

Analysis of subtypes

Total injuries

Facial fractures (Figs. 2 and 3). In 1997, there were 393 fractures of the zygoma (7%), whereas in 2008 there were 212 in a larger group (7% of the total injuries in 1997 and 2% of those in 2008, a reduction of 62%).

The number of mandibular fractures had decreased from 371 in 1997 to 254 in 2008 in a dataset that was almost half as large again (6% of the total injuries in 1997 and 3% of those in 2008, a reduction of 52%).

In 1997, there were 216 fractures of the nose compared with 575 in 2008 – an increase of 166% in a dataset that was 140% of the 1997 denominator (4% of the total injuries in 1997 and 7% of those in 2008, an increase of 86%).

In 1997, there were 110 fractures of the orbit compared with 148 in 2008, an increase of 35% in a dataset that was 40% larger (2% of the total fractures in 1997, and 2% of those in 2008, but a reduction 6% as a proportion of the total injuries). In 1997, there were 110 fractures of the maxilla, compared with 94 in 2008 (2% of the total injuries in 1997, and 1% of those in 2008, a reduction of 40%).

In the 1997 survey, there were 84 dentoaveolar fractures compared with 28 in 2008, an actual and relative reduction (1% of the total injuries in 1997 and 0.3% of those in 2008, a reduction of 77% as a proportion of the total).

In the 1997 survey, there were 31 fractures of the cranial bones or skull whereas in 2008 there were 151 (0.5% of the total injuries in 1997, and 2% of those in 2008, an increase of 241% as a proportion of the total).

Dental injuries (Figs. 2 and 3). In 1997, there were 305 dental fractures compared with 215 in 2008 (5% of the total injuries in 1997, and 3% of those in 2008, a reduction of 51% as a proportion of the total).

In 1997, there were 185 cases of dental subluxation and 110 in 2008 (3% of the total injuries in 1997, and 1% of those in 2008, a reduction of 59% as a proportion of the total).

In 1997 there were 172 dental avulsions compared with 112 in 2008 (3% of the total injuries in 1997 and 1% of those in 2008, a reduction of 55% as a proportion of the total).

Analysis of injury subgroups

We also analysed the subgroups of facial bones fractured and the exact type of dental injury, and calculated the proportional increase within their respective subgroups (Supplemental data Appendix 2 and 3) (Figs. 4 and 5). It was notable that of all facial fractures, nasal fractures accounted for 16% in

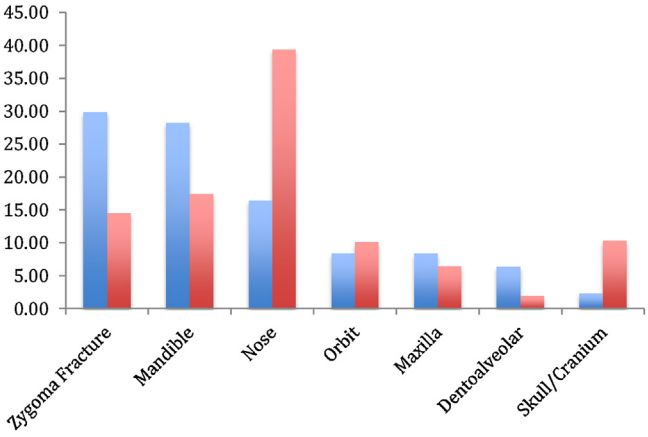

Fig. 4. Chart showing the subtype of facial fracture as a proportion of the total facial fractures (the injury subtype subgroup) (blue = 1997, red = 2008).

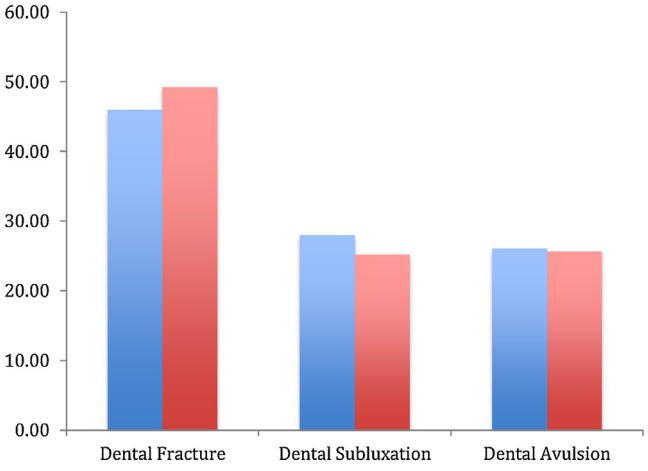

Fig. 5. Chart showing the subtype of dental injury as a proportion of the total dental injuries (the injury subtype subgroup) (blue = 1997, red = 2008).

1997 (n = 216) and for 39% (n = 575) in 2008, an increase of 139%; orbital fractures accounted for 8% in 1997 (n = 110) and 10% (n = 148) in 2008, an increase of 21%; and cranial fractures and those of the skull accounted for 2% (n = 31) in 1997, and for 10% (n = 151) in 2008, an increase of 339%.

Discussion

Although both surveys used similar pro formas and were done by the same organisations at the same time of year, it is difficult to say that they are entirely comparable. The locations of the emergency departments were similar but not identical and, even when the same department participated it is likely that the configuration, staff, and workload would have changed between the two surveys. Comparison between the total numbers of injuries should be viewed in this context, but the large numbers in both should enable comparison of the proportions of each type.

With this proviso, the general increase in facial injuries over the 11-year period has been mirrored by data on attendances at NHS emergency departments and by national and international epidemiological studies of maxillofacial injuries.[1,3,7,8,16–20] It has also been supported by the manner in which the morphology of these injuries has changed, which we know is strongly related to the force of the mechanism. It is accepted that in the case of hard tissues, low-energy injuries will favour more fragile bones or more vulnerable anatomy such as the nose, orbit, or zygoma,[16] and the morphology is related to the cause and the force applied.[15,16,18]

Data from developed countries, including the UK, during and after the period of this study have shown a reduction in maxillofacial injuries caused by road traffic collisions (high-energy injuries).[9,16]Those that occur seem to be less severe and therefore less likely to involve the hard tissues. This may support our finding of a slight reduction in hard-tissue injuries, but specifically the fact that these accounted for a considerably lower proportion of the total injuries.

In most developed countries, interpersonal violence is the most common cause of facial injury.[9,16]In these cases the mechanism is important for delineation of the morphology (blunt trauma with fists more commonly results in fractures of the nose, orbitozygomatic complex, and mandible),[9,17,21] and this supports our finding of an increase in the numbers of nasal and orbital fractures. In a UK study, Hussain et al also found that nasal fracture was the most common type.[4]

Further evidence regarding aetiology has shown an increase in sports-related injuries in developed countries, including the UK. These tend to be relatively low-energy, and to result in orbital, zygomatic, and nasal fractures.[3] This has been supported by an Irish study that found that sporting activities caused most hard-tissue facial injuries, and that nasal fractures predominated.[22] In elderly people, our surveys and more recent data have shown that most of these injuries are caused by falls.[9]

Our study has shown an increase in cranial injuries and those of the skull over time. We think that these records may refer to fractures of the frontal bone (particularly those that affect the anterior wall of the frontal sinus) and fractures of the temporal bone, which involve the lateral orbit or zygoma rather than other bones of the skull that cannot be construed as "facial". Studies on maxillofacial injuries often do not include those of the nose or skull, which makes comparison difficult.[9,17,23] In their UK study, Hussain et al showed that the most common facial hard-tissue injuries were nasal and cranial,[4] which supports our findings and is in keeping with more widespread trends in mechanisms of injury.

The reduction in mandibular, dentoalveolar, and maxillary fractures is at odds with other studies outside the UK.[17] It must be remembered, however, that most of those reported in European and international papers are caused by road traffic collisions, whereas in the UK most are caused by interpersonal violence.[17,18,21–24]

Our results showed a reduction of all forms of dental injury. Surveys on children's health in the UK since 1973 have shown a reduction in the incidence of accidental damage to the teeth over the last 30 years, particularly

in teenagers,[25] and the 2003 children's dental health survey found a marked reduction in the incidence of accidental damage to the incisors, which supports this as well as our findings.[26] High-energy injuries can result in major facial fractures as well as dental trauma,[17] but although dental injuries have traditionally been relatively common, data from UK units have suggested that this is not necessarily the case in NHS emergency departments.[3,4,26] The reduction in the number of patients treated for dental injuries in secondary care may reflect changes in the behaviour of those at risk (less outdoor play and activities), and an improvement in the ability to access emergency dental care through walk-in clinics and out-of-hours primary care. Published papers seem to infer, however, that the most important reason is a change in culture regarding the likelihood and location of presentation to healthcare services, rather than a reduction in the injuries themselves. Nonetheless, there seems to be an independent, unexplained, downward trend in dental injuries in the UK, inclusive of primary care, which supports our findings.[26]

In conclusion, maxillofacial injuries constitute an appreciable clinical burden on UK emergency departments, and the type of injury has a huge bearing on management and outcome. The number of hard-tissue injuries changed minimally, but represented a considerably smaller percentage of the much larger number of total injuries recorded in the second survey. Subgroup analysis showed an increase in facial fractures as a proportion of hard-tissue injuries (particularly nasal, cranial and orbital), and a general reduction in dental trauma. Overall, the results point to a reduction in the energy of the mechanism and subsequently in the severity of the injuries.

A third survey

An important subsidiary aim was to use this project as a feasibility study to plan an identical third facial injury survey. A study similar to this one would then be completed to analyse the data in the form of a cross-sectional, tri-serial, temporal survey study using over more than 20 years of facial injury data. The present study has shown that this would indeed be feasible.

Conflict of interest

The corresponding author has no conflicts of interest. Iain Hutchison is the Honorary Chief Executive of Saving Faces.

Ethics statement/confirmation of patients' permission

No ethics approval required. Consent gained during original data collection for use of the database.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.bjoms.2019.11.002.

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