TRAUMA

Traumatic amputations in children and adolescents

DEMOGRAPHICS FROM A REGIONAL LIMB-FITTING CENTRE IN THE UNITED KINGDOM

There is no published literature detailing the demographics of paediatric amputations in the United Kingdom. We performed this review of children and adolescents referred to a regional limb-fitting centre from the 1930s to the current decade who suffered amputation as a result of trauma, and compared our data with similar cohorts from other units. Of the 93 patients included, only 11 were injured in the last 20 years. Road traffic accidents accounted for 63% of traumatic amputations. Of all amputations, 81% were in the lower limb and 19% in the upper limb.

Our figures are similar to those from a United Kingdom national statistical database of amputees which showed on average four traumatic amputee referrals to each regional limb-fitting centre in the United Kingdom per ten-year period. Compared with the United States, the incidence of paediatric traumatic amputations in the United Kingdom is low.

The leading cause of mortality in England and Wales in 2008 in children aged one to 14 years and in teenagers aged 15 to 19 was external causes which include traffic and non-traffic accidents. Although there are reports of the patterns of injury in children, including the demographics and economic burden of paediatric amputations, the United Kingdom-based literature is lacking in these areas. Paediatric trauma care and awareness of its implications for health provision has not been in the forefront of research and development in the United Kingdom, as highlighted in the NCEPOD 2007 report, despite alarming mortality statistics.

We undertook this study to report the demographics of severe trauma leading to amputation in an urban United Kingdom paediatric population, and to compare our cohort with similar groups in other units.

Patients and Methods

In this retrospective study data were collected from our regional limb-fitting centre following hospital review board approval. This centre assesses and treats all patients within a catchment area of 1 to 1.3 million people who have been referred from local hospitals with loss of digits or limbs or for advice on the management of prostheses. It also offers treatment to those referred from other regions, usually as a result of repatriation, or patients moving home. The study population was identified from the database as having had an amputation as a result of trauma from any mechanism, including thermal, electrical, mechanical, and non-specific causes. Patients were included if they were ≤18 years of age when injured. All other causes of amputation were excluded. The patient’s case notes were retrieved and examined, and the data collected included age, gender, date and mechanism of injury, and level of amputation.

The mechanisms of injury were classified as road traffic accident, motorcycle accident, railway line injury, crush injury, farming accident, burns, electrical accident, pedestrian road traffic accident (bus, car/lorry, cyclist), industrial injury, fall and explosion. In order to verify the data, the National Amputee Statistical Database was contacted. This contains information on new referrals to United Kingdom prosthetic centres from 43 different limb-fitting centres across the United Kingdom between 1997 and 2007. Details on all amputees are recorded, not only those due to trauma. The mechanisms of injury for traumatic amputations are recorded as thermal, electrical, mechanical or no mechanism given.

Results

There were details on 112 patients, for 13 of whom the case-notes were irretrievable, leaving 99 available for review. Of these, four had been injured outside the region and therefore excluded. One was coded incorrectly and another had insufficient data. The remaining 93 had records ranging from the 1930s to the...
current decade. There were 25 female and 68 male patients. Their mean age was 10.3 years (0.3 to 18.3). A total of 85 children had an amputation involving one limb, seven involved two limbs, and one involved three limbs. There were 19 upper-limb amputations including seven above the elbow, one through elbow, eight below the elbow or mid forearm, two partial hand and one thumb amputation; and there were 83 lower-limb amputations including one hip disarticulation, 26 above knee, two through knee, 48 below knee, four Symes, one forefoot and one big toe amputation.

Accidents on the road accounted for 63% (59 of 93 patients) of all injuries, with almost one-third being the result of a pedestrian being struck by a bus (30 of 93, 32%) (Fig. 1). All railway accidents involved children playing adjacent to the tracks (7 of 93, 8%) and farming accounted for 2% (2 of 93) of cases. The pedestrians injured by buses all resulted in lower-limb amputations, as did almost all the other road injuries. The upper-limb amputations showed no obvious aetiological pattern.

The distribution of the age of the injured and mechanism of injury is shown in Figure 2 and the pattern of road traffic injuries related to year of occurrence in Figure 3.

In the National Amputee Statistical database for trauma as a cause of amputation in children aged 16 years or younger, there were 191 amputee referrals in ten years. These represent an average of nine upper-limb and ten lower-limb amputees annually across the 43 United Kingdom centres. There are approximately four referrals per institution each decade.15

Discussion
This study of paediatric traumatic amputations is to our knowledge the first of its kind in the United Kingdom. Our centre provided a good data source because it has served as the main regional limb-fitting centre for a significant time, and patients are offered lifelong follow-up. Despite this, it is difficult to obtain a true measure of the frequency of amputations, as some patients may not have been referred to the centre, possibly not requiring future prosthetic management. In spite of this limitation, we believe our study provides useful information on the demographics of
traumatic paediatric amputations. In agreement with national data, which estimate an average of four to each institution per decade, we received 11 referrals during the past 20 years. Our data and those of the National Amputee Statistical database show that the frequency of paediatric amputation as a result of trauma across the United Kingdom is particularly low.

The demographics of prosthesis users in a United Kingdom limb-fitting centre has been studied but did not specify paediatric amputation secondary to trauma. Paediatric trauma and amputations have been studied more closely in the United States, where it seems that they are more frequent. Loder performed a demographic study similar to ours in a much larger catchment population of between 11 and 14 million, and showed some contrasting results. He reviewed the care of 235 children who suffered an amputation between 1980 and 2000. Over half were caused by a combination of lawnmowers (29%) and farming machinery (24%), and only 16% followed road traffic accidents. Our institution serves a largely urban area and patterns of injury mechanisms may differ between populations. Considering their much larger catchment area, this American institution had roughly twice as many referrals over a 20-year period as we did. Trautwein et al, from the Harborview Medical Center in the United States, treated 74 childhood amputees over a ten-year period and again showed around twice as many referrals as our centre. Whereas paediatric injuries due to lawnmowers do occur in the United Kingdom and Ireland, it is possible that the majority of these injuries are digit/partial losses which are more likely to be treated by reconstruction.

Our study revealed that in the 1940s to the 1970s bus collisions with pedestrians caused more injuries. This may be explained by the design of buses in those days, whereby the driver’s seat was beside the engine and the view of the nearside kerb was restricted. We did not discover any other patterns of injury but this may be the result of the relatively small size of the study over a long time and changing environments, compared with studies from other countries. Our study highlights a relatively infrequent but devastating injury in the United Kingdom, which has been shown to have significant financial burdens in other countries, and would have similar burdens in this country. However, this was not the focus of this study, on which it would be difficult to make recommendations to try to prevent such injuries in the United Kingdom. More extensive clinical data collection and analysis is necessary at a national level which may help introduce prevention strategies and public health awareness to further reduce the incidence of traumatic amputation in children. One such data collection network is the Trauma Audit Research Network group, which helps to increase awareness of and the profile of trauma management.

References