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## Cycling and spinal trauma: A worrying trend in referrals to a national spine centre

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### ABSTRACT

**Introduction:** Cycling has seen a large increase in popularity worldwide over the last number of years. This has been linked to an increase in the number of road traffic accidents involving cyclists. Participation in cycling as part of competitive sport and endurance events has seen particular growth.

**Aim:** To examine patients referred with spinal trauma related to cycling and to assess whether the growing popularity of cycling and particularly competitive cycling is linked to an increase in spinal trauma.

**Methods:** A retrospective analysis was carried out of a prospectively maintained database of referrals to a national referral centre for spinal trauma over a 4-year period (2010–2013). Data were further analysed for years 2012–2013, as there were incomplete data for years 2010–2011.

**Results:** Spinal injuries involving cyclists increased by 200% from 2010 to 2013. In comparison those involving cars only increased by 29% and motorcycles reduced by 68%. From 2012 to 2013 there were 24 cyclist trauma referrals. The most common level injured was cervical spine (71%). Five patients (20.8%) had neurological deficit with 12.5% complete paralysis ASIA A disability score. The spinal fixation rate was 29.1%, 16.6% were managed with a HALO device. In total, 25% of patients were injured whilst training on a racer style bicycle, including all of the patients with complete spinal cord injury.

**Conclusion:** There has been a significant increase in spinal trauma due to cycling accidents over this four year period. Competitive cycling has been a factor in the most severely injured patients. Increased public awareness campaigns for those participating in cycling for sport may be warranted.

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### Introduction

The health benefits of cycling have been widely published.<sup>1–4</sup> The sport has seen a large increase in popularity worldwide,

and especially in Ireland in recent years. According to the 2011 Census carried out by the Central Statistics Office (CSO) 95,000 bikes were sold that year versus 91,732 new vehicles.<sup>5</sup> The number of commuters to work in that same census had increased by 9.6% from 2006 to 2011.

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Concurrently, however, there has been a significant increase in the number of injuries from cycling road traffic accidents (RTAs) in Ireland. According to the Road Safety Authority (RSA), in 2012 a total of 630 cyclists were injured, a 59% increase from the previous year.<sup>6</sup> The UK has seen a significant number of deaths and serious injuries related to cycling in 2013, with 109 killed and 3143 seriously injured.<sup>7</sup> According to the same report, the number of seriously injured does not give a full reflection of numbers due to under reporting to police.<sup>7</sup> The numbers of those both engaging in cycling and hospitalised due to biking accidents has increased in Australia, New Zealand and Taiwan.<sup>8–10</sup> A study from Tasmania estimated the total annual costs to society of major cycling accidents at AU\$4,123,445 per annum, with an average cost of AU\$12,156 per accident based on direct medical costs, indirect costs, loss of earning and leisure time.<sup>11</sup>

As well as increased commuter cyclists, there has been a significant growth in the popularity of competitive road cycling and long distance events. Triathlon has experienced double digit growth in Ireland since 2007, and over 20,000 people participated in a triathlon in 2011.<sup>12</sup> Cycle Ireland currently has over 22,000 members, with over 400 clubs.<sup>13</sup> In Britain triathlon is now the fastest growing sport at 10% per year.<sup>14</sup>

A large part of research related to cycling accidents has been in the area of traumatic brain injury and the use of helmets. Numerous studies have shown the benefit of helmets in reducing head injuries in both adult and child populations.<sup>15–17</sup> This has also been studied in the area of cycling for sport.<sup>18,19</sup> However there have only been a limited number of studies looking at spinal trauma in cyclists. Fewer still have looked in detail at the nature of spinal injury and surgical management.<sup>20–22</sup> There is significant potential benefit to be gained from research in this field for clinicians, public health officials and the general public.

## Aim

The aim of this study was to examine the patients being referred with spinal trauma related to cycling. We also wished to investigate whether the growing popularity of cycling and particularly competitive cycling is linked to a significant increase in spinal trauma.

## Methods

A retrospective analysis was carried out of referrals to a national referral centre for spinal trauma over a four year period (2010–2013). Almost all cases of spinal column disease (trauma, degenerative, malignancy etc) in the Republic of Ireland are referred to our institution for either transfer or advice regarding optimum management at the local referring hospital. A small number of cases from the national referral centre for neurosurgery are managed by the neurosurgeons without referral to our institution. A template document for each patient is completed and faxed to our institution. This included the following information: cause of injury, past medical history, physical examination including American

Spinal Injury Association (ASIA) score, level of injury and relevant imaging reports. Injury level was verified by review of imaging on National Integrated Medical Imaging System (NIMIS) or from hard copies of images from hospitals not currently using NIMIS. All data were stored in a prospectively maintained computerized database. The data are presented in two sections. Firstly, the number of referrals and indication were analysed for years 2010–2013, with results presented as percentage change over time. Further analysis was performed for patients referred 2012–2013 only, this was not possible for 2010–2011 due to incomplete data.

## Results

Overall referrals to the National Spinal Unit increased by 18.5% from 361 in 2010 to 428 in 2013. However spinal referrals for trauma increased by 52% from 193 to 295 over this time period. Referrals for car RTAs increased by 29% whereas referrals for bicycle related trauma increased by 200%. Motorcycle RTA referrals have reduced by 68% (Table 1). This is despite the fact the number of deaths on the road for motorcycle RTAs has increased over this time and cycling related deaths has remained stable (Table 2).

From 2012 to 2013 there were 24 referrals for spinal trauma in cyclists, 19 patients (79.2%) were male and 5 female (20.8%). The mean age was 44.3 years (range 16–81 years). Twenty three patients were injured on the road, with 60% of patients injured on collision with another vehicle. A significant 20.8% of patients had evidence of neurological deficit on ASIA exam with 12.5% tetraplegia ASIA A disability. Two patients (8.3%) had ASIA D score with no follow up of recovery recorded and the remainder were ASIA E. All of the most seriously injured patients were involved in an RTA with a racer style bicycle with motorized vehicle. Of the three ASIA A patients, two were thoracic (T3/T4 and T6) with concomitant extra spinal injuries and the third was low cervical (C6/C7). Overall, the majority of injuries were incurred to the cervical spine (71%), with 29% to thoracic spine and no lumbar or sacral spine injuries. Hyper-extension injury was the most common mechanism of cervical spine injury.

Overall, 5 patients were managed with posterior decompression of the spine with fusion above and below the level of injury, one patient underwent anterior decompression and fusion of the cervical spine and one had both anterior and posterior approach performed. Four patients had a HALO device applied. The remaining patients were managed with

**Table 1 – Trend in referrals for spinal trauma 2010–2013 by cause.**

| Year     | Car RTA | Motorcycle RTA | Bicycle RTA | All spinal trauma |
|----------|---------|----------------|-------------|-------------------|
| 2010     | 41      | 19             | 5           | 193               |
| 2011     | 36      | 14             | 3           | 157               |
| 2012     | 54      | 8              | 9           | 198               |
| 2013     | 53      | 6              | 15          | 295               |
| % Change | +29%    | -68%           | +200%       | +52%              |

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