Although the vast majority of injuries suffered while cycling are minor, acute spinal injuries have been reported. We describe three cases of acute spinal injury occurring while cycling. All three patients reported being thrown over the handlebars, while travelling downhill at speed. Two of the cases resulted in profound neurological deficit. These cases show that there is a spectrum of spinal injury due to bicycle accidents, ranging from no neurological deficit to profound insult, and from high cervical injury to mid-thoracic spinal injury. In cases of bicycle accidents, increased awareness of the possibility of such spinal injury is advisable.

**Keywords**: bicycle accident ; spinal cord injury ; spinal trauma.

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**INTRODUCTION**

The vast majority of injuries sustained while cycling are considered minor in nature (9). More serious injuries can occur. We present three cases of acute spinal injury which occurred following cycling accidents. In two cases, profound neurological deficit was the result.

**CASE REPORTS**

**Case 1**

The first patient is a 30 year-old gentleman who lost control of his bicycle at speed during an adventure race downhill over mountainous terrain, and was thrown over the handlebars. He landed head first in a ditch approximately six feet below road surface level. He was wearing a helmet. On initial assessment by paramedics he was found to have no motor or sensory function from level T6 and below. His helmet was found in multiple fragments. He was transferred to the nearest emergency department on full spinal precaution for further management. On arrival his Glasgow Coma Score (GCS) was 15 out of 15. He was hypertensive with a blood pressure of 174/96 mmHg and hypothermic with a temperature of 34.2°C. His blood investigation revealed a haemoglobin of 14.0 g/dL, and his white cell count was 20.01 × 10⁹/L. He had no prior past medical history. Examination by the orthopaedic...
team revealed tenderness to palpation over C7 and T2. Plain film imaging and Computed Tomography (CT) imaging of his whole spine was requested. CT revealed a four-column spinal injury involving profound fracture-dislocation of T4 on T5 with an associated displaced manubrium fracture (Figs. 1 & 2). He also suffered a mediastinal haematoma (aorta intact), fractures of the first and second ribs on the left side, and second rib on the right side, mid-shaft fracture of his left clavicle, moderate left pulmonary contusion, and an undisplaced fracture of the left base of skull at the level of the foramen magnum. No intra-abdominal injury was noted. The patient was transferred to a tertiary level specialist spinal injury unit for operative management. The following day he underwent posterior decompression and stabilisation from T1 to T8. In view of this gentleman’s lung parenchymal injury and concern for possible cardiac contusion, a decision was made to achieve fixation of this Type C injury by posterior approach. This decision was made in conjunction with Cardiothoracic and Anaesthetic services. His spinal cord was found transected at level T4-T5. He spent six days in a High Dependency Unit before transfer back to the ward. His post-operative American Spinal Injury Association Score was T4 ASIA A Spinal Cord Injury.

**Case 2**

A 59-year-old gentleman walked into his local Emergency Department complaining only of neck pain several hours following a mountain-bike accident. He reported losing control of his bicycle travelling downhill at speed and was thrown head first over the handlebars. His impact with the ground was sufficiently forceful to split his helmet into two pieces. On arrival his GCS was 15 out of 15, and his observations were stable. He had no neurological deficit. CT and subsequent Magnetic Resonance Imaging (MRI) confirmed wedge compression fractures at T1 and T2, a left facet dislocation of C6 on C7, and fracture of C7 left facet. The anterior and posterior longitudinal ligaments were disrupted at the level of C7-T1 (Fig. 3). He underwent posterior cervical decompression and fusion C4-T4 the following day. His post-operative period was uneventful. He mobilised without
difficulty on day 1 post-op, and was discharged home on his third post-operative day.

**Case 3**

A 61-year-old gentleman sustained catastrophic cervical spine injury when the front wheel forks of his intermediate performance carbon fibre racing bicycle reportedly collapsed, throwing him forward over the handlebars. At the time he was applying brakes to slow down as he reached the bottom of a gentle hill (with approximately 15° incline). He was travelling at approximately 20 mph. He impacted onto the tarmacadam road surface head first, sustaining a hyperextension injury to his cervical spine. He reported no loss of consciousness as he recalls telling a friend following behind not to move him as he had sustained a neck injury. He was unable to move both arms and legs at the scene. His helmet was broken in two pieces. Paramedics on the scene record a GCS 13 out of 15. His heart rate was 69 bpm, and he was hypertensive with a blood pressure of 151/101. Plain film, Computed Tomography and Magnetic Resonance Imaging of his cervical spine demonstrated bilateral lamina fracture at C5, bilateral lamina and pedicle fracture at C6, bilateral jumped facets at C5-C6 level, and fracture of spinous processes from C2-C6 (Figs. 4-6). Haematoma was identified within the spinal cord, and anterior to the vertebral bodies leading to tracheal compromise. He required emergency tracheostomy, and sedation in the Intensive Care Unit. His other injuries included a fracture of his left clavicle, and abrasions to his shins and back. Once stable, he was transferred to a tertiary level specialist spinal injury unit for operative management. He underwent anterior decompression and fusion C5-C6. Intra-operatively, his spinal cord was found transected and herniating through the disc space at this level. His neurological injury was classified as C2 ASIA A spinal cord injury, with motor preservation on right side at C5 level.

**DISCUSSION**

Bicycle riding remains an ever popular sport across all age groups. Although most injuries
reported are usually minor in nature (9), more devastating spinal injuries can be the result.

Where spinal injury occurs, the mechanism is usually a forward fall over the handlebars (7), and usually while moving downhill (8). Overall, males are more commonly injured than females (1,10). Carmont observes however that the most serious injuries are more common in women, since females tend to be lighter than males, and thus more easily thrown over the handlebars (4).

Falls where the rider impacts the ground with the top of their head may lead to flexion injury of the cervical spine, while landing on the face could lead to hyperextension injury (2). Kim et al report that the cervical spine is the most common site of spinal injury, and cord injury is a feature in 24% of cases (6). A number of risk factors for bicycle-related injury have been identified including slippery road surface, the cyclists’ poor assessment of the situation, and excessive speed (5).

In our report, all three riders were male. All three describe being thrown over the handlebars, though in one case mechanical malfunction may have been to blame. All three were travelling downhill. The terrain involved was variable ranging from smooth tarmacadam to mountainous. Two of our patients suffered spinal cord injury and subsequent neurological impairment. In both cases, the cord was found transected at time of surgery.

A limited number of case reports of spinal trauma following bicycle accidents have been described before (3). To our knowledge this represents the first time three cases of spinal trauma related to bicycle accidents have been described in an Irish context. We also note the spectrum of injury that can occur from these accidents. Two of the three patients in this report suffered neurological deficit. One patient however escaped with no neurological injury at all. In case one, the level of injury was mid-thoracic. In cases two and three, the cervical spine was involved, though at varying levels. This serves to remind that bicycle-related spinal injury is not just limited to the cervical spine, and that there exists a spectrum of spinal injury associated with bicycle accidents. Regard to this important consideration is advisable in initial management and treatment of patients with suspected spinal trauma following bicycle accidents.
REFERENCES


