

Review

Incidence and severity of neck injury in Rugby Union: A systematic review

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Abstract

Objectives. To collate and appraise incidence and severity data for neck injury in Rugby Union. To report risk factors for neck injury in Rugby Union that are supported by incidence and severity data. **Design.** Systematic review. **Methods.** Original journal articles were retrieved from electronic searches of AusportMed, AUSPORT, Scopus, Medline (Ovid), CINAHL, Mantis, and Pubmed databases and relevant bibliographic hand searches. Selection criteria were restricted to: (a) prospective study designs including cohort, case–control, and intervention methodologies; (b) populations of Rugby Union players, either male or female of any age; (c) studies must report on neck injury incidence and/or severity specifically; (d) articles with republished neck injury data were excluded. The STROBE Statement was adapted for the quality assessment of included studies and categorised as either poor, moderate or good. **Results.** Thirty-three original articles met the selection criteria. Wide variation of injury and exposure definitions and population sampling was identified in the included articles. Neck injury incidence ranged between 0.26 (CI: 0.08, 0.93) and 9.17 (CI: 1.89, 26.81) per 1000 player hours for mixed populations that adopted an all inclusive sports injury definition. There is a paucity of severity data and analytical data which evaluates causal roles of risk factors for neck injury in Rugby Union. **Conclusions.** Meaningful understanding of neck injury incidence and severity in Rugby Union is restricted to a few studies which adopt comparable methodological construct. This paper provides an index for future neck injury studies in Rugby Union. © 2010 Sports Medicine Australia. Published by Elsevier Ltd. All rights reserved.

Keywords: Epidemiology; Rugby; Football; Neck injury; Athletic injury

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1. Introduction

Neck injury in Rugby Union (RU) may result in neck pain,^{1,2} reduced neck mobility,^{2,3} neck deformity,³ neurological symptoms (sensory and motor loss),^{1,4} altered mental state^{1,4} or secondary injury (e.g. faciomaxillary, eye or limb trauma).^{1,4} Athletes may require on-field evaluation and treatment, and/or referral to hospital emergency departments. Although time loss from play, work/school or social activities may occur subsequent to injury,⁵ hospital based management is frequently not required.¹

Heightened awareness of neck injury in RU is related to the nature of the sequelae of neck injuries, fatal and non-fatal alike. Non-fatal catastrophic neck injury from RU participation is associated with high financial costs to the healthcare system.^{6,7} Most notably, it has been suggested for every debilitating spinal cord injury there may be as many as ten near misses.^{6,8}

Reports of catastrophic neck injuries have dominated the epidemiological data available in RU. Case reports, case series, cross sectional studies and retrospective reviews (Supplement 1) which fit the definition of catastrophic, non-catastrophic, or career ending spinal injuries have portrayed much of the epidemiological landscape regarding neck injury in RU. It is not scientifically sound to rely on case report study design to indicate injury patterns in sport,⁹ and yet it has been common practice for neck injuries in RU. While etiological factors are assumed to be similar, the study designs fail to provide rigorous interpretation of incidence and severity. Furthermore definitions utilised in such studies, if at all, are limiting, depicting only the 'tip-of-the-iceberg'¹⁰ of the most sinister neck injuries. As such, these definitions are a subset of neck injury which is the submerged part of the iceberg which is to be evaluated in this systematic review.

Data on injury incidence and severity provides a yardstick in the first step of prevention of sport injuries.¹⁰ The primary purpose of this paper is to review and collate incidence and severity data on all neck injury in RU as reported in the literature. The secondary aim is to identify risk factors for neck injury in RU that are supported by incidence and severity risk data.

2. Methods

A comprehensive search of the literature was conducted by the first author (MSS), which consisted of an electronic search of the AusportMed, AUSPORT, Scopus, Medline (Ovid), CINAHL, Mantis, and Pubmed databases from the earliest available record to March 2009. Key words used in the literature search were "RUGBY" in combination with "INJURY" (including truncated terms) and "NECK" or "CERVICAL". In addition bibliographies of included studies, and previous review articles were searched to identify potentially eligible studies not captured by the electronic searches. Duplicates and reprints were identified and removed. Titles and abstracts

of the retrieved articles were screened for relevance, with non-relevant articles being discarded. Conference proceedings, abstracts, generic non-peer reviewed articles, letters, reviews and commentaries retrieved from electronic searches were identified, logged and discarded prior to application of the selection criteria. Non-English articles were logged and discarded.¹¹ Full text versions of potentially relevant articles were retrieved and evaluated for inclusion.

Two reviewers (MSS and RPL) independently applied the selection criteria to the retrieved articles. Inclusion criteria for retrieved articles were set at (a) prospective study designs with case-control, cohort and intervention methodologies; and (b) study population consisting of RU players, both male and female of any age. Seven aside and ten aside variants of the games were included. Populations from other football codes (e.g. rugby league and soccer) as well as wheelchair variants of the game were excluded; (c) studies must report on neck injury incidence and/or severity specifically. The description of "neck region" was adopted from Guzman et al.¹²; (d) articles with republished neck injury data were excluded. In such cases the review authors identified the less informative report for exclusion. A reject log (Supplement 2) was maintained of all relevant articles which did not meet the inclusion criteria.

In this review the methodological quality of included studies was assessed by two independent reviewers (MSS and RPL) using the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) Statement.¹³ The STROBE Statement (available at: <http://www.strobe-statement.org/index.php?id=available-checklists>) is a 22 point checklist developed by an international collaborative effort of epidemiologists, methodologists, statisticians, researchers and journal editors. It flag marks key aspects of information dissemination particularly pertaining to methodological construct, results reporting and conflict of interest. Although the STROBE Statement was not specifically designed to assess methodological quality, it has recently been adopted as a quality assessment tool for observational studies by a number of authors.^{14–17} As per Olmos et al.,¹⁵ studies were arbitrarily categorised as either poor, moderate, or good, with percentage of fulfilled items from the STROBE statement checklist cut-off values of <50%, 50–80%, and >80%, respectively.

Data on study methods, region of study, sample population, exposure, incidence and severity was extracted and tabulated. In addition, data on risk factors and injury types were extracted, tabulated and summarised. Where possible, if not mentioned in the published article, incidence (percentage and injury rates) was calculated from presented data on number of neck injuries, number of total injuries and RU exposure. In these instances injury rate was expressed per 1000 reported exposures. Furthermore, 95% confidence intervals were calculated using the method provided by Ulm.¹⁸ For meaningful comparison, sports injury definitions of included studies were categorised into broad groups guided by the commentary of Brooks and Fuller.¹⁹ These groups consisted of: *medical*

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