

IN BRIEF

- Pain in the temporomandibular joint/region could be referred from the cervical spine.
- Cervical spine should be routinely examined in patients presenting with pain in the temporomandibular joint/region following trauma to eliminate its involvement.
- Physiotherapy opinion should be routinely sought in acute, chronic and in patients with known history of cervical spondylosis.
- Inter-professional links should be established for effective management of the temporomandibular symptoms.

VERIFIABLE
CPD PAPER

Temporomandibular joint pain following airbag deployment on the face: a case report

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Varieties of injuries have been reported as a result of the deployment of the airbag/s following road traffic accidents. The purpose of this case-report is to present a physiotherapist's perspective of a patient who was diagnosed as having temporomandibular pain and dysfunction following the deployment of the airbag on the face and its implications for the dental profession. The patient was assessed using a modified Maitland assessment procedure to establish the diagnosis and the treatment consisted of Maitland mobilisation techniques, pulsed short wave diathermy and ultrasound as and when indicated directed to the upper cervical spine. The outcome of this case-report suggests that the temporomandibular symptoms presented by this patient were of cervical origin. Therefore, it is suggested that the cervical spine should be routinely examined in patients presenting with temporomandibular pain and dysfunction following trauma and early referral to physiotherapy may facilitate early recovery.

INTRODUCTION

An airbag is an inflatable rubber-lined nylon bag which is particularly effective in preventing life-threatening and debilitating head and chest injuries.¹ A study of real-world crashes conducted by the National Highway Traffic Safety Administration² (NHTSA) found that a combination of seat belts and airbags is 75% effective in preventing serious head injuries and 66% effective in preventing serious chest injuries.

AIRBAG MECHANISMS

Airbag deploys between 98–211 mph in about less than 10 milliseconds and deflates within 2 seconds of full inflation via vents at the back of the apparatus.¹ On impact/collision the sensors located in the

front of the car triggers a series of chemical reactions that convert sodium azide to nitrogen gas and causes the airbag to inflate forming a cushion between the driver and the steering wheel. Airbag inflation produces up to six litres of gas per second. The deployment system will also generate a mixture of gases, importantly an alkaline aerosol consisting mostly of sodium hydroxide but also metallic oxides.^{3,4}

A range of injuries has been reported as a result of the deployment of the air bag and the injuries vary from minor to fatalities. The injuries range from bilateral smith fracture,⁵ colles fracture,⁶ burns to face and hands,^{3,4,7–10} otologic injuries,^{11,12} eye injuries,^{13–16} maxillofacial fractures,¹⁷ facial paresis,¹⁸ basilar skull fracture,¹⁹ with transection of the internal carotid artery,²⁰ atlanto-occipital dislocation,^{21–23} and spinal cord injuries.^{24,25}

The severity of the injury relates directly to the proximity of the driver to the steering column and the force and the direction of the impact of the airbag. Hyperextension injury of the cervical spine appears to be the most common type of injury of the cer-

vical spine resulting in varying degrees of severity to fatalities. In this context a physiotherapist's perspective on a patient who was diagnosed as having temporomandibular pain and dysfunction following a road traffic accident resulting in the deployment of the airbag on the face is presented.

CASE REPORT

Mrs S. a 39-year-old lady was involved in a road traffic accident on 17th November 2001. The car driven by Mrs S. crashed into a car that pulled in front, at about 25 mph, resulting in the deployment of the airbag on her face. Mrs S. was seen at the accident and emergency department and at that time complained of pain, swelling around the left lower jaw and malocclusion and also had sustained superficial burns to her hands, forearms, chest, and face, due to the burst airbag. Following radiographs of the temporomandibular region Mrs S. was given painkillers and anti-inflammatory medications and was referred to the dental clinic with a diagnosis of suspected fracture of the mandibular ramus. Mrs S. was

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seen at the dental clinic 5 days later. At that time, the swelling around the face and jaws had resolved and occlusion had improved slightly. Since clinically there was no obvious signs of fracture, the patient was given analgesics and advised to be on a soft diet and was reviewed 3 weeks later. A review of the radiographs of the temporomandibular region taken at the accident and emergency department revealed no evidence of fracture. Mrs S. was reviewed four times at the dental clinic due to persistent pain in the temporomandibular region and increased level of clicking in the jaw and was given a bite-splint to wear at night. The patient was eventually referred to physiotherapy on 30 May 2002 for pain management with a diagnosis of temporomandibular joint pain and dysfunction following trauma.

Main Complaints

Mrs S. was seen at the physiotherapy department some 8 months after the initial trauma and her main complaints at the time of assessment (16/07/02) were: (a) constant pain in the left temporomandibular joint made worse by chewing food; (the patient rated the pain level to be 6 out of 10 on Visual Analogue Scale – a score of 10 being worse), (b) clicking noise on movements of the jaws, (c) 'tired feeling' around the left supra-scapular region.

Analysis of the accident

Mrs S., due to her short stature tends to sit close to the steering wheel while driving. At the time of impact, the deploying airbag might have hit her face/chin from below, forcibly extending the cervical spine against the headrest, and the resulting impact may have forcibly flexed the cervical spine straining the intervertebral joint structures. Although the symptoms presented by the patient were suggestive of temporomandibular origin, considering the impact it was decided to examine the cervical spine.

Examination

A modified Maitland²⁶ assessment procedure was used to assess the patient. At the time of assessment the cervical spine range of movements was full and pain-free except to left rotation, which presented end range 'stiffness'. On deep palpation, there was no significant tenderness around the cervical region. However, postero-anterior pressure (movement assessed by using pressure through the tips of the thumbs against the spinous processes) and postero-anterior unilateral pressure²⁶ (at the articular pillar) of the upper cervical spine presented a minimal degree of discomfort at late and mid-ranges respectively and compression of the cervical spine presented

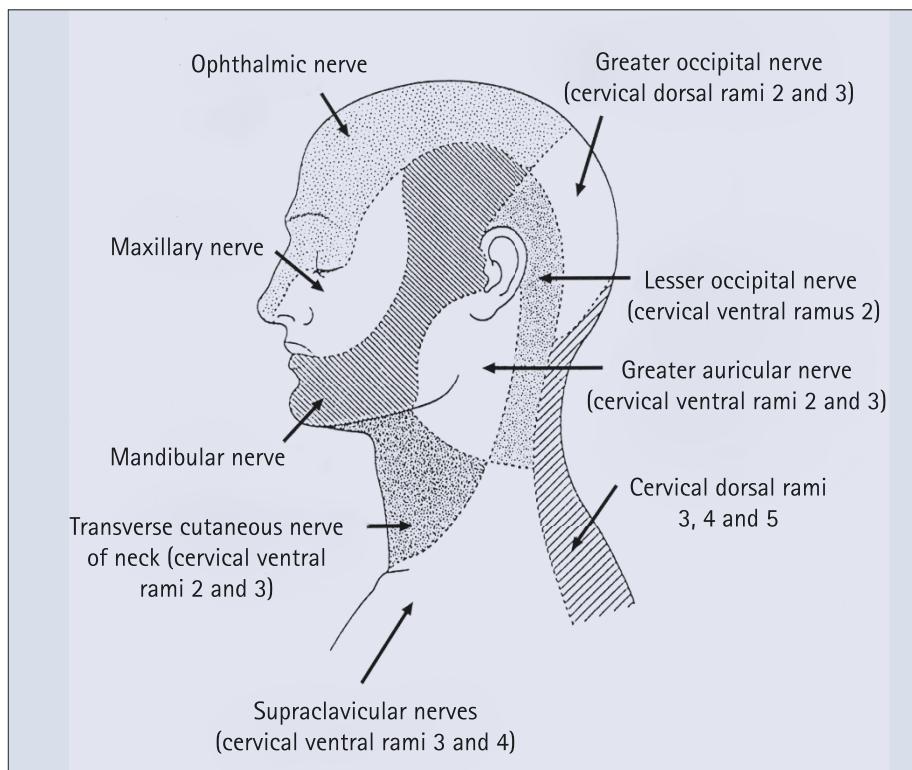


Fig. 1 Cutaneous nerve supply of the face, scalp and neck

pain in the neck suggesting probable cervical spine involvement.

Treatment and outcome

Following assessment, the 2nd and 3rd cervical vertebral segments were mobilised using Maitland postero-anterior left unilateral mobilisation techniques. (Mobilisation is a gentle, coaxing passive rhythmical oscillatory movements performed using the thumbs within or at the limits of the range of a joint. It is at all times, within the ability of the patient to prevent the movement if he or she chooses²⁶).

Immediately following mobilisation, there was little or no palpable tenderness at the left temporomandibular joint and around the muscles of mastication, indicating that these symptoms were due to nerve impingement. The patient was able to clench her teeth, and was able to open her mouth fully following two more sessions of mobilisation of the upper cervical spine. However, Mrs S. complained of fluctuating pain in the neck, shoulders and upper thoracic region and was given about 15 sessions in all (including review appointments) consisting of mobilisation of the cervico-thoracic and upper thoracic regions, pulsed short wave diathermy, and ultrasound as and when indicated. At the time of discharge on 30/10/02, there was no pain/tenderness at or around the temporomandibular joint, and at the muscles of mastication. The patient was able to open her mouth fully and the pain in the

cervical region, shoulders and upper thoracic region had also reduced to about 2/10 on a visual analogue scale (a score of 10 being worse).

MECHANISMS OF TEMPOROMANDIBULAR PAIN

A university-based collision investigation team across Canada²⁷ suggests that the situational factors such as the proximity of the occupant to the airbag module could increase the level of risk significantly. NHTSA² recommends that the driver should place him/herself 10 inches away from the airbag. Furthermore, they suggest that the risk zone lie in the first 2–3 inches of inflation of the airbag.

Analysis of the impact suggests that the expanding airbag might have forcibly extended the cervical spine against the headrest and that in turn may have forcibly flexed the cervical spine. The forcible extension and flexion of the cervical spine may have strained the intervertebral joint structures resulting in inflammation and impingement of the upper cervical nerve/s. Pain from the intervertebral joint structures such as discs, nerves/roots, ligaments, capsular structures and zygapophyseal joints can be referred to areas distant from their source²⁶ and pain may lead to muscle spasms and muscle weakness. Since the first cervical dorsal and ventral rami (suboccipital nerve) emerges superior and posterior to the arch of the atlas and the second dorsal and ventral rami, emerges

between the posterior arch of the atlas and the lamina of the axis and the third cervical dorsal ramus courses backwards round the articular pillar of the third cervical vertebra and the ventral ramus appears between longus capitis and scalenus medius muscles,²⁸ it is likely that one or more of these nerve roots and joint structures may have been involved in producing the symptoms (Fig. 1). The soft tissue injury to the face resolved in about 5 days following anti-inflammatory medication, however, the constant pain, limitation of movement and clicking in the jaw persisted until physiotherapy was directed to the cervical spine.

It is suggested that the cervical spine should be routinely examined in patients presenting with acute and persisting temporomandibular joint pain following deployment of the airbag on the face, to exclude cervical spine involvement. Physiotherapy opinion should be routinely sought in patients presenting with acute and persisting temporomandibular joint pain²⁹ in the presence of negative radiological findings and non-response to anti-inflammatory medications as well as in patients with known cervical spondylosis. A multi-disciplinary team approach for research, diagnosis and management of temporomandibular disorders is suggested.

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