RESEARCH ABSTRACT

Burners: Offensive Strategy for an Underreported Injury

The results of this study suggest that football players frequently sustain burners, and often repeatedly.

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INTRODUCTION

Burners, or transient brachial plexopathies, are common in football players. However, because their associated symptoms rarely last longer than two minutes, often they are not reported. Therefore, the purpose of this study was to investigate the incidence and frequency of the injury in college athletes. Also examined were the frequency and to whom the injury was reported.

METHODS

Six football teams from an NCAA Division III football conference were surveyed after the 1991 season. Questionnaires were sent to the athletic trainer of each team for distribution to players. Questions were asked regarding a player's position, frequency of burners, and whether such an injury was reported and to whom.

RESULTS

Trainers from five of the six teams returned the questionnaires, yielding a total of 201 respondents. Of these, 104 players reported sustaining one or more burners during the 1991 season. In addition, 131 reported one during their college careers, with 115 (or 87 percent) sustaining more than one. The total number of burners sustained by a given player ranged from 0-40 with an average of 3.6.

Regarding position, of the 131 players who reported at least one burner during the 1991 season:

- 30% PLAYED DEFENSIVE BACK
- 18% DEFENSIVE LINE
- 18% SPECIAL TEAMS
- 17% OFFENSIVE LINE
- 11% OFFENSIVE BACK
- 5% RECEIVER
- 2% KICKER/PUNTER

In terms of injury reporting, 91 (70%) indicated that they did not report all of the burners they sustained. Of those that were reported, 62 players (47%) reported them to the trainer, 37 (28%) reported them to the coach, and 13 (10%) reported them to the team physician.

DISCUSSION

The results of this study suggest that football players frequently sustain burners, and often repeatedly. The risk of permanent nerve damage increases with these recurrent injuries. Defensive backs appear to be at the greatest risk. Players do not routinely report these to medical professionals. While relatively rare, these injuries can result in prolonged weakness. These results highlight the need for medical professionals to increase their awareness of this potential injury.

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COVER STORY

Managing Brachial Plexus Injuries in Football

Brachial plexus injuries, otherwise known as "stingers" or "burners," are common among football players of all ages. Such an injury is best described as a brief episode of a burning, prickly sensation that radiates from the neck into one or both upper extremities, often accompanied by transient paralysis of the arm.

Each episode typically lasts only a few seconds or minutes. It is common for players to remain in a game while experiencing this condition. In more severe cases or repeated cases, however, symptoms can last for days and even months, and may require further intervention, rehabilitation and/or diagnostics. This injury also is common in wrestling, gymnastics and ice hockey.

A player who has suffered burner-like symptoms should be removed from competition and evaluated.

Burners are most commonly caused by a stretching mechanism of the brachial plexus. This occurs during lateral neck flexion and extension as well as shoulder depression, such as when tackling or blocking. In football, defensive players are most susceptible, largely because of the awkward positions they assume while tackling. Burners also can occur on the contra-lateral side of contact from forced compression of the brachial plexus during lateral neck flexion and extension.

Classifications have been developed to categorize the severity of this type of injury. Seddon's classification describes three types of nerve injury based on severity and potential for regeneration of the nerve. These types, in order of increasing severity, include neuropraxia, axonotmesis and neurotmesis. Clancy's classification (Grades I, II and III), based on the pathophysiology of brachial plexus injury, correlates to Seddon's classification.

Neuropraxia (Grade I) is the mildest lesion. Neuropraxia results from a mild stretching of the nerve, causing a localized conduction block of the axon. Axonal structures remain intact; however, the ability of the axon to support electrical nerve conduction is impaired. Healing occurs rapidly with neuropraxia, often within a few days or weeks.

Axonotmesis (Grade II) describes a disruption of the myelin sheath with preservation of the Schwann cell tubes and internal architectural framework.

BURNERS ARE MOST COMMONLY CAUSED BY A STRETCHING MECHANISM OF THE BRACHIAL PLEXUS DURING LATERAL NECK FLEXION AND EXTENSION.

Neurotmesis (Grade III) describes complete disruption of both the internal architecture and axon. In severe cases of neurotmesis, the prognosis for healing is poor and surgical intervention is often recommended. Motor and sensory deficits have been described for a year or more, with axonal regeneration only occurring at a rate of 1-2 mm per day.

A player who has suffered from burner-like symptoms should be removed from competition and evaluated. On-field assessment is likely to consist of ruling out a cervical spine fracture, rotator cuff or other shoulder pathology (such as an acromioclavicular sprain) that often accompanies a brachial plexus injury. Once another pathology has been eliminated, dermatomal and myotomal testing helps determine the nerve root affected. A typical burner presentation consists of a burning dysesthesias along with weakness in the deltoid, biceps and rotator cuff muscle groups.

Determining when a player is ready to return to action is based on several factors. Range of motion of the cervical spine and shoulder should be within normal limits. The player should have complete resolution of symptoms. Dermatomal and myotomal testing should be normal when compared bilaterally.

If the player continues to have symptoms, loss of range of motion or weakness, the athlete should be monitored and not allowed to return to play until his condition is resolved. He should be monitored as he returns to play and in the days that follow to determine any signs of weakness.

Avoiding recurrence is critical to preventing peripheral nerve injuries of the arm. During pre-season physicals, athletes with prior histories of burners should be identified. Often, preventing a recurrence is as simple as having properly fitted shoulder pads and a hel-

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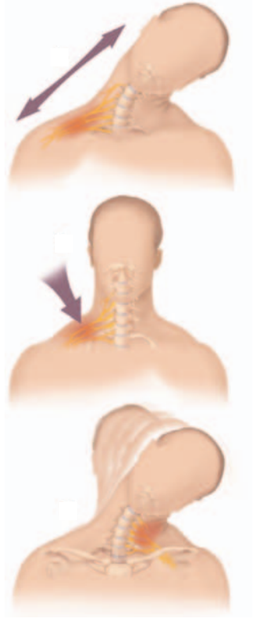
met based on player's height, weight and position. Equipment, when fitted properly, should help eliminate extreme end-range cervical lateral flexion and extension motion. In severe cases, a neck roll, cowboy collar or other associated device can be attached to the shoulder pads. This eliminates end-range lateral flexion and extension by producing a cantilever effect.

Conditioning also plays a role in preventing burners. Emphasis should be focused on strengthening the upper and middle trapezius, deltoid, rotator cuff, biceps, triceps and rhomboid musculature. Isolated cervical strengthening may cause further cervical pathology and should be avoided.

Coaching and education also are vital to preventing burners. Players should be instructed on proper tackling and blocking techniques. Incorporating a "head-up" and "squared-up" position that ensures neutral positioning of the head during contact helps distribute forces evenly through the body.



CASE STUDY

Treating Brachial Plexopathy

PATIENT HISTORY

The patient is a 20-year-old athlete who sustained a blow to the head and neck while tackling an opponent during a college football game. He complained of neck and right shoulder pain as well as a "dead" feeling in his arm. He did not lose consciousness and was able to walk off the field under his own power. He was examined by a certified athletic trainer and team physician who concluded that he suffered a "burner/stinger" injury. The patient exhibited full range of motion but no numbness, tingling or loss of sensation. He demonstrated good strength with myotomal testing two to three minutes after the initial injury and returned to the game. After the game, he reported to the athletic trainer and was instructed to follow up with the team physician the next morning.

PHYSICAL EXAMINATION DAY 1

The patient reported numbness and tingling down the lateral aspect of the right shoulder and into the hand. Cervical spine radiographs were not significant for any fractures, deformities or congenital anomalies. The patient was prescribed Motrin (800 mg two times per day) and physical therapy.

The patient reported to physical therapy with a chief complaint of numbness and tingling from his upper trapezius, down the lateral aspect of his right shoulder and into the radial aspect of his hand. He reported a pain level of 3/10 at rest that increased to 7/10 with arm elevation beyond 60 degrees. He reported neither dizziness nor a headache.

Upon observation, there appeared to be no bruising, edema, joint effusion or muscle atrophy. The patient stood with his right arm held in internal rotation and adduction, close to the body, with the forearm pronated and the wrist slightly flexed. After he underwent the subjective portion of the exam, the possible differential diagnoses included cervical spine injury (brachial plexopathy, nerve root injury, sprain/strain), rotator cuff pathology, anterior cruciate joint injury and/or glenohumeral joint injury.

Close communication among the team physician, certified athletic trainer, physical therapist and patient was crucial.

The patient underwent an upper quarter screen as part of his objective examination. With sensory testing, he reported decreased sensation to light touch only at the C5 dermatome compared bilaterally. Reflexes were equal bilaterally at C5, C6 and C7. Manual muscle testing was deferred due to pain with movement. Active range of motion (AROM) and passive range of motion (PROM) revealed abduction to 60 degrees, elevation to 60 degrees, and internal rotation (reaching behind his back) to T12 spinous process (unaffected extremity to T9). All motions on the right were accompanied by pain and open end-feels. AROM of the left arm was full and produced no symptoms. With palpation, the patient was tender along the right upper trapezius/supraclavicular region and the lateral shoulder.

Treatment initially focused on pain modulation. The patient performed Codman's pendulum exercises while standing, along with pain-free active-assisted range of motion (AAROM) exercises with a cane in the supine position. His treatment ended with icing for 20 minutes. He continued with these pain-free exercises, Motrin and ice.

PHYSICAL EXAMINATION WEEK 1

One week later, the patient reported right shoulder pain at 0/10 at rest and 6/10 with active elevation. He continued to experience decreased sensation at the level of C5, mild numbness and tingling down the lateral and posterior aspects of the arm. He had no tenderness in the upper trapezius/supraclavicular region with palpation, and reflexes remained equal when compared bilaterally.

AROM of abduction and elevation improved from 60 to 140 degrees. Internal rotation was now equal bilaterally, with the patient able to reach behind his back to the level of T9. Manual muscle testing of the middle deltoid, biceps and triceps were graded at 4/5 each. The patient's supraspinatus was graded at 4-/5.

Treatment was modified to include a progression of pain-free AAROM exercises in the seated and standing positions. In addition, pulley exercises were added. Codman's pendulum exercises were continued as needed for pain. Because of the patient's schedule, he would not be reexamined for two weeks.

PHYSICAL EXAMINATION WEEK 3

Upon the patient's return, he continued to experience decreased sensation along with several other unexpected findings. He had diminished reflexes at the levels of C5 and C6, a positive drop arm test, visible muscle atrophy and decreased AROM compared with his prior exam. His active abduction decreased from 140 to 90 degrees and his active elevation decreased from 140 to 110 degrees. His internal rotation remained equal to that of the left arm. Re-evaluation of muscle strength revealed increased weakness of the middle deltoid and supraspinatus, which were graded at 3/5. Biceps and triceps strength remained unchanged at 4/5.

The working hypothesis at this time was a diagnosis of a brachial plexopathy. An EMG revealed that the serratus anterior, deltoid and triceps exhibited slowed conduction velocities consistent with axonotmesis. Treatment during this week included pain free AAROM exercises as well as gentle "opening" exercises for the cervical spine to take pressure away from the nerve roots. The patient continued rehabilitation over the next several months that focused on pain-free range of motion and strengthening exercises as the nerves continued to regenerate.

SUMMARY

This case describes an athlete who sustained a brachial plexus injury that resulted in axonotmesis. The patient had an acute brachial plexopathy particularly affecting the C5-C7 nerve roots, upper trunk and posterior cord of the brachial plexus. He had decreased range of motion and strength that occurred over time. The initial loss of strength was attributed to pain. However, the patient's worsening status, over time, gave clues to a brachial plexopathy, particularly axonotmesis. His nerve had yet to undergo Wallerian (axonal and myelin) degeneration, which is why his weakness was delayed and symptoms progressed. Peripheral nerve regeneration had been described as occurring proximal to the lesion, then crossing the injury until reaching the target at approximately 1 mm per day. Several months after the injury, the patient's symptoms were absent.

The mechanism of injury, diagnostic testing and physical examination played important roles in helping to determine the diagnosis. The patient's treatment focused on medication, rest, modalities and a carefully constructed rehabilitation program to address his range of motion and strength impairments. Close communication among the team physician, the certified athletic trainer, physical therapist and patient was crucial. The patient ultimately reached his goal of returning to college athletics without symptoms.

Q&A:

About Radiating Nerve Pain in the Arm

Pain, numbness and tingling – classic nerve symptoms that travel down the arm – can have many causes but are always the result of some mechanical and/or chemical stress to a nerve. The location of the stress varies but typically involves the neck and shoulder. Depending upon the extent of injury, the symptoms can run the course of the nerve, resulting in a radiation down the arm. Degeneration of the cervical spine, discal pathology, fracture and tumor are possible causes of this stress. The onset of symptoms may be immediate, such as what one experiences with a "whiplash" accident or a "burner," or can occur insidiously as with degenerative conditions.

HOW DO I KNOW I HAVE IT?

Usually, radiating symptoms are accompanied by neck and shoulder pain. Radicular symptoms may be constant or intermittent depending upon the severity of the injured structures. Symptoms may follow a very specific course into the arm, wrist and hand; may manifest themselves variably depending upon the nerve(s) affected; or may be position-dependent (for instance, someone describes no symptoms unless he moves his neck or shoulder into a certain position). Weakness and loss of control of the arm, wrist and hand may result from a miscommunication between the nerves and muscles of the arm.

HOW DID I GET IT?

The pain in the arm can be the result of a traumatic stretch injury, such as a "whiplash" or "burner." These events are easier to attribute symptoms to because of the immediate cause-effect nature of their presentation. At other times, radicular symptoms can develop insidiously, making it more difficult to determine the cause. That said, degenerative spine and postural changes often are probable causes. A nerve can be pinched because of a narrowing of the spaces between the vertebrae where the nerve exits the spine. A much less common and somewhat controversial cause of radicular symptoms is thoracic outlet syndrome. This condition involves neural and vascular structures being pinched between the clavicle and the first rib.

IS IT TREATABLE?

Yes. A thorough examination of the upper quarter (neck, upper back and arm) is necessary to determine the cause. Most cases can be treated successfully with conservative management. Medications often are prescribed to control symptoms; physical therapy is performed to correct postural influences causing stress to affected nerves. When conservative management fails to improve the problem, injection therapy and surgical intervention are sometimes necessary.

WHAT SHOULD I EXPECT IN PHYSICAL THERAPY?

Your therapist should conduct a thorough evaluation of your condition, including a detailed history and postural and physical assessment. Treatments are aimed at relieving the stress to the involved nerve(s) and correcting postural influences causing or lending to the condition. A therapeutic exercise regime specific to your condition should be developed and implemented. Your therapist should place great emphasis on postural education and instruct you in postural correction techniques to be performed at home and work to facilitate your recovery. Activity modification also may be necessary for a period of time to further assist your rehabilitation.