

Serratus anterior paralysis as an occupational injury in scaffolders

8

two case reports

Abstract

Background: Shoulder complaints in scaffolders are very common and may result in permanent disability.

Methods: We present two case reports of patients who developed acute shoulder complaints. After lifting weights up to 50 kg both patients suffered an isolated lesion of the long thoracic nerve resulting in serratus anterior paralysis.

Results: Physical signs are unilateral winging of the scapula and loss of strength in the arm. A combined effect of pressure and stretching of the nerve resulted in an occupational injury with a different prognosis of reversibility in both patients.

Conclusion: Shoulder pads in the overall and limiting the weight to carry may prevent future injuries.

Keywords: Serratus anterior paralysis, occupational injury, scaffolders.

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Introduction

Shoulder complaints are often reported among scaffolders. The prevalence of shoulder complaints in scaffolders is 31% (Arbouw 1997). In the general population the prevalence was estimated 6%-11% (Van Windt et al. 2000). Most scaffolders with shoulder complaints recover in a few weeks or months with or without treatment by general practitioner (GP) or physiotherapist (PT). However, some shoulder complaints tend to be long lasting, show a long recovery time or frequent recurrence, which makes sickness absence or even disability inevitable. This article presents two case reports of scaffolders, who suffered a serratus anterior paralysis after experiencing excess load on the shoulder.

Case reports

Patient 1

A 30-year old Dutch employee of a scaffolding company was employed for over 11 years before his first period of sick leave ever in the current company. He complained about pain in the right upper arm and shoulder. After one week of treatment with a Non-Steroid Anti-Inflammatory Drug (NSAID) the occupational physician (OP) advised work resumption.

Figure 1 Thirty-year-old Dutch scaffolder with winging of the right scapula



Figure 2 Scapula alata on the right in 18-year-old Turkish scaffolder



Ten months later recurrence of complaints of the same right shoulder forced the patient to go on sick leave again. The OP diagnosed a functional impairment of the right shoulder. A sudden painful arc had developed after manual horizontal transport on the right shoulder of a few pipes, weighing over 50 kg. While elevating the arm to the front of the body the scaffolder experienced a loss of strength in the right arm. The GP also noticed winging of the right scapula and prescribed a series of 18 PT treatments. Due to a lack of therapeutic results the patient was referred to a clinician specialised in shoulder disorders. The complaint was finally diagnosed as a "serratus anterior muscle paralysis". Consequently, after 6 months of sick leave, the patient was referred to the neurologist. By then the pain in the shoulder had disappeared but scapula winging, provoked by elevation of the right arm, remained unchanged (Fig. 1).

Functional tests of the rotator cuff of the right shoulder revealed no abnormalities. Reflexes and sensibility-tests were normal. Electromyography (EMG) showed signs of denervation caused by axonotmesis (= axonal damage without loss of continuity of the long thoracic nerve) of the right serratus anterior muscle. The neurologist concluded that the shoulder disorder had been caused by a pressure injury of the nerve. He could not give any prognosis concerning time of recovery. Two years after developing the shoulder disorder no change had occurred. The patient lost his job in the current company and filed for a disability pension. For the past few months, he has been working as a truck-driver 24 hours a week.

Patient 2

An 18-year-old Turkish employee working as a scaffolder in the same company as Patient 1, went on sick leave after only two weeks of work. His major complaint was pain in the right shoulder and neck and loss of strength while lifting heavy materials on the shoulder. Two weeks prior to the sick leave the OP had performed a pre-employment medical examination, which rendered no musculoskeletal disorder whatsoever. The patient reported that he had just lifted 2 pipes, with an estimated weight of 50 kg on the shoulder, when he instantly experienced heavy pain in the right shoulder and neck. The patient consulted his GP who prescribed some pain medication. One week later the complaints of the neck had disappeared. However, after functional testing, the OP concluded that heavy loads on the shoulder might have caused a serratus anterior muscle paralysis. It seemed that it was not a total paralysis because winging of the scapula was not yet complete. However, two weeks later winging of the scapula was complete and it seemed that a total paralysis of the serratus anterior muscle had developed (Fig. 2).

Knowledge of the case report from Patient 1 urged the OP to inform the patient that recovery could be a long process. The OP also contacted the GP who referred the patient to the neurologist. After 3 months the pain in the shoulder disappeared, and by means of physiotherapy treatment the patient slightly seemed to regain strength in the right shoulder. Consecutive EMG tests recently showed some signs of regeneration. However, the disabling shoulder disorder that the patient experienced required him to look for a new job. He is now working as a data-entry typist 40 hours a week.

Discussion

Paralyses of the serratus anterior muscle due to injury of the long thoracic nerve was first described in literature by Velpeau (1837): lateral rotation and protraction of the scapula by forward elevation of the arm is inhibited. This results in winging of the scapula known as scapula alata.

Lesion of the long thoracic nerve, sometimes combined with lesions of other nerves from the brachial plexus is called a "Steinträgerlähmung", "hod carrier's palsy", "Rucksacklähmung" or "pack palsy". The last two synonyms refer to the nerve lesions caused by carrying a rucksack or a heavy bag on the shoulder. This injury, for instance, has been described in army personnel in the Second World War who had to carry their own bags on the shoulder. Frequent carrying of heavy loads on the shoulder, like in "Steinträger" or "hod carrier's", who used a V-shaped wooden trough on the shoulder to transport stones and coals, is a common characteristic in long thoracic nerve palsy (Lange et al. 1995).

The pathophysiology of long thoracic nerve palsy is determined by three factors: direct pressure on the nerve, stretching of the nerve, and ischemia. Each factor separately can cause a nerve lesion. In most cases acute nerve lesions are caused by excess force on the shoulder due to mechanical damage by direct pressure on the nerve. In chronic overexertion ischemia is the cause of damage to the nerve. The stretching capacity of a peripheral nerve is estimated at 8-15%. In research on human cadavers, in which the head was turned to the opposite shoulder while elevating the ipsilateral arm, the long thoracic nerve could be stretched twice its lengths between its two fixation points (Oware et al. 1995). Ischemia occurs if stretching exceeds 8% (Mumenthaler 1987).

In order to estimate the importance of the injury it is essential to consider the anatomy of the long thoracic nerve. From its origin, the root of C5, C6, C7, and the brachial plexus, the long thoracic nerve runs between the first rib and the clavicle to the serratus anterior muscle over a distance of approximately 35 cm. Restoration of the nerve is a very slow process: about 1 cm per week. Recovery may occur between a few months and 2 years, otherwise the injury is permanent (Caudros et al. 1995, Kauppila et al. 1996).

At first treatment of serratus anterior paralysis is conservative; in which it is better to assume an attitude of expectation. In time, if EMG testing does not reveal any reinnervation activity, application of an orthosis or surgery can be considered. In the literature a few operations for serratus anterior paralysis have been described, but none of them are helpful in relieving the complaints of workers with an injured shoulder who, like scaffolders, perform jobs requiring high forceful exertions of the shoulder (Connor et al. 1997).

Both scaffolders suffered from an acute serratus anterior paralysis. The differential diagnosis showed that these injuries were not caused by amyotrophic shoulder neuralgia (plexusneuritis). Hence, both cases were diagnosed as an occupational injury (Mumenthaler 1990).

Scaffolders often carry heavy materials on their shoulders. The pressure applied on the shoulder can exceed 25 kg. Carrying heavy loads is sometimes circumstantial and cannot always be avoided. The combined effect of a heavy load and an object, which is not easy to handle, could have caused the shoulder complaint in Patient 1. In Patient 2 the lack of experience in lifting heavy loads should not be neglected. In both patients stretching of the nerve and mechanical pressure may be responsible for the long thoracic nerve palsy.

After the second case, which had occurred within a few year of the first, the scaffolding company took preventive measures. All materials heavier than 25 kg were marked with a fluorescent orange text. All scaffolders were informed about the risks of carrying excess loads on the shoulder in tool-box-meetings. To prevent shoulder injuries staff and safety personnel commanded scaffolders at the workplace to comply to the required company regulations of only lifting loads less than 25 kg. Other options in reducing shoulder exertion are the use of lighter scaffolding materials or lifting devices such as a fork-lift truck. Pallet trucks for carrying scaffolding materials, shorter ladders/boards or electrical winches are further possibilities in improving the ergonomic environment of the scaffolder. In this company some control measures have been implemented (Vink et al. 1997).

Finally, the company started the development of a shoulder pad that is able to reduce the point-pressure on the shoulder. However, earlier research conveyed that, shoulder protection in clothing to enlarge the contact area was not judged well by scaffolders because of low expectations. Therefore, the measures should not be introduced separately. Only an integrated improvement of working conditions by a stepwise approach will hopefully prevent scaffolders from developing shoulder injuries in the future.

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