Postural taping and braces following osteoporotic vertebral fracture

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Introduction

This article relates to the use of postural taping and braces for stable osteoporotic vertebral fractures (OVFs) where treatment aims might include pain relief and postural re-education. Normally, such techniques or devices will allow some movement, are used intermittently and form just one part of a more complex conservative management package which will include education and exercise. Postural taping may initially be applied by a health professional and, if it proves helpful, carers may then be taught to do so. A range of over-the-counter postural taping and bracing devices are also widely available. More specialist devices may be tailored and fitted by orthotic services for acute or unstable OVFs but will not be discussed in detail in this article.

Osteoporotic Vertebral Fracture (OVF)

OVFs are common and account for 27% of all fragility fractures [1]. Across Europe, an estimated 12% of women and men aged 50-79 years had evidence of vertebral deformity, a marker of OVF [2]. In Canada, this was 23.5% of women and 21.5% of men over 50 years [3]. OVF most commonly affects the area between the sixth thoracic and first lumbar vertebrae and prevalence increases with age [4]. OVF can be associated with significant pain and impacts negatively on emotional health, function, mobility, sleep and quality of life [5, 6, 7, 8]. Indeed, pain following OVF is one of the most important determinants of quality of life [9]. OVF is thus a major challenge to patients and health services.

Conservative management of OVF

In addition to pharmacological treatment for underlying osteoporosis and pain relief, conservative approaches such as physiotherapy to improve pain and mobility, and to reduce future falls and fractures are advocated [6, 10]. Conservative management of OVFs is often multi-modal, employing techniques such as education, exercise, postural correction, thermal modalities and pain management programmes [11]. Postural taping and braces can form part of this multi-modal approach, particularly where postural correction is required (most commonly thoracic kyphosis).

OVF & Spinal Posture

In a population of people with vertebral fractures, it has been found that thoracic kyphosis was correlated with increased loading on vertebrae and intervertebral discs [12]. Thoracic kyphosis is known to be a key risk factor for further vertebral fracture [13] and older adults with thoracic kyphosis have a higher likelihood of future falls [14]. The theoretical case for postural correction in reducing spinal loading, pain, falls and risk of further fractures is therefore a convincing one.

Types of postural taping and braces

Postural taping can be applied in a range of different ways, using either flexible or rigid adhesive tapes, with tension applied in either a vertical or a crossed pattern. It is usual for the patient to be positioned

in an upright posture prior to application so that any subsequent deviation from that posture is accompanied by increased tension on the tape. This tension provides both mechanical support and proprioceptive feedback via the skin. If taping is found to be helpful, a family member or carer can be taught to apply it. Postural taping devices designed for different regions of the spine (such as Posture Pals or PosturePlast) are other alternatives and may be applied at home.

A. B. C.

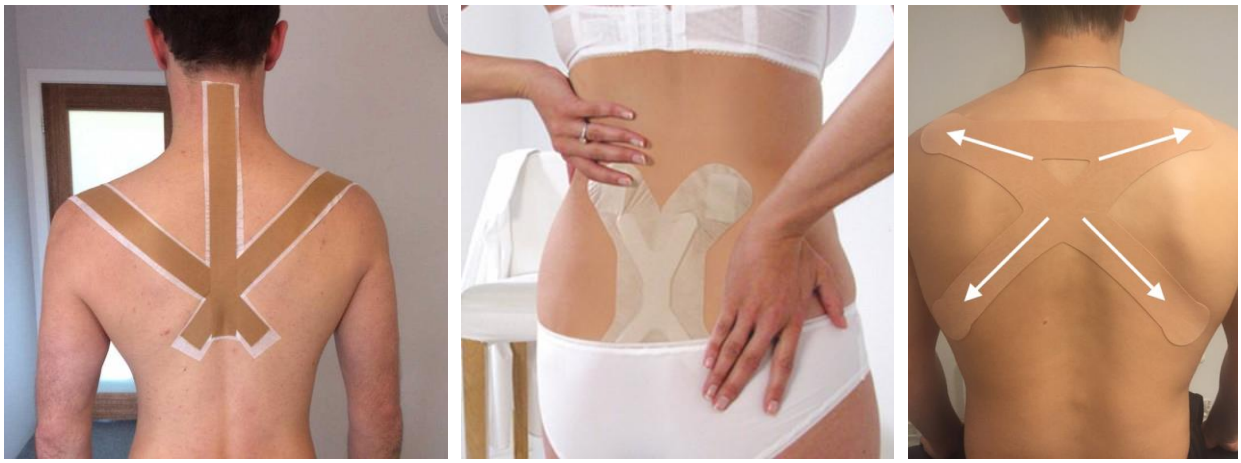

Figure 1. Examples of postural taping. A. Therapist-applied rigid taping for the thoracic spine (image used with permission, www.richmondrehab.com.au). B. PosturePlast device for the lumbar spine (image used with permission, www.postureplast.co.uk). C. Posture Pals device applied to the thoracic spine (image used with permission, www.sportsphysio.ie).

Many different over-the-counter lumbosacral or thoracolumbar braces are available. Most will have a circumferential or 'corset' design at the level of the lumbar spine which can be tightened using straps. The materials used will either be elasticated (to allow more movement) or inextensible (to provide more support). They may also incorporate vertical support struts made from metal or plastic to provide additional rigidity. More sophisticated thoracolumbar braces, such as the Spinomed brace (Figure 2B), include shoulder straps and support struts for the entire thoracolumbar spine and are donned like a rucksack. It should be noted that few specific braces have been adequately evaluated and therefore choice will depend on price, location of the fracture and careful consideration of the desired balance between movement and support.

A. B.

Figure 2. Examples of spinal braces. A. Lumbosacral brace (image used with permission, www.neo-g.co.uk). B. Spinomed thoracolumbar brace (image used with permission, www.mediuk.co.uk/products/spinomed).

Theoretical effects of postural taping and braces

As noted previously, the established links between posture in people with OVF and spinal loading, pain, falls and risk of further fractures, means that the use of taping and braces to provide external mechanical support seems intuitive. Such techniques are also purported to improve proprioceptive input, balance and to allow patients to move within a pain-free range of movement, assisting them to engage in functional activity. The psychological effects of such interventions may also be important, such that if using taping or a brace gives somebody confidence to be more physically active than they would otherwise be, that is likely to bring benefits. A commonly held belief is that reliance on braces might lead to muscle atrophy but there is inconsistent evidence to support such beliefs [15]. There are unlikely to be issues if such techniques are only used intermittently, at times when patients feel that they require additional support or pain relief. This is particularly true if taping and bracing is used as part of a rehabilitation programme that includes regular exercise and physical activity without external support in situ.

Evidence of effectiveness

Systematic review evidence

Two systematic reviews explored the effectiveness of taping and spinal orthoses for OVF [16, 17], both identifying a lack of evidence to support practice and that the existing research is generally of low quality. Jin and Lee [18] conducted a meta-analysis of the effects of spinal bracing following OVF, finding positive evidence for the effectiveness of the Spinomed device for sub-acute OVF, although the quality of that evidence was judged to be low. There was very low-quality evidence of a lack of difference in the relative effectiveness of Spinomed, rigid and soft braces for acute OVF. It is clear from evidence synthesis that further high-quality studies of the effects of both taping and bracing are required.

Effectiveness of taping

When considering individual primary studies, taping has been investigated as part of a complex rehabilitation package including other techniques such as manual therapy and exercise. Within such a context, Bautmans et al. [19] found evidence of reduced thoracic kyphosis (n=48) and Bennell et al. [20] found improved pain and function (n=20). However, Barker et al. [21] found no difference in the

effectiveness of a 'manual therapy' intervention (which included postural taping) relative to home exercise or a single advice session in a recent large randomized controlled trial (n=615). When used in isolation, a small cross-over study (n=15) found that that taping reduced thoracic kyphosis, although it did not alter other outcome measures of balance or muscle activity [22]. Finally, our research group investigated the effects of using PosturePlast for four weeks in addition to usual care in people with OVF [23]. This small feasibility study (n=24) found preliminary evidence for positive effects on pain at rest, pain on movement, function and quality of life, although the results need to be confirmed in a definitive trial. The evidence for taping is therefore conflicting and further high-quality evidence is required.

Effectiveness of bracing

Pfeifer et al. [24] undertook a randomised controlled trial (n=62) to investigate the effectiveness of six months' use of the Spinomed brace relative to no brace, finding positive effects on back extensor muscle strength, kyphosis, postural sway, lung vital capacity, pain, well-being and activities of daily living. A later randomised trial [25] (n=108) found that both Spinomed and Spinomed Active (developed to be worn beneath clothing) demonstrated beneficial effects on similar outcome measures (in addition to abdominal flexor strength) relative to no brace at six months. Participants were advised to wear the devices for two hours per day. Potential weaknesses in methodological rigour have been identified in previous reviews of both of these studies (for example in relation to randomisation, allocation concealment and blinding [18]) but the results are consistent and worthy of note. There is, however, scope for further high-quality studies of the effects of bracing in OVF.

Potential Adverse Effects

The most likely adverse effect of taping and bracing interventions is skin irritation, particularly given possible age-related skin fragility in many people with OVF. This is particularly true for adhesive taping, which is applied directly to the skin surface. Indeed, our small feasibility study found that 3 of the 13 people who received taping (23%) developed a mild skin reaction and were advised to discontinue use, although all resolved quickly [23]. Most braces can be worn on top of clothing so skin irritation may be less likely, indeed no adverse effects were reported by Pfeifer and colleagues in their studies [24, 25]. However, anecdotally abrasions can still occur (for example over bony prominences or where the arms rub against the device). Skin should therefore be checked regularly. Where a brace has a circumferential design (enclosing the chest and/or abdomen) respiratory capacity and the efficiency of the digestive system should be additional considerations.

Conclusion

Postural taping and braces are commonly used as one component of a more complex OVF management package. The theoretical benefits of doing so are convincing but there is a lack of high-quality research conducted in this area of clinical practice. Nevertheless, such techniques are worth considering as an adjunct to other conservative management techniques, where additional pain relief and/or postural reeducation is required. Further high-quality research is required to provide additional evidence to support practice.

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