EUR MED PHYS 2004;40:247-9

The osteoporotic spine: rehabilitation management

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The valuable paper published by Lin et al. in this issue of Europa Medicophysica,[1] that highlights a very interesting topic for rehabilitation practice, such as vertebral fractures, needs some deepening. In fact, the rehabilitation management of vertebral fractures, that is called non-medical management (and this is much better than the usual terminology of conservative management, or even not-surgical treatment, where rehabilitation is not considered a treatment *per se*, but as the negation of the treatment, as surgery is judged), is rapidly described, while the 2 surgical procedures, vertebroplasty and kyphoplasty, are thoroughly explained: it is true that these are new treatments, but rehabilitation is the main interest of our readers. The aim of this commentary is to rapidly review the rehabilitation management of the patient with actual or previous vertebral fractures, focusing on orthosis and physical exercises, even if the last have already been partially addressed by Davis [2] and Shea [3] in this same issue of Europa Medicophysica.

In general, the use of supports for the spine is controversial during everyday clinical practice, either for adults and for elderly people, leaving, unfortunately, to individual and discussed experiences the decision to prescribe these spinal orthoses. In the literature there are data on adult low back pain patients only: a recent meta-analysis of controlled studies4 pointed out that there is an evidence, though biased, on the possibility of limiting the range of motion without the side effect of diminishing the muscle vertebral strength. The effect could then be useful, because it would be possible to limit wrong spine movements, even if the real utility of this aim can many times be questioned. Moreover, when wearing a brace, vertebral strength (EMG findings) doesn't change:[4] on this basis, it is not possible to assure a reduced muscular load on the spine with a possible pain-relieving effect. According to these results, we cannot deny the always supposed, but never proved, adverse effect of the prolonged use of a brace, *i.e.* rapid muscle weakness and spine dysfunction. Finally, till now we do not have any study [4] to proof that the hypothetical increase in abdominal pressure assured by a lumbar support could lead to a lower mechanical (compressive) load, resulting in a diminished biomechanical stress. Thus, when thinking at a thoraco-lumbar brace, we can only say that an effect in the limitation of spine movements was found, but no other effects can be clearly stated.

If this is the situation regarding the effect of the brace on the adult spine, what can be added focusing on brace management of osteoporosis patients? Some proves have been found on the acute phase management of fractures of the vertebral body as a consequence of osteoporosis. Although this phase is underestimated by most patients and misunderstood by a good amount of primary care clinicians,5 rigid

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braces are usually employed, nevertheless low adaptability and compliance are sometimes advocated. These braces are for sure better than long time (usually 2 months) bed rest, that is the only alternative when the fracture is important; in the other cases, you can either use a brace or the new, very interesting invasive procedures described by Lin *et al*.,[1] while no treatment leads to a progressive increase of the deformity, due to the load on a vertebral body where the vertical trabeculae have been destroyed. In these cases, what is the place of physical exercises? As a curiosity, we could cite the classic treatment in ancient China, where vertebral fractures required 2 months of bed rest, during which intensive exercises were performed in prone position to isometrically and isotonically strengthen paravertebral muscles. The ancient wisdom reveals what should be easily understood by rehabilitation experts: movement is not forbidden in general, but only in the direction that increases the not wanted load on the vertebral body. So, strengthening of extensors and active mobilisation in that direction can be performed, helping in this way both the recovery of the acute phase (more nutrition and oxygenation) and from the acute phases, when it will be time to leave the brace and retrieve full spine function. Obviously, flexion exercises will be allowed only when the bone will have been completely restored. Anyway, it must be added that there are no evidences in the literature on this protocol, aside from some studies on recurrent fractures [6, 7] and the expert view.[8-10]

Not the same happens in sub-acute and chronic phase, in which exercises are commonly introduced to favour spine long-term recovery and to control pain:[8-10] also in this case there is the strong idea of avoiding as much as possible flexion exercises,[6] not to unduly increase the load on already weak vertebral bodies, in which stress ruptures can easily be produced in the trabeculae, finally leading to a visible fracture. All what has been described by Davis,[2] and Lin *et al*.,[1] but also by Shea [3] in this issue of Europa Medicophysica must obviously be added here.

If exercises are stated to be important, till now complete darkness is on the way when judging subacute and chronic phase brace use. The only exception is a very recent study by Pfeifer *et al*.:[11] they introduced a new special dynamic orthosis, that preliminarily showed to be able to significantly increase trunk muscle strength, strictly related to an increased muscular activity (biofeedback effect) while wearing the cast. Researchers also found that stronger back muscles (as it happens with exercises) favour a decrease of the angle of kyphosis and consequently increase body height, posture control and lower body sway. But, what are the real aims of spinal braces in osteoporosis? Pain relief? Postural and proprioceptive improvement? Secondary prevention of thoracic and thoraco-lumbar iperkyphosis? Ancillary aid to exercises? It is hardly difficult to give a satisfying response, because an answer does not exist in the literature. But, are these the right endpoints when managing patients with osteoporosis? These endpoints cannot be considered as stand-alone aims, disregarding the importance to see such an important disability in its complexity. Osteoporotic spine patients need a more complex management, in which a passive instrument, like an elastic or semi-rigid orthosis, will fail all its duties if used alone. A sothought brace has to become part of a treatment which goes beyond a strictly pain-related vision. As it happens for chronic low back pain,[12] a bio-psychosocial approach should be considered, to face all different aspects of the ongoing disability. Besides a correct medical (diagnosis, and instrumental follow-up) and pharmacological management, the rehabilitation point of view claims to re-consider these patients in their complete picture of dysfunction and disability, seeing a brace for what it is: an instrument to help all requested rehabilitation programs like, for instance, spine muscles strengthening13 and postural correct behaviour.[14]

A new need is today advocated for all spine researchers and clinicians: avoiding prolonged immobilization and strictly pain-related symptoms decisions, but going towards a multidisciplinary possibility to completely solve the problems of our patients, in which physical exercises, braces, and surgery can find their right place.

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