Mechanical spinal cord compression at the apex of a kyphosis: a propos of one case. Review of the literature

Elhadi Sariali · Stéphanie Panier · Christophe Glorion

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Abstract There are a few case reports in the literature on mechanical compressions of the spinal cord associated with Scheuermann's disease and the treatment is not codified. We describe a case of spinal cord compression at the apex of the kyphosis, which disappeared with the reduction of the deformity. Given the skeletal immaturity, anterior and posterior fusions had to be performed together in order to obtain a good result.

Keywords Adolescent kyphosis · Mechanical cord compression · Scheuermann's disease

Introduction

Neurological complications associated with Scheuermann's disease are infrequent. Usual aetiologies are disc hernias, extradural spinal cysts and mechanical spinal cord compression at the apex of the kyphosis [1]. There are a few case reports in the literature on mechanical compressions [3, 4, 6] and the treatment is not codified. We describe a case of spinal cord compression at the apex of the kyphosis, which disappeared with the reduction of the deformity. Authors think that the cord compression was due to the dystrophic deformity.

Case report

A 14-year-old youth had suffered thoracic pain for several months. He has consulted for kyphosis associated with recent urinary disorders. He had a urinary incontinence with micturitions by overflow. Neurological examination showed a pyramidal syndrome (including ankle clonus, a clearly positive Babinski sign and hyper-reflexia) with no neurological deficit. The neurological status was explored with SSEPs (Spinal Somato Sensory Potentials), which was abnormal. X-Rays showed a 28° T4–T8 kyphosis (Fig. 1), and bone maturation Risser 3. Plaster jacket was used for the correction of the kyphosis; it was made on a Cotrel casting frame with the patient positioned so as to diminish the deformity. This cast was used for 3 months. Pain disappeared immediately and neurological deficit resolved in around 3 weeks. He was not fused at the time of his first visit because he had recovered with a good neurologic status, with immobilization. Four months later, neurological signs re-appeared with a radiological aggravation of deformity and we noticed a 39° T2–T10 kyphosis (Fig. 2). Dynamic X-rays showed a 16° reduction of Kyphosis. Major signs of dystrophy were located at T6–T7 levels (Fig. 3). MRI sagittal-view showed a mechanical compression at the apex of kyphosis (Fig. 4). There was no disc herniation, no infectious sign, with no abnormality of blood formula and a negative intra-dermo-reaction. Neurological signs disappeared after 1 week bed rest in supine position. Surgery was performed after this 1 week period of bed rest because we prefer to have first, a good recovery of the chord. Anterior inter-vertebral fusion of T4–T10 using tibial graft was performed. We preferred to use the tibial graft rather than the iliac one because of the structural support. One week bed rest was observed, and then an immobilisation with a plaster jacket was used for 14 months. During the surgical

E. Sariali · S. Panier · C. Glorion
Necker-Enfants-Malades Hospital, Paris, France

E. Sariali (✉)
154 Rue de Picpus, 75012 Paris, France
e-mail: hedisari@yahoo.fr

Fig. 1 X-Ray showed a 28° kyphosis of T4–T8

procedure, a biopsy was performed and many samples were taken for a detailed bacteriologic analysis including tuberculosis and fungal infection. Biopsy showed a bone dystrophy, and no infection was found.

At a follow-up of 18 months, a mal-union occurred (Fig 5) with a radiological aggravation of the kyphosis (55°) and repetition of the spinal cord compression at the apex. This deformity reappeared progressively but no surgical revision was performed as we were waiting for fusion. Dynamic X-rays showed a reduction of the kyphosis (Fig. 6). We think that fusion did not occur because

Fig. 2 Four months later, X-Ray showed a 39° kyphosis of T2–T10

of posterior mobility and anterior dystrophy. A posterior instrumented fusion of T2–L2 was performed using CD instrumentation, with a reduction of kyphosis. The patient has been reviewed with 8 years follow-up. He has no pain, aesthetic result is good, neurological examination is normal and complete circumferential fusion is obtained (Fig 7). At final follow-up, sagittal plane thoracic kyphosis is 53° and lumbar lordosis is 40°. His neurological and urological symptoms and signs returned to normal.

Discussion

Mechanical compression at the apex of kyphosis is very rare in sheuerman's disease. There are few cases reported in the literature [1, 3, 4] and not one from that shows a complete neurological recovery, immediately after reduction of deformity. In fact, compression is more likely related to other aetiology such as disc hernia or extra-dural cysts [5]. Fau et al. [2] reported a case of disco-arterial conflict with a compression of the anterior spinal artery.

The strong correlation between neurological deficit and aggravation of deformity on one hand, and neurological recovery on the other hand, proves that the compression is purely mechanical. Normalisation of neurological examination after bed-rest period is a diagnostic test.

In case of neurological complications in Sheuermann's disease, we should eliminate other aetiologies such as bacterial infections, particularly Pott's disease. Blood formula, sedimentation rates and C-reactive protein are normal. Given the normal clinical examination at the last follow-up of 8 years, the X-rays aspect, the results of the biopsy, and the normal microbial examinations (no tuberculosis, no bacteria, no fungus), we think that these neurological symptoms were related to mechanical cord

Fig. 3 Major signs of dystrophy were at T6–T7 levels (a). There was no disc hernia at the thoracic levels (b)

Fig. 4 Compression at the apex of the kyphosis

Fig. 5 Eighteen months after anterior inter-vertebral fusion, we noticed malunion and repetition of the compression at the apex of the kyphosis

compression at the apex of a dystrophic kyphosis, possibly related to a scheuermann's disease.

Cases reported in the literature were diagnosed with myelogram, which is an invasive exam. We have used spinal MRI with sagittal reconstructions to detect the mechanical compression at the apex, and to exclude other aetiologies such as herniation.

The initial treatment with isolated anterior inter-vertebral fusion was a failure, probably because bone maturation was not complete as patient was still Risser 3, so posterior growth induced a kyphosis aggravation. Ryan and Taylor [6] treated two cases (18 and 20 years old) with anterior release and fusion, and one case (14 year old) by anterior release and circumferential fusion. They have all fused. Klein et al. [3] used only posterior fusion using Harrington compression instrumentation for a 17-year-old boy.

Our case lets us think that anterior fusion should not be performed separately in case of incomplete bone maturation, but in association with a posterior fusion.

Fig. 6 Reduction of the kyphosis on dynamic X-Rays

Fig. 7 Final result with 8 year follow-up. No pain, normal neurologic examination and complete circumferential fusion. 53° thoracic kyphosis and 40° lumbar lordosis

In fact, in case of isolated anterior fusion, bone growth may continue in the posterior part of the vertebrae inducing an increase in kyphotic deformity. Furthermore, a combined anterior and posterior fusion provides a stronger stability than an isolated un-instrumented anterior fusion.

Conclusion

Spinal cord compression at the apex of kyphosis is very rare. Other aetiologies such as disc hernia or extra-dural cysts should be eliminated first. Neurological recovery after a bed-rest period is a diagnostic test. Spinal MRI should be performed for diagnosis. Anterior fusion should not be achieved separately before complete bone maturation, anterior and posterior fusions should be done together the first time, given the skeletal immaturity.

Conflict of interest statement None of the authors has any potential conflict of interest.

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