Posterior only treatment of adult thoracic kyphosis with multiple Ponte osteotomies and pedicle screw instrumentation

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Introduction

The surgical treatment of the kyphotic deformity in the adult is recommended when the deformity is greater than 75°, painful and with unacceptable cosmetic appearance [1].

There was a long debate among surgeons regarding the best approach to be adopted to properly correct a kyphotic deformity, with some authors who proposed an anterior release with a posterior instrumentation-fusion during the past.

However, posterior fusion alone has been reported to be adequate to correct the vast majority of the thoracic kyphosis with less morbidity than a combined approach [2].

In 1984 Professor Alberto Ponte published his personal procedure to treat the Scheuermann's kyphosis with a posterior column shortening via multiple wide segmental osteotomies and posterior compression instrumentation and fusion [3].

The advent of segmental posterior pedicle screws fixation of the thoracic spine has significantly reduced the risk of postoperative loss of correction and non-union.

Learning targets

- To learn how to get an accurate pre-operative planning regarding the fusion area and the choice of osteotomy site
- To learn how to do the Ponte procedure
- To learn how to correct the kyphotic deformity with a cantilever manoeuvre and a compression construct
- To learn the importance of an accurate preparation of the arthrodesis area and of the bone graft

Case description

We report the case of a 43 years old man with a high-grade thoracic kyphosis (88°), thoracic pain especially during daily activities and sports and with an unacceptable cosmetic problem (Figs. 1, 2, 3).

The spino-pelvic study was done on standard AP and LL X-rays of the entire spine in standing position and was: PI = 53°; SS = 45°; PT = 8°; LL (L1-S1) = 80°, TK (T1-T12) = 88°; SSA = 134.8° (X-ray 1).

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Fig. 1 View of the patient from behind before the surgery

Fig. 2 Lateral view of the patient before the surgery

Fig. 3 Side view of the patient in flexion before the surgery, showing the rigidity of the thoracic kyphosis

Surgical procedure

The surgical procedure is done with the patient in prone position with a standard mid-line incision from T2 to the neutral vertebra, L2 in this case.

We plan multiple Ponte osteotomies from T5 to T12 with variable width depending on the level (maximum width at the deformity apex).

The Ponte procedure starts in the midline with excision of the supra- and interspinous ligaments, and then the yellow ligaments on both sides are removed exposing the dura. The osteotomy extends at the facet joints with a V shape on the frontal plane.

In this case we performed seven Ponte osteotomies at the levels T5/T6, T6/T7, T7/T8, T8/T9, T9/T10, T10/T11 and T11/T12.

The instrumentation covers the whole deformity from the top (T2) to the neutral vertebra at the bottom of the spine (in this case L2) by using pedicle screws and leaving free the apex of the kyphotic curve (T9 without screws).

The reduction manoeuvre consists in a cantilever movement with a strong compression along the instrumentation, in between each level from the top to the bottom.

At the end we perform a good lamina decortication with implementation of homologous bone graft in order to achieve a solid fusion.

Postoperative information

The patient was mobilized on the second day after surgery and no corset was used.

He has begun a standard rehabilitation program for the improvement of the pulmonary function and for strengthening of the lower limbs.

The full-spine X-rays in standing position demonstrates a huge improvement of the kyphotic deformity (TK) that it reduced from 88° to almost 38° of curve (X-ray 2), with good consequence on the cosmetic impact of the patient (Figs. 4, 5).

Fig. 4 View of the patient from behind after the surgery

Lumbar lordosis (LL) also reduced his value to almost 60° starting from 80° (L1-S1).

Discussion and conclusion

The surgical correction of the kyphotic deformity of the adults is a complex procedure that must be sharply planned. The major point to be considered is the type of the osteotomy and its location along the spine. Many different types of osteotomy were presented in the literature with different range of average correction. The pedicle subtraction osteotomy (PSO) allows the higher grade of correction but it is associated with a high complication rate, while the Ponte procedure is a posterior column shortening with a very low complication rate. The average correction range for the Ponte osteotomy is about 8° to 10° for each procedure level. It is a posterior only surgical technique especially ideated by Professor Ponte to allow an optimal safe correction of the Scheuermann's kyphosis.

A prerequisite for the osteotomy is an adequate disc height with a residual flexibility within the intervertebral disc [4].

In conclusion we think that the posterior only approach with multiple Ponte osteotomies and all pedicle screw

Fig. 5 Lateral view of the patient after the surgery

instrumentations allows an optimal correction of the adult thoracic kyphosis with a very low complication rate.

Conflict of interest None.

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