Cineradiography of the Hypomobile First Rib

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A patient with bilateral chronic brachialgia was cineradiographically shown to have hypomobile first ribs bilaterally. This finding can be elicited by the Expiration-Inspiration (E-I) test, in which the patient is palpated just beneath the clavicles while breathing. Right side scalenus muscle activation restored the movement of the right first rib. The cineradiography confirms the validity of the palpatory E-I test which has been previously described.

KEY WORDS: Cineradiography; Reflex sympathetic dystrophy; Ribs; Thoracic outlet syndrome

We have previously suggested that the hypomobile first rib is a possible mechanism causing thoracic outlet syndrome (TOS). The rich nervous network and especially the stellate ganglion in the intimate vicinity of the first costotransversal joint can explain the brachialgias and reflex sympathetic dystrophy (RSD) symptoms. During breathing, a patient's first rib rotates on its long axis and moves up and down like a bird wing. The first costotransversal joint lacks a cranially directed ligamentous support, which is found in all lower costotransversal joints. This makes the topmost joint less stable than the lower ones, and susceptible to subluxation and "locking up."

CASE REPORT

Our patient was a 55-year-old farmwife who had severe bilateral brachialgia for ten years. Her pain was worse on the right side. She was unable to work with her arms raised over shoulder level. In the Roos test her hands became clumsy and dropped down in about 20 seconds. Her cervical mobility was restricted. Cervical spine x-ray examination showed moderate disc degeneration. Cervical myelography had previously been normal. Both first ribs were found hypomobile in the Expiration-Inspiration (E-I) test when she was palpated just underneath the clavicles while breathing.

A systolic bruit was heard on auscultation of her right subclavian artery when her right arm was abducted. Transfemoral intraarterial digital subtraction angiography (DSA) of the aortocervical vessels revealed no occlusive arteriosclerotic changes. Right after the DSA, a cineradiographic examination of the first ribs was performed at 25 frames/sec at PA-projection with 30° of caudal angulation during inspiration and expiration (fig 1). Neither one of the first ribs was moving, and they looked like the left one in figure 2.

The right first rib was then mobilized by using the scalenus exercises previously described. The exercises were performed by the patient herself. She pushed her head against the palm of her painful side moving forward, to the side, and backward. Each movement lasted one second with a short pause between positions. This series of pushing movements was repeated ten times. The cineradiography was then repeated. The right first rib moved normally while the left one was still locked up in the inspiration position. The asymmetry of the thoracic outlet kinetics can be seen in figure 2.

DISCUSSION

Asymmetries of the respiratory movements of the first rib have been presented radiologically. They have, however, occurred in association with structural asymmetries of the cervicothoracic spine.

An upward dislocation of the first rib has been previously
Fig 2—After mobilization, the right first rib moves normally while the left one is still locked up (on top: maximal inspiration; on bottom: maximal expiration). (PA-projection, the right side labelled dex.)

suggested elsewhere as a cause of brachialgia. Contrary to our findings, both the costotransversal and the costovertebral joints seemed dislocated in the radiographs presented by McCormick and colleagues. The cineradiography demonstrated both the E-I test and the immediate result of the scalenus activation treatment. The further prognosis, however, is multifactorial.

The relatively wide movement of the first rib on the mobilized side is illustrated in figure 3. This suggests the significance of the normal mobility of the thoracic outlet. The subclavian artery bruit could have been a coincidence or possibly related to the symptomatology. It was probably hemodynamic since the vessel lacked thrombotic changes.

References

Fig 3—A schematic representation of the normal (shaded) and restricted first rib movement.