[IMAGE]

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Functional Anatomy and Respiration

By Craig Liebenson, DC

Editor's note: The time values mentioned in this article are taken from a videotape series by Robert Acland.[1]

Introduction

In last month's column, I introduced you to a new videotape series by Robert Acland of the University of Louisville. His discussion of the muscles of respiration is fascinating and revealing, particularly because the function of respiration is often ignored clinically when in fact it is one of the most important perpetuating factors of repetitive strain to the cervical or lumbar spine. Think about cervicobrachial disorders with poor upper-rib mobility (in a caudal direction) and scalene trigger points. Treating the rib dysfunction and myofascial component is bound to fail if the real problem is in faulty respiration. Overactivation of the scalenes during inspiration results in upper-rib dysfunction and trigger points. Management is incomplete unless normal diaphragmatic breathing is re-educated.

Discussion

The diaphragm is a complex muscle with attachments to the central tendon; back of the sternum, costal arch; tip of the 12th rib; ventral portions of the vertebral bodies of L1 and L2; and the fascia of the quadratus lumborum and psoas major muscles (52:00).

Acland shows how inhalation occurs when the diaphragm contracts and moves inferiorly, thus increasing the volume of the pleural cavity. The lungs expand to fill the available space. Normal, quiet inspiration is visualized by the abdominal wall slightly protruding out as the abdominal contents are pushed forward to make room for the diaphragm. Normally, there is hardly any visible rib movement!

Quiet exhalation is a result of retraction of the pleural cavity due to its passive elasticity, and therefore requires no muscle activity (55:30).

Accessory muscles of inhalation are the external intercostals, which move the chest upwards and forward (56:41), and the scalenes, which raise the first and second ribs (57:26). Accessory muscles of exhalation are the internal intercostals (58:30), which move the ribs down and back and the abdominal wall musculature (59:57), which force the diaphragm upwards, causing exhalation. The rectus abdominus, transverse abdominus, internal oblique, and external oblique muscles are all involved in forced exhalation, such as with coughing or sneezing.

Clinically, when evaluating respiration, there are two simple signs of dysfunction to check for:

1. elevation of the clavicle during quiet inhalation (1st rib lies behind the clavicle);
2. failure of the abdomen to move forward during quiet inhalation.

Faulty respiration not only leads to cervical problems, but compromises a patient's ability to stabilize their low back during lifting tasks. For instance, during lifting tasks, the abdominal muscles must not protrude out or else the lumbodorsal fascia will not be tensed. Proper abdominal respiration/function is key to maintaining the intra-abdominal pressure during lifting.

Acland's observations show us the connection between the thoracolumbar junction and respiration, and the psoas major and quadratus lumborum and respiration. Perhaps in cervicobrachial syndromes, these areas should also be evaluated.

Disorders involving excessive thoracic kyphosis are also often related to faulty respiration. The upper ribs must be able to move cephalad or else the upper thoracic spine will stay kyphotic.

Conclusion

Improving the function of respiration is no less important than improving back extensor endurance, posture, or joint play. However, it is often poorly understood and undertreated. Yoga, soft tissue release of the diaphragm, and rib mobilization techniques all play a role in functional rehabilitation of faulty respiration. Rehabilitation courses, such as Dr. Maria Perri's postural reeducation course in LACC's third 100 hour rehabilitation diplomate program, teach the concepts and techniques necessary for addressing this important topic.[2]

References

1. Acland RD, Riggs GH. The Video Atlas of Human Anatomy. Tapes 1-3: The upper extremity; the lower extremity; and the trunk. Williams & Wilkins, Baltimore, 1998.
2. LACC postgraduate division. 3rd 100-hour postural re-education course. Instr. M. Perri. Las Vegas, Philadelphia, Seattle, Meriden CT, Oakland, and Denver; (562) 902-3379.

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