Letter to the Editor

A Step-by-Step Approach to Reducing Work-Related Musculoskeletal Disorders in Echocardiographers

Dear Editor,

Work-related musculoskeletal disorders (WMSDs) develop due to sustained injuries made by repetitive movements and pressures during work.[1] The discrepancy between the physical capacity of the human body and the physical requirement of the work can result in WMSDs, recognized as a multifactorial disease state due to the interaction of diverse risk factors.[2] Echocardiography is among the professions with a high likelihood of WMSD development.[3] The problem is exacerbated when patients are old and their collaboration is diminished by hearing problems, muscular rigidity, and cognitive impairment. Excessive shoulder abduction and internal rotation, ulnar/radial deviation during flexion, and upper cervical hyperextension are common during repeated echocardiographic examinations.

Herein, we present commonly felt discomforts during echocardiography and provide brief troubleshooting instructions to which we adhere at our center to reduce WMSDs.

First and foremost, the appropriate height of the patient's bed and the echocardiographer's chair and monitor should be considered. The distance between the operator, the patient, and the echocardiography machine should also be minimized. Moreover, keeping the wrist in its neutral position is a healthy work style as is repetitive blinking to prevent eye dryness. What should not be neglected is taking enough rest between examinations, and echocardiographers should adjust their position constantly because repeated minor injuries will eventually lead to serious problems. Feeling discomfort in the cervical spine region might be the result of the placement of the monitor higher than the echocardiographer's eyesight center. The operator's eyesight and the image on the center of the monitor should make a straight line. The proper positioning of the monitor is essential to the prevention of eye and neck strain. Most guidelines recommend the positioning of the monitor at or below eye level to attain a comfortable distance between the screen and the viewing angle.[3] The preferable distance to the monitor for most operators is between 63 cm and 85 cm.[4] When the sitting distance to the echo machine is even slightly farther, the body tends to compensate for it by drawing the neck forward, resulting in forwarding head posture and round shoulders and, ultimately, chronic neck pain owing to sustained pressure on the trapezius muscle. Sitting on a chair with waist support can help ameliorate the stress applied to the cervical region. Feeling spasms unilaterally in the paravertebral muscles of the neck could mean excessive or prolonged cervical bending toward one side. To prevent this spasm, echocardiographers should straighten their cervical muscles and eschew keeping their neck rotated for sustained periods.

Generally, excessive abduction and internal rotation are damaging to the echocardiographer's shoulder, while ulnar/radial deviation during flexion is dangerous for the echocardiographer's wrist. Feeling pain in the operating shoulder may be due to excessive abduction or bending over the patient; operators should, therefore, decrease their distance from the patient. The low height of the sitting chair in relation to the patient's bed is another cause of excessive shoulder abduction. Performing echocardiography on an obese patient may create the same situation as a lower chair or a higher-than-normal examination table. Sitting straight is also greatly significant for shoulder health during echocardiography. If the operator's trunk is bent forward even slightly, the shoulder could be leveraged backward, causing discomfort. Pain in the shoulder while working with the keyboard might be related to the distance from the echo machine, which could be associated with the poor position of the operating arm (shoulder flexion). All the mentioned positions and considerations are the same for right or left-handed examiners.

Feeling discomfort in the operating wrist might mean that it is not in its neutral position, supposed to be at 0° or to have a slight extension (eg, when holding the mouse). The examining wrist should not be held in a flexed position so as for it to be kept in its neutral position. It seems helpful if operators could lay their wrists on the patient's chest or learn to disperse the applied pressure between the wrist and fingers. If the navigation field is located lower than the operating hand, excessive shoulder abduction and wrist flexion can occur. Thus, echocardiographers should imagine a triangle composed of them, the echo machine, and the laid patient and adjust each part of this operating triangle with the other parts. The components of this triangle should be closer to each other but not at the expense of wrist flexion, which occurs most often in the case of excessive shoulder adduction (Figure 1). The examining bed should be placed far from the wall because if the bed is attached to the wall, the patient moves toward it unconsciously to overcome the fear of falling, which makes the patient slightly farther from the echocardiographer. The same scenario could occur when the lateral bedside is mounted. As the first step, the operating

hand should be adjusted to the patient's position before the adjustment of the other mentioned parameters.

Figure 1. The image demonstrates the application of ergonomics during echocardiography. The monitor is at sight level or slightly lower. The echocardiographer sits with a straight back, while the patient lies close to the machine and the operator.

The ankle position is of great importance, too. The ankle should be positioned at a neutral position of 0° with no plantar flexion or extension. The knee should be bent at 90°. Some echo machines are supplied with foot stands, but echocardiographers might encounter problems using foot stands since they are likely to lose appropriate knee and waist posture subsequent to sitting with legs apart.

Visual health is vitally important in echocardiographers. Normally, an individual blinks about 14 times per minute. Focusing the eyes on screens diminishes the rate of blinking by a third to a half, leading to the development of dry eyes. Thus, encouraging frequent blinking or blinking exercises maintains the moisture of the ocular surface to prevent related dryness and irritation.[5]

All the abovementioned items should be determined by the individual echocardiographer. The patient's height and heart position in the chest should also be taken into account. In smokers or patients with hyperinflated chests, operators may need to draw the echo machine and the sitting chair slightly lower than the examination table or ask the patient to move slightly upward because the heart is shifted downward. Echocardiographers should also adjust their position when taking subcostal and suprasternal views.

The human body is intelligent, and any alarming signal of discomfort during the examination of each patient should not be missed. If echocardiographers feel any discomfort during echocardiography, they should change their navigation area and correct the position of the laid patient. Focusing on anti-discomfort strategies should be an everyday approach in an echocardiographer's practice to prevent injuries in the long term and take appropriate images from the patient's heart. The sooner the operator learns echo machine-friendly styles and appropriate positioning, the less time is wasted when trying to obtain high-quality images. A useful rule of thumb is that echocardiographers should alter their posture frequently during echocardiography to lessen the likelihood of WMSD development.

As a final note, if echocardiographers still feel discomfort after applying all the aforementioned recommendations, they should request a colleague to take photos of them during the procedure so that they can identify the problem(s) in the images. Furthermore, fatigue should not be underestimated since the body can cope with only a limited number of uncomfortable positions over time. Based on the rule of 3–30, for every 30 minutes of sitting, one needs 3 minutes of walking or simple resistance exercises or a combination of both to prevent WMSDs.[6]

References

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