Sonography

Thyroid cyst mirror artifact mimicking a tracheal cyst on ultrasound in a patient with excessive trachea collapsibility

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A B S T R A C T
Mirror image artifact in ultrasound is not an unusual phenomenon. However, it is rarely seen in thyroid ultrasound because of the natural convexity of the tracheal surface. We report a mirror artifact during thyroid ultrasound in a patient with an excessively collapsible trachea. Minor pressure with the transducer made the trachea surface flat or concave, and then a cyst in the thyroid was mirrored across the trachea, which mimicked an intratracheal cyst. This case illustrates how an unusual collapsible trachea can generate an image that simulates an intratracheal lesion during thyroid ultrasound.

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I n t r o d u c t i o n

Ultrasound image artifacts are commonly encountered and may be a cause of image misinterpretation. Mirror artifact is one of these ultrasound image artifacts and is produced when the primary beam meets a highly reflective interface [1,2]. The reflected waves then encounter the back side of a structure, bounce back toward the reflective interface, and return to the transducer. This phenomenon doubles the round-trip time for each point within the mass and registers the echoes equidistant on the opposite side of the reflector surface.

We report a case of mirror artifact from the trachea during thyroid ultrasound. Because the surface of the trachea is convex, the beam scatters after bouncing off the trachea, and no mirror image is expected in normal situations. In our case, the trachea was excessively collapsible, which resulted in a mirror artifact during thyroid ultrasound.

C a s e   r e p o r t

A 46-year-old man was referred from a private clinic, where he was diagnosed with thyroid cyst and intratracheal cyst. The man smoked several years in his 20s and had no respiratory symptoms.

On ultrasound examination, a 1.5 × 1-cm-sized movable cyst was noted in the isthmus of the thyroid (Fig. 1). On the other
side of the tracheal wall, another cyst with similar dimensions was observed; the lesion definition was changed as the angle of the transducer changed. The lesion was most clearly defined when the anterior trachea wall became flattened or concave. We thought that the intratracheal cyst was a mirror image of the thyroid cyst, and aspirated the thyroid cyst with a 23G needle under ultrasound guidance. About 1 cc of chocolate-colored, thick fluid was obtained and the cyst collapsed. The other cyst mimicking the intratracheal cyst also decreased in size (Fig. 2). The cervical trachea was very soft and easily compressible in this patient, so even the placement of the probe made the anterior wall of the trachea a little flat. Moreover, the compression to remove the gap between the probe and the skin resulted in remarkable flattening. We measured the inner diameter of the anterior wall of the trachea before and after compression; the diameter was increased by about 16% after compression (from 1.9 to 2.2 cm). Actually, “before compression” already means some degree of compression in this patient, so the increase in ratio must be more than 16%. The pulmonary function test (PFT) and the routine chest computed tomography (CT) scan results were normal. On inspiration and expiration chest CT scan, no definite collapse of the cervical trachea was seen (Fig. 3A and B). We gave mild manual compression to the anterior neck between the thyroid cartilage and the sternal notch during the scan, and then the lumen became markedly deformed and flattened (Fig. 3C). The patient had no specific complaint but only minor discomfort when the trachea was compressed.
Mirror image artifact may occur adjacent to highly reflective acoustic interfaces, such as the diaphragm, the pleura, and the bowel. Reverberations develop between the real mass and the reflective surface [1]. This phenomenon doubles the round-trip time for each point within the mass and registers the echoes equidistant on the opposite side of the reflector surface. Mirror artifacts have been reported in many body parts, including abdominal [1,2], obstetric [3–5], cardiac [6], vascular [7–9], and musculoskeletal ultrasound [6,10]. Our literature search showed that only 1 case of mirror image has been reported during thyroid imaging [11]. In that case, the authors suggested that the lean body structure and neck hyperextension of the patient were the causes of tracheal concavity and facilitated mirror image artifact. As the surface of the trachea is convex under normal conditions, the beam from the transducer scatters after bouncing off the tracheal surface and does not gather to make an image. So, there is usually no chance of mirror artifact during thyroid ultrasound. In our case, excessive collapsibility of the trachea resulted in a rare mirror image across the trachea. We performed dynamic airway CT and a pulmonary function test to rule out tracheomalacia [12]. Both studies did not demonstrate an excessive tracheal collapse during the expiratory phase. However, we found an excessive, collapsible anterior tracheal wall upon minor manual compression. We suggest that the intrinsic flexibility of tracheal cartilage induced such an excessive collapse.

Our case demonstrates that mirror image artifacts can occur on thyroid ultrasound when the tracheal anterior wall has unusual excessive collapsibility. Proper recognition of them can prevent diagnostic error and unnecessary examination.

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