

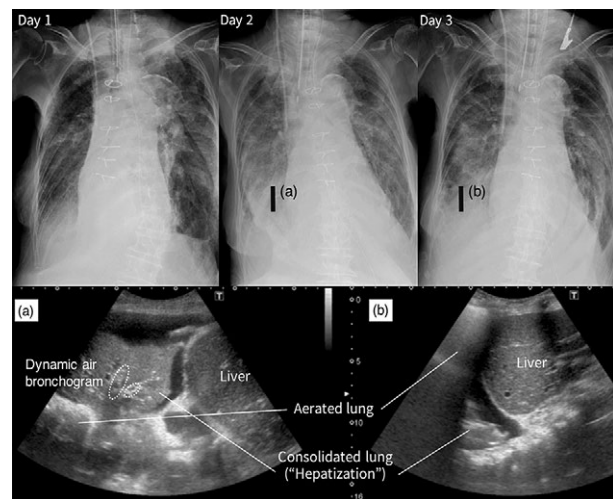
## Dynamic air bronchogram and lung hepatization: ultrasound for early diagnosis of pneumonia

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### To the Editor,

An 81-year-old woman was admitted to the intensive care unit for septic shock. Crystalloid resuscitation was initiated, followed by treatment with broad-spectrum antibiotics immediately after sputum and blood cultures. As the patient was hemodynamically unstable, she was intubated and put on mechanical ventilation. On the first day of admission, auscultation revealed faint coarse crackles in the right lung. Chest radiography showed bilateral pleural effusion. Blood test results revealed a white blood cell (WBC) count of  $9.2 \times 10^3/\mu\text{L}$  (neutrophils, 96.2%) and marked elevation of C-reactive protein (CRP) levels at 26.3 mg/dL; other results, including urinary tests, were within normal ranges. The sputum Gram stain was negative. On the second day of admission, bedside lung ultrasound revealed bilateral pleural effusion; right lung “hepatization,” liver-like echogenicity of the consolidated lung (fig 1a) and “dynamic air bronchogram” (hyperechoic bubbles - sputum in the bronchus - moving synchronously with respiration) in the right lung. The latter two features strongly suggest pneumonia [1,2]. On a new chest radiography, an increased density of the right lung parenchyma reflecting pneumonia was found. Further blood tests revealed an elevated WBC count ( $15.7 \times 10^3/\mu\text{L}$ ) and CRP levels (29.2 mg/dL). Positive end-expiratory pressure was raised from 5 cm H<sub>2</sub>O to 10 cm H<sub>2</sub>O, and postural drainage and high-frequency chest wall oscillation were initiated. On the third day of admission, right lung density decreased slightly



**Fig 1.** Chest radiographs and ultrasound images. Lung ultrasound revealed lung hepatization and dynamic air bronchogram (see video 1, on the journal site).

on chest radiography, and lung aeration improved on ultrasound, excluding the right dorsal lower lobe (fig 1b). *Klebsiella pneumoniae* at  $>100,000$  colonies/mL were obtained from sputum culture sampled on the first day of admission. WBC and CRP levels decreased steadily over a few days and CT scan showed no spread of infection from the right lung and no other infectious focus.

CT is the gold standard for diagnosing pneumonia. However, it is sometimes difficult to transfer an unstable patient to the radiology department. Although chest radiography is the first choice for patients with suspected pneumonia, a systematic review showed that chest radiography has 54% sensitivity in the diagnosis of pneumonia compared with 93% for lung ultrasound [3]. Additionally, CT scans may fail to differentiate pneumonia from atelectasis, unlike dynamic air bronchogram on real-time ultrasound [2]. Lung ultrasound may enable early identification and timely intervention in pneumonia as in this case.

Received 02.03.2021 Accepted 18.04.2021

Med Ultrason

2021, Vol. 23, No 2, 238-239, DOI: 10.11152/mu-3136,

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## References

1. Lichtenstein DA, Lascols N, Mezière G, Gepner A. Ultrasound diagnosis of alveolar consolidation in the critically ill. *Intensive Care Med* 2004;30:276-281.
2. Lichtenstein D, Mezière G, Seitz J. The dynamic air bronchogram. A lung ultrasound sign of alveolar consolidation ruling out atelectasis. *Chest* 2009;135:1421-1425.
3. Ye X, Xiao H, Chen B, Zhang S. Accuracy of Lung Ultrasonography versus Chest Radiography for the Diagnosis of Adult Community-Acquired Pneumonia: Review of the Literature and Meta-Analysis. *PLoS One* 2015;10:e0130066.

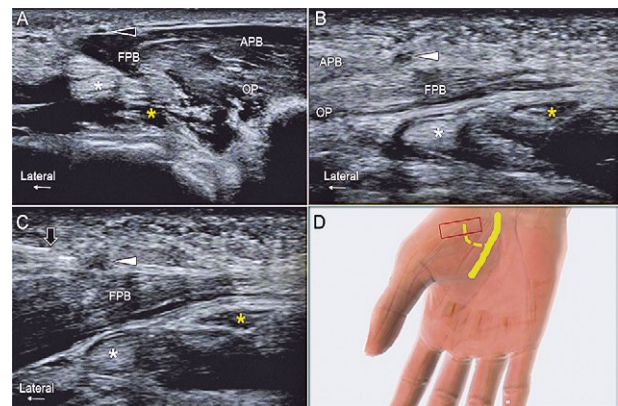
# Ultrasound imaging and guided hydro-dissection for injury of the recurrent motor branch of the median nerve

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## To the Editor

A 30-year-old man had right thumb pain - irresponsive to oral medication and physical therapy - for the last six months. He had visited a pain physician who had performed landmark-guided trigger point injections over the base of his right thumb. Unfortunately, he had been feeling weakness during thumb opposition since then. Electrophysiological studies were general. Ultrasound (US) showed a normal cross-sectional area (<10 mm<sup>2</sup>) [1] of his right median nerve at the carpal tunnel inlet. The transducer was then relocated to the thenar eminence. Compared with the asymptomatic hand, the thenar muscle at the painful side appeared thinner and more echogenic (fig 1A, B). The recurrent motor branch of the median nerve (RBMN) appeared swollen compared with the contra-lateral side. Under the impression of



**Fig 1.** Ultrasound imaging of the recurrent motor branch (black and white arrowheads) of the median nerve at the normal (A) and symptomatic (B) sites; ultrasound-guided perineural hydro-dissection for the swollen nerve (C); schematic drawing of the recurrent motor branch (yellow dashed line) of the median nerve and the position of the transducer (red square) (D). Arrow, needle; white asterisks, flexor pollicis longus tendon; yellow asterisks, main trunk of the median nerve; APB, abductor pollicis brevis; OP, opponens pollicis; FFB, flexor pollicis brevis.

Received 31.03.2021 Accepted 18.04.2021

Med Ultrason

2021, Vol. 23, No 2, 239-240, DOI: 10.11152/mu-3183,

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thenar muscle atrophy secondary to RBMN neuropathy, US-guided hydro-dissection with 2 mL 5% dextrose was performed (fig 1C, Video, on the journal site) four times and the patient experienced a gradual recovery of thenar

muscle strength and more than 50% decrease in thumb pain.

The RBMN provides innervation to the thenar muscles [2]. It mostly emerges from the main trunk of the median nerve distal to the carpal tunnel outlet and ascends vertically to the palmar surface through the anterior edge of the transverse carpal ligament [3]. The RBMN further curves backward to pierce and innervate the thenar muscles (fig 1D). The RBMN neuropathy is uncommon and can result from neurogenic tumours, compression of the thenar muscles during long-distance cycling and iatrogenic injury. In this case, we speculated that the antecedent trigger point injection might be the culprit of RBMN neuropathy. Moreover, the subsequent thenar fibrosis could have led to entrapment of the nerve across its passage through the palmar fascia. Therefore, the US-guided perineural hydro-dissection relieved the focal compression and facilitated the neural recovery [4,5].

**Acknowledgement:** The current research project was supported by National Taiwan University Hospital, Bei-Hu Branch, Ministry of Science and Technology (MOST

106-2314-B-002-180-MY3 and 109-2314-B-002-114-MY3), and Taiwan Society of Ultrasound in Medicine.

### References

1. Chen IJ, Chang KV, Lou YM, Wu WT, Özçakar L. Can ultrasound imaging be used for the diagnosis of carpal tunnel syndrome in diabetic patients? A systemic review and network meta-analysis. *J Neurol* 2020;267:1887-1895.
2. Riegler G, Pivec C, Platzgummer H, et al. High-resolution ultrasound visualization of the recurrent motor branch of the median nerve: normal and first pathological findings. *Eur Radiol* 2017;27:2941-2949.
3. Smith J, Barnes DE, Barnes KJ, et al. Sonographic visualization of thenar motor branch of the median nerve: A cadaveric validation study. *PM R* 2017;9:159-169.
4. Lin CP, Chang KV, Huang YK, Wu WT, Özçakar L. Regenerative injections including 5% dextrose and platelet-rich plasma for the treatment of carpal tunnel syndrome: A systematic review and network meta-analysis. *Pharmaceuticals (Basel)* 2020;13:49.
5. Chang KV, Wu WT, Özçakar L. Ultrasound imaging and guidance in peripheral nerve entrapment: hydrodissection highlighted. *Pain Manag* 2020;10:97-106.

## Utilization of diagnostic ultrasound in the detection of hip fracture

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### To the Editor,

A 72-year-old woman with history of rectal adenocarcinoma and brain metastasis (but no documented bone metastasis) had in the recent medical history left proximal femoral vein thrombosis treated with an anti-coagulation agent. One month before visiting the clinic she had sudden onset of a severe right hip pain when she

took a walk. She reported no falling episode at the time. Initially, she could walk with a walker but, during the following days, her hip pain progressed and finally she became wheelchair-bound.

On examination, she was intolerant to both the passive and active range of motion test due to severe right hip pain. The pain worsened on weight bearing and improved when resting supine. Ultrasound evaluation demonstrated discontinued cortex of the right femoral neck and a hypervascular hyperechoic amorphous soft tissue was noted just over the cortical cleft (fig 1a, b). These findings were consistent with right hip fracture at the femoral neck with callus formation. The hip plain film disclosed displaced hip fracture of the right femoral neck, Garden type IV (fig 1c). Therefore, she underwent bipolar hemiarthroplasty of the right hip. Pathological exam disclosed osteoporosis with marrow atrophy and no evidence of malignancy.

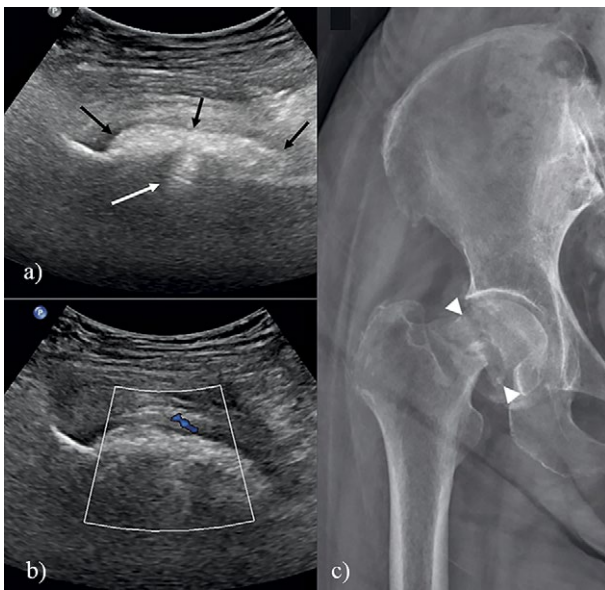
Received 30.03.2021 Accepted 18.04.2021

Med Ultrason

2021, Vol. 23, No 2, 240-241, DOI: 10.11152/mu-3180,

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**Fig 1.** Coronal view of the right femoral ultrasound shows discontinued bony cortex with penetrating ultrasound beam (white arrow) at the right femoral neck. A hyperechoic amorphous soft tissue (black arrow) is also noted; b) Doppler mode showed hypervascularity of the amorphous soft tissue; c) the right hip x-ray reveals right femoral neck fracture, Garden type IV (white arrowhead).

Hip fracture is a debilitating health issue that usually results in a decreased quality of life and marked mobility and mortality. It deserves special attention when the patient has disabling hip pain or the problem of weight bearing. Although the patient usually has a functional decline after a fracture reduction and fixation operation, the

overall mortality rate of conservative treatment is four times as high in one year [1]. Decision of the surgical method depends on the likelihood of blood supply restoration. Internal fixation is indicated in the femoral neck fracture with age less than 60 or non-displaced fracture, while arthroplasty is indicated in displaced fracture for those aged more than 60 [2].

Ultrasound is a convenient image modality that allows early diagnosis of the hip fracture, especially when occult fracture is undetectable in the x-ray. A previous study disclosed that compared with magnetic resonance imaging, sensitivity and specificity of ultrasound for hip fracture was 100% and 65% respectively [3]. Classical ultrasound findings include fracture line with cortical discontinuity, peritrochanteric hypoechoic hematoma or fluid collection, soft tissue swelling and callus formation [3].

This case highlights the importance of the detection of a potential hip fracture in a patient with negative high energy trauma or fall history. In view of the high cost-effectiveness and accessibility, we suggest the physician should become familiar with the clinical picture and ultrasound findings of the hip fracture.

## References

1. Tay E. Hip fractures in the elderly: operative versus non-operative management. *Singapore Med J* 2016;57:178-181.
2. Bhandari M, Swiontkowski M. Management of acute hip fracture. *N Engl J Med* 2017;377:2053-2062.
3. Safran O, Goldman V, Applbaum Y, et al., Posttraumatic painful hip: sonography as a screening test for occult hip fractures. *J Ultrasound Med* 2009;28:1447-1452.

## When meniscus ‘tears’ make the Baker’s cyst ‘cry’: a story on knee ultrasound

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Received 28.12.2020 Accepted 03.01.2021

Med Ultrason

2021, Vol. 23, No 2, 241-242, DOI: 10.11152/mu-3193,

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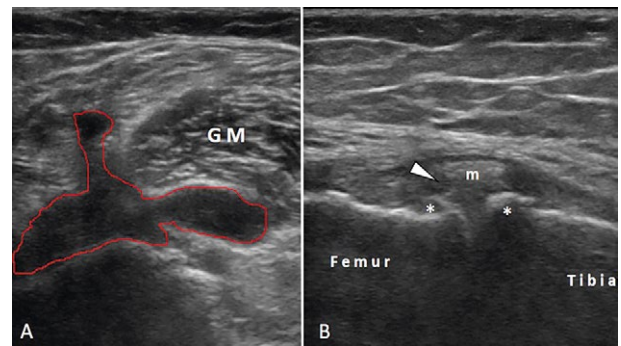
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## To the Editor,

A 60-year-old female patient was seen because of pain and functional limitation in the right knee for the last two months. The pain was worse at night and when running. She declared that she had medial meniscus and anterior cruciate ligament tears for about five years and that

previous physiotherapy had been only partially effective. The medical history was otherwise noncontributory. Her physical examination revealed painful and limited right knee movements especially during flexion. There was no joint swelling and instability tests were negative. Ultrasound (US) examination of the knee was performed in accordance with the EURO-MUSCULUS/USPRM basic scanning protocol [1]. The meniscal tear as well as the multilobular Baker's cyst (area: 2.94 cm<sup>2</sup>) were clearly visualized (fig 1) whereby the latter also was tender to sono-palpation (Video 1, on the journal site). Power Doppler imaging was unremarkable. While the patient lay in a prone position, dynamic/transverse US imaging was further carried out during knee flexion i.e., in order to better understand the movement and path of the fluid inside the cyst/knee (Video 2, on the journal site). Based on the US findings, three sessions of manual therapy (Fascial Manipulation®) and physical therapy were prescribed - for maintaining knee flexibility and reducing fluid collection and pain alike.

Baker's cysts are commonly found in association with intra-articular knee disorders, such as osteoarthritis, meniscus or cruciate ligament tears, chondral lesions and inflammatory arthritis [2]. Based on cadaveric studies, a valvular opening of the posterior capsule, on the medial side and deep to the medial head of the gastrocnemius, is present in up to 40% to 54% of healthy adult knees [3]. This valvular opening allows flow during knee flexion, but (due to the tension between the semimembranosus muscle and the medial head of gastrocnemius muscle) it is compressed/closed during knee extension. In this sense, it is noteworthy that sono-palpation and the dynamic US imaging of the cysts should be evaluated similar to the clinical examination [4] i.e., to uncover the



**Fig 1.** (A) Sono-inspection of the multi-lobulated Baker's cyst (area: 2.94 cm<sup>2</sup>); (B) Sono-inspection of the medial meniscal (m) tear (arrowhead). GM, gastrocnemius medialis muscle; \*, osteophytes

exact pain generator as well as to confirm the fluid path during normal (daily life) movements of the joint. In this way not only can a prompt diagnosis of the patient be established (with better understanding of the symptomatology and tissue/fluid biomechanics), but also targeted interventions can be planned accordingly.

### References

1. Özçakar L, Kara M, Chang KV, et al. EURO-MUSCULUS/USPRM. Basic scanning protocols for knee. *Eur J Phys Rehabil Med* 2015;51:641-646.
2. Serrano S, Ferreira JB, Özçakar L. When "sono-palpation" becomes "sono-explosion": The Baker's cyst report. *Am J Phys Med Rehabil* 2020;99:e125.
3. Frush TJ, Noyes FR. Baker's Cyst: Diagnostic and surgical considerations. *Sports Health* 2015;7:359-365.
4. Pirri C, Stecco C, Fede C, De Caro R, Özçakar L. Dynamic ultrasound examination of the paratenon and fascia in chronic achilles tendinopathy. *Am J Phys Med Rehabil* 2021;100:e75.

## Controversies in the management of bowel obstruction in pregnant woman

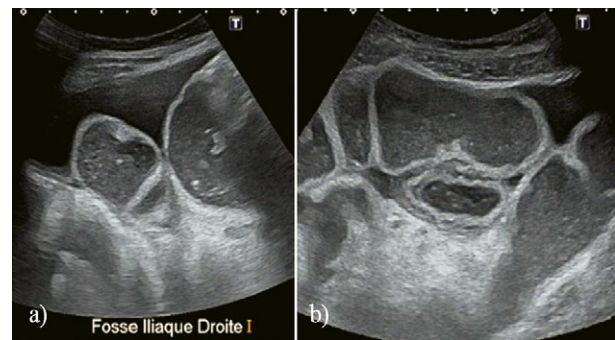
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### To the Editor,

A 44-year-old female patient with a 13 week pregnancy in evolution, presented to the emergency department with severe and persistent epigastric pain associated with gastrointestinal reflux. Surgical history mentioned a pelvic endometriosis operated in 2010 and rectal resection and caesarean in 2014. The patient received in vitro fertilization in October 2019. An abdominal ultrasound was performed showing dilation of the colon, stercoral stasis and free fluid in the pocket of Morisson (fig 1). The computed tomography (CT) scan confirmed the bowel obstruction. Laparoscopic approach was initiated and conversion to laparotomy was done due to the high risk of small bowel perforation. The postoperative evolution was complicated by pregnancy loss, urinary retention, paralytic ileus and abdominal wall abscess. After several months of medical care, the outcome was clinically favorable and the patient recovered.

Even if there is no clear-cut protocol of investigations for pregnant women [1], intestinal ultrasound is recommended to be the first-line imaging modality in pregnancy for the assessment of luminal disease activity in both colonic and small bowel diseases [2]. As in our case, the first imaging line she had was abdominal ultrasound, followed by a CT scan. The hospital was not equipped with MRI at that time. After long discussions with the gynecologist a decision was made to consent the patient



**Fig 1.** Abdominal ultrasound showing dilation of the colon, with presence of stercoral stasis and free fluid in Morisson space in longitudinal (a) and transvers scan (b)

for surgery. Sometimes current practice is different from guidelines and controversies remain. We mention some of the fetal mortality risk factors that were present in our case: medical and surgical past history of the patient, stress triggered due to multiple medical maneuvers, exposure to radiation imaging, the risk of general anesthesia, the risk factors of the surgery involving the manipulation of the uterus.

Some of these factors could explain the complications occurred postoperatively. Bowel obstruction in pregnant women is challenging to diagnose and difficult to manage and, in spite of multiple treatment modalities the patient was submitted, with the intention of reducing the mortality risk factors, she had a bad outcome losing her pregnancy.

### References

1. Mukherjee R, Samanta S. Surgical emergencies in pregnancy in the era of modern diagnostics and treatment. *Taiwan J Obstet Gynecol* 2019;58:177-182.
2. Flanagan E, Bell S. Abdominal Imaging in pregnancy (maternal and foetal risks). *Best Pract Res Clin Gastroenterol* 2020;44-45:101664.

Received 22.03.2021 Accepted 25.04.2021

Med Ultrason

2021, Vol. 23, No 2, 243, DOI: 10.11152/mu-3165,

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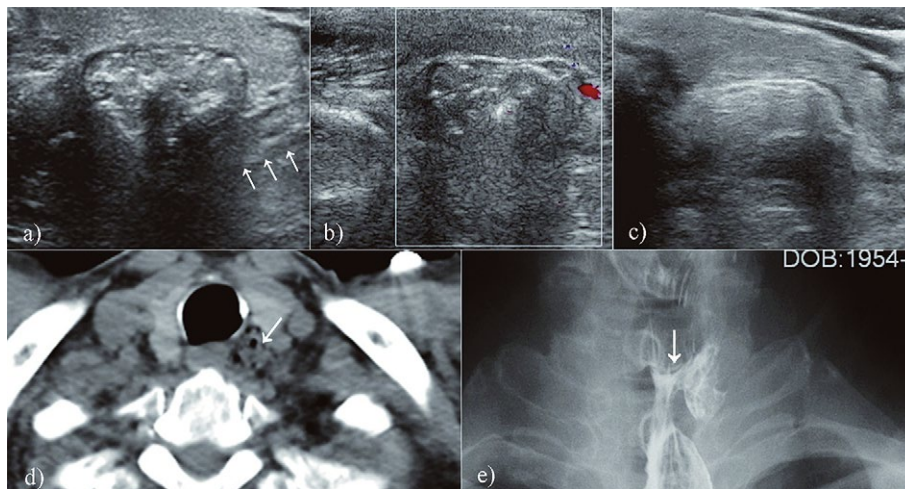
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## An interesting dynamic ultrasound finding of pharyngoesophageal diverticulum: technical advice

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**Fig 1.** The lesion is abutting posterior aspect of the left lobe of the thyroid and seems connected with the esophagus (arrow); b) No apparent blood flow signal in or around the lesion; c) Ultrasound imaging reveals a gas-filled lumen projecting to the left lobe of the thyroid; d) CT reveals a low-density lesion with a clear contour and partial gas-fluid filled (arrow); e) Barium swallow demonstrates a barium-filled pouch projecting from the esophagus.

### To the Editor,

A 60-year-old male with mild dysphagia and nausea for three months was admitted to our hospital. His physical examination was within normal limits. Esophagogastroscopy was carried out and chronic superficial gastritis was found.

Neck ultrasound was performed. Several heterogeneous hypoechoic nodules with clear boundary, oval in shape in bilateral lobes of the thyroid were found. Fur-

thermore, a 2×1.9 cm hypoechoic, heterogeneous lesion, with clear boundary, internal strong echo was identified abutting the posterior upper aspect of the left lobe of the thyroid gland. At first, we thought it was a thyroid nodule with internal calcification. After careful scanning, we found that the lesion seemed connected with the esophagus (fig 1a). There was no apparent blood flow signal in or around the lesion (fig 1b). The patient was asked to swallow, but no significant changes in the lesion were observed. Likewise, the shape and internal echo of the lesion remained unchanged when compressed with the probe. The patient was asked to drink water, to detect whether fluid entered the lesion, and ultrasound imaging revealed a gas-filled lumen projecting to the left lobe of the thyroid (fig 1c).

A pharyngoesophageal diverticulum was suspected. Computed tomography revealed a 2.3×1.6 cm low-density lesion with a clear contour and partial gas-fluid filled in the posterior aspect of the left lobe of the thy-

Received 02.04.2021 Accepted 18.04.2021

Med Ultrason

2021, Vol. 23, No 2, 244-245, DOI: 10.11152/mu-3187,

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roid (fig 1d). Finally, the diagnosis was confirmed by an esophageal barium swallow, which demonstrated a barium-filled pouch projecting from the esophagus and abutting posterior upper aspect of the left lobe of the thyroid (fig 1e).

Pharyngoesophageal diverticulum is a relatively rare disorder with the characters of a sac-like pouch or a dilated lumen resulting from the esophagus. The diagnosis of pharyngoesophageal diverticulum has mostly been made on the basis of a barium swallow test or endoscopy [1,2]. In our case, there were no obvious changes found in the lesion when compressed with the probe or when the patient was asked to perform the act of swallowing, which

might be due to the narrow junction between the esophagus and the diverticulum. So, we advise that drinking water may be helpful in differentiating pharyngoesophageal diverticulum from other lesions when no obvious changes are found after swallowing or compression.

### References

1. Shao Y, Zhou P, Zhao Y. Ultrasonographic findings of pharyngoesophageal diverticulum: two case reports and review of literature. *J Med Ultrason* (2001) 2015;42:553-557.
2. Chen HC, Chang KM, Su WK. Incidental pharyngoesophageal diverticulum mistaken for a thyroid nodule: Report of two cases. *Diagn Cytopathol* 2019;47:503-506.

## Comment to: Effectiveness of contrast-enhanced ultrasound for detecting the staging and grading of bladder cancer: a systematic review and meta-analysis

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### To the Editor,

We read with great interest the manuscript of Ge et al [1]. We strongly agree with the authors about the importance of contrast-enhanced ultrasound in the diagnosis of bladder cancer, but we would like to pay attention to several important missing aspects in the article.

We reveal some different results regarding the quality assessment of the included studies in the article [1]. Concerning the reference standard domain, 3 studies [2-4] should be considered as an unknown risk of bias because

the blinded status of the index test was not definitely reported. Furthermore, concerning the flow and timing domain, one study [4] should be considered as having an unknown risk as it did not definitely report the interval time between the index test and the reference standard.

The authors found that, after the test, the positive likelihood ratio increased from 20% to 70%, while the negative likelihood ratio decreased to 2%. We think the interpretation is not appropriate. The rational interpretation is that patients with a probability of 20% of developing the disease show a probability of 70% of the disease when a positive result of the test, while a probability of 2% of the disease when it is a negative result.

Ge et al [1] revealed that the pooled sensitivity ( $I^2=62.02\%$ ,  $p=0.03>0.01$ ) and specificity ( $I^2=45.69\%$ ,  $p=0.12>0.01$ ) indicated no significant heterogeneity. But as described in the statistical analysis that if the outcome was  $I^2>0.5$  or  $p<0.1$  a random-effects model was selected to indicated the heterogeneity's result. Therefore, the  $p>0.01$  indicating no significant heterogeneity was in-

Received 10.03.2021 Accepted 18.04.2021

Med Ultrason

2021, Vol. 23, No 2, 245-246, DOI: 10.11152/mu-3146,

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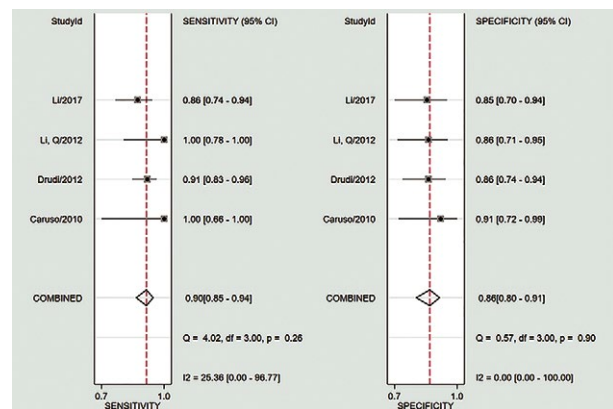


consistent with that described in the statistical analysis. So, there is a moderate heterogeneity of the sensitivity based on  $I^2=62.02\%$  and  $p=0.03<0.1$ .

Figure 5 of the study [1] showed that the study by Gupta et al [5] was an outlier. Therefore, subgroup analysis excluding the outlier was performed, which implied the heterogeneity was acceptable (sensitivity:  $I^2=25.36\%$ ,  $p=0.26>0.1$ ; specificity:  $I^2=0.00\%$ ,  $p=0.90>0.1$ ) (fig 1). Hence, we believe that this study might be also a source of heterogeneity.

## References

1. Ge X, Lan ZK, Chen J, Zhu SY. Effectiveness of contrast-enhanced ultrasound for detecting the staging and grading of bladder cancer: a systematic review and meta-analysis. *Med Ultrason* 2021;18;23:29-35.
2. Caruso G, Salvaggio G, Campisi A, et al. Bladder tumor staging: comparison of contrast-enhanced and gray-scale ultrasound. *AJR Am J Roentgenol* 2010;194:151-156.
3. Drudi FM, Di Leo N, Malpassini F, Antonini F, Corongiu E, Iori F. CEUS in the differentiation between low and high-grade bladder carcinoma. *J Ultrasound* 2012;15:247-251.



**Fig 1.** Forest plot of CEUS diagnosing bladder cancer, showing sensitivity and specificity

4. Li Q, Tang J, He E, Li Y, Zhou Y, Wang B. Differentiation between high- and low-grade urothelial carcinomas using contrast enhanced ultrasound. *Oncotarget* 2017;8:70883-70889.
5. Gupta VG, Kumar S, Singh SK, Lal A, Kakkar N. Contrast enhanced ultrasound in urothelial carcinoma of urinary bladder: An underutilized staging and grading modality. *Cent European J Urol* 2016;69:360-365.

## Author's response

# Effectiveness of contrast-enhanced ultrasound for detecting the staging and grading of bladder cancer: a systematic review and meta-analysis

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### Dear Editor,

We appreciate Wu et al's interest in our review and we have read with interest the comments.

Before the literature search, we limited the inclusion criteria. The reference standards were considered to be cystoscopy and/or transurethral resection of bladder tumors and, concerning the index test domain, the readers were blinded to the final diagnoses of the patients, there-

fore, 3 studies [1-3] were considered low risk. As for the Li et al study [3], in another study by the same group [4] published in 2012, the interval time between the index test and the reference standard was mentioned and we took it in consideration.

Regarding probability, our interpretation is as follows: the pre-test probability is the probability of a bladder cancer (BC) being detected without taking contrast-enhanced ultrasound (CEUS) into account. The post-test

probability takes into account the results of CEUS. When detection of BC was based on a CEUS-positive result, there was a 70% “post-test” probability of detecting a subsequent BC. With a negative CEUS, the “post-test” probability of detecting BC dropped to 2%. Consistent with other diagnostic meta-analysis articles [5,6].

We believe that moderate heterogeneity exists, so we stated in the discussion that the P-SEN and PLR– with 95%CI forest plots displayed moderate heterogeneity and we made corresponding explanations and analyses.

We agree with your valuable comments on the Gupta et al study [8]. We included this article in analysis because in this study CEUS was a good alternative for pre-operatively T staging and grading of BC.

### References

1. Caruso G, Salvaggio G, Campisi A, et al. Bladder tumor staging: comparison of contrast-enhanced and gray-scale ultrasound. *AJR Am J Roentgenol* 2010;194(1):151-156.
2. Drudi FM, Di Leo N, Malpassini F, Antonini F, Corongiu E, Iori F. CEUS in the differentiation between low and high-grade bladder carcinoma. *J Ultrasound* 2012;24;15(4):247-251.
3. Li QY, Tang J, He EH, Li YM, Zhou Y, Wang BJ. Differentiation between high- and low-grade urothelial carcinomas using contrast enhanced ultrasound. *Oncotarget* 2017;10;8(41):70883-70889.
4. Li QY, Tang J, He EH, et al. Clinical utility of three-dimensional contrast-enhanced ultrasound in the differentiation between noninvasive and invasive neoplasms of urinary bladder. *Eur J Radiol* 2012; 81:2936-2942.
5. Sang L, Wang XM, Xu DY, Cai YF. Accuracy of shear wave elastography for the diagnosis of prostate cancer: A meta-analysis. *Sci Rep*, 2017; 7(1): 1949.
6. Yang Y, Zhao XX, Shi JW, Huang Y. Value of shear wave elastography for diagnosis of primary prostate cancer: a systematic review and meta-analysis. *Med Ultrason* 2019, 21(4): 382-388.
7. Gupta VG, Kumar S, Singh SK, Lal A, Kakkar N. Contrast enhanced ultrasound in urothelial carcinoma of urinary bladder: An underutilized staging and grading modality. *Cent European J Urol* 2016;69:360-365.