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A different perspective of the use of ultrasound in COVID-19: Peripheral nervous system. Comment on 'Role of point of care ultrasound in COVID-19 pandemic: what lies beyond the horizon?'

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To the Editor,

We were interested in the recently published article entitled 'Role of point of care ultrasound in COVID-19 pandemic: what lies beyond the horizon?' by Galluccio F et al [1]. They provided a comprehensive review of the role of ultrasound (US) in the COVID-19 infection and its impact on the lungs, cardiovascular system, eyes and abdominal organs. They emphasized the importance of bed-side assessment during a pandemic, in patients hospitalized in intensive care units (ICU). While we congratulate the authors for their efforts in increasing awareness of US use during a pandemic, we would also like to draw the readers' attention to the use of US in the locomotor system.

At this stage of the COVID-19 pandemic, the clinicians began to encounter a new population with disabilities following prolonged ICU hospitalization. Peripheral nerve entrapment, is one of the preventable causes of these ICU-related disabilities. In the management of COVID-19 patients with acute respiratory distress syndrome (ARDS), the prone position is frequently used to improve oxygenation. Malik et al [2] recently reported peripheral nerve injuries involving the ulnar nerve, radial nerve, brachial plexus, median nerve, and sciatic nerve, associated with prone positioning in patients who developed ARDS diagnosed with COVID-19.

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A 46-year-old woman presented with numbness, weakness and pain in her left 4th and 5th finger. Her clinical history revealed that she had a history of 2-week ICU hospitalization due to COVID 19 infection. After extubation, she started to complain about numbness in the ulnar side of her left hand. On physical examination, she had weakness in the abductor digits minimi and all the interossei muscles on the affected side. Ultrasonographic examination showed an increased cross-sectional area of the left ulnar nerve adjacent to the medial epicondyle, compared to the right side (fig 1). The electrodiagnostic study demonstrated axonal damage of the left ulnar nerve in the medial epicondyle level compatible with US findings. Having a history of hospitalization in the ICU with

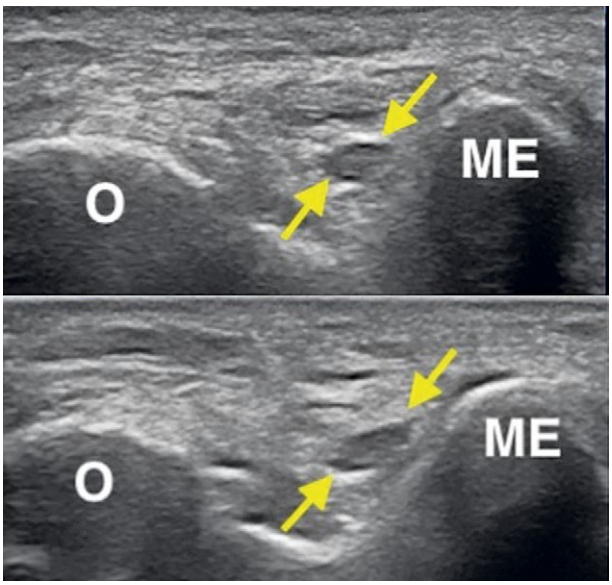

Fig 1. Side by side comparison of the axial scans of the ulnar nerves: a) right side with a cross sectional area value of 5 mm^2. b) left side with a cross sectional area value of 9 mm^2

supine-prone cycles for 2 weeks, pressure-induced nerve palsy was considered and a conservative treatment was initially planned.

Our case confirms that US is a valuable and easily accessible diagnostic modality which can be used for many systems. Our aim is to remind the readers that use of US in the locomotor system manifestations after COVID-19 which we might face more commonly in the near future can be very useful.

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Ultrasound examination for facial asymmetry: thermal injury of the zygomatic major muscle after ultherapy

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To the Editor,

A female had received ultherapy to tighten her facial skin. Unfortunately, due to an improper energy setting, she had swelling and redness over her bilateral cheeks. After conservative management, her face had gradually improved with asymmetric facial expression during smiling (fig 1A) and weakness in lifting her right mouth angle. The electrophysiological study revealed normal facial nerve conduction velocity and symmetrical blink reflex. The ultrasound examination was arranged to scrutinize for a possible zygomatic major muscle (fig 1B) injury. The transducer was placed over her right cheek whereby a hypoechoic area was clearly identified on top of the zygomatic arch. The transducer was then pivoted to point toward the mouth angle appreciating the entire course of the zygomatic major muscle. Its cranial attachment appeared thickened with disorganized muscle fibers (fig 1C). Power Doppler imaging was normal. At the contralateral side, the normal muscle appeared as a thin band bridging the zygomatic arch and the maxilla (fig 1D). Under the impression of an antecedent thermal muscle injury, she was then referred for further physical therapy.

Ultheray, also known as the microfocused ultrasound therapy [1], is an emerging non-invasive approach for skin tightening. The therapeutic effect is derived from contraction of the collagen fibers owing to thermal-induced denaturation. The temperature at the deep dermis and fibromuscular layer can reach up to 60-70 degrees Celsius, which increases the risk of thermal injury. Although rare, severe complications of ultherapy including skin blistering and ulceration, subcutaneous tissue edema and cutaneous necrosis have been reported [2].

The zygomatic major muscle pertains to be part of the buccolabial muscles, originating from the zygomatic arch and attaching to the upper lip muscles nearby the mouth angle. It is innervated by the buccal and zygomatic branches of the facial nerve and functions as a mouth angle elevator. It is noteworthy that high-resolution ultrasound enables the visualization of facial and masseter muscles [3,4]. The normal muscle is very thin and can hardly be differentiated from the deep subcutaneous layer. Herein, dynamic examination by asking the subject to smile would be helpful for identifying. In short, the pre-

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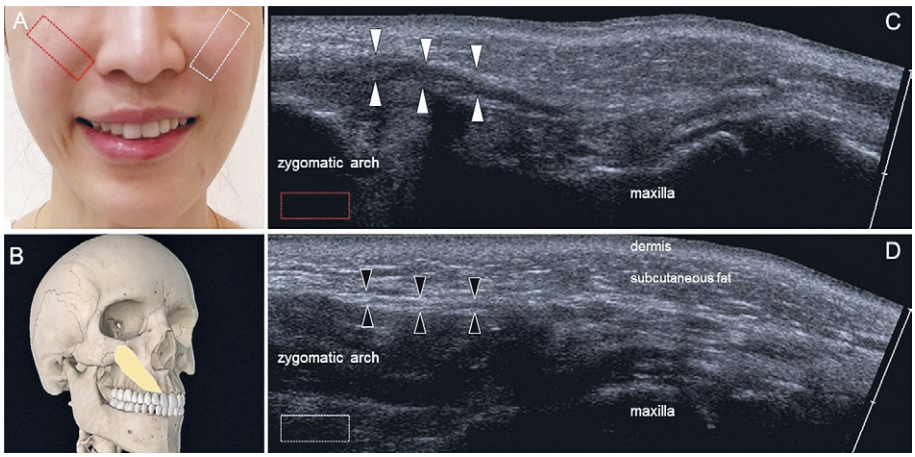

Fig 1. Asymmetric facial expression of the patient, revealing weakness in lifting her right mouth angle (A). Schematic drawing of the zygomatic major muscle (yellow color block) (B). Ultrasound imaging of the zygomatic major muscle (white and black arrowheads) at the injured (C) and contra-lateral normal (D) sides. Dashed square: the position of the ultrasound transducer.

sent case highlights the usefulness of ultrasound imaging in diagnosing thermal injuries of the facial muscles after ultherapy.

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Close sonographic follow-up for an A-1 pulley ganglion – in good times and bad times

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To the Editor,

A 32-year-old female (secretary) presented for pain and functional limitation in the fourth finger of her right hand for the last six months. The pain was worse during typing and previous physiotherapy had been only partially effective. Physical examination revealed painful

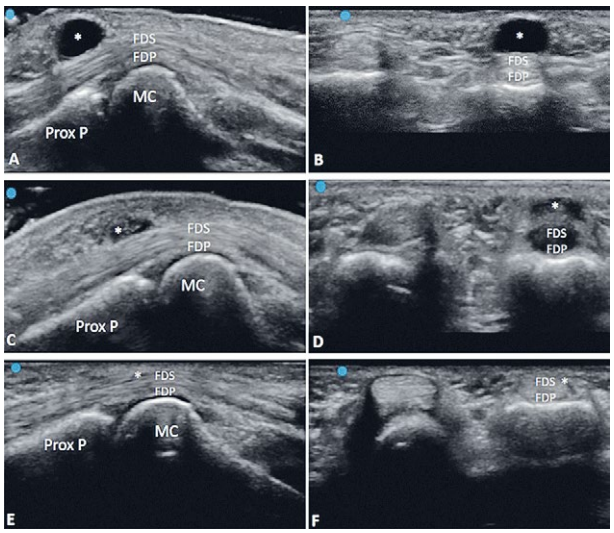

Fig 1. Sono-inspection of the A1-pulley ganglion (area: 2.45 mm^2) in transverse (A) and longitudinal (B) views. Repeat imaging (one week later) shows its decreased size (area: 0.79 mm^2) in transverse (C) and longitudinal (D) views. Dramatic/further reduction in size was observed after two months in transvers (E) and longitudinal (F) views. MC, metacarpal bone; Prox P: proximal phalangeal bone; FDS: flexor digitorum superficialis tendon; FDP: flexor digitorum profundus tendon; *, A1-pulley ganglion cyst.

and limited fourth finger movements, especially during flexion. The finger was swollen but instability tests were negative.

Using a high-frequency linear probe (6-15 MHz, Sonosite Edge II, FUJIFILM), ultrasound (US) examination was performed in accordance with the EURO-MUSCULUS/USPRM protocol [1]. An A1-pulley ganglion cyst was visualized (fig 1A, 1B). Dynamic US imaging was carried out during slow (Video 1, on the journal site) and fast (Video 2, on the journal site) finger flexions for better understanding its anatomical relationship with the soft tissues nearby. Interestingly, one week later, she was seen for a trauma in the volar region, which caused severe finger pain initially and self-resolved thereafter. Physical examination was unremarkable. Repeat US imaging (fig 1C, 1D) revealed reduced ganglion size, sonopalpation showed softening (Video 3, on the journal site). Two months later, US imaging (fig 1E, 1F) showed almost complete disappearance.

A1-pulley ganglia are benign tumor-like masses seen near synovial tissues (tendon sheath or joint), commonly in association with trigger finger [2]. Herein, US imaging (with sono-palpation and dynamic assessment) is noteworthy for the prompt understanding of the pain generator as well as the origin and changes of the fluid [3]. Likewise, our case exemplifies the possible/convenient use of US during close follow up of these patients with repeat exams on demand i.e. in accordance with the (un) expected changes in the clinical symptomatology/scenario.

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Ultrasound as an alternative bedside tool to quickly confirm the position of the enteral catheter in the context of the COVID-19 pandemic

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To the Editor,

In early December 2019, an outbreak of infection by the Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) was detected in Wuhan, China [1]. Beyond the challenges for clinical management of the viral infection and its complications, intensive care unit (ICU) teams had to adapt their routines to a particularly elevated risk of healthcare workers contamination. Therefore, preventive strategies had to be implemented, mainly during orotracheal intubation and other aerosol-generating procedures. These included rigorous use of personal protective equipment and limiting the number of professionals in the patients' room to avoid unnecessary exposure [2].

In most cases, severely ill patients were fed through an enteral feeding catheter (EFC), which requires chest radiography (CR) for positioning confirmation [3]. Bedside ultrasound (US) is routinely used in ICU for several applications. Recent studies have suggested that bedside US might be useful to guide the EFC placement among intensive care patients [4-5].

In the adult ICU of our hospital, we are currently enrolling ICU patients with enteral feeding requirement in a single-center observational study to investigate the concordance between US and CR regarding the EFC positioning. The intragastric position of the EFC was confirmed by US by visualizing the entry of air and saline solution (5 mL + 5 mL) into the stomach (fig 1) or by direct visualization of the catheter. All patients underwent CR to confirm EFC positioning, which is the gold standard to authorize the onset of enteral feeding.

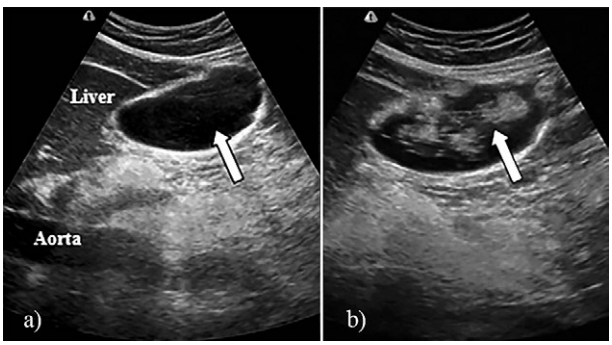

Fig 1. a) Ultrasound image before and b) after administration of contrast in stomach (white arrows).

From a total of 82 critically ill patients included so far, 36 (43.9%) individuals had confirmed COVID-19. Among this subgroup, median (Q1-Q3) age was 62 (54-71) years, 61% were female and the median body mass index was 28.1 (24.3-31.5) kg/m^2. EFC position was confirmed by US in 34 (94.4%) patients and by CR in 36 (100%) patients; the agreement between 2 methods was 94.4%. The median (Q1-Q3) duration of the ultrasound examination was 2 (2-3.75) minutes. During US examination, no patients showed complications in unplanned extubation or new hemodynamic instability.

In conclusion, in our experience, bedside US proved to be an effective, less time consuming and safe method to confirm the EFC position. This method could be beneficial in pandemic times, where restrictions to limit the exposure of healthcare workers to the SARS-CoV2 are pivotal.

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An appendiceal mucinous neoplasm should be considered in the differential diagnosis of giant abdominopelvic tumor

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To the Editor,

We encountered a unique clinical case of a 47-year-old female with a gradually enlarged abdomen in the last three months. She denied abdominal pain, vomit and vaginal bleeding and her family was negative for any history of malignancy.

Laboratory test results demonstrated a carbohydrate antigen 72-4 level of 20.76 U/mL (normal value, ≤6.9 U/mL), while other results were within normal limits. Abdominal ultrasonography revealed that the abdominopelvic cavity was full with amounts of anechoic fluid with internal linear septations (fig 1a) and dot-like blood flow signals in the septations were monitored by color Doppler ultrasonography (fig 1b). Contrast-enhanced CT disclosed amounts of low density fluid, some of which was loculated with internal enhanced septations (fig 1c), and an enlarged appendix with thickened wall and fluid accumulation in the lumen (fig 1d).

Significant amounts of mucus were found throughout the abdomen and pelvis intraoperatively (fig 1e). Furthermore, a dilated and ruptured appendix filled with abundant mucus and multiple ruptured mucinous pseudotumors with the maximum diameter of 12 cm were detected. Finally, pathology confirmed the diagnosis of a low-grade appendiceal mucinous neoplasm (LAMN) with pseudomyxoma peritonei.

A prior perforation of LAMN may cause pseudomyxoma peritonei and it can be malignant and proliferate outside the appendix [1], which is always misdiagnosed as ovarian mucinous neoplasms.

Accurate preoperative diagnosis of LAMN can be really difficult, especially in female patients that share the similar clinical and imaging findings of appendiceal and ovarian mucinous neoplasms. Specific imaging presentations for appendiceal mucinous neoplasm such as "onion skin sign" (concentric echogenic layers with septa and fine echoes) and calcifications of the neoplasm wall were

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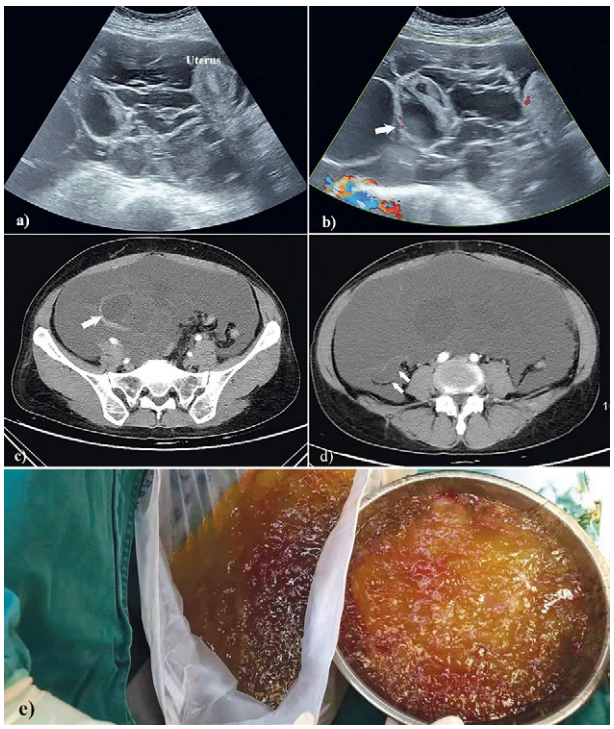

Fig 1. a) Ultrasonography reveals abdominopelvic cavity is full of a massive amount of anechoic fluid with internal linear septations with b) internal dot-like blood flow signal (arrow); c) contrast-enhanced CT discloses amounts of low density fluid, some of which was loculated with internal enhanced septations (arrow); d) an enlarged appendix with thickened wall and fluid accumulation in the lumen (arrow); e) about 3000 mL of gelatinous mucus was removed from the abdominal cavity.

not evident on the imaging examinations that were taken [2,3]. The enlarged appendix was found only when the CT scanning was reviewed.

We would like to highlight the fact that appendiceal mucinous neoplasm should be considered in the differential diagnosis of ovarian mucinous neoplasms with peritoneal cavity implants.

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