



Correspondence

The effect of point of care ultrasonography before urgent orthopedic surgery on anesthetic management - A prospective, pilot study



Editor,

Emergency orthopedic surgery in the elderly population is characterized by a high incidence of morbidity [1]. The urgent nature of the surgery and the pre-operative evaluation by inexperienced anesthesia trainees are contributing factors for increased anesthetic risk. [2]

POCUS (Point Of Care Ultrasound), performed at the bedside by trained anesthesiologists, can provide crucial information in a relatively short time. The assessment can provide an estimation of heart function, demonstrate the presence of valvulopathies, pericardial effusion, severe pulmonary hypertension, pulmonary congestion, lung atelectasis or consolidation, pleural effusion and pneumothorax [3,4]. Abdominal assessment can detect blood or fluids in the peritoneal, pelvic, pleural and pericardial cavities.

There is well established literature demonstrating the impact of POCUS on diagnosis, but there are only a few studies documenting changes in management and outcome or examining a comprehensive POCUS study as part of their protocol [5].

We describe the prevalence of previously undiagnosed, significant clinical findings detected by a comprehensive pre-operative POCUS, which includes a pulmonary and abdominal component (not traditionally a part of POCUS), performed by an anesthesiologist, in elderly patients undergoing urgent orthopedic procedures.

This study adds to the existing literature by investigating the effect of an examination that encompasses the cardiac, pulmonary and abdominal components, is performed by an anesthesiologist in real time, and is used as a tool for anesthetic management. This assessment allows a broader clinical picture of the patient's medical status in a simple and efficient manner.

The study was approved by the Research Ethics Board of Rambam Medical Campus, Haifa, Israel. All enrolled patients signed informed consent. A convenience sample size of 30 was used for this pilot study. Patients were included if they were over 65 years old, scheduled for an urgent orthopedic surgery and had no previous echocardiographic examination in the past six months before surgery. Patients were excluded if the preoperative POCUS study would have delayed surgery, if they were hemodynamically unstable, or were unable to provide informed consent. To standardize the patient's baseline health status we used the Charlson comorbidity index [6].

The primary outcome was the prevalence of new significant clinical findings that were unknown to the anesthesiologist prior to the POCUS examination. The secondary outcome was any change in management attributed to the POCUS study.

Clinical significant findings were predefined as POCUS findings that may change the timing or the management of surgery. These were defined by two independent expert anesthesiologists and included: significant left or right ventricular dysfunction, significant valvulopathy, signs of hypovolemia, signs of volume overload or lung edema,

pericardial effusion, pneumothorax, moderate or severe pleural effusion, significant amount of peritoneal fluid and increased RV overload [3,4]. Following the POCUS report, no recommendations regarding change of management were provided.

A change in operative management was defined as substitution of general anesthesia by regional anesthesia or vice versa, unplanned fluid loading before induction, unplanned use of invasive monitoring, a change of planned induction agents, use of vasopressors versus fluid loading to treat hypotension intraoperatively, a request for urgent consultation with other disciplines (i.e. cardiologists), surgery cancellation or rescheduling, transfer to a higher postoperative level of care than originally planned or a request for an additional imaging modality (i.e. CT, TEE) by the primary anesthesiologist.

The final analysis included 14 males and 16 females. The average age was 83 years and the average Charlson Comorbidity Index score was 7.5 (on scale of 0–37, where a score above 5 is a predictor of between 60 and 100% mortality within one year) [6].

Our results demonstrate that in 46.6% (14) of patients that underwent pre-surgical POCUS augmented assessment, clinically significant, previously unknown diagnoses were demonstrated. Five (16.6%) patients from this group had more than one finding.

From the 14 patients diagnosed with significant findings, a change in anesthetic management occurred in eight patients (57%). In two cases (14.2%) an additional change in postoperative management was noted. The remaining six patients (43%) had further diagnostic intervention, cardiology consult or postponement of surgery. Our main findings included; two patients (14.2%) with severe aortic stenosis, Five (35.7%) patients with signs of significant hypovolemia, nine patients (64.2%) with severe or moderate to severe left ventricle dysfunction, one with severe aortic regurgitation and one with signs of hypertrophic obstructive cardiomyopathy and lastly, one patient with significant pleural effusion.

General anesthesia was chosen over regional anesthesia in three (21.4%) patients. An additional Three (21.4%) underwent a formal, comprehensive echocardiography exam at the echo lab to confirm and quantify our primary assessment. Four patients (28.5%) had cardiology consultation due to our findings, surgery postponement in three cases (21.4%). In some cases, the POCUS results ruled out comorbidities e.g. significant aortic stenosis, thus allowing the anesthesiologist to select a different anesthetic approach i.e. regional anesthesia, which is possibly beneficial for patients [7].

We demonstrated that augmentation of the pre-operative physical examination with a comprehensive POCUS study can alter the anesthetic plan and perioperative management. The novelty of our study lies in its prospective design, the comprehensiveness of the POCUS examination, and an operator who is not a cardiologist or radiologist but rather a POCUS trained anesthesiologist.

Our results show that a relatively short training period enables a

trainee to diagnose significant pathologies or rule out others. The technique and skills can be refined through repeated supervised practice. We believe that POCUS enhances patient safety through recognition of major pathologies that can lead to a safer patient management plan. Larger prospective randomized studies are needed in order to assess the effect of pre-operative POCUS augmented assessment on patients' outcome.

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Declaration of competing interest

None.

Appendix A

- A) The course included cardiac ultrasound image acquisition and interpretation, identification of major cardiac pathologies, the utilization of POCUS for the diagnosis of shock (obstructive, hypovolemic, distributive and cardiogenic), lung and chest ultrasound and focus assessment sonography for trauma (FAST). The course, designed for non-cardiologists, consisted of extensive hands on training as well as exposure to many clinical cases, where POCUS was a key modality in the diagnosis and management.
- B) The eViews course is part of eMedical Academy's online Focus teaching platform (<https://emedicalacademy.com>). It teaches in details how to obtain POCUS views, including proper probe

orientation and positioning, the sonographic anatomy, guidance on how to acquire and optimize each view, perform quality checks and trouble-shooting strategies.

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