

# THE ROLE OF ULTRASONOGRAPHY IN ASSESSMENT OF STERNAL STABILITY AFTER CLOSURE OF MEDIAN STERNOTOMY

Wael Mahmoud Hassanein, Samer Saad Bessa,\* Amr Ahmed Rayan,\*\* Dina Abdel-Salam Ahmed,\*\* Karim Mohamed Elsharkawi,  
Mohamed Abdel-Meguid Mohamed Ramadan

Department of Cardiothoracic Surgery, General Surgery,\* Radiology,\*\* Faculty of Medicine, Alexandria University

## Introduction

Median sternotomy is, by far, the most popular and the most commonly used incision in cardiac surgical procedures. The main advantages of median sternotomy are the speediness in opening and closing, the familiarity to many surgeons, and the outstanding exposure for the heart and anterior mediastinal lesions. Major post operative complications such as dehiscence, mediastinitis, osteomyelitis, sternal wound infection (SWI), and sternal displacement rarely occur after sternotomies. On the other hand, though, when such complications occur, they result in considerable morbidity, mortality, and resource utilization. There is a wide variety of methods for assessment of sternal stability after closure of median sternotomy. Ultrasonography is an emerging imaging modality used for early detection of sternal instability providing a chance for early management and prevention of devious complications of median sternotomy.

## Aim of the work

The aim of this study was to assess ultrasonography as a diagnostic tool for sternal instability in patients undergoing median sternotomy with wire cerclage closure.

## Patients and Methods

**Patients:** This was a prospective clinical study including 20 patients who underwent median sternotomy.

**Inclusion criteria:** Adult patients undergoing thoracic or cardiac surgery via a median sternotomy.

**Exclusion criteria:** Patients who die within 6 weeks postoperatively because of reasons not related to sternal instability. Patients who do not come for follow up. Informed consent was taken from all patients included in the study according to the Committee of Ethics.

**Methods:** All individuals included in this study were subjected to Detailed history taking stressing on different risk factors. Full operative data including the diagnosis, surgery done, sternal saw used. Bone wax used as a hemostatic agent on the sternal bone marrow.

Harvested left internal mammary arteries in CABG cases were all skeletonized. Sternal closure by wire cerclage in the form of 6 simple wire sutures and a manubrial figure of 8 sutures. Standard post-operative care. Chest binder used by all patients for 6 weeks after discharge. Ultrasonography of the sternum: Clinical assessment of sternal stability was done along with recording of the micro-motion of the sternal edges (millimeters) as quantified by ultrasonography), and then clinical examination of sternal stability was done 6 weeks postoperatively for monitoring of sternal healing. Sternal micro-motion was measured using the linear caliper function of the software program by the SONOSITE M-TURBO 2000 ultrasound machine with a linear probe frequency of 6-13 MHz. Ultrasonography was done on day 2 postoperatively after extubation with deep inspiration, bilateral upper limb elevation, and cough. Clinical examination on the 6<sup>th</sup> week postoperatively to assess the sternal stability and to correlate the findings with the previously recorded measurements. Statistical tests used: T test for 2 groups comparison with normal distribution Paired t test to compare variables for the same subject Mann-Witney U test for non-normal distribution Fischer exact test for categorical variables (too few numbers for Chi square test) Pearson correlation.

## Results

There was a statistically significant difference in ultrasound measurements when comparing the stable and unstable patients. High BMI, LIMA harvest, and deep infections seemed to be consistent with instability which was even seen by ultrasonography. On the other hand, age, operative time, and mechanical ventilation time did not have any statistical impact.

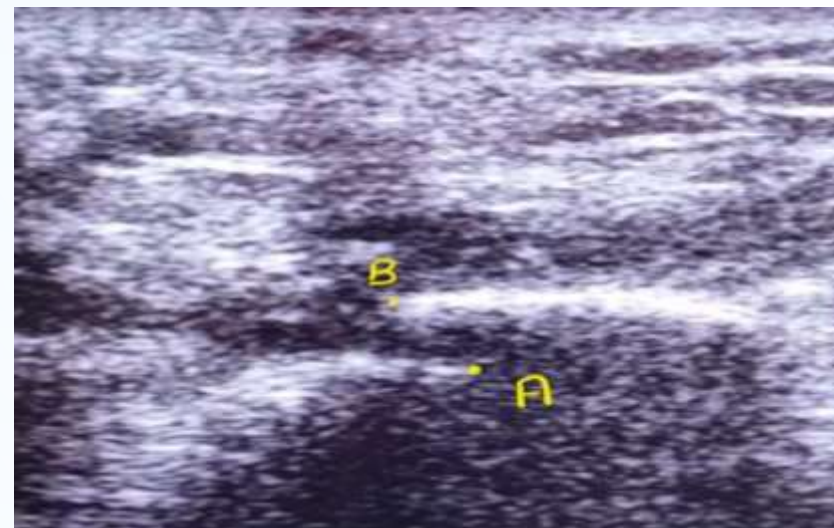


Fig (1):

Ultrasound image showing separated sternal edges consistent with sternal instability.

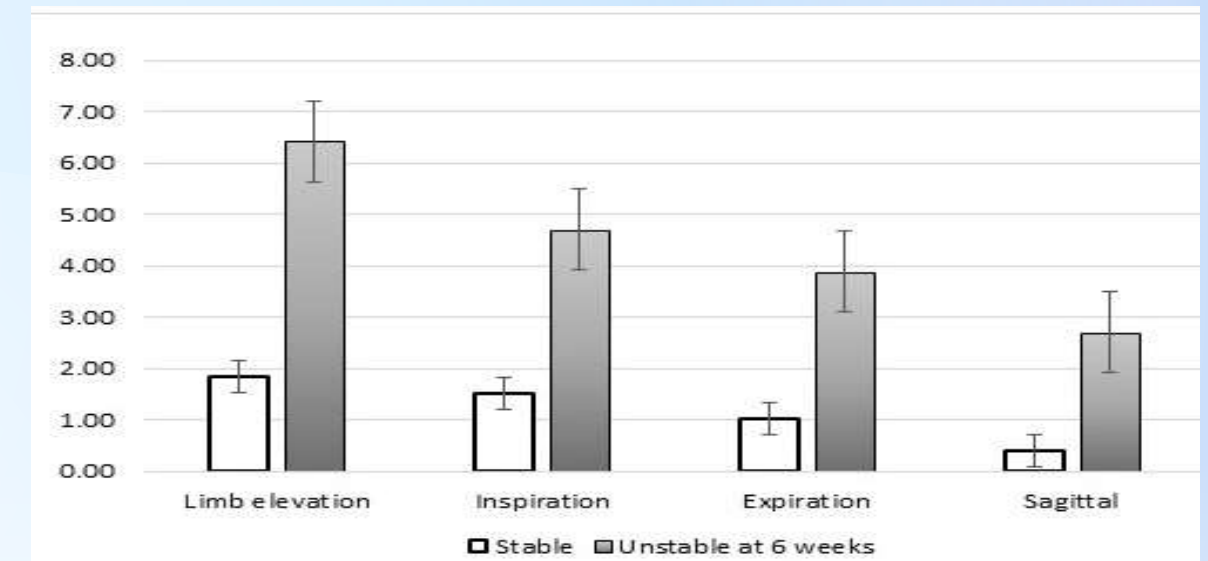


Fig (2): Ultrasound measurements

## Conclusion

**According to the results of the present study, we concluded that:**

Sternal instability was associated with high BMI, LIMA harvest and sternal wound infections. Bilateral limb elevation showed the greatest recorded distance between sternal edges. Pain is directly proportional to the degree of sternal instability. Ultrasound is a useful tool for early detection of sternal instability after sternotomy closure. Ultrasound is an easy bedside diagnostic tool that limits the need of unnecessary transportation during patients' hospital stays.