

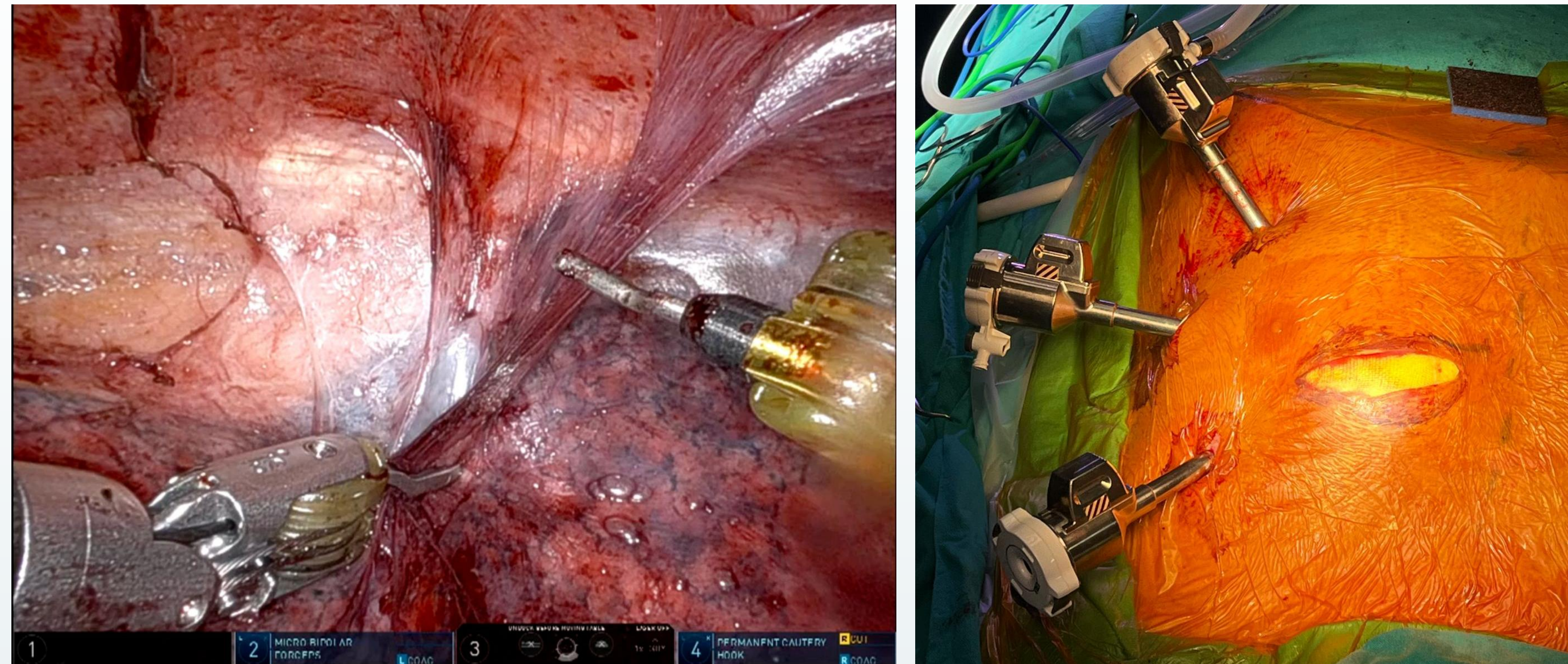
Incidence And Management Of Pleural Adhesions During Robotic Cardiac Surgery: Utility Of ‘Pleural Sliding Test’

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Objective

Adhesions between the parietal and visceral pleura can prevent lung collapse during single-lung ventilation and complicate thoracic access in robotic cardiac surgery. Factors such as prior thoracotomy, thoracic drains, or pneumonia increase the risk of adhesions, making entry into the thoracic space challenging. The pleural sliding test performed using thoracic ultrasound enables the surgeon to identify regions with adhesions and plan the setup of robotic approach accordingly. We investigated the utility of the pleural sliding test in robotic cardiac surgery.



Methods

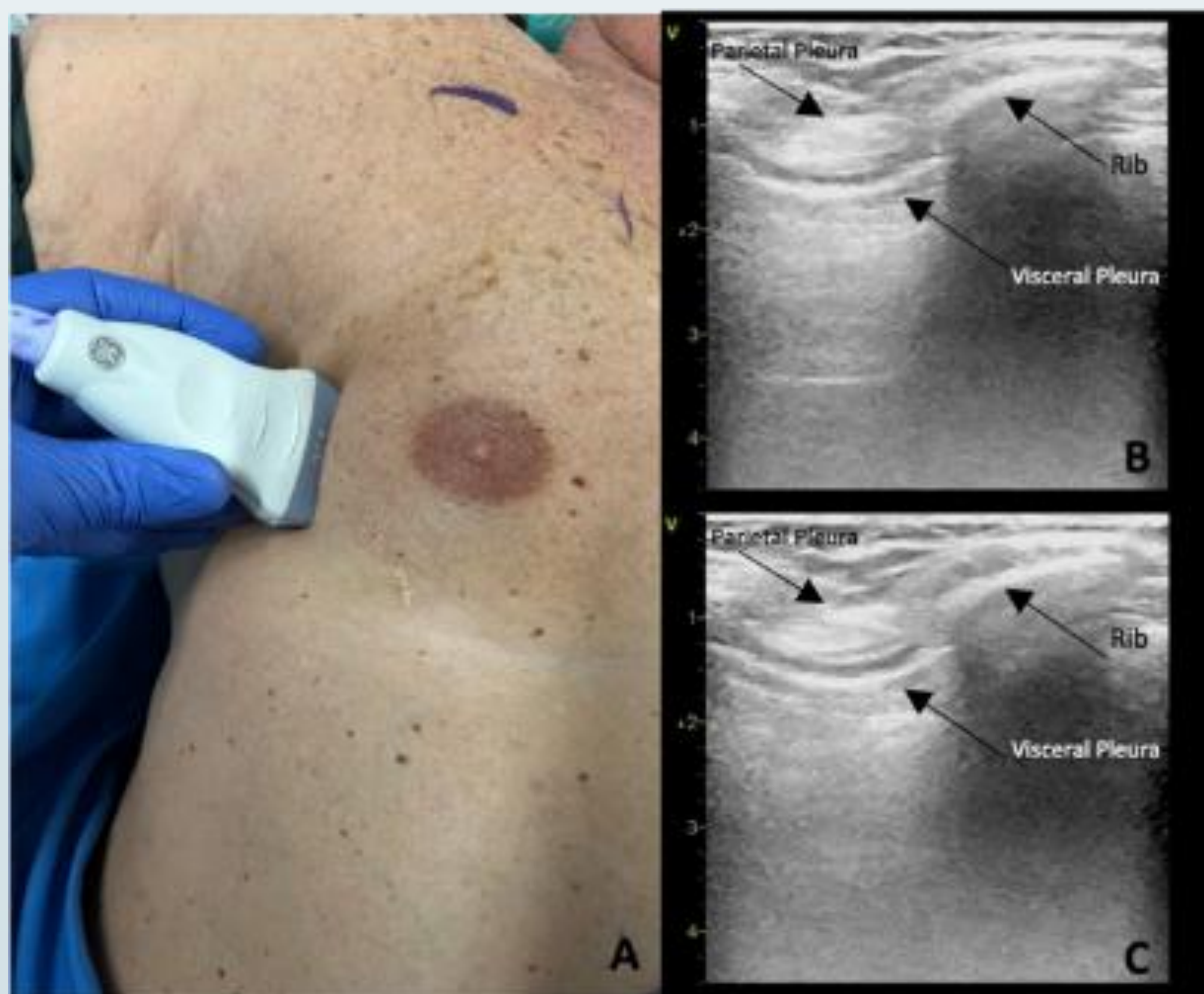
The utility of the pleural sliding test was analyzed in 250 consecutive robotic cardiac surgery cases. The pleural sliding test was performed by the surgeon in the operating theater after intubation, with the patient in the supine position. A linear array probe was used to image the target thoracic side at six locations: the 2nd, 4th, 6th intercostal spaces along the midclavicular and anterior axillary lines. The movement of the visceral pleura during double-lung ventilation was assessed. Restricted sliding (<1 cm) or pulling of the parietal pleura and intercostal muscle during respiration were indicative of potential adhesions. In robotic-assisted coronary cases, if adhesions were suspected in the camera port area, the initial port was placed in a quadrant with no adhesions, and subsequent ports were placed under camera guidance. If all quadrants showed adhesions, a minithoracotomy was performed for adhesiolysis before port placement. For right thoracic procedures, minithoracotomy was performed cautiously, with adhesiolysis limited to port insertion before further removal of adhesions with robotic instruments. Patient characteristics including previous thoracotomy or sternotomy and operative outcomes were investigated.

Results

The mean patient age was 60.7 ± 13.7 years, and 86 (34.4%) were female. Cases included 122 (48.8%) robotic-assisted CABG, 116(46.4%) mitral and tricuspid valve procedures, and 12 (4.8%) other procedures (ASD repair, myxoma resection, cryoablation). Twenty-four (9.6%) patients had a history of prior cardiac surgery and 9 (3.6%) had a prior ipsilateral thoracotomy. Adhesions were identified in 19 (7.6%) patients. No cases of pulmonary injury or massive bleeding were observed. Duration of mechanical ventilation (6.4 ± 6.9 vs. 4.7 ± 3.8 hours, $p=0.136$), intensive care unit stay (24.6 ± 10.2 vs. 21.3 ± 7.4 hours, $p=0.236$), and 24-hour chest tube output (725.9 ± 862.9 vs. 467.5 ± 421.4 mL, $p=0.139$) were similar between patients with and without adhesions.

Conclusion

Pleural adhesions are not rare in patients undergoing robotic cardiac surgery, and its optimal management enhances the safety and efficiency of robotic cardiac procedures, particularly in patients with a history of thoracic interventions. By guiding tailored modifications to the robotic setup based on the location of adhesions, this test reduces the risk of pulmonary injury during thoracic access.



A) Perioperative pleural sliding test; B and C) Ultrasonographic view of visceral and parietal pleura and their sliding showing no adhesions during the test.