Diaphragm ultrasound as a predictor of patients at risk of pulmonary postoperative complications after phrenic nerve compromise.



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BACKGROUND

In some patient, procedures (like Interscalene Block (ISB)) that could produce phrenic nerve palsy should be avoided. This procedures can produce postoperative respiratory failure (PRF) if hemidiaphragm palsy occurs.

Diaphragmatic ultrasound applied during weaning in critical care patients has shown that after unilateral phrenic nerve injury, extubation was possible when there was a contralateral health hemidiaphragm with at least Diaphragmatic Thickening Fraction (TF)>30% and Diaphragmatic Excursion (DE)>25mm

Diaphragm evaluation using TF and DE during the perioperative period

METHODS

Case report series (n=6) performing D-POCUS before and after ISB for shoulder surgery. We observe DTF, DE, and signs of PRF at PACU.



Diaphragmatic Thickening Fraction (TF) Measure Diaphragmatic thickness at maximum inspiration and maximum expiration in apposition zone (5-8th intercostal space at anterior axillary line) with 12Mhz linear probe TF= Ti-Te/Te x100%



Diaphragmatic Excursion (DE)

Measure perpendicular diaphragmatic distance (mm) from maximal expiration to maximal inspiration with a convex 3-5 Mhz. probe at subcostal space

RESULTS AND DISCUSSION

		BEFORE INTERSCALENE BLOCK				R INTERESC	POSTOPERATIVE		
PATIENT IPSILATERAL		ERAL	CONTRA	LATERAL	IPSILA	IPSILATERAL		ATERAL	RESPIRATORY
ID	HEMIDIAP	HEMIDIAPHRAGM		HEMIDIAPHRAGM		HEMIDIAPHRAGM		HRAGM	FALIURE
	TF (%)	DE (mm)	TF (%)	DE (mm)	TF (%)	DE (mm)	TF (%)	DE (mm)	
1	68	35	64	52	4	7	59	46	No
2	219	28	95	16	0	1	28	14	YES
3	35	46	14	46	2	8	16	44	No
4	47	48	59	44	27		103	35	No
5	56	73	64	69	7	4	69	43	No
6	30		96	55	6		47	52	No

(D-POCUS) can be useful in detecting patients at risk of suffering postoperative respiratory failure (PRF) if hemidiaphragm palsy occurs.

PARTIAL CHECK CHECK **IPSILATERAL HD** CONTRALATERAL FUNCTION COMPLETE PRE-PROCEDURE Predicts increassed risk if HD **INCREASSED RISK OF** AVOID PROCEDURE PALSY ocurrs PARTIAL **OR TAKE PREVENTIVE** PRF IF IPSILATERAL HD PALSY OCURRS MEASSURES CHECK CONTRALATERAL HD FUNCTION COMPLETE LOW RISK OF PRF PROCEED PERIOPERATIVE Interscalene Block **D-POCUS** (PLANNED DIAPHRAGM POINT PROCEDURE with risk CHECK **OF CARE** PARTIAL of HD palsy) CONTRALATERAL ULTRASOUND CHECK IPSILATERAL HD **FUNCTION** CHECK : POST-PROCEDURE COMPLETE LOW RISK OF PRF **RESIDUAL BLOCK** Confirms PAIN increassed risk if HD PALSY ocurrs POSTSURGICAL CHANGES **INCREASSSED RISK OF** PARTIAL PRF PREPARE: NIV CHECK CONTRALATERAL tracheal HD FUNCTION intubation ICU ADMISSION COMPLETE LOW RISK OF PRF

 ID_2 has Dysphoea, tachyphoea of 34 rpm, and SaO2/FiO2 reduction from 466 to 247 at PACU. Diaphragm evaluation of ID₂ shows DTF=28% DE=14mm.

8 ± 3 minutes lasted the Ultrasound evaluation of the diaphragm.

83% (5/6) has postoperative complete palsy of ipsilateral hemidiaphragm after ISB.

But only 16% (1/6) has PRF.

Patients with ipsilateral hemidiaphragm palsy after ISB were common, this fact didn't produce PRF because contralateral hemidiaphragm is healthy (TF>30% and DE>25mm). the only patient with PRF has TF<30% and DE<25mm.

This cut point is only validated for weaning not for PPC prediction, a new study is granted to validate this test because this evaluation could increase patient safety.

When phrenic palsy could be produced, perioperative Point-of-Care Ultrasound measuring TF and DE of)f
contralateral healthy hemidiaphragm seem a fast and simple test to detect and prevent complications.	

CONCLUSION