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AUTOFLUORESCENCE BRONCHOSCOPY AS INNOVATIVE MARKER OF AIRWAY COMPLICATIONS AFTER LUNG TRANSPLANTATION

AIRWAY COMPLICATIONS IN LUNG TRANSPLANTATION

- Healing of airway anastomosis is considered the Achilles' heel of lung transplantation.
- Airway complications lead to morbidity, to worsening in QOL and increased health care costs.
- Incidence 10%-15%, related mortality rate 2%-3%.

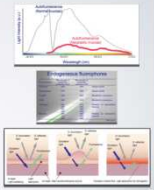
RISK FACTORS

- Length of mechanical ventilation both in donor (50-70 hrs) and recipient (PGD, acute cellular rejection) - barotrauma, inflammation, infection.
- Height mismatch (gender)
- Length of donor bronchus (secondary carina).
- Corticosteroids (not only adverse effects).
- Ischemic time ????
- BMI, organ preservation technique, acute kidney injury.
- No difference between DCD and DBD.

Machuzak et al

AUTOFLUORESCENCE PRINCIPLES

- Autofluorescence: tissue stimulated by high energy short wavelength blue light emits light at lower energy frequencies in green and red spectrum.
- Fluorescence reaction is achieved by exciting endogenous fluorophores in the sub-epithelial layer.
- AF is attenuated by thickening of epithelial layer (tumorous tissues) and by hemoglobin.
- Facilitates detections of lung cancer at an early stage.



AUTOFLUORESCENCE PRINCIPLES

- Normal tissues are displayed in green and tumorous lesions in magenta.
- In addition to blue excitation AFI uses green illumination light that is reflected by hemoglobin contained in the living tissues.
- A similar result is obtained in ischemic or infected mucosa (bacterial biofilms).

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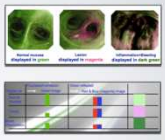


STUDY AIM

Find a relationship between the degree of bronchial vascularization after lung transplantation and the onset of airway stenosis using autofluorescence bronchoscopy.

METHODS

- From February 2014 and May 2015 all consecutive patients receiving single or double lung transplantation were included.
- Surgical technique was the same in all patients: end to end bronchial anastomosis with two absorbable 4/0 running sutures.
- Patients requiring separate lung ventilation, intensive care unit stay > 7 days, survival < 6 months were excluded.
- Bronchoscopies were scheduled every 7 days for the first month after operation then at 3, 6 and twelve months.
- All procedures were conducted with the same instrument (*EVIS Lucera Spectrum AFI, Olympus, Japan*) by the same endoscopist and recorded on USB storage device.

METHODS

- Bright pink color was typical of ischemic mucosa.
- Deep green was characteristic for normal mucosa.
- Pictures of the first bronchial carina were analyzed with color histograms.
- The red and green intensity ratio (R/G) was used to graduate the pictures.

RESULTS

- 23 patients were eligible for the study and we examined 39 bronchial anastomosis.
- We considered each anastomosis as a unit for statistical purpose.
- We observed 8 bronchial stenosis in 6 patients.
- Airway complications was correlated with ECMO, ischemic time, gender R/D mismatch, PGD.
- R/G ratio was correlated with stenosis onset.
- Statistic analysis: Fischer's exact test, Roc curve, logistic regression.

STUDY POPULATION

39 anastom.	range	mean	95% CI	median	95% CI	SD
AGE R	21-67	43,4	39,1-47,8	41	34,8-48,2	13,43
AGE D	16-67	41,4	36,1-46,7	41	34,8-53,8	16,33
MeccVent D	0-8	2,62	1,8-3,5	2	1,8-3,8	2,49
Cold Isc Time	180-1200	474	399,8-548,8	420	330,8-482,4	244

TX	7 SL	16 DL	12 FC	8 IPF	2 BPCO	1 LAM

STENOSIS

	Site	Time	Gender	PGD	ECMO	BAS	MDS	Treat.
1	IPF	L-inf.	9 m	FF	-	-	-	M0D3d5S	Stent
2	FC	R-int.	6 m	MM	-	-	Pseudo A - A. Xylosa	M0D3b5S	Pneumatic - Stent
3	IPF	L-main	3-6 m	MM	-	-	KPC	M2D1a5S	Stent
4	FC	R-int.	6 m	MM	+	Bridge-Post	Pseudo A	M0D2b5S	Stent
5	FC	L-main	1 m	MM	+	Bridge-Post	Pseudo A	M2D2a5S	Pneumatic
6	IPF	L-main	1 m	MF	+	-	-	M2D1a5S	No treat.
7	FC	L-main	12 m	FM	+	Post	PA-KPC	M0D2a5S	No treat.
8	FC	R-main	12 m	FM	+	Post	PA-KPC	M0D2a5S	No treat.

RESULTS

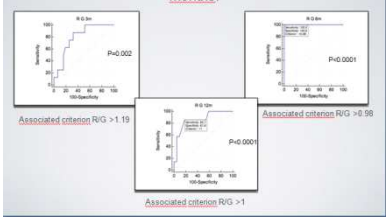
RESULTS

- After Logistic regression we found correlation between stenosis onset and
  - R/G ratio at 45 days (p=0.0417, OR 97.36)
  - R/G ratio at 3 months (p=0.00231, OR 17.66)
  - R/G ratio at 6 months (p=0.0036, OR 61.98)
  - R/G ratio at 12 months (p=0.0027, OR 533.18)
  - Cold ischemia time (p=0.0014, OR1.00)
- No correlation between stenosis and days of intubation of the donor (p=0.815).

STENOSIS TREATMENT

RESULTS

ROC curve: stenosis and R/G ratio at 3, 6 and 12 months.



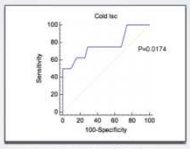
Associated criterion R/G >1.19

Associated criterion R/G >0.98

Associated criterion R/G >1

RESULTS

ROC curve: stenosis and cold ischemia.



Associated criterion >840 min.

RESULTS

Fisher's exact test

- We found correlation between stenosis and postopECMO (p=0.0105), PGD (p=0.0089).
- No statistical significance with D/R gender mismatch (p=0.087).
- No correlation with ECMO bridge and intraoperative ECMO.

CONCLUSIONS

- Autofluorescence bronchoscopy may allow the assessment of bronchial ischemic mucosa.
- Autofluorescence bronchoscopy may provide a valuable tool as preclinical marker of airway complications after lung transplantation.
- Further studies with larger series are mandatory.