



TRANSBRONCHIAL CRYOBIOPSY COMPLICATIONS & MANAGEMENT

- MD, PhD, TITOPOULOS IRAKLIS
- INTERVENTIONAL PULMONOLOGIST
- DIRECTOR PULMONOLOGY CLINIC
- EUROPERAN INTERBALKAN MEDICAL CENTER
THESSALONIKI, GREECE

TRANSBRONCHIAL CRYOBIOPSY

- THE DECISION NEEDS TO BE INDIVIDUALIZED BASED ON ASSESSMENT OF BENEFITS AND RISKS
- STUDIES DOCUMENTING COMPLICATIONS, DIAGNOSTIC YIELD, AND CLINICAL ROLE OF TBCB ARE NEEDED CONSIDERING THAT BAL COULD HAVE SOME DIAGNOSTIC IMPACT IN DIFFUSE LUNG DISORDERS WITH A RAPID DETERIORATION, ALTHOUGH WITH POTENTIAL RISKS AND LOW YIELD IN SOME CASES
- ACUTE DETERIORATION IN RESPIRATORY STATUS SHOULD BE CONSIDERED A RELATIVE CONTRAINDICATION
- MORTALITY DUE TO ACUTE EXACERBATION OF UIP AFTER TBCB HAS BEEN REPORTED

COMPLICATIONS

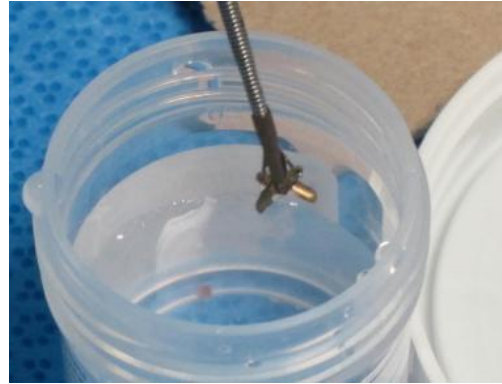
HEMORRAGE

PNEUMOTHORAX

FAMILIAR TO PRACTITIONERS OF TRADITIONAL FORCEPS TBB



- PNEUMOTHORAX RESULTS FROM A BIOPSY OBTAINED SO DISTALLY THAT THE VISCERAL PLEURA IS VIOLATED
- HEMORRHAGE IS THOUGHT TO BE GREATER IN THE MORE PROXIMAL REGION OF THE PERIPHERAL LUNG, WHERE VESSELS HAVE BRANCHED LESS EXTENSIVELY AND ARE LARGER BUT STILL TOO DISTAL TO BE PROTECTED BY THE CARTILAGINOUS RINGS OF THE CENTRAL AIRWAY



BECAUSE CRYOBIOPSY DISRUPTS A MUCH GREATER VOLUME OF LUNG TISSUE THAN TRADITIONAL SMALL FORCEPS TBB, A MALPOSITIONED CRYOPROBE HAS THE CAPACITY TO CAUSE GREATER PLEURAL OR VASCULAR DISRUPTION

OPTIMAL CRYOPROBE PLACEMENT WITH RESPECT TO THE PLEURAL LINE IS THEREFORE OF PARAMOUNT IMPORTANCE IN BALANCING THESE TWO COMPETING RISKS



Available data indicate pneumothorax to be a complication associated with TBCB. However, the rate varies considerably between different studies: from less than 1% to almost 30%

In a meta-analysis that included 15 studies comprising 994 patients, the average rate was 10%; the same results were confirmed by a more recent meta-analysis of 13 studies with an incidence of postprocedural pneumothorax of 9.5%

The risk of pneumothorax increases with UIP histology, fibrotic reticulation on HRCT scan, and with biopsies taken close to the pleura

There are very few data regarding chest tube time, but when chest drainage was necessary, time of drainage was similar to that of drainage after VATS

Transbronchial Cryobiopsies for the Diagnosis of Diffuse Parenchymal Lung Diseases: Expert Statement from the Cryobiopsy Working Group on Safety and Utility and a Call for Standardization of the Procedure

Jürgen Hetzel^a Fabien Maldonado^b Claudia Ravaglia^c Athol U. Wells^d Thomas V. Colby^e
 Sara Tomassetti^c Jay H. Ryu^f Oren Fruchter^g Sara Picciocchi^h Alessandra Dubiniⁱ
 Alberto Cavazza^j Marco Chilosi^k Nicola Sverzellati^l Dominique Valeyre^m Dimitri Leducⁿ
 Simon L.F. Walsh^o Stefano Gasparini^p Martin Hetzel^q Lars Hagmeyer^r Maik Haentschel^a
 Ralf Eberhardt^s Kaid Darwiche^t Lonny B. Yarmus^u Alfonso Torrego^v Ganesh Krishna^w
 Pallav L. Shah^x Jouke T. Annema^y Felix J.F. Herth^s Venerino Poletti^{c,z}

Table 2. Transbronchial cryobiopsy for diffuse lung disease: different approaches

First author [Ref.]	OT	RB	LM	NI	GA + JV	GA/DS	LA	Bronchial blocker	Cryoprobe size, mm	Freezing time, s
Babiak [16]	x					x		x	2.4	4
Pajares [20]	x					x		N	2.4	3
Griff [21]	x			x		x	x			
Kropski [22]	x					x			1.9	4
Yarmus [23]		x (10)	x (11)		x	x		Y	1.8	3
Fruchter [24]				x			x	N	2.4	4
Fruchter [25]				x			x	N	2.4	4
Fruchter [26]				x			x	N	2.4	4
Casoni [27]		x				x		Y	2.4	5/6
Pajares [28]	x					x		Y	2.4	3/4
Poletti [29]		x				x		Y	2.4	5/6
Griff [30]		x		x		x	x	N	1.9	3/5
Gershman [31]				x			x	N	2.4	4
Hagmeyer [32]	x	x			x			N	2.4	4/5
Hernández-González [33]	x					x		Y	1.9	3/4

Modified from [17]. OT, orotracheal tube; RB, rigid bronchoscope; LM, laryngeal mask; NI, no intubation; GA, general anesthesia; JV, jet ventilation; DS, deep sedation; LA, local anesthesia; Y, yes; N, no; x, method used.

Transbronchial Cryobiopsies for the Diagnosis of Diffuse Parenchymal Lung Diseases: Expert Statement from the Cryobiopsy Working Group on Safety and Utility and a Call for Standardization of the Procedure

Jürgen Hetzel^a Fabien Maldonado^b Claudia Ravaglia^c Athol U. Wells^d Thomas V. Colby^e
Sara Tomassetti^c Jay H. Ryu^f Oren Fruchter^g Sara Piciucchi^h Alessandra Dubiniⁱ
Alberto Cavazza^j Marco Chilosi^k Nicola Sverzellati^l Dominique Valeyre^m Dimitri Leducⁿ
Simon L.F. Walsh^o Stefano Gasparini^p Martin Hetzel^q Lars Hagmeyer^r Maik Haentschel^s
Ralf Eberhardt^t Kaid Darwiche^u Lonny B. Yarmus^v Alfonso Torrego^w Ganesh Krishna^w
Pallav L. Shah^x Jouke T. Annema^y Felix J.F. Herth^z Venerino Poletti^{c,z}

Table 1. Comparison between transbronchial forceps biopsy, transbronchial cryobiopsy, and surgical lung biopsy

First author [Ref.], year	Diagnostic yield	Pneumothorax	Serious bleeding	Mortality due to AE (in 30 days)
Cryobiopsy	>50.6%	0–26%	0–42%	<2%
Babiak [16], 2009	39/41 (94%)	2 (4.8%)	0	–
Kropski [22], 2013	20/25 (80%)	0	0	–
Fruchter [24], 2013	40/40 (100%)	0	0	–
Yarmus [23], 2013	–	1 (4.8%)	0	0
Pajares [28], 2014	39/77 (50.6%)	3 (8%)	0	–
Fruchter [26], 2014	51/75 (68%)	2 (2.6%)	3 (4%)	0
Pourabdollah [54], 2016	21/40 (52.5%)	–	–	–
Griff [30], 2014	41/52 (79%)	0	0	0
Hernández-González [33], 2015	28/33 (84%)	4 (12%)	0	0
Hagmeyer [32], 2016	23/32 (72%)	6 (19%)	2 (6%)	–
Gershman [31], 2015	–	15 (5%)	16 (5%)	–
Ramaswamy [55], 2016	37/56 (66%)	11 (20%)	1 (2%)	0
Echevarria-Uraga [40], 2016	83/85 (97%)	3 (3%)	10 (10%)	–
Ravaglia [34], 2016	246/297 (82.8%)	60 (20%)	0	1 (0.3%)
Ussavarungsi [56], 2017	38/74 (51%)	1 (1.4%)	9 (12%)	–
DiBardino [19], 2017	14/25 (56%)	2 (8%)	3 (12%)	–
Bango-Alvarez [36], 2017	91/106 (86%)	5 (4.7%)	0	0
Kronborg-White [57], 2017	28/38 (74%)	10 (26%)	3 (8%)	0
Sriprasart [42], 2017	65/74 (87.8%)	5 (7%)	1 (1%)	–
Ravaglia [53], 2017	–	7 (16%)	0	–
Forceps biopsy	25–65%	0–14.3%	0–6.0%	
Wall [58], 1981	20/53 (37.7%)	2/52 (3.8%)	0	0
O'Brien [59], 1997	29/83 (34.9%)	10/83 (14.3%)	5/83 (6.0%)	0
Berbesu [13], 2006	7/22 (31.8%) UIP	–	–	–
Casoni [60], 2008	62/95 (65%)	0	0	0
Facciolo [61], 2009	–	22/1,660 (1.3%)	21/1,660 (1.3%)	0
Tomassetti [12], 2012	13/64 (25%)	5/64 (8%)	–	0
Yarmus [23], 2013	–	1/21 (4.76%)	0	0
Pajares [28], 2014	11/38 (29.1%)	2/38 (5.3%)	0	0
Pourabdollah [54], 2016	14/26 (53.8%)	–	–	–
Gershman [31], 2015	–	9/286 (3.15%)	13/288 (4.4%)	0
Ramaswamy [55], 2016	16/56 (29%)	–	–	–
Sheth [62], 2017	13/33 (39.4%)	–	–	–

Transbronchial Cryobiopsies for the Diagnosis of Diffuse Parenchymal Lung Diseases: Expert Statement from the Cryobiopsy Working Group on Safety and Utility and a Call for Standardization of the Procedure

Jürgen Hetzel^a Fabien Maldonado^b Claudia Ravaglia^c Athol U. Wells^d Thomas V. Colby^e
Sara Tomassetti^c Jay H. Ryu^f Oren Fruchter^g Sara Picciocchi^h Alessandra Dubiniⁱ
Alberto Cavazza^j Marco Chilosi^k Nicola Sverzellati^l Dominique Valeyre^m Dimitri Leducⁿ
Simon L.F. Walsh^o Stefano Gasparini^p Martin Hetzel^q Lars Hagmeyer^r Maik Haentschel^s
Ralf Eberhardt^t Kaid Darwiche^u Lonny B. Yarmus^v Alfonso Torrego^w Ganesh Krishna^x
Pallav L. Shah^y Jouke T. Annema^z Felix J.F. Herth^a Venerino Poletti^{c,z}

Table 1. Comparison between transbronchial forceps biopsy, transbronchial cryobiopsy, and surgical lung biopsy

First author [Ref.], year	Diagnostic yield	Pneumothorax	Serious bleeding	Mortality due to AE (in 30 days)
Surgical biopsy	>69.9%	NA	No bleeding	Up to 9%
Rena [63], 1999	50/58 (86%)	NA	0	0
Kreider [64], 2007	52/68 (76.5%)	NA	0	3/68 (4.4%)
Zhang [65], 2010	368/418 (88.0%)	NA	0	3/418 (0.7%)
Fibla [66], 2012	195/224 (87%)	NA	0	–
Blackhall [67], 2013	72/103 (69.9%)	NA	0	4/103 (3.9%)
Morris [68], 2014	49/66 (74.2%)	NA	0	1/66 (1.5%)
Rotolo [69], 2015	154/161 (95.7%)	NA	0	4/161 (2.5%)
Fibla [70], 2015	232/311 (74.6%)	NA	0	28 (9%)
Hutchinson [4], 2016	–	NA	–	2,051/32,022 (6.4%)
Hutchinson [71], 2016	–	NA	–	68/2820 (2.4%)
Ravaglia [34], 2016	140/150 (98.7%)	NA	0	4/150 (2.7%)
Sheth [62], 2017	232/311 (75%)	NA	0	–
Lieberman [72], 2017	47/47 (100%)	NA	0	1 (2.1%)

AE, adverse event; UIP, usual interstitial pneumonia; NA, not applicable (after surgical lung biopsy usually a chest tube is applied).

Most papers grade on a scale of 4 steps:

No bleeding

Mild bleeding

requiring suction to clear

Moderate bleeding

- requiring endoscopic procedures like bronchial occlusion-collapse and/or
- instillation of ice-cold saline

Severe bleeding

- causing hemodynamic or respiratory instability
- requiring tamponade or other surgical interventions
- transfusions
- admission to the intensive care unit

- In a previous meta-analysis, **moderate bleeding** after cryobiopsy was observed in 65 cases among 383 patients from 12 studies (16.9%)
- No episodes of **severe bleeding**, as defined above, are reported in literature (in some papers bleeding has been reported as severe but was controlled by placement of bronchial blocker or catheter)
- no **bleeding-related deaths** have been reported after cryobiopsy the authors are aware of unpublished cases in which severe bleeding led to death when a bronchial blocker was not preventively employed
- A recently published report highlights the risk of potentially life-threatening complications when these precautions are not taken.

contraindications

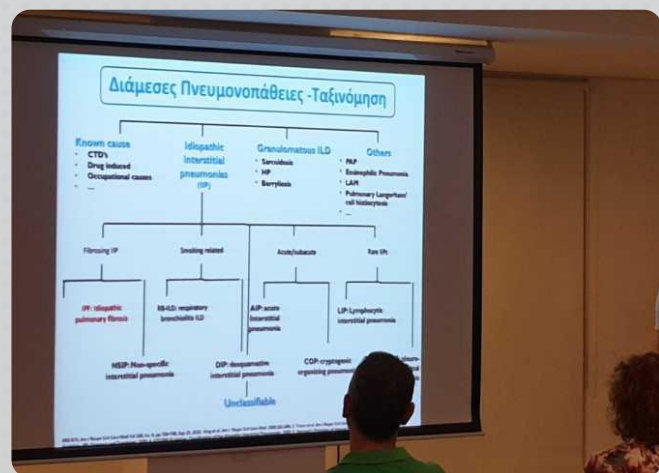
- Abnormal coagulation parameters
- Use of clopidogrel or other new antiplatelet drugs
- Thrombocytopenia ($<50 \times 10^9 /L$)

relative contraindications

- treatment with aspirin
- pulmonary function is severely impaired (FEV1 <0.8 L or $<50\%$ predicted, DLCO $<35\%$ or FVC $<50\%$)
- Significant hypoxemia, defined as PaO₂ <55 – 60 mm Hg on room air or while receiving 2 L/min of nasal oxygen
- Systolic pulmonary artery pressure >50 mm Hg on echocardiography
- A high body mass index (BMI >35)



Bleeding during cryobiopsy is common but is generally readily controlled endoscopically, e.g., by the use of bronchial blockers (Fogarty balloon or other tools) and/or use of rigid bronchoscopy



ΟΛΟΚΛΗΡΩΘΗΚΕ ΜΕ ΜΕΓΑΛΗ ΕΠΙΤΥΧΙΑ Η ΗΜΕΡΙΔΑ ΜΕ ΘΕΜΑ ΤΗΝ ΙΔΙΟΠΑΘΗ ΠΝΕΥΜΟΝΙΚΗ ΙΝΩΣΗ, ΠΟΥ ΟΡΓΑΝΩΘΗΚΕ ΑΠΟ ΤΗΝ ΕΝΘΕ ΣΤΙΣ 23 ΟΚΤΩΒΡΙΟΥ ΣΕ ΓΝΩΣΤΟ ΞΕΝΟΔΟΧΕΙΟ ΤΗΣ ΚΑΒΑΛΑΣ



ΥΠΟΥΡΓΕΙΟ ΚΑΙ
ΚΑΤΟΛΟΓΙΣΜΟΥ
ΠΑΝΕΠΙΣΤΗΜΙΟ
ΑΘΗΝΩΝ



ΔΙΟΙΚΗΤΙΚΟ
ΠΑΝΕΠΙΣΤΗΜΙΟ
ΕΠΙΣΤΕ



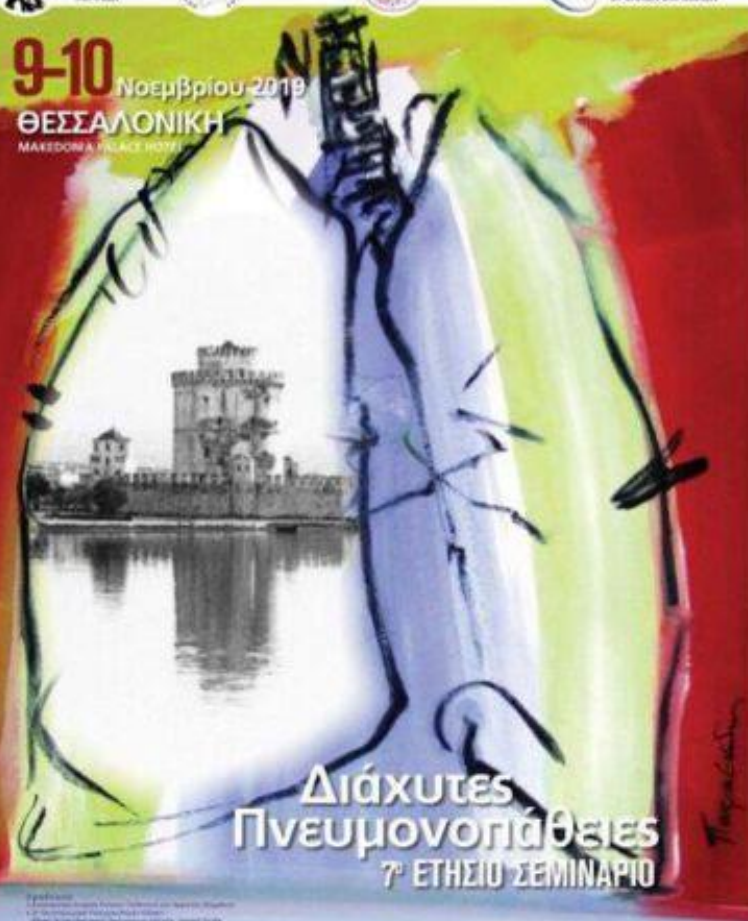
ΑΡΧΙΤΕΚΤΟΝΙΚΟ
ΠΑΝΕΠΙΣΤΗΜΙΟ
ΘΕΣΣΑΛΟΝΙΚΗΣ



ΕΠΙΣΤΗΜΟΝΗ
ΣΤΑΤΙΣΤΙΚΩΝ
ΕΠΙΣΤΗΜΩΝ ΚΑΙ
ΕΡΕΥΝΩΝ ΕΦΑΡΜΟΓΩΝ

9-10 Νοεμβρίου 2019

ΘΕΣΣΑΛΟΝΙΚΗ
MAKEDONIA PALACE HOTEL

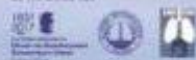


Διάχυτες Πνευμονοπάθειες 7^ο ΕΤΗΣΙΟ ΣΕΜΙΝΑΡΙΟ

Επισκεπόμενοι:
Δρ. Γεώργιος Παπαδόπουλος, Καθηγητής και Απαιτητής, Αθήνα
Δρ. Γεώργιος Παπαδόπουλος, Καθηγητής και Απαιτητής, Αθήνα
Δρ. Γεώργιος Παπαδόπουλος, Καθηγητής και Απαιτητής, Αθήνα
Δρ. Γεώργιος Παπαδόπουλος, Καθηγητής και Απαιτητής, Αθήνα
Δρ. Γεώργιος Παπαδόπουλος, Καθηγητής και Απαιτητής, Αθήνα
Δρ. Γεώργιος Παπαδόπουλος, Καθηγητής και Απαιτητής, Αθήνα

Με τη συνεργασία:
Εταιρεία Ελληνικών Πνευμονολογικών Εταιρειών (ΕΕΠΕ)
Εταιρεία Ελληνικών Πνευμονολογικών Εταιρειών (ΕΕΠΕ)
Εταιρεία Ελληνικών Πνευμονολογικών Εταιρειών (ΕΕΠΕ)
Εταιρεία Ελληνικών Πνευμονολογικών Εταιρειών (ΕΕΠΕ)
Εταιρεία Ελληνικών Πνευμονολογικών Εταιρειών (ΕΕΠΕ)
Εταιρεία Ελληνικών Πνευμονολογικών Εταιρειών (ΕΕΠΕ)

Με την αρωγή των:



Εταιρεία Ελληνικών
ΕΕΠΕ ΕΕΠΕ

Αντιόχεια 17, 700-80 Αθήνα
Τ. 210 3334041, Φ. 210 3334041
Ε. 9759914, Γ. 97 99914



**ΕΤΑΙΡΕΙΑ
ΝΟΣΗΜΑΤΩΝ
ΘΩΡΑΚΟΣ
ΕΛΛΑΔΟΣ**

Πρόσκληση

Επιστημονική Ημερίδα

Διασυνδεδετική Ενημέρωση για την Ιδιοπαθή Πνευμονική Ίνωση

27 Νοεμβρίου 2019

Esperos Palace Hotel



ΕΤΑΙΡΕΙΑ
ΝΟΣΗΜΑΤΩΝ
ΘΩΡΑΚΟΣ
ΕΛΛΑΔΟΣ

ΣΥΝΕΔΡΙΟ ΝΟΣΗΜΑΤΩΝ ΘΩΡΑΚΟΣ

21-24 ΜΑΪΟΥ 2020

THE MET HOTEL
ΘΕΣΣΑΛΟΝΙΚΗ
