

BONNES PRATIQUES EN ECHO-ENDOSCOPIE DIAGNOSTIQUE

1. Introduction

Les premières descriptions de l'échoendoscopie linéaire datent de 2003 (76). Il s'agit d'un endoscope à l'extrémité duquel est placée une sonde d'échographie miniaturisée. Cette technique permet de réaliser des ponctions en temps réel en visualisant en même temps l'image endobronchique et échographique. Elle permet d'explorer les stations 2R, 2L, 3P, 4R, 4L, 7, 10R, 10L, 11R, 11L, 12R et 12L et les lésions au contact de l'arbre trachéo-bronchique. Le mode doppler permet de visualiser les structures vasculaires adjacentes.

2. Pré-requis : Cartographie des adénopathies (annexe 3)

Les classifications de Naruke (77) et Mountain & Dressler (78) ont été actualisées par l'*International Association for the Study of Lung Cancer* (IASLC) afin d'harmoniser la nomenclature des adénopathies (79).

Quelques remarques :

- Les stations ganglionnaires sont regroupées en zones.
- La limite entre les stations para-trachéales droites et gauches est déplacée jusqu'au bord latéral gauche de la trachée.
- Les limites des stations sont désormais clairement définies, notamment les stations 2 et 4. La limite inférieure de la station 2R est définie par l'intersection entre le bord inférieur du tronc veineux brachio-céphalique gauche et la trachée. Le bord inférieur de la station 4R est défini par le bord inférieur de l'azygos. A gauche, la limite inférieure de la station 2 correspond au bord supérieur de la crosse de l'aorte et celle de la station 4 au bord supérieur de l'artère pulmonaire gauche.

3. Aspects techniques

3.1 Anesthésie et voie d'insertion :

L'écho-endoscopie bronchique est pratiquée sous anesthésie locale ou générale selon les centres. L'endoscope est inséré par voie endonasale, orale, ou via un masque laryngé ou une sonde d'intubation oro-trachéale (rendant difficile l'accès aux aires 2 et 4) (80).

3.2 Critères échographiques de malignité :

Il n'existe pas de critère échographique suffisamment fiable pour s'abstenir d'une confirmation histologique. On peut malgré tout s'aider de certains critères pour optimiser le choix des adénopathies à prélever (80). Une adénopathie arrondie, avec des contours distincts, une échogénicité hétérogène et de la nécrose centrale sont des caractéristiques échographiques en faveur de malignité (81). Lorsque ces 4 critères sont absents, les adénopathies sont bénignes dans 96% des cas (82). La forme arrondie est un critère de malignité fréquemment retrouvé (82–85).

Le critère de taille a également été étudié. Certaines études établissent un lien entre une adénopathie de taille augmentée et la présence de cancer (83,84) ce qui n'est pas confirmé par d'autres (82,86). Cela est probablement lié à l'utilisation de cut-off de tailles différentes.

La vascularisation permet également de suspecter la présence de malignité. L'absence de vascularisation ou la présence d'un seul vaisseau central sont des critères en faveur de bénignité (86,87). Inversement, une hypervascularisation sera suspecte de malignité (87).

3.3 Modalités de prélèvements

Les prélèvements sont effectués avec une aiguille de 19, 21, 22 (80) ou 25 Gauge (88) . Même si les prélèvements obtenus avec les aiguilles de 19G sont de plus grandes dimensions, le diamètre de l'aiguille n'influence pas les performances diagnostiques de l'écho endoscopie bronchique (89). Il est possible également d'utiliser une pince à biopsie coreDX® pour optimiser les prélèvements en complément de la ponction à l'aiguille (90).

Lors d'un staging ganglionnaire médiastinal, au minimum, les stations 4R, 4L et 7 doivent être explorées et ponctionnées si une adénopathie mesure 5 mm ou plus (91,92). Le prélèvement systématique des adénopathies N3 hilaires TEP négatives reste controversé (93–95).

Pour éviter une contamination liée à l'utilisation de la même aiguille tout au long de l'examen, les ponctions sont réalisées successivement des sites N3 puis N2 puis N1 (91).

Le nombre optimal de ponctions par adénopathie est au minimum de 3, permettant d'obtenir une sensibilité de 95,3% et une valeur prédictive négative de 97,6% (96).

L'application d'une aspiration ne semble pas modifier les performances de l'examen (97). En cas de prélèvement avec aspiration, si la ponction est hémorragique ou que l'on visualise des vaisseaux dans le ganglion à prélever, on peut réaliser les prélèvements sans aspiration (80).

3.4 Critères qualités des prélèvements

Un prélèvement est considéré comme contributif lorsqu'il met en évidence des lymphocytes (98).

3.5 Rapid On-Site Evaluation (ROSE)

L'analyse directe du matériel de ponction sur place par un cytopathologiste permet de diminuer le nombre de ponctions réalisées sur la cible principale (99,100) ainsi que le nombre de sites prélevés lorsque l'examen est réalisé à visée diagnostique (99). Cette technique n'améliore pas les performances diagnostiques de l'écho-endoscopie (101) et ne diminue pas la durée de la procédure. Elle peut permettre de diminuer les procédures annexes (102) et de vérifier la présence de matériel en quantité suffisante pour les recherches de biologie moléculaire.

3.6 Biologie moléculaire

Plusieurs études ont montré qu'il est possible de réaliser les recherches d'altérations oncogéniques de manière fiable et reproductible (103). Il est également recommandé de réaliser des ponctions supplémentaires dans ce but (80,104). Les prélèvements obtenus par écho-endoscopie bronchique permettent aussi de réaliser les techniques de NGS (105). L'écho-endoscopie est un examen qui peut s'avérer utile dans le cadre de re-prélèvement à la recherche des mécanismes de résistances des ITK dont la mutation T790M (106,107). La rentabilité de l'écho-endoscopie bronchique dans cette indication est influencée par les traitements antérieurs. Les antécédents de radiothérapie thoracique diminueraient les performances de cette technique (sensibilité de 83% et valeur prédictive négative à 76,5%) (108).

3.7 Programmed Death Ligand 1 (PDL1)

Les prélèvements cytologiques permettent une analyse de PDL1 dans environ 90% des cas (109,110). Il est également recommandé de réaliser des ponctions supplémentaires dans ce but (111).

Des études récentes confirment la concordance des résultats entre des prélèvements histologiques et cytologiques sur cytoblocs sous réserve de la présence d'au moins 100 cellules tumorales analysées, (112–114). Cette donnée devrait donc apparaître sur les comptes-rendus anatomopathologiques.

Néanmoins, l'hétérogénéité intra-tumorale d'expression de PDL1 peut expliquer certaines discordances entre les résultats histologiques et cytologiques (115,116).

Recommandations

- Il est recommandé de réaliser l'écho-endoscopie bronchique sous sédation modérée à profonde.
- Pour un staging médiastinal, les stations 4R, 4L et 7 au minimum doivent être explorées et ponctionnées si une adénopathie est $\geq$ à 5 mm.
- Les ponctions doivent être réalisées des stations N3, à N2 puis N1 (consensus).
- Les caractéristiques échographiques des adénopathies peuvent être utilisées pour évaluer le potentiel tumoral d'une adénopathie, mais un prélèvement doit toujours être obtenu pour confirmer un diagnostic (consensus).
- L'écho-endoscopie bronchique peut être réalisée avec ou sans ROSE.
- En l'absence de ROSE, il est recommandé de réaliser 3 ponctions par ganglion (consensus).
- Des prélèvements supplémentaires sont recommandés en cas de nécessité d'analyse de biologie moléculaire, NGS, et de détermination du PDL1.

4 Indications

4.1 Diagnostic et Staging des CBNPC

Il s'agit de la principale indication de l'écho-endoscopie bronchique. La sensibilité de cette technique est rapportée par Silvestri et al. à 89% (46 à 97% selon les études) avec une valeur prédictive négative de 91% (117). Elle éviterait 80% de médiastinoscopie, pour un coût moindre (118).

Les performances limitées du scanner et du TEP scanner pour détecter les métastases médiastinales (119) imposent le recours à un staging mini-invasif ou invasif. En effet, 30% des patients cN1 au TEP sont en réalité pN2-N3 (120) ; la valeur prédictive négative du TEP pour les tumeurs > 3 cm est de 89% (121). Par ailleurs 21,6% des tumeurs centrales classées cN0 au TEP sont en réalité pN2 (122).

Pour les patients sans métastases à distance, Il est donc recommandé de réaliser une écho-endoscopie de staging dans les cas suivants et si elle est susceptible de changer la stratégie thérapeutique :

- Adénopathies médiastinales élargies au scanner et/ou TEP scanner positif
- Adénopathies médiastinales normales au scanner et positives au TEP scanner
- Ganglions médiastinaux normaux et non fixants au TEP si :
 - Tumeurs N1 au scanner et/ou TEP scanner,
 - Tumeur centrale,
 - Tumeur de plus de 3 cm surtout s'il s'agit d'un adénocarcinome fixant hautement le FDG (121).

Si la suspicion d'atteinte ganglionnaire reste élevée après une écho endoscopie négative ou non contributive, du fait d'une valeur prédictive négative variant avec la prévalence, et des meilleures performances de l'association écho-endoscopie bronchique + médiastinoscopie versus médiastinoscopie seule, il est recommandé de réaliser un staging chirurgical (91,117).

L'écho-endoscopie bronchique est également recommandée comme méthode diagnostique pour les patients présentant une tumeur avec envahissement médiastinal si elle constitue la technique disponible la moins invasive (64).

L'écho-endoscopie bronchique est indiquée pour le diagnostic de tumeur pulmonaire ayant un contact avec l'arbre bronchique (123–125).



REFERENCES

1. Facciolo N, Patelli M, Gasparini S, Lazzari Agli L, Salio M, Simonassi C, et al. Incidence of complications in bronchoscopy. Multicentre prospective study of 20,986 bronchoscopies. *Monaldi Arch Chest Dis Arch Monaldi Mal Torace*. mars 2009;71(1):8-14.
2. Hehn BT, Haponik E, Rubin HR, Lechtzin N, Diette GB. The relationship between age and process of care and patient tolerance of bronchoscopy. *J Am Geriatr Soc*. juill 2003;51(7):917-22.
3. Bechara RI. Practice and Complications of Flexible Bronchoscopy With Biopsy Procedures. *J Bronchol Interv Pulmonol*. juill 2005;12:139-42.
4. McLaughlin CW, Skabelund AJ, Easterling ER, Morris MJ. The Safety and Utility of Fiberoptic Bronchoscopy in the Very Elderly. *J Bronchol Interv Pulmonol*. oct 2018;25(4):300-4.
5. British Thoracic Society Bronchoscopy Guidelines Committee, a Subcommittee of Standards of Care Committee of British Thoracic Society. British Thoracic Society guidelines on diagnostic flexible bronchoscopy. *Thorax*. mars 2001;56 Suppl 1:i1-21.
6. Du Rand IA, Barber PV, Goldring J, Lewis RA, Mandal S, Munavvar M, et al. British Thoracic Society guideline for advanced diagnostic and therapeutic flexible bronchoscopy in adults. *Thorax*. nov 2011;66 Suppl 3:iii1-21.
7. Du Rand IA, Blaikley J, Booton R, Chaudhuri N, Gupta V, Khalid S, et al. British Thoracic Society guideline for diagnostic flexible bronchoscopy in adults: accredited by NICE. *Thorax*. août 2013;68 Suppl 1:i1-44.
8. Febvre M, Trosini-Désert V, Atassi K, Hermant C, Colchen A, Raspaud C, et al. [Diagnostic flexible bronchoscopy. Recommendations of the Endoscopy Working Group of the French Society of Pulmonary Medicine]. *Rev Mal Respir*. déc 2007;24(10):1363-92.
9. van Zwam JP, Kapteijns EFG, Lahey S, Smit HJM. Flexible bronchoscopy in supine or sitting position: a randomized prospective analysis of safety and patient comfort. *J Bronchol Interv Pulmonol*. janv 2010;17(1):29-32.
10. Yildiz P, Özgül A, Yılmaz V. Changes in oxygen saturation in patients undergoing fiberoptic bronchoscopy. *Chest*. mars 2002;121(3):1007-8.
11. Milman N, Faurschou P, Grode G, Jørgensen A. Pulse oximetry during fiberoptic bronchoscopy in local anaesthesia: frequency of hypoxaemia and effect of oxygen supplementation. *Respir Int Rev Thorac Dis*. 1994;61(6):342-7.
12. Fang W-F, Chen Y-C, Chung Y-H, Woon W-T, Tseng C-C, Chang H-W, et al. Predictors of oxygen desaturation in patients undergoing diagnostic bronchoscopy. *Chang Gung Med J*. juin 2006;29(3):306-12.
13. Jones AM, O'Driscoll R. Do all patients require supplemental oxygen during flexible bronchoscopy? *Chest*. juin 2001;119(6):1906-9.
14. Schiffman PL, Westlake RE, Fourre JA, Leonard ET. Arterial oxygen saturation and cardiac rhythm during transoral fiberoptic bronchoscopy. *J Med Soc N J*. sept 1982;79(10):723-6.
15. Ouellette DR. Elevation of the Double Product During Flexible Bronchoscopy... : *Journal of Bronchology & Interventional Pulmonology*. *J Bronchol Interv Pulmonol*. avr 2008;15:73-7.
16. Davies L, Mister R, Spence DP, Calverley PM, Earls JE, Pearson MG. Cardiovascular consequences of fiberoptic bronchoscopy. *Eur Respir J*. mars 1997;10(3):695-8.
17. Katz AS, Michelson EL, Stawicki J, Holford FD. Cardiac arrhythmias. Frequency during fiberoptic bronchoscopy and correlation with hypoxemia. *Arch Intern Med*. avr 1981;141(5):603-6.
18. Dweik RA, Mehta AC, Meeker DP, Arroliga AC. Analysis of the safety of bronchoscopy after recent acute myocardial infarction. *Chest*. sept 1996;110(3):825-8.
19. Dunagan DP, Burke HL, Aquino SL, Chin R, Adair NE, Haponik EF. Fiberoptic bronchoscopy in coronary care unit patients: indications, safety, and clinical implications. *Chest*. déc 1998;114(6):1660-7.
20. Cordasco EM, Mehta AC, Ahmad M. Bronchoscopically induced bleeding. A summary of nine years' Cleveland clinic experience and review of the literature. *Chest*. oct 1991;100(4):1141-7.
21. Bernasconi M, Koegelenberg CFN, Koutsokera A, Ogna A, Casutt A, Nicod L, et al. Iatrogenic bleeding during flexible bronchoscopy: risk factors, prophylactic measures and management. *ERJ Open Res*. avr 2017;3(2).
22. Bjørtuft O, Brosstad F, Boe J. Bronchoscopy with transbronchial biopsies: measurement of bleeding volume and evaluation of the predictive value of coagulation tests. *Eur Respir J*. nov 1998;12(5):1025-7.
23. Diette GB, Wiener CM, White P. The higher risk of bleeding in lung transplant recipients from bronchoscopy is independent of traditional bleeding risks: results of a prospective cohort study. *Chest*. févr 1999;115(2):397-402.
24. Trosini-Désert V, Vergnon JM, Collet JP, Montalescot G, Similowski T, Groupe d'Endoscopie bronchique de Langue Française. [Fiberoptic bronchoscopy and anti-platelet agents: a risk-benefit analysis]. *Rev Mal Respir*. janv 2007;24(1):48-56.
25. Kozak EA, Brath LK. Do « screening » coagulation tests predict bleeding in patients undergoing fiberoptic bronchoscopy with biopsy? *Chest*. sept 1994;106(3):703-5.
26. Zahreddine I, Atassi K, Fuhrman C, Febvre M, Maitre B, Housset B. [Impact of prior biological assessment of coagulation on the hemorrhagic risk of fiberoptic bronchoscopy]. *Rev Mal Respir*. juin 2003;20(3 Pt 1):341-6.
27. Abuqayyas S, Raju S, Bartholomew JR, Abu Hweij R, Mehta AC. Management of antithrombotic agents in patients undergoing flexible bronchoscopy. *Eur Respir Rev Off J Eur Respir Soc*. 30 sept 2017;26(145).
28. Metha N. Should Renal Insufficiency Be a Relative Contraindication to... : *Journal of Bronchology & Interventional Pulmonology* [Internet]. LWW. [cité 9 nov 2016]. Disponible sur: http://journals.lww.com/bronchology/Fulltext/2005/04000/Should_Renal_Insufficiency_Be_a_Relative.5.aspx
29. Jain P, Sandur S, Meli Y, Arroliga AC, Stoller JK, Mehta AC. Role of flexible bronchoscopy in immunocompromised patients with lung infiltrates. *Chest*. févr 2004;125(2):712-22.
30. Shannon VR, Andersson BS, Lei X, Champlin RE, Kontoyiannis DP. Utility of early versus late fiberoptic bronchoscopy in the evaluation of new pulmonary infiltrates following hematopoietic stem cell transplantation. *Bone Marrow Transplant*. avr 2010;45(4):647-55.
31. Weiss SM, Hert RC, Gianola FJ, Clark JG, Crawford SW. Complications of fiberoptic bronchoscopy in thrombocytopenic patients. *Chest*. oct 1993;104(4):1025-8.



32. Rebull P. Platelet transfusion trigger in difficult patients. *Transfus Clin Biol.* juin 2001;8(3):249-54.
33. Febvre M. [Systematic evaluation of hemostasis before a bronchoscopy--against]. *Rev Mal Respir.* janv 1999;16 Suppl 3:S69-70.
34. Veitch AM, Baglin TP, Gershlick AH, Harnden SM, Tighe R, Cairns S, et al. Guidelines for the management of anticoagulant and antiplatelet therapy in patients undergoing endoscopic procedures. *Gut.* sept 2008;57(9):1322-9.
35. Veitch AM, Vanbiervliet G, Gershlick AH, Boustiere C, Baglin TP, Smith L-A, et al. Endoscopy in patients on antiplatelet or anticoagulant therapy, including direct oral anticoagulants: British Society of Gastroenterology (BSG) and European Society of Gastrointestinal Endoscopy (ESGE) guidelines. *Endoscopy.* avr 2016;48(4):385-402.
36. Pathak V, Allender JE, Grant MW. Management of anticoagulant and antiplatelet therapy in patients undergoing interventional pulmonary procedures. *Eur Respir Rev Off J Eur Respir Soc.* 30 sept 2017;26(145).
37. Siegal DM, Curnutte JT, Connolly SJ, Lu G, Conley PB, Wiens BL, et al. Andexanet Alfa for the Reversal of Factor Xa Inhibitor Activity. *N Engl J Med.* 17 déc 2015;373(25):2413-24.
38. Herth FJF, Becker HD, Ernst A. Aspirin does not increase bleeding complications after transbronchial biopsy. *Chest.* oct 2002;122(4):1461-4.
39. Hittelet A, Devière J. Management of anticoagulants before and after endoscopy. *Can J Gastroenterol J Can Gastroenterol.* mai 2003;17(5):329-32.
40. Yousfi M, Gostout CJ, Baron TH, Hernandez JL, Keate R, Fleischer DE, et al. Postpolypectomy lower gastrointestinal bleeding: potential role of aspirin. *Am J Gastroenterol.* sept 2004;99(9):1785-9.
41. Ernst A, Eberhardt R, Wahidi M, Becker HD, Herth FJF. Effect of routine clopidogrel use on bleeding complications after transbronchial biopsy in humans. *Chest.* mars 2006;129(3):734-7.
42. Stather DR, MacEachern P, Chee A, Tremblay A. Safety of endobronchial ultrasound-guided transbronchial needle aspiration for patients taking clopidogrel: a report of 12 consecutive cases. *Respir Int Rev Thorac Dis.* 2012;83(4):330-4.
43. Meena N, Abouzgheib W, Patolia S, Rosenheck J, Boujaoude Z, Bartter T. EBUS-TBNA and EUS-FNA: Risk Assessment for Patients Receiving Clopidogrel. *J Bronchol Interv Pulmonol.* oct 2016;23(4):303-7.
44. Gil H-I, Choe J, Jeong B-H, Um S-W, Jeon K, Hahn J-Y, et al. Safety of endobronchial ultrasound-guided transbronchial needle aspiration in patients with lung cancer within a year after percutaneous coronary intervention. *Thorac Cancer.* 2018;9(11):1390-7.
45. Webb TN, Flanagan E, Martin R, Parks C, Bechara RI. Effect of Routine Clopidogrel Use on Bleeding Complications After Endobronchial Ultrasound-guided Fine Needle Aspiration. *J Bronchol Interv Pulmonol.* janv 2019;26(1):10-4.
46. Cadroy Y, Thalamas C, Sakariassen K, Boneu B. Superior efficacy of clopidogrel plus acetylsalicylic acid compared with extended-release dipyridamole plus acetylsalicylic acid in preventing arterial thrombogenesis in healthy volunteers. *Thromb Res.* 2005;116(4):293-300.
47. Collet JP, Himbert F, Steg PG. Myocardial infarction after aspirin cessation in stable coronary artery disease patients. *Int J Cardiol.* déc 2000;76(2-3):257-8.
48. Collet JP, Montalescot G, Blanchet B, Tanguy ML, Golmard JL, Choussat R, et al. Impact of prior use or recent withdrawal of oral antiplatelet agents on acute coronary syndromes. *Circulation.* 19 oct 2004;110(16):2361-7.
49. Kafuza GL, Joseph J, Lee JR, Raizner ME, Raizner AE. Catastrophic outcomes of noncardiac surgery soon after coronary stenting. *J Am Coll Cardiol.* avr 2000;35(5):1288-94.
50. Kariyawasam HH, Aizen M, Kay AB, Robinson DS. Safety and tolerability of three consecutive bronchoscopies after allergen challenge in volunteers with mild asthma. *Thorax.* juin 2007;62(6):557-8.
51. Elston WJ, Whittaker AJ, Khan LN, Flood-Page P, Ramsay C, Jeffery PK, et al. Safety of research bronchoscopy, biopsy and bronchoalveolar lavage in asthma. *Eur Respir J.* sept 2004;24(3):375-7.
52. Tapanainen L, Lindqvist A, Halme M, Laitinen LA. Investigative bronchoscopy and endobronchial biopsy is well tolerated in hyperreactive asthma patients. *Respir Med.* juin 2002;96(6):466-8.
53. Peacock AJ, Benson-Mitchell R, Godfrey R. Effect of fiberoptic bronchoscopy on pulmonary function. *Thorax.* janv 1990;45(1):38-41.
54. Chechani V. Flexible Bronchoscopy in Patients with Hypercapnia. : *Journal of Bronchology & Interventional Pulmonology.* J Bronchol Interv Pulmonol. juill 2000;7:226-32.
55. Rivera MP, Mehta AC, American College of Chest Physicians. Initial diagnosis of lung cancer: ACCP evidence-based clinical practice guidelines (2nd edition). *Chest.* sept 2007;132(3 Suppl):131S-148S.
56. van der Drift MA, van der Wilt G-J, Thunnissen FBJM, Janssen JP. A prospective study of the timing and cost-effectiveness of bronchial washing during bronchoscopy for pulmonary malignant tumors. *Chest.* juill 2005;128(1):394-400.
57. McLean AN, Semple PA, Franklin DH, Petrie G, Millar EA, Douglas JG. The Scottish multi-centre prospective study of bronchoscopy for bronchial carcinoma and suggested audit standards. *Respir Med.* sept 1998;92(9):1110-5.
58. Acharya K V, B U, Shenoy A, Holla R. Utility of Various Bronchoscopic Modalities in Lung Cancer Diagnosis. *Asian Pac J Cancer Prev APJCP.* 27 2017;18(7):1931-6.
59. Dasgupta A, Jain P, Minai OA, Sandur S, Meli Y, Arroliga AC, et al. Utility of transbronchial needle aspiration in the diagnosis of endobronchial lesions. *Chest.* mai 1999;115(5):1237-41.
60. Shure D, Fedullo PF. Transbronchial needle aspiration in the diagnosis of submucosal and peribronchial bronchogenic carcinoma. *Chest.* juill 1985;88(1):49-51.
61. Gellert AR, Rudd RM, Sinha G, Geddes DM. Fiberoptic bronchoscopy: effect of multiple bronchial biopsies on diagnostic yield in bronchial carcinoma. *Thorax.* sept 1982;37(9):684-7.
62. Popovich J, Kvale PA, Eichenhorn MS, Radke JR, Ohorodnik JM, Fine G. Diagnostic accuracy of multiple biopsies from flexible fiberoptic bronchoscopy. A comparison of central versus peripheral carcinoma. *Am Rev Respir Dis.* mai 1982;125(5):521-3.
63. Dietel M, Bubendorf L, Dingemans A-MC, Doms C, Elmberger G, García RC, et al. Diagnostic procedures for non-small-cell lung cancer (NSCLC): recommendations of the European Expert Group. *Thorax.* févr 2016;71(2):177-84.
64. Rivera MP, Mehta AC, Wahidi MM. Establishing the diagnosis of lung cancer: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest.* mai 2013;143(5 Suppl):e142S-65S.
65. Minami D, Nakasuka T, Ando C, Iwamoto Md Y, Sato K, Fujiwara K, et al. Bronchoscopic diagnosis of peripheral pulmonary lung cancer employing sedation with fentanyl and midazolam. *Respir Investig.* sept 2017;55(5):314-7.



Endoscopie

66. Steinfert DP, Vincent J, Heinze S, Antippa P, Irving LB. Comparative effectiveness of radial probe endobronchial ultrasound versus CT-guided needle biopsy for evaluation of peripheral pulmonary lesions: a randomized pragmatic trial. *Respir Med.* nov 2011;105(11):1704-11.
67. Steinfert DP, Khor YH, Manser RL, Irving LB. Radial probe endobronchial ultrasound for the diagnosis of peripheral lung cancer: systematic review and meta-analysis. *Eur Respir J.* avr 2011;37(4):902-10.
68. Han Y, Kim HJ, Kong KA, Kim SJ, Lee SH, Ryu YJ, et al. Diagnosis of small pulmonary lesions by transbronchial lung biopsy with radial endobronchial ultrasound and virtual bronchoscopic navigation versus CT-guided transthoracic needle biopsy: A systematic review and meta-analysis. *PloS One.* 2018;13(1):e0191590.
69. Nakai T, Matsumoto Y, Suzuk F, Tsuchida T, Izumo T. Predictive factors for a successful diagnostic bronchoscopy of ground-glass nodules. *Ann Thorac Med.* sept 2017;12(3):171-6.
70. Huang C-T, Tsai Y-J, Ho C-C, Yu C-J. The value of repeat radial-probe endobronchial ultrasound-guided transbronchial biopsy after initial non-diagnostic results in patients with peripheral pulmonary lesions. *BMC Pulm Med.* 17 oct 2017;17(1):132.
71. Hong KS, Jang JG, Ahn JH. Radial probe endobronchial ultrasound-guided transbronchial lung biopsy for the diagnosis of cavitary peripheral pulmonary lesions. *Thorac Cancer.* juin 2021;12(11):1735-42.
72. Bertoletti L, Robert A, Cottier M, Chambonniere ML, Vergnon J-M. Accuracy and feasibility of electromagnetic navigated bronchoscopy under nitrous oxide sedation for pulmonary peripheral opacities: an outpatient study. *Respir Int Rev Thorac Dis.* 2009;78(3):293-300.
73. Gildea TR, Mazzone PJ, Karnak D, Meziane M, Mehta AC. Electromagnetic navigation diagnostic bronchoscopy: a prospective study. *Am J Respir Crit Care Med.* 1 nov 2006;174(9):982-9.
74. Makris D, Scherpereel A, Leroy S, Bouchindhomme B, Faivre J-B, Remy J, et al. Electromagnetic navigation diagnostic bronchoscopy for small peripheral lung lesions. *Eur Respir J.* juin 2007;29(6):1187-92.
75. Eberhardt R, Anantham D, Herth F, Feller-Kopman D, Ernst A. Electromagnetic navigation diagnostic bronchoscopy in peripheral lung lesions. *Chest.* juin 2007;131(6):1800-5.
76. Mehta AC, Wang K-P. Teaching conventional transbronchial needle aspiration. A continuum. *Ann Am Thorac Soc.* déc 2013;10(6):685-9.
77. Naruke T, Suemasu K, Ishikawa S. Lymph node mapping and curability at various levels of metastasis in resected lung cancer. *J Thorac Cardiovasc Surg.* déc 1978;76(6):832-9.
78. Mountain CF. Regional lymph node classification for lung cancer staging. 1997;(111):1710-7.
79. Rusch VW, Crowley J, Giroux DJ, Goldstraw P, Im J-G, Tsuboi M, et al. The IASLC Lung Cancer Staging Project: Proposals for the revision of the N descriptors in the forthcoming seventh edition of the TNM classification for lung cancer. *J Thorac Oncol.* juill 2007;2(7):603-12.
80. Wahidi MM, Herth F, Yasufuku K, Shepherd RW, Yarmus L, Chawla M, et al. Technical Aspects of Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration: CHEST Guideline and Expert Panel Report. *Chest.* mars 2016;149(3):816-35.
81. Hylton DA, Kidane B, Spicer J, Turner S, Churchill I, Sullivan K, et al. Endobronchial Ultrasound Staging of Operable Non-small Cell Lung Cancer. *Chest.* juin 2021;159(6):2470-6.
82. Fujiwara T, Yasufuku K, Nakajima T, Chiyo M, Yoshida S, Suzuki M, et al. The Utility of Sonographic Features During Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration for Lymph Node Staging in Patients With Lung Cancer: A Standard Endobronchial Ultrasound Image Classification System. *Chest.* avr 2010;138(3):641-7.
83. Memoli JSW, El-Bayoumi E, Pastis NJ, Tanner NT, Gomez M, Huggins JT, et al. Using endobronchial ultrasound features to predict lymph node metastasis in patients with lung cancer. *Chest.* déc 2011;140(6):1550-6.
84. Garcia-Olivé I, Monsó E, Andreo F, Sanz J, Castellà E, Llatjós M, et al. Sensitivity of linear endobronchial ultrasonography and guided transbronchial needle aspiration for the identification of nodal metastasis in lung cancer staging. *Ultrasound Med Biol.* août 2009;35(8):1271-7.
85. Wang L, Wu W, Hu Y, Teng J, Zhong R, Han B, et al. Sonographic Features of Endobronchial Ultrasonography Predict Intrathoracic Lymph Node Metastasis in Lung Cancer Patients. *Ann Thorac Surg.* oct 2015;100(4):1203-9.
86. Satterwhite LG, Berkowitz DM, Parks CS, Bechara RI. Central intranodal vessels to predict cytology during endobronchial ultrasound transbronchial needle aspiration. *J Bronchol Interv Pulmonol.* oct 2011;18(4):322-8.
87. Nakajima T, Anayama T, Shingyoji M, Kimura H, Yoshino I, Yasufuku K. Vascular image patterns of lymph nodes for the prediction of metastatic disease during EBUS-TBNA for mediastinal staging of lung cancer. *J Thorac Oncol Off Publ Int Assoc Study Lung Cancer.* juin 2012;7(6):1009-14.
88. Okubo Y, Matsumoto Y, Tanaka M, Imabayashi T, Uezono Y, Watanabe S, et al. Clinical validity of 25-gauge endobronchial ultrasound-guided transbronchial needle in lymph node staging of lung cancer. *J Thorac Dis.* mai 2021;13(5):3033-41.
89. Doms C, Vander Borgh S, Yserbyt J, Testelmans D, Wauters E, Nackaerts K, et al. A Randomized Clinical Trial of Flex 19G Needles versus 22G Needles for Endobronchial Ultrasonography in Suspected Lung Cancer. *Respir Int Rev Thorac Dis.* 2018;96(3):275-82.
90. Legodec J, Ammar Y, Vaunois B, Tchouhadjian C, Thomas G, Escarguel B. Biopsies médiastinales à la pince en échoendoscopie bronchique : utilisation du nouveau dispositif Core-Dx en routine. *Rev Mal Respir.* janv 2019;36:A231.
91. De Leyn P, Doms C, Kuzdzal J, Lardinois D, Passlick B, Rami-Porta R, et al. Revised ESTS guidelines for preoperative mediastinal lymph node staging for non-small-cell lung cancer. *Eur J Cardio-Thorac Surg Off J Eur Assoc Cardio-Thorac Surg.* mai 2014;45(5):787-98.
92. Doms C, Muylle I, Yserbyt J, Ninane V. Endobronchial ultrasound in the management of nonsmall cell lung cancer. *Eur Respir Rev Off J Eur Respir Soc.* 1 juin 2013;22(128):169-77.
93. Sainz Zúñiga PV, Martínez-Zayas G, Molina S, Grosu HB, Arain MH, Ost DE. Is Biopsy of Contralateral Hilar N3 Lymph Nodes With Negative PET-CT Scan Findings Necessary When Performing Endobronchial Ultrasound Staging? *Chest.* avr 2021;159(4):1642-51.
94. Borda-Martinez J, Vercher-Conejero JL, Rodriguez-González G, Cubero N, Lopez-Lisbona RM, Díez-Ferrer M, et al. N3 hilar sampling decision in the staging of mediastinal lung cancer. *ERJ Open Res.* juill 2021;7(3):00116-2021.
95. Serra P, Centeno C, Sanz-Santos J, Torky M, Baeza S, Mendiluce L, et al. Is it necessary to sample the contralateral nodal stations by EBUS-TBNA in patients with lung cancer and clinical N0 / N1 on PET-CT? *Lung Cancer.* avr 2020;142:9-12.
96. Lee HS, Lee GK, Lee H-S, Kim MS, Lee JM, Kim HY, et al. Real-time endobronchial ultrasound-guided transbronchial needle aspiration in mediastinal staging of non-small cell lung cancer: how many aspirations per target lymph node station? *Chest.* août 2008;134(2):368-74.



97. Casal RF, Staerckel GA, Ost D, Almeida FA, Uzbek MH, Eapen GA, et al. Randomized clinical trial of endobronchial ultrasound needle biopsy with and without aspiration. *Chest*. sept 2012;142(3):568-73.
98. Nasir BS, Yasufuku K, Liberman M. When Should Negative Endobronchial Ultrasonography Findings be Confirmed by a More Invasive Procedure? *Ann Surg Oncol*. 10 janv 2017;
99. Oki M, Saka H, Kitagawa C, Kogure Y, Murata N, Adachi T, et al. Rapid on-site cytologic evaluation during endobronchial ultrasound-guided transbronchial needle aspiration for diagnosing lung cancer: a randomized study. *Respir Int Rev Thorac Dis*. 2013;85(6):486-92.
100. Murakami Y, Oki M, Saka H, Kitagawa C, Kogure Y, Ryuge M, et al. Endobronchial ultrasound-guided transbronchial needle aspiration in the diagnosis of small cell lung cancer. *Respir Investig*. mai 2014;52(3):173-8.
101. Griffin AC, Schwartz LE, Baloch ZW. Utility of on-site evaluation of endobronchial ultrasound-guided transbronchial needle aspiration specimens. *CytoJournal*. 2011;8:20.
102. van der Heijden EHFM, Casal RF, Trisolini R, Steinfort DP, Hwangbo B, Nakajima T, et al. Guideline for the acquisition and preparation of conventional and endobronchial ultrasound-guided transbronchial needle aspiration specimens for the diagnosis and molecular testing of patients with known or suspected lung cancer. *Respir Int Rev Thorac Dis*. 2014;88(6):500-17.
103. Sakairi Y, Nakajima T, Yasufuku K, Ikebe D, Kageyama H, Soda M, et al. EML4-ALK fusion gene assessment using metastatic lymph node samples obtained by endobronchial ultrasound-guided transbronchial needle aspiration. *Clin Cancer Res Off J Am Assoc Cancer Res*. 15 oct 2010;16(20):4938-45.
104. van der Heijden EHFM, Casal RF, Trisolini R, Steinfort DP, Hwangbo B, Nakajima T, et al. Guideline for the acquisition and preparation of conventional and endobronchial ultrasound-guided transbronchial needle aspiration specimens for the diagnosis and molecular testing of patients with known or suspected lung cancer. *Respir Int Rev Thorac Dis*. 2014;88(6):500-17.
105. Chaddha U, Hogarth DK, Murgu S. The role of endobronchial ultrasound transbronchial needle aspiration for programmed death ligand 1 testing and next generation sequencing in advanced non-small cell lung cancer. *Ann Transl Med*. août 2019;7(15):351.
106. Izumo T, Matsumoto Y, Chavez C, Tsuchida T. Re-biopsy by endobronchial ultrasound procedures for mutation analysis of non-small cell lung cancer after EGFR tyrosine kinase inhibitor treatment. *BMC Pulm Med*. 26 juill 2016;16(1):106.
107. Goag EK, Lee JM, Chung KS, Kim SY, Leem AY, Song JH, et al. Usefulness of Bronchoscopic Rebiopsy of Non-Small Cell Lung Cancer with Acquired Resistance to Epidermal Growth Factor Receptor-Tyrosine Kinase Inhibitor. *J Cancer*. 2018;9(6):1113-20.
108. Kim J, Kang HJ, Moon SH, Lee JM, Kim HY, Lee G-K, et al. Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration for Re-biopsy in Previously Treated Lung Cancer. *Cancer Res Treat Off J Korean Cancer Assoc*. oct 2019;51(4):1488-99.
109. Heymann JJ, Bulman WA, Swinarski D, Pagan CA, Crapanzano JP, Haghighi M, et al. PD-L1 expression in non-small cell lung carcinoma: Comparison among cytology, small biopsy, and surgical resection specimens. *Cancer Cytopathol*. déc 2017;125(12):896-907.
110. Biswas A, Leon ME, Drew P, Fernandez-Bussy S, Furtado LV, Jantz MA, et al. Clinical performance of endobronchial ultrasound-guided transbronchial needle aspiration for assessing programmed death ligand-1 expression in nonsmall cell lung cancer. *Diagn Cytopathol*. mai 2018;46(5):378-83.
111. Wang Y, Wu J, Deng J, She Y, Chen C. The detection value of PD-L1 expression in biopsy specimens and surgical resection specimens in non-small cell lung cancer: a meta-analysis. *J Thorac Dis*. juill 2021;13(7):4301-10.
112. Sakakibara R, Inamura K, Tambo Y, Ninomiya H, Kitazono S, Yanagitani N, et al. EBUS-TBNA as a Promising Method for the Evaluation of Tumor PD-L1 Expression in Lung Cancer. *Clin Lung Cancer*. sept 2017;18(5):527-534.e1.
113. Skov BG, Skov T. Paired Comparison of PD-L1 Expression on Cytologic and Histologic Specimens From Malignancies in the Lung Assessed With PD-L1 IHC 28-8pharmDx and PD-L1 IHC 22C3pharmDx. *Appl Immunohistochem Mol Morphol AIMM*. août 2017;25(7):453-9.
114. Büttner R, Gosney JR, Skov BG, Adam J, Motoi N, Bloom KJ, et al. Programmed Death-Ligand 1 Immunohistochemistry Testing: A Review of Analytical Assays and Clinical Implementation in Non-Small-Cell Lung Cancer. *J Clin Oncol Off J Am Soc Clin Oncol*. 20 oct 2017;JCO2017747642.
115. Kim S, Koh J, Kwon D, Keam B, Go H, Kim YA, et al. Comparative analysis of PD-L1 expression between primary and metastatic pulmonary adenocarcinomas. *Eur J Cancer Oxf Engl*. 1990. 2017;75:141-9.
116. Sakata KK, Midthun DE, Mullon JJ, Kern RM, Nelson DR, Edell ES, et al. Comparison of Programmed Death Ligand-1 Immunohistochemical Staining Between Endobronchial Ultrasound Transbronchial Needle Aspiration and Resected Lung Cancer Specimens. *Chest*. oct 2018;154(4):827-37.
117. Silvestri GA, Gonzalez AV, Jantz MA, Margolis ML, Gould MK, Tanoue LT, et al. Methods for staging non-small cell lung cancer: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest*. mai 2013;143(5 Suppl):e211S-50S.
118. Chouaid C, Salaün M, Gounant V, Febvre M, Vergnon J-M, Jouniaux V, et al. Clinical efficacy and cost-effectiveness of endobronchial ultrasound-guided transbronchial needle aspiration for preoperative staging of non-small-cell lung cancer: Results of a French prospective multicenter trial (EVIEPEB). *PLoS One*. 2019;14(1):e0208992.
119. Silvestri GA, Gould MK, Margolis ML, Tanoue LT, McCrory D, Toloza E, et al. Non invasive staging of non-small cell lung cancer. *Chest*. 2007;132(3 suppl):178S-201S.
120. Hishida T, Yoshida J, Nishimura M, Nishiwaki Y, Nagai K. Problems in the current diagnostic standards of clinical N1 non-small cell lung cancer. *Thorax*. juin 2008;63(6):526-31.
121. Wang J, Welch K, Wang L, Kong F-MS. Negative predictive value of positron emission tomography and computed tomography for stage T1-2N0 non-small-cell lung cancer: a meta-analysis. *Clin Lung Cancer*. mars 2012;13(2):81-9.
122. Lee PC, Port JL, Korst RJ, Liss Y, Meherally DN, Altorki NK. Risk factors for occult mediastinal metastases in clinical stage I non-small cell lung cancer. *Ann Thorac Surg*. juill 2007;84(1):177-81.
123. Nakajima T, Yasufuku K, Fujiwara T, Chiyo M, Sekine Y, Shibuya K, et al. Endobronchial ultrasound-guided transbronchial needle aspiration for the diagnosis of intrapulmonary lesions. *J Thorac Oncol Off Publ Int Assoc Study Lung Cancer*. sept 2008;3(9):985-8.
124. Tournoy KG, Rintoul RC, van Meerbeeck JP, Carroll NR, Praet M, Buttery RC, et al. EBUS-TBNA for the diagnosis of central parenchymal lung lesions not visible at routine bronchoscopy. *Lung Cancer Amst Neth*. janv 2009;63(1):45-9.
125. Zhao H, Xie Z, Zhou Z-L, Sui X-Z, Wang J. Diagnostic value of endobronchial ultrasound-guided transbronchial needle aspiration in intrapulmonary lesions. *Chin Med J (Engl)*. nov 2013;126(22):4312-5.
126. Sarwate D, Sarkar S, Krinsky WS, Burgan CM, Patel K, Evans R, et al. Optimization of mediastinal staging in potential candidates for stereotactic radiosurgery of the chest. *J Thorac Cardiovasc Surg*. juill 2012;144(1):81-6.



Endoscopie

127. Steinfurt DP, Siva S, Leong TL, Rose M, Herath D, Antippa P, et al. Systematic Endobronchial Ultrasound-guided Mediastinal Staging Versus Positron Emission Tomography for Comprehensive Mediastinal Staging in NSCLC Before Radical Radiotherapy of Non-small Cell Lung Cancer: A Pilot Study. *Medicine (Baltimore)*. févr 2016;95(8):e2488.
128. Schonewolf CA, Verma V, Post CM, Berman AT, Frick MA, Vachani A, et al. Outcomes of invasive mediastinal nodal staging versus positron emission tomography staging alone for early-stage non-small cell lung cancer treated with stereotactic body radiation therapy. *Lung Cancer Amst Neth*. 14 juill 2017;
129. Vial MR, Khan KA, O'Connell O, Peng SA, Gomez DR, Chang JY, et al. Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration in the Nodal Staging of Stereotactic Ablative Body Radiotherapy Patients. *Ann Thorac Surg*. mai 2017;103(5):1600-5.
130. Guberina M, Darwiche K, Hautzel H, Ploenes T, Pöttgen C, Guberina N, et al. Impact of EBUS-TBNA in addition to [18F]FDG-PET/CT imaging on target volume definition for radiochemotherapy in stage III NSCLC. *Eur J Nucl Med Mol Imaging*. août 2021;48(9):2894-903.
131. Cole AJ, Hardcastle N, Turgeon G-A, Thomas R, Irving LB, Jennings BR, et al. Systematic endobronchial ultrasound-guided transbronchial needle aspiration improves radiotherapy planning in non-small cell lung cancer. *ERJ Open Res*. juill 2019;5(3):00004-2019.
132. Kennedy WR, Samson PP, Gabani P, Nikitas J, Bradley JD, Roach MC, et al. Impact of invasive nodal staging on regional and distant recurrence rates after SBRT for inoperable stage I NSCLC. *Radiother Oncol*. sept 2020;150:206-10.
133. Le Pechoux C, Faivre-Finn C, Ramella S, McDonald F, Manapov F, Putora PM, et al. ESTRO ACROP guidelines for target volume definition in the thoracic radiation treatment of small cell lung cancer. *Radiother Oncol*. nov 2020;152:89-95.
134. Annema JT, van Meerbeeck JP, Rintoul RC, Dooms C, Descheppe E, Dekkers OM, et al. Mediastinoscopy vs endosonography for mediastinal nodal staging of lung cancer: a randomized trial. *JAMA*. 24 nov 2010;304(20):2245-52.
135. Vilman P, Clementsen PF, Colella S, Siemsen M, De Leyn P, Dumonceau J-M, et al. Combined endobronchial and esophageal endosonography for the diagnosis and staging of lung cancer: European Society of Gastrointestinal Endoscopy (ESGE) Guideline, in cooperation with the European Respiratory Society (ERS) and the European Society of Thoracic Surgeons (ESTS). *Endoscopy*. juin 2015;47(6):c1.
136. Dong Z, Li H, Jiang H, Wu C. Evaluation of cytology in lung cancer diagnosis based on EBUS-TBNA. *J Cytol*. juin 2017;34(2):73-7.
137. Uchimura K, Yamasaki K, Hirano Y, Sakagami K, Kido T, Mukae H, et al. The Successful Removal of a Broken Needle as an Unusual Complication of Endobronchial Ultrasound-guided Transbronchial Needle Aspiration (EBUS-TBNA): A Case Report and Literature Review. *J UOEH*. 2019;41(1):35-40.
138. Bante N, Singh A, Gupta A, Mittal A, Suri J. Accidental breakage of needle tip during endobronchial ultrasound-guided transbronchial needle aspiration: A case report and review of literature. *Lung India*. 2021;38(1):80.
139. Castro-Varela A, Molina S, Grosu HB. Tracheomediastinal Fistula Formation After Endobronchial Ultrasound Transbronchial Needle Aspiration While on Bevacizumab Treatment. *Cureus [Internet]*. 30 mars 2021 [cité 4 mars 2022]; Disponible sur: <https://www.cureus.com/articles/54511-tracheomediastinal-fistula-formation-after-endobronchial-ultrasound-transbronchial-needle-aspiration-while-on-bevacizumab-treatment>
140. Jang JG, Ahn JH, Lee SS. Delayed onset of mediastinitis with tracheomediastinal fistula following endobronchial ultrasound-guided transbronchial needle aspiration; A case report. *Thorac Cancer*. avr 2021;12(7):1134-6.
141. Navani N, Brown JM, Nankivell M, Woolhouse I, Harrison RN, Jeebun V, et al. Suitability of endobronchial ultrasound-guided transbronchial needle aspiration specimens for subtyping and genotyping of non-small cell lung cancer: a multicenter study of 774 patients. *Am J Respir Crit Care Med*. 15 juin 2012;185(12):1316-22.
142. Miller DR, Mydin HH, Marshall ADL, Devereux GS, Currie GP. Fatal haemorrhage following endobronchial ultrasound-transbronchial needle aspiration: an unfortunate first. *QJM Mon J Assoc Physicians*. mars 2013;106(3):295-6.
143. Bolliger CT, Mathur PN, Beamis JF, Becker HD, Cavaliere S, Colt H, et al. ERS/ATS statement on interventional pulmonology. European Respiratory Society/American Thoracic Society. *Eur Respir J*. févr 2002;19(2):356-73.
144. Ernst A, Silvestri GA, Johnstone D, American College of Chest Physicians. Interventional pulmonary procedures: Guidelines from the American College of Chest Physicians. *Chest*. mai 2003;123(5):1693-717.
145. Verkindre C, Brichet A, Maurage CA, Ramon P, Homasson JP, Marquette CH. Morphological changes induced by extensive endobronchial electrocautery. *Eur Respir J*. oct 1999;14(4):796-9.
146. Tremblay A, Marquette C-H. Endobronchial electrocautery and argon plasma coagulation: a practical approach. *Can Respir J J Can Thorac Soc*. juin 2004;11(4):305-10.
147. Guibert N, Mazieres J, Marquette C-H, Rouviere D, Didier A, Hermant C. Integration of interventional bronchoscopy in the management of lung cancer. *Eur Respir Rev Off J Eur Respir Soc*. sept 2015;24(137):378-91.
148. Lee S-H, Choi W-J, Sung S-W, Kim Y-K, Kim C-H, Zo J-I, et al. Endoscopic cryotherapy of lung and bronchial tumors: a systematic review. *Korean J Intern Med*. juin 2011;26(2):137-44.
149. Vergnon J-M, Huber RM, Moghissi K. Place of cryotherapy, brachytherapy and photodynamic therapy in therapeutic bronchoscopy of lung cancers. *Eur Respir J*. juill 2006;28(1):200-18.
150. Vergnon J-M. [Supportive care. Endoscopic treatments for lung cancer]. *Rev Mal Respir*. oct 2008;25(8 Pt 2):35160-166.
151. Akopov A, Rusanov A, Gerasin A, Kazakov N, Urtenova M, Chistyakov I. Preoperative endobronchial photodynamic therapy improves resectability in initially irresectable (inoperable) locally advanced non small cell lung cancer. *Photodiagnosis Photodyn Ther*. sept 2014;11(3):259-64.
152. Moghissi K, Dixon K, Thorpe JAC, Stringer M, Oxtoby C. Photodynamic therapy (PDT) in early central lung cancer: a treatment option for patients ineligible for surgical resection. *Thorax*. mai 2007;62(5):391-5.
153. Fernando HC, Landreneau RJ, Mandrekar SJ, Nichols FC, Hillman SL, Heron DE, et al. Impact of brachytherapy on local recurrence rates after sublobar resection: results from ACOSOG Z4032 (Alliance), a phase III randomized trial for high-risk operable non-small-cell lung cancer. *J Clin Oncol Off J Am Soc Clin Oncol*. 10 août 2014;32(23):2456-62.
154. Speiser BL, Sprattling L. Remote afterloading brachytherapy for the local control of endobronchial carcinoma. *Int J Radiat Oncol Biol Phys*. 15 mars 1993;25(4):579-87.
155. Seven-Year Experience with the Dumon Prosthesis. : *Journal of Bronchology & Interventional Pulmonology [Internet]*. LWW. [cité 28 sept 2015]. Disponible sur: http://journals.lww.com/bronchology/Fulltext/1996/01000/Seven_Year_Experience_with_the_Dumon_Prosthesis_.3.aspx
156. Ernst A, Feller-Kopman D, Becker HD, Mehta AC. Central airway obstruction. *Am J Respir Crit Care Med*. 15 juin 2004;169(12):1278-97.



157. Husain SA, Finch D, Ahmed M, Morgan A, Hetzel MR. Long-term follow-up of ultraflex metallic stents in benign and malignant central airway obstruction. *Ann Thorac Surg.* avr 2007;83(4):1251-6.
158. Wisnivesky JP, Yung RC-W, Mathur PN, Zulueta JJ. Diagnosis and treatment of bronchial intraepithelial neoplasia and early lung cancer of the central airways: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest.* mai 2013;143(5 Suppl):e263S-77S.
159. Bota S, Auliac JB, Paris C, Métayer J, Sesboué R, Nouvet G, et al. Follow-up of bronchial precancerous lesions and carcinoma in situ using fluorescence endoscopy. *Am J Respir Crit Care Med.* 1 nov 2001;164(9):1688-93.
160. Venmans BJ, van Boxem TJ, Smit EF, Postmus PE, Sutedja TG. Outcome of bronchial carcinoma in situ. *Chest.* juin 2000;117(6):1572-6.
161. Jeremy George P, Banerjee AK, Read CA, O'Sullivan C, Falzon M, Pezzella F, et al. Surveillance for the detection of early lung cancer in patients with bronchial dysplasia. *Thorax.* janv 2007;62(1):43-50.
162. Deygas N, Froudarakis M, Ozenne G, Vergnon JM. Cryotherapy in early superficial bronchogenic carcinoma. *Chest.* juill 2001;120(1):26-31.
163. Mathur PN, Edell E, Sutedja T, Vergnon J-M, American College of Chest Physicians. Treatment of early stage non-small cell lung cancer. *Chest.* janv 2003;123(1 Suppl):176S-180S.
164. Edell ES, Cortese DA. Photodynamic therapy in the management of early superficial squamous cell carcinoma as an alternative to surgical resection. *Chest.* nov 1992;102(5):1319-22.
165. Usuda J, Ichinose S, Ishizumi T, Hayashi H, Ohtani K, Maehara S, et al. Outcome of photodynamic therapy using NPe6 for bronchogenic carcinomas in central airways >1.0 cm in diameter. *Clin Cancer Res Off J Am Assoc Cancer Res.* 1 avr 2010;16(7):2198-204.
166. Pérol M, Caliendo R, Pommier P, Malet C, Montbarbon X, Carrie C, et al. Curative irradiation of limited endobronchial carcinomas with high-dose rate brachytherapy. Results of a pilot study. *Chest.* mai 1997;111(5):1417-23.
167. Marsiglia H, Baldeyrou P, Lartigau E, Briot E, Haie-Meder C, Le Chevalier T, et al. High-dose-rate brachytherapy as sole modality for early-stage endobronchial carcinoma. *Int J Radiat Oncol Biol Phys.* 1 juin 2000;47(3):665-72.
168. Aumont-le Guilcher M, Prevost B, Sunyach MP, Peiffert D, Maingon P, Thomas L, et al. High-dose-rate brachytherapy for non-small-cell lung carcinoma: a retrospective study of 226 patients. *Int J Radiat Oncol Biol Phys.* 15 mars 2011;79(4):1112-6.
169. van Boxem TJ, Venmans BJ, Schramel FM, van Mourik JC, Golding RP, Postmus PE, et al. Radiographically occult lung cancer treated with fiberoptic bronchoscopic electrocautery: a pilot study of a simple and inexpensive technique. *Eur Respir J.* janv 1998;11(1):169-72.
170. Cavaliere S, Foccoli P, Toninelli C. Nd: YAG Laser Therapy in Lung Cancer: An 11-Year Experience... : Journal of Bronchology & Interventional Pulmonology. *J Bronchol Interv Pulmonol [Internet].* [cité 20 sept 2015]; Disponible sur: http://journals.lww.com/bronchology/Fulltext/1994/04000/Nd_YAG_Laser_Therapy_in_Lung_Cancer_An_11_Year.6.aspx
171. Asimakopoulos G, Beeson J, Evans J, Maiwand MO. Cryosurgery for malignant endobronchial tumors: analysis of outcome. *Chest.* juin 2005;127(6):2007-14.
172. Simoff MJ, Lally B, Slade MG, Goldberg WG, Lee P, Michaud GC, et al. Symptom management in patients with lung cancer: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest.* mai 2013;143(5 Suppl):e455S-97S.
173. Jeon K, Kim H, Yu C-M, Koh W-J, Suh GY, Chung MP, et al. Rigid bronchoscopic intervention in patients with respiratory failure caused by malignant central airway obstruction. *J Thorac Oncol Off Publ Int Assoc Study Lung Cancer.* mai 2006;1(4):319-23.
174. Han CC, Prasetyo D, Wright GM. Endobronchial palliation using Nd:YAG laser is associated with improved survival when combined with multimodal adjuvant treatments. *J Thorac Oncol Off Publ Int Assoc Study Lung Cancer.* janv 2007;2(1):59-64.
175. Oviatt PL, Stather DR, Michaud G, Maceachern P, Tremblay A. Exercise capacity, lung function, and quality of life after interventional bronchoscopy. *J Thorac Oncol Off Publ Int Assoc Study Lung Cancer.* janv 2011;6(1):38-42.
176. Ost DE, Ernst A, Grosu HB, Lei X, Diaz-Mendoza J, Slade M, et al. Therapeutic bronchoscopy for malignant central airway obstruction: success rates and impact on dyspnea and quality of life. *Chest.* mai 2015;147(5):1282-98.
177. Zaric B, Kovacevic T, Stojic T, Sarcev T, Kocic M, Urošević M, et al. Neodymium yttrium-aluminium-garnet laser resection significantly improves quality of life in patients with malignant central airway obstruction due to lung cancer. *Eur J Cancer Care (Engl).* juill 2015;24(4):560-6.
178. Dutau H, Di Palma F, Thibout Y, Febvre M, Cellerin L, Naudin F, et al. Impact of Silicone Stent Placement in Symptomatic Airway Obstruction due to Non-Small Cell Lung Cancer – A French Multicenter Randomized Controlled Study: The SPOC Trial. *Respiration.* 2020;99(4):344-52.
179. Ong P, Grosu HB, Debiante L, Casal RF, Eapen GA, Jimenez CA, et al. Long-term quality-adjusted survival following therapeutic bronchoscopy for malignant central airway obstruction. *Thorax.* 25 sept 2018;thoraxjnl-2018-211521.
180. Murgu S, Langer S, Colt H. Bronchoscopic intervention obviates the need for continued mechanical ventilation in patients with airway obstruction and respiratory failure from inoperable non-small-cell lung cancer. *Respir Int Rev Thorac Dis.* 2012;84(1):55-61.
181. Boyd M, Rubio E. The utility of interventional pulmonary procedures in liberating patients with malignancy-associated central airway obstruction from mechanical ventilation. *Lung.* oct 2012;190(5):471-6.
182. Marchioni A, Andrisani D, Tonelli R, Piro R, Andreani A, Cappiello GF, et al. Integrated interventional bronchoscopy in the treatment of locally advanced non-small lung cancer with central Malignant airway Obstructions: a multicentric RETrospective study (EVERMORE). *Lung Cancer.* oct 2020;148:40-7.
183. Guibert N, Mazieres J, Lepage B, Plat G, Didier A, Hermant C. Prognostic factors associated with interventional bronchoscopy in lung cancer. *Ann Thorac Surg.* janv 2014;97(1):253-9.
184. Wahidi MM, Unroe MA, Adlakha N, Beyea M, Shofer SL. The use of electrocautery as the primary ablation modality for malignant and benign airway obstruction. *J Thorac Oncol Off Publ Int Assoc Study Lung Cancer.* sept 2011;6(9):1516-20.
185. Simone CB, Friedberg JS, Glatstein E, Stevenson JP, Serman DH, Hahn SM, et al. Photodynamic therapy for the treatment of non-small cell lung cancer. *J Thorac Dis.* févr 2012;4(1):63-75.
186. Vergnon JM, Thibout Y, Dutau H. Is a stent required after initial resection of an obstructive lung cancer. The lessons of the SPOC trial, the first randomized study in interventional bronchoscopy. *ERS Int Congr 2013.*
187. Nihei K, Ishikura S, Kawashima M, Ogino T, Ito Y, Ikeda H. Short-course palliative radiotherapy for airway stenosis in non-small cell lung cancer. *Int J Clin Oncol.* oct 2002;7(5):284-8.



Endoscopie

188. Dagnault A, Ebacher A, Vigneault E, Boucher S. Retrospective study of 81 patients treated with brachytherapy for endobronchial primary tumor or metastasis. *Brachytherapy*. sept 2010;9(3):243-7.
189. Manali ED, Stathopoulos GT, Gildea TR, Fleming P, Thornton J, Xu M, et al. High dose-rate endobronchial radiotherapy for proximal airway obstruction due to lung cancer: 8-year experience of a referral center. *Cancer Biother Radiopharm*. avr 2010;25(2):207-13.
190. Hauswald H, Stoiber E, Rochet N, Lindel K, Grehn C, Becker HD, et al. Treatment of recurrent bronchial carcinoma: the role of high-dose-rate endoluminal brachytherapy. *Int J Radiat Oncol Biol Phys*. 1 juin 2010;77(2):373-7.
191. de Aquino Gorayeb MM, Gregório MG, de Oliveira EQ, Aisen S, Carvalho H de A. High-dose-rate brachytherapy in symptom palliation due to malignant endobronchial obstruction: a quantitative assessment. *Brachytherapy*. oct 2013;12(5):471-8.
192. Reveiz L, Rueda J-R, Cardona AF. Palliative endobronchial brachytherapy for non-small cell lung cancer. *Cochrane Database Syst Rev*. 2012;12:CD004284.
193. Rodrigues G, Macbeth F, Burmeister B, Kelly K-L, Bezjak A, Langer C, et al. Consensus statement on palliative lung radiotherapy: third international consensus workshop on palliative radiotherapy and symptom control. *Clin Lung Cancer*. janv 2012;13(1):1-5.
194. Bolliger CT, Sutedja TG, Strausz J, Freitag L. Therapeutic bronchoscopy with immediate effect: laser, electrocautery, argon plasma coagulation and stents. *Eur Respir J*. juin 2006;27(6):1258-71.
195. Saji H, Furukawa K, Tsutsui H, Tsuboi M, Ichinose S, Usuda J, et al. Outcomes of airway stenting for advanced lung cancer with central airway obstruction. *Interact Cardiovasc Thorac Surg*. oct 2010;11(4):425-8.
196. Vergnon JM, Costes F, Bayon MC, Emonot A. Efficacy of tracheal and bronchial stent placement on respiratory functional tests. *Chest*. mars 1995;107(3):741-6.
197. Razi SS, Lebovics RS, Schwartz G, Sancheti M, Belsley S, Connery CP, et al. Timely airway stenting improves survival in patients with malignant central airway obstruction. *Ann Thorac Surg*. oct 2010;90(4):1088-93.
198. Caplin ME, Baudin E, Ferolla P, Filosso P, Garcia-Yuste M, Lim E, et al. Pulmonary neuroendocrine (carcinoid) tumors: European Neuroendocrine Tumor Society expert consensus and recommendations for best practice for typical and atypical pulmonary carcinoids. *Ann Oncol Off J Eur Soc Med Oncol ESMO*. août 2015;26(8):1604-20.
199. Neuberger M, Hapfelmeier A, Schmidt M, Gesierich W, Reichenberger F, Morresi-Hauf A, et al. Carcinoid tumours of the lung and the « PEPPS » approach: evaluation of preoperative bronchoscopic tumour debulking as preparation for subsequent parenchyma-sparing surgery. *BMJ Open Respir Res*. 2015;2(1):e000090.
200. Bertoletti L, Elleuch R, Kaczmarek D, Jean-François R, Vergnon JM. Bronchoscopic cryotherapy treatment of isolated endoluminal typical carcinoid tumor. *Chest*. nov 2006;130(5):1405-11.
201. Brokx HAP, Paul MA, Postmus PE, Sutedja TG. Long-term follow-up after first-line bronchoscopic therapy in patients with bronchial carcinoids. *Thorax*. mai 2015;70(5):468-72.
202. Luckraz H, Amer K, Thomas L, Gibbs A, Butchart EG. Long-term outcome of bronchoscopically resected endobronchial typical carcinoid tumors. *J Thorac Cardiovasc Surg*. juill 2006;132(1):113-5.
203. Fuks L, Fruchter O, Amital A, Fox BD, Abdel Rahman N, Kramer MR. Long-term follow-up of flexible bronchoscopic treatment for bronchial carcinoids with curative intent. *Diagn Ther Endosc*. 2009;2009:782961.
204. Neyman K, Sundset A, Naalsund A, Espinoza A, Solberg S, Kongerud J, et al. Endoscopic treatment of bronchial carcinoids in comparison to surgical resection: a retrospective study. *J Bronchol Interv Pulmonol*. janv 2012;19(1):29-34.
205. Rusch VW, Asamura H, Watanabe H, Giroux DJ, Rami-Porta R, Goldstraw P. The IASLC Lung Cancer Staging Project: A Proposal for a New International Lymph Node Map in the Forthcoming Seventh Edition of the TNM Classification for Lung Cancer. *J Thorac Oncol*. mai 2009;4(5):568-77.