



Endobronchial lesions cases treated with interventional bronchoscopic techniques: Our single-center experiences

*Girişimsel bronkoskopik teknikler ile tedavi edilen endobronşiyal lezyon olguları:
Tek merkezli deneyimlerimiz*

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ABSTRACT

Background: In this study, we aimed to present our experience with interventional bronchoscopy in the treatment of endobronchial lesions in our clinic.

Methods: Between January 2010 and December 2018, a total of 18 patients (11 males, 7 females; mean age 55.1 years; range, 17 to 82 years) who were diagnosed with an endobronchial lesion using bronchoscopy in our clinic were retrospectively analyzed. Demographic characteristics, presenting symptoms, bronchoscopic procedure, location of the lesion, pathological diagnosis, treatment approaches, success of the bronchoscopic treatment, and follow-up outcomes of the patients were evaluated.

Results: Control bronchoscopy was performed in 14 patients and a second control bronchoscopy was performed in eight patients. The lesions were located in the right bronchial system in nine (50%), in the left bronchial system in six (33%), and in the trachea in three patients (17%). Except for one pregnant patient, all interventional procedures were performed with a rigid bronchoscope under general anesthesia. Distal areas which were unable to be reached with the rigid bronchoscope were evaluated by a flexible bronchoscope. There were no complications in any of the patients. At the end of the study, the final control biopsies of all patients were found to be normal. The success rate of interventional bronchoscopic methods was 100%.

Conclusion: Interventional bronchoscopic methods are the most effective procedures in the diagnosis and treatment of bronchial lesions with a high success rate. Based on our study findings, we suggest that bronchoscopic methods should be preferred as the first-line treatment of benign and selected some malignant endobronchial lesions.

Keywords: Bronchoscope, case series, endobronchial lesion.

ÖZ

Amaç: Bu çalışmada, endobronşiyal lezyonların tedavisinde kliniğimizde kullandığımız girişimsel bronkoskopi konusundaki deneyimlerimiz sunuldu.

Çalışma planı: Kliniğimizde Ocak 2010 - Aralık 2018 tarihleri arasında bronkoskopi ile endobronşiyal lezyon tanısı konulan toplam 18 hasta (11 erkek, 7 kadın; ort. yaş 55.1 yıl; dağılım 17-82 yıl) retrospektif olarak değerlendirildi. Hastaların demografik özellikleri, mevcut semptomları, bronkoskopik işlem, lezyonun yeri, patolojik tanısı, tedavi yaklaşımları, bronkoskopik tedavi başarısı ve takip sonuçları değerlendirildi.

Bulgular: On dört hastaya kontrol bronkoskopisi ve sekiz hastaya ikinci kontrol bronkoskopisi yapıldı. Lezyonlar hastaların dokuzunda (%50) sağ bronşiyal sistem, altısında (%33) sol bronşiyal sistem ve üçünde (%17) trakea yerleşimli idi. Bir gebe hasta hariç, tüm girişimsel işlemler genel anestezi altında rijit bronkoskop ile yapıldı. Rijit bronkoskop ile ulaşılamayan distal alanlar, fleksibl bronkoskop ile değerlendirildi. Hastaların hiçbirinde komplikasyon görülmedi. Çalışmanın sonunda tüm olguların son kontrol biyopsileri normal bulundu. Girişimsel bronkoskopik yöntemlerin başarı oranı %100 idi.

Sonuç: Girişimsel bronkoskopik yöntemler, bronşiyal lezyonların tanı ve tedavisinde en yüksek başarı oranı ile en etkili işlemlerdir. Çalışma bulgularımıza göre, Bronkoskopik yöntemlerin benign ve seçilmiş bazı malign endobronşiyal lezyonlarda ilk tedavi seçeneği olması gerektiği görüşündeyiz.

Anahtar sözcükler: Bronkoskop, olgu serisi, endobronşiyal lezyon.

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Primary tracheobronchial tree tumors can be either malignant or benign. For lung carcinomas, treatment process includes surgery, chemotherapy, and radiotherapy, if necessary. However, pure endobronchial neoplasms are rare and their treatment methods are still controversial.^[1] The malignant forms are as follows: adenocarcinoma, squamous cell carcinoma, carcinoid tumor, mucoepidermoid carcinoma, and adenoid cystic carcinoma. Benign forms include hamartomas, leiomyoma, lipoma, squamous cell papilloma, pleomorphic adenoma, granular cell tumors, hemangiomas, fibroma, neurogenic tumors, or inflammatory myofibroblastic tumor.^[2] Benign endobronchial tumors are rare primary tumors of the tracheobronchial system. These are about 1 to 10% of bronchopulmonary neoplasms. They usually settle toward the lumen through the trachea and the main airways and may cause obstruction. This may result in life-threatening complications such as respiratory insufficiency, bleeding, and infection.^[3] While the most common lesions are bronchial adenomas and hamartomas, other benign lesions include leiomyoma, hemangioma, lipoma, papilloma, chondroma, fibroma, endometriosis, teratoma, and pseudolymphoma. It is recommended to use bronchoscopic resection for the diagnosis, palliative care, and treatment of both benign and malignant endobronchial tumors.^[4] In benign endobronchial tumors, malignancy should first be excluded and treated before the development of distal airway diseases (obstruction, pneumonia). Endoscopic methods particularly in benign and suitable malignant neoplasms are superior to surgical methods in terms of protecting the lung parenchyma.^[5]

The literature on this topic is lacking in terms of adequate information about the treatment of endobronchial lesions. The majority of data are drawn from case reports or experiences from small series. This situation constitutes considerable confusion in the approach to treatment. In this study, we aimed to present our experience with interventional bronchoscopy in our clinic and to identify the characteristics and findings of endobronchial lesions treated with these methods.

PATIENTS AND METHODS

In this single-center study, we retrospectively evaluated all patients who were diagnosed with an endobronchial lesion at Gaziantep University Hospital, Department of Thoracic Surgery between January 2010 and December 2018. We only included the cases in which the endobronchial lesion was thoroughly assessed with bronchoscopy and was not found to be related with histopathologically another tumor. Those with endobronchial metastasis due to

solid tumors were excluded from the study. Finally, a total of 18 patients (11 males, 7 females; mean age 55.1 years; range, 17 to 82 years) were included. A written informed consent was obtained from each patient. The study protocol was approved by the Gaziantep University Faculty of Medicine Ethics Committee. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Demographic characteristics, initial complaints, the bronchoscopic procedure and number of interventions, localization, type of lesion, pathological diagnosis, treatment approach, success of the bronchoscopic treatment, and follow-up period of all patients were recorded. Preoperative examinations included complete blood count, biochemistry work-up, pulmonary function tests, electrocardiogram, and imaging studies consisting of direct X-ray of the lung, and cervical and thoracic computed tomography (Figure 1). Interventional procedures were performed with a rigid bronchoscope under general anesthesia. Only a 27-week pregnant woman received deep sedation. However, a flexible bronchoscope was used for distal areas which could not be accessed with the rigid bronchoscope, where necessary. There were no complications during and after any of the bronchoscopic procedures.

In the bronchoscopic treatment of endobronchial lesions, methods such as mechanical debridement by forceps, laser, and cautery were used and total excision was performed (Figure 2). Laser cautery was performed with a Holmium-YAG laser system (StoneLight, American Medical Systems, San Jose, California, USA) (Figure 3). After the initial treatment, further excisions were performed on suspected sites



Figure 1. A thoracic computed tomography showing a tracheal lesion.

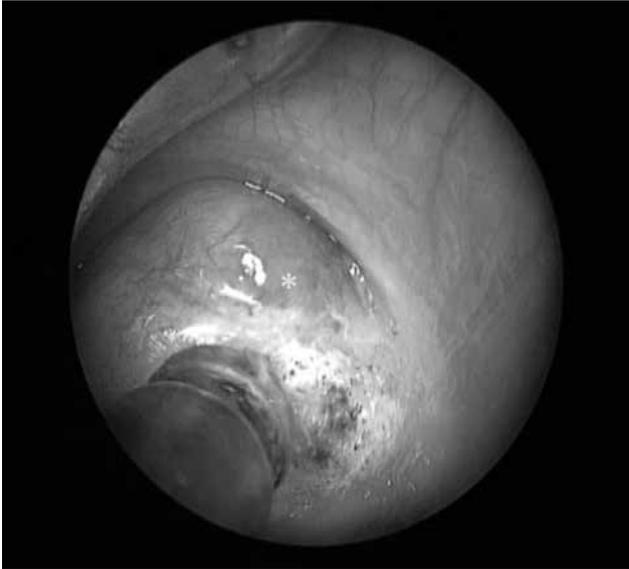


Figure 2. Application of bipolar cautery on an endobronchial lesion.



Figure 3. Application of Holmium-YAG laser on an endobronchial lesion.

with control bronchoscopy (scheduled three weeks after the initial intervention) via laser or cautery, and biopsies were obtained, when required. Control pathological study was performed in suspicious cases.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics version 23.0 software (IBM Corp., Armonk, NY, USA). Descriptive data were expressed in mean \pm standard deviation (SD), median (min-max) or number and frequency.

RESULTS

Presenting symptoms were hemoptysis (n=2), cough (n=5), productive cough (n=3), and dyspnea (n=13). The lesions were located in the right bronchial system in nine (50%), in the left bronchial system in six (33%), and in the trachea in three cases (17%). Six lesions were diagnosed as hamartomas, four as carcinoid tumors, one as a Ewing sarcoma, one as focal squamous metaplasia (FSM), one as a lipoma, one as a schwannoma, two as a benign bronchial polyp, one as an intraepithelial carcinoma, and one as a mucoepidermoid carcinoma upon pathological examination. Demographic and clinical characteristics of the patients are shown in Table 1.

Control bronchoscopy was performed in 14 patients, and eight of them underwent a second control bronchoscopy. At the end of the study, the final control biopsies of all patients were found to be

normal. No surgical intervention was required after bronchoscopic excision in any of the patients, except for two similar cases. The lesion of the first case (a 53-year-old male) was located in the left lower lobe of the lung. Total laser excision was performed, and the diagnosis was initially reported as an adenocarcinoma. In the second case (a 63-year-old female), the lesion was located in the right intermediate bronchus; excision was performed with forceps and a Holmium-YAG laser system and pathological examination result was found to be malignant. Both patients underwent bronchial sleeve resection and biopsy samples were obtained. The results of these biopsies were reported to have no evidence of disease in the resected tissue, indicating that the first bronchoscopic intervention was sufficient to treat the lesion in both cases. The single schwannoma case was also treated with laser (Figure 4a-c). Total excision of the lesion was achieved, and control bronchoscopy revealed no abnormal findings. At the end of the study, the final control biopsies of all patients were found to be normal (Figure 5a, b). Therefore, interventional bronchoscopic methods were considered successful in 18 patients (100%) cases. The pathological sample of the first patient (initially reported as an adenocarcinoma) was decided to be a mucoepidermoid carcinoma after re-consultation with another pathology department of an external institute, while the second patient was diagnosed with an intraepithelial carcinoma (Figure 6).

Table 1. Demographic and clinical characteristics of patients

No	Age/ Gender	Initial symptoms	Tumor type	Location	Resection type	Control (repeat) Bronchoscopy 1	Control (repeat) Bronchoscopy 1	Control (repeat) Bronchoscopy 2	Control (repeat) Bronchoscopy 2	Follow-up periods	Survival
1	42/F	H	Carcinoid	Right intermediate bronchus	Total with cautery and laser	Bulging at lesion site Cauterized	N/A	Normal	N/A	21	Alive
2	82/F	D	FSM	Left main bronchus	Total with forceps and laser	Normal	N/A	N/A	N/A	88	Alive
3	76/M	D	Ewing	Right upper lobe entrance	Total with laser	Bulging at lesion site Biopsy taken	Ewing sarcoma/PNET	Bulging at lesion site Biopsy taken	Benign	6	Exitus
4	23/F	C,H	Carcinoid	Right main bron- chus entrance	Total with laser	Bulging at lesion site Cauterized	N/A	Normal	N/A	53	Alive
5	50/M	D	Hamartoma	Right upper lobe entrance	Total with laser	Normal	N/A	Normal	N/A	41	Alive
6	77/M	D,C	Lipoma	Right middle-lower lobe carina	Total with forceps	Normal	N/A	N/A	N/A	24	Alive
7	45/F	D	Schwannoma	Left main bronchus	Total with laser	Normal	N/A	N/A	N/A	53	Alive
8	77/F	PC	Hamartoma	Right upper lobe entrance	Total with laser	N/A	N/A	N/A	N/A	14	Exitus
9	24/M	PC	Carcinoid	Right upper lobe entrance	Total with cautery and laser	Bulging at lesion site Total excision performed with laser and forceps	Carcinoid	Normal	Normal	44	Alive
11	68/M	D	Hamartoma	Trachea	Total with cautery and forceps	N/A	N/A	N/A	N/A	41	Alive
12	74/M	D	Chondroid Hamartoma	Left upper lobe entrance	Total with forceps and laser	Irregular left main bronchus wall Total excision with forceps	Chondroid Hamartoma	Bulging at lesion site Excised with forceps	N/A	75	Alive
13	17/M	S	Lipomatous Hamartoma	Trachea	Total with laser	Same site cauterized.	N/A	Normal	N/A	21	Alive
14	72/M	D,C	Polypoid lesion	Left upper lobe entrance	Total with laser and forceps	N/A	N/A	N/A	N/A	8	Exitus
10	68/M	D	Polypoid lesion	Left main bronchus	Total with laser	N/A	N/A	N/A	N/A	19	Alive
15	35/M	D,C	Hamartoma	Right intermediate bronchus	Total with forceps and cautery	Residue at initial site	N/A	N/A	N/A	41	Alive
16	47/F	D,PC	Carcinoid	Trachea	Total with laser	Residue at initial site Biopsy taken	Benign	N/A	N/A	51	Alive
17	53/M	D,C	Mucoepidermoid Carcinoma	Left lower lobe entrance	Total with laser	No residue Biopsy taken for con- trol evaluation	Benign	Normal	Benign	44	Alive
18	63/F	D	Intraepithelial Carcinoma	Right intermediate bronchus	Total with forceps and laser	Normal	Benign	Normal	-	8	Alive

Bx: Biopsy; F: Female; H: Hemoptysis; N/A: not applicable; D: Dyspnea; FSM: Focal Squamous Metaplasia; M: Male; PNET: Primitive neuroectodermal tumor; C: Cough; PC: Productive cough; S: Stridor.

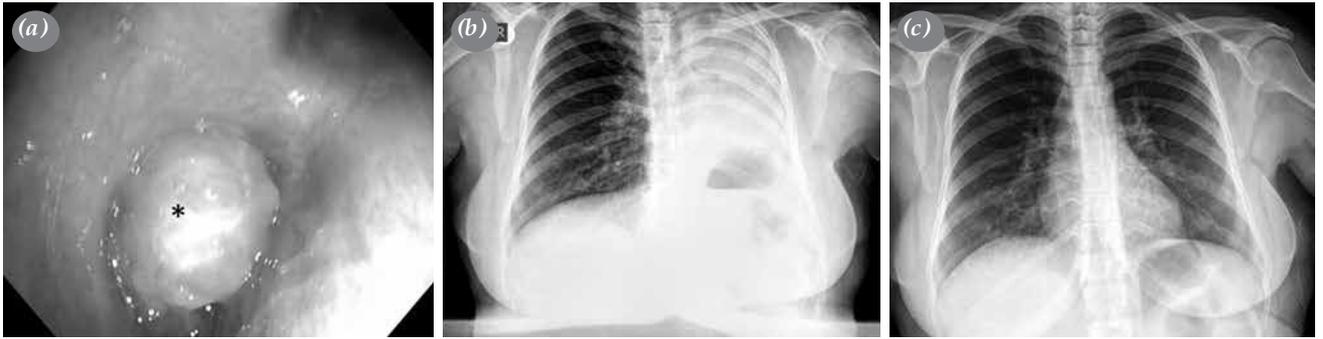


Figure 4. (a) A bronchoscopic image of endobronchial lesion at the entrance of left main bronchus (schwannoma). (b) Lesion obstructing left main bronchus. Posteroanterior chest radiography before bronchoscopy. (c) Posteroanterior chest radiography after bronchoscopy.

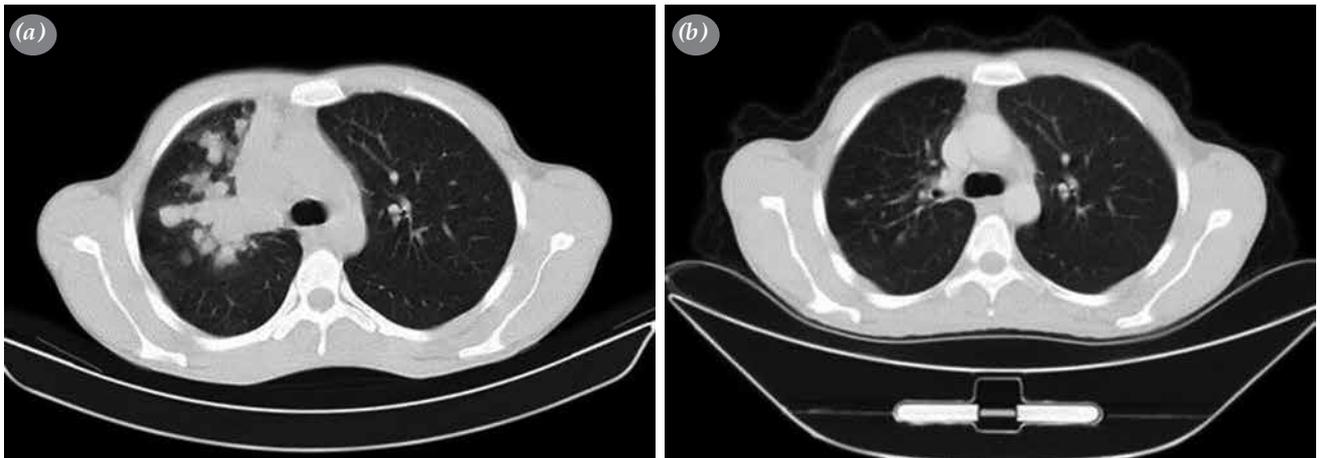


Figure 5. (a) Lesion at the right upper lobe entrance. Pathological findings in the upper lobe of right lung before bronchoscopic resection. (b) Post-procedural control thoracic computed tomography showing no iceberg tumor.

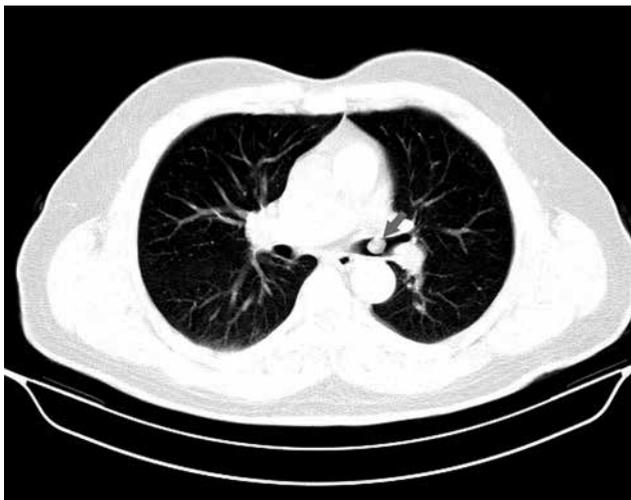


Figure 6. A computed tomography image of an endobronchial lesion at the entrance of left lower lobe bronchus (mucoepidermoid carcinoma).

There were no serious complications due to bronchoscopy in any of our patients. Three patients died during follow-up: one from comorbidities of chemotherapy, one from a cerebrovascular event, and one from gastrointestinal tract problems.

DISCUSSION

Bronchoscopy is an invasive procedure utilized for the diagnosis and treatment of lung and trachea disorders.^[6] Currently, endobronchial tumor destruction can be accomplished with several techniques via bronchoscopy including heat therapy (i.e., laser therapy, electrocautery, or argon plasma coagulation), photodynamic therapy, cryotherapy, mechanical debridement by forceps, or radiotherapy (brachytherapy).^[7-11] To date, no consensus or clear recommendation has been established regarding the method for the bronchoscopic treatment of benign

endobronchial tumors. There are two main reasons for this: firstly, all of these methods have been shown to have advantages and disadvantages leading to different suggestions by the authors, and, secondly, several studies have reported success with hybrid use of methods, suggesting that an optimal method has not been put forth to date.^[12,13] In some clinics, such endobronchial lesions are still removed by lung or trachea or bronchial resections. However, this situation increases mortality particularly in elderly patients and patients with poor general condition. Therefore, although there is no decrease in the respiratory capacity of the patients during such endobronchial procedures, it significantly reduces mortality and morbidity.

Lung neuroendocrine tumors (NETs) are another group of pulmonary neoplasms which also include bronchial carcinoid tumors. In these tumors, surgical resection is recommended for definitive treatment such as endobronchial resection, although it has suboptimal results.^[14] However, in patients with a low pulmonary reserve and those which have low-grade localized tumors, bronchoscopic resection can be utilized as an alternative in the treatment of endobronchial carcinoids.^[15,16] In our study, we performed total excision by laser for two carcinoid tumor cases and total excision by laser with cautery for the other two carcinoid tumor cases. In these cases, radiological examination revealed only endobronchial presence and no iceberg tumor requiring sleeve bronchial and/or lung resection. Control bronchoscopy revealed that one patient had residue at the initial site, while the other three patients only had mild bulging due to scar tissue. Control biopsy results of one of these patients were consistent with a carcinoid and the lesion was excised with laser and forceps. The final bronchoscopy findings of all patients were normal. All patients were continued to attend follow-up visits and were found to be disease-free at 21, 41, and 49 months.

Schwannomas are very rare tumors of the intrapulmonary nerve sheath.^[17] Schwannomas and neurofibromas are benign lesions accounting for 90% of adult neurogenic tumors.^[18] In the literature, non-invasive methods are recommended in asymptomatic cases, and resection and laser are recommended in symptomatic cases or in patients who do not respond to conservative treatment.^[19,20] In our study, the single schwannoma case was treated with laser. Total excision of the lesion was achieved, and control bronchoscopy revealed no abnormal findings.

Endobronchial polyp cases are reported to be diagnosed by bronchoscopy and treatment approach is endoscopic.^[21-23] In our study, the single patient

with an endobronchial polyp presented with dyspnea. Treatment was performed with laser. Total resection was achieved, and the patient was scheduled for further evaluation and control bronchoscopy; however, we were unable to reach the patient by any means and control studies were unable to be performed.

The diagnoses of the remaining six patients were as follows: FSM, Ewing sarcoma, lipoma, benign polypoid lesion, mucoepidermoid carcinoma, and intraepithelial carcinoma. The FSM case was treated via total excision with forceps and control bronchoscopy was normal. The patient with primary a tracheal Ewing sarcoma without metastasis was treated via total excision with laser and their control biopsy, taken during repeat bronchoscopy, was identified as an Ewing sarcoma/primitive NET and another control bronchoscopy was scheduled for biopsy which was normal; however, the patient died due to comorbid conditions after four months of disease-free survival. In the lipoma case, forceps was used for total excision and control bronchoscopy was normal. Forceps excision was also used in the treatment of the patient with a benign polypoid lesion and total excision was achieved; however, residual tissue was observed during control bronchoscopy. The patient died due to gastrointestinal tract disease after eight months of disease-free survival. Another patient with a mucoepidermoid carcinoma (initially diagnosed as an adenocarcinoma) was treated with total excision via laser and control bronchoscopy showed no abnormal findings; however, biopsy was obtained to confirm the results. The patient has been symptom-free for 44 months and is still attending to his regular follow-up. Finally, the patient with an intraepithelial carcinoma was treated with total excision via forceps and laser, and the initial and second control biopsy results were normal.

Our study has several limitations such as a small sample size and retrospective, single-center study design. However, most studies in this field have similar limitations due to the rareness of these cases. Of note, long-term follow-up is the main strength of our study. Nonetheless, to make more precise judgments about the characteristics of patients and to determine optimal treatment approach, further large-scale, prospective-controlled studies are warranted.

In conclusion, despite the low incidence of benign endobronchial tumors, early diagnosis and treatment are of utmost importance due to the possibility of serious complications. Our study results suggest that bronchoscopic procedures play an important role in the evaluation and treatment of endobronchial lesions,

although repeat procedures may be required, with a success rate of 100% and without any complications in patients with miscellaneous diagnoses. Nevertheless, due to the fact that most studies have small sample sizes, it is difficult to determine the impact of bronchoscopic techniques on survival. It is rather clear that more researches are needed to address the characteristics of interventional approaches and to compare their results.

Declaration of conflicting interests

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