

World Journal of *Clinical Cases*

World J Clin Cases 2020 June 6; 8(11): 2066-2407



**REVIEW**

- 2066** Tumor circulome in the liquid biopsies for digestive tract cancer diagnosis and prognosis
Chen L, Chen Y, Feng YL, Zhu Y, Wang LQ, Hu S, Cheng P
- 2081** Isoflavones and inflammatory bowel disease
Wu ZY, Sang LX, Chang B

MINIREVIEWS

- 2092** Cytapheresis for pyoderma gangrenosum associated with inflammatory bowel disease: A review of current status
Tominaga K, Kamimura K, Sato H, Ko M, Kawata Y, Mizusawa T, Yokoyama J, Terai S
- 2102** Altered physiology of mesenchymal stem cells in the pathogenesis of adolescent idiopathic scoliosis
Ko DS, Kim YH, Goh TS, Lee JS
- 2111** Association between liver targeted antiviral therapy in colorectal cancer and survival benefits: An appraisal
Wang Q, Yu CR
- 2116** Peroral endoscopic myotomy for management of gastrointestinal motility disorder
Feng Z, Liu ZM, Yuan XL, Ye LS, Wu CC, Tan QH, Hu B

ORIGINAL ARTICLE**Case Control Study**

- 2127** Clinical prediction of complicated appendicitis: A case-control study utilizing logistic regression
Sasaki Y, Komatsu F, Kashima N, Suzuki T, Takemoto I, Kijima S, Maeda T, Miyazaki T, Honda Y, Zai H, Shimada N, Funahashi K, Urita Y
- 2137** Clinical application of ultrasound-guided selective proximal and distal brachial plexus block in rapid rehabilitation surgery for hand trauma
Zhang J, Li M, Jia HB, Zhang L
- 2144** High flux hemodialysis in elderly patients with chronic kidney failure
Xue HY, Duan B, Li ZJ, Du P
- 2150** Determination of vitamin D and analysis of risk factors for osteoporosis in patients with chronic pain
Duan BL, Mao YR, Xue LQ, Yu QY, Liu MY

Retrospective Study

- 2162** Differences in parents of pediatric liver transplantation and chronic liver disease patients
Akbulut S, Gunes G, Saritas H, Aslan B, Karipkiz Y, Demyati K, Gungor S, Yilmaz S
- 2173** Epidemiological investigation of *Helicobacter pylori* infection in elderly people in Beijing
Zhu HM, Li BY, Tang Z, She J, Liang XY, Dong LK, Zhang M
- 2181** Application of a pre-filled tissue expander for preventing soft tissue incarceration during tibial distraction osteogenesis
Chen H, Teng X, Hu XH, Cheng L, Du WL, Shen YM
- 2190** Evaluation of clinical significance of claudin 7 and construction of prognostic grading system for stage II colorectal cancer
Quan JC, Peng J, Guan X, Liu Z, Jiang Z, Chen HP, Zhuang M, Wang S, Sun P, Wang HY, Zou SM, Wang XS
- 2201** Choice and management of negative pressure drainage in anterior cervical surgery
Su QH, Zhu K, Li YC, Chen T, Zhang Y, Tan J, Guo S
- 2210** Risk scores, prevention, and treatment of maternal venous thromboembolism
Zhang W, Shen J, Sun JL
- 2219** Role of Hiraoka's transurethral detachment of the prostate combined with biopsy of the peripheral zone during the same session in patients with repeated negative biopsies in the diagnosis of prostate cancer
Pan CY, Wu B, Yao ZC, Zhu XQ, Jiang YZ, Bai S
- 2227** Efficacy of thoracoscopic anatomical segmentectomy for small pulmonary nodules
Li H, Liu Y, Ling BC, Hu B

Observational Study

- 2235** Attitudes, awareness, and knowledge levels of the Turkish adult population toward organ donation: Study of a nationwide survey
Akbulut S, Ozer A, Gokce A, Demyati K, Saritas H, Yilmaz S
- 2246** Metabolic biomarkers and long-term blood pressure variability in military young male adults
Lin YK, Liu PY, Fan CH, Tsai KZ, Lin YP, Lee JM, Lee JT, Lin GM
- 2255** Cytokines predict virological response in chronic hepatitis B patients receiving peginterferon alfa-2a therapy
Fu WK, Cao J, Mi NN, Huang CF, Gao L, Zhang JD, Yue P, Bai B, Lin YY, Meng WB

SYSTEMATIC REVIEWS

- 2266** Utilising digital health to improve medication-related quality of care for hypertensive patients: An integrative literature review
Wechkunanukul K, Parajuli DR, Hamiduzzaman M

META-ANALYSIS

- 2280** Role of *IL-17* gene polymorphisms in osteoarthritis: A meta-analysis based on observational studies
Yang HY, Liu YZ, Zhou XD, Huang Y, Xu NW

CASE REPORT

- 2294** Various diagnostic possibilities for zygomatic arch pain: Seven case reports and review of literature
Park S, Park JW
- 2305** Extensive multifocal and pleomorphic pulmonary lesions in Waldenström macroglobulinemia: A case report
Zhao DF, Ning HY, Cen J, Liu Y, Qian LR, Han ZH, Shen JL
- 2312** Lung cancer from a focal bulla into thin-walled adenocarcinoma with ground glass opacity – an observation for more than 10 years: A case report
Meng SS, Wang SD, Zhang YY, Wang J
- 2318** Pyogenic discitis with an epidural abscess after cervical analgesic discography: A case report
Wu B, He X, Peng BG
- 2325** Clinical characteristics, diagnosis, and treatment of COVID-19: A case report
He YF, Lian SJ, Dong YC
- 2332** Paraplegia after transcatheter artery chemoembolization in a child with clear cell sarcoma of the kidney: A case report
Cai JB, He M, Wang FL, Xiong JN, Mao JQ, Guan ZH, Li LJ, Wang JH
- 2339** Macrophage activation syndrome as a complication of dermatomyositis: A case report
Zhu DX, Qiao JJ, Fang H
- 2345** Serial computed tomographic findings and specific clinical features of pediatric COVID-19 pneumonia: A case report
Chen X, Zou XJ, Xu Z
- 2350** Myxofibrosarcoma of the scalp with difficult preoperative diagnosis: A case report and review of the literature
Ke XT, Yu XF, Liu JY, Huang F, Chen MG, Lai QQ
- 2359** Endoscopic pedicle flap grafting in the treatment of esophageal fistulas: A case report
Zhang YH, Du J, Li CH, Hu B
- 2364** Hemophagocytic syndrome as a complication of acute pancreatitis: A case report
Han CQ, Xie XR, Zhang Q, Ding Z, Hou XH
- 2374** Reduced delay in diagnosis of odontogenic keratocysts with malignant transformation: A case report
Luo XJ, Cheng ML, Huang CM, Zhao XP

- 2380** Gastric pyloric gland adenoma resembling a submucosal tumor: A case report
Min CC, Wu J, Hou F, Mao T, Li XY, Ding XL, Liu H
- 2387** Ataxia-telangiectasia complicated with Hodgkin's lymphoma: A case report
Li XL, Wang YL
- 2392** Uterine incision dehiscence 3 mo after cesarean section causing massive bleeding: A case report
Zhang Y, Ma NY, Pang XA
- 2399** Optical coherence tomography guided treatment avoids stenting in an antiphospholipid syndrome patient: A case report
Du BB, Wang XT, Tong YL, Liu K, Li PP, Li XD, Yang P, Wang Y

LETTER TO THE EDITOR

- 2406** Macrophage activation syndrome as an initial presentation of systemic lupus erythematosus
Shi LJ, Guo Q, Li SG

ABOUT COVER

Editorial Board Member of *World Journal of Clinical Cases*, Consolato M Sergi, FRCP (C), MD, PhD, Professor, Department of Lab. Medicine and Pathology, University of Alberta, Edmonton T6G 2B7, Canada

AIMS AND SCOPE

The primary aim of *World Journal of Clinical Cases* (WJCC, *World J Clin Cases*) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

INDEXING/ABSTRACTING

The WJCC is now indexed in PubMed, PubMed Central, Science Citation Index Expanded (also known as SciSearch®), and Journal Citation Reports/Science Edition. The 2019 Edition of Journal Citation Reports cites the 2018 impact factor for WJCC as 1.153 (5-year impact factor: N/A), ranking WJCC as 99 among 160 journals in Medicine, General and Internal (quartile in category Q3).

RESPONSIBLE EDITORS FOR THIS ISSUE

Responsible Electronic Editor: *Yan-Xia Xing*

Proofing Production Department Director: *Yun-Xiaojian Wu*

Responsible Editorial Office Director: *Jim-Lei Wang*

NAME OF JOURNAL

World Journal of Clinical Cases

ISSN

ISSN 2307-8960 (online)

LAUNCH DATE

April 16, 2013

FREQUENCY

Semimonthly

EDITORS-IN-CHIEF

Dennis A Bloomfield, Bao-Gan Peng, Sandro Vento

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

PUBLICATION DATE

June 6, 2020

COPYRIGHT

© 2020 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>

Retrospective Study

Efficacy of thoracoscopic anatomical segmentectomy for small pulmonary nodules

Hui Li, Yang Liu, Bao-Cun Ling, Bo Hu

ORCID number: Hui Li (0000-0001-9707-701X); Yang Liu (0000-0002-4551-2259); Bao-Cun Ling (0000-0002-8012-3259); Bo Hu (0000-0003-1637-2784).

Author contributions: Li H and Liu Y contributed equally to this article and should be considered as co-first authors; Ling BC and Hu B performed the operation; Li H and Liu Y designed this retrospective study; Ling BC and Hu B wrote this paper; Li H and Liu Y was responsible for sorting the data.

Institutional review board statement: This study was reviewed and approved by the Ethics Committee of 960 Hospital of PLA.

Informed consent statement: Informed consent was obtained from the patients.

Conflict-of-interest statement: The authors declare that they have no conflict of interest.

Data sharing statement: No additional data are available.

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

Hui Li, Yang Liu, Bao-Cun Ling, Bo Hu, Cardiothoracic Surgery Department, Zibo Hospital, 960 Hospital of PLA, Zibo 255300, Shandong Province, China

Corresponding author: Bao-Cun Ling, BHMS, Chief Physician, Cardiothoracic Surgery Department, Zibo Hospital, 960 Hospital of PLA, No. 20, Zhanbei Road, Zhoucun District, Zibo 255300, Shandong Province, China. 2189358576@qq.com

Abstract

BACKGROUND

Small pulmonary nodules are tissue shadows and thoracoscopic segmentectomy in China is still at the exploratory stage with limited application.

AIM

To evaluate the efficacy of thoracoscopic anatomical segmentectomy for small pulmonary nodules.

METHODS

Medical records of 86 patients with small pulmonary nodules treated at our hospital between August 2016 and October 2019 were retrospectively analyzed; 40 cases who underwent thoracoscopic lobectomy were set as a reference group, and 46 cases who underwent thoracoscopic anatomical segmentectomy were set as an observation group. Preoperative and postoperative parameters were measured in both groups, including the percentage of forced expiratory volume in the first second (FEV₁%), the percentage of forced vital capacity (FVC%), and the FEV₁/FVC ratio (FEV₁/FVC). Patients with positive pathological diagnosis received tests for neuron-specific enolase, carbohydrate antigen 125 (CA125), CA19-9, and squamous cell carcinoma antigen. Intraoperative bleeding volume, drainage volume, the number of dissected lymph nodes, drainage time, hospital stay, treatment cost, postoperative complications, and postoperative pain condition were compared between the two groups.

RESULTS

No significant difference was observed in the results of four serum tumor marker (CA125, CA19-9, squamous cell carcinoma antigen, and neuron-specific enolase), the number of dissected lymph nodes, treatment cost, or preoperative pulmonary ventilation index between the two groups. Intraoperative bleeding volume, drainage volume, drainage time, hospital stay, and visual analogue scale score were significantly lower in the observation group ($P < 0.05$). The results of FEV₁%, FVC%, and FEV₁/FVC were significantly higher in the observation group ($P < 0.05$).

<http://creativecommons.org/licenses/by-nc/4.0/>

Manuscript source: Unsolicited manuscript

Received: March 22, 2020

Peer-review started: March 22, 2020

First decision: April 19, 2020

Revised: April 24, 2020

Accepted: May 21, 2020

Article in press: May 21, 2020

Published online: June 6, 2020

P-Reviewer: Chamberlain MC, Gilbert MR

S-Editor: Wang JL

L-Editor: Wang TQ

E-Editor: Xing YX



CONCLUSION

The efficacy of thoracoscopic anatomical segmentectomy and lobectomy for small pulmonary nodules shows no significant difference in terms of lesion removal, but anatomical segmentectomy is less invasive with fewer postoperative complications and less influence on lung function.

Key words: Thoracoscopy; Small pulmonary nodules; Anatomical segmentectomy; Clinical efficacy; Lobectomy

©The Author(s) 2020. Published by Baishideng Publishing Group Inc. All rights reserved.

Core tip: To evaluate the efficacy of thoracoscopic anatomical segmentectomy for small pulmonary nodules, this study retrospectively analyzed the medical records of 86 patients with small pulmonary nodules treated at our hospital.

Citation: Li H, Liu Y, Ling BC, Hu B. Efficacy of thoracoscopic anatomical segmentectomy for small pulmonary nodules. *World J Clin Cases* 2020; 8(11): 2227-2234

URL: <https://www.wjgnet.com/2307-8960/full/v8/i11/2227.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v8.i11.2227>

INTRODUCTION

Small pulmonary nodules are tissue shadows surrounded by gas-containing lung tissues with a diameter of 5-10 mm in clinical imaging. They are generally round and can be single or multiple. Various factors contribute to the formation of nodules: Benign nodules are usually caused by inflammation, tuberculosis, bleeding, *etc.*; malignant nodules are primary lung cancer or lung metastasis of malignant tumors^[1]. Epidemiology suggests that the incidence of small pulmonary nodules has increased in recent years with declining air quality^[2].

Thoracoscopic lobectomy has been widely adopted since its first clinical application for the liver in 1993. The safety and efficacy of this surgical method have been proven in treating small pulmonary nodules, which is less invasive with rapid postoperative recovery^[3]. To further improve the safety and reduce operative trauma of clinical surgery, some researchers suggest that a lobe can be divided into segments, and therefore more normal tissues can be preserved during segment resection and operative injury can be reduced, which is called anatomical segmentectomy^[4].

Currently, thoracoscopic segmentectomy in China is still at the exploratory stage with limited application. To further evaluate the efficacy of this surgical method for small pulmonary nodules, this study retrospectively analyzed the medical records of 86 patients with small pulmonary nodules treated at our hospital.

MATERIALS AND METHODS

Baseline characteristics

The medical records of 86 patients with small pulmonary nodules treated at our hospital between August 2016 and October 2019 were reviewed. All cases met the diagnosis and treatment standards of "Chinese Expert Consensus on the Diagnosis and Treatment of Pulmonary nodules"^[5]. The inclusion criteria were: (1) No serious cardio-cerebrovascular disease; (2) No human immunodeficiency virus, immune deficiency, or coagulation dysfunction; (3) No other malignant tumor or a previous history of lymphoma; (4) Normal mental and intellectual assessment results and no mental disorder or low intelligence; (5) The patient was informed of the study and consented to medical records usage; (6) Suspected malignant lesions on preoperative examination; (7) Enhanced computed tomography scan showing tumor diameter ≤ 2 cm; and (8) Distant metastasis excluded by positron emission tomography/computed tomography. The exclusion criteria were: (1) Insufficient clinical records; (2) Combined with serious infection; (3) Combined with multiple organ failure and massive hemorrhage; and (4) Number of metastatic inclusion criteria < 8 . According to the surgical option, patients who underwent thoracoscopic segmentectomy were included in an observation group (46 cases) and patients who underwent thoracoscopic

lobectomy were included in a reference group (40 cases). The baseline characteristics of the two groups showed no significant difference ($P > 0.05$) (Table 1).

Surgical methods

The patient was placed in the lateral decubitus position under general anesthesia with single-lung ventilation by double-lumen endotracheal tube intubation. A 1-cm skin incision was made along the anterior axillary line in the 7th or 8th intercostal space (observation port), a 3-cm incision was made along the anterior axillary line in the 4th-5th intercostal space (working port), and another incision was made along the posterior axillary line in the 7th intercostal space (accessory working port). The scope was inserted through the observation port and apparatus was inserted through the working port. Lesion was detected by the scope. Segmentectomy was initially planned in 48 patients and pathological biopsy was obtained through wedge resection. Patients with benign lesions underwent segmentectomy. Biopsies and frozen pathological sections of the 10th, 11th, and 13th groups of lymph nodes were further obtained and examined in patients with malignant lesions and 2 patients with positive diagnosis switched to lobectomy. Therefore, segmentectomy was finally performed in 46 patients. The resected segments were based on lesion location (left superior lobe: 3 cases of apico-posterior segment, 4 of anterior segment, 3 of lingular segment, and 2 of posterior segment; right inferior lobe: 4 cases of basal segment and 5 of dorsal segment; left inferior lobe: 6 cases of basal segment and 7 of dorsal segment; right superior lobe: 4 cases of apical segment, 3 of posterior segment, and 5 of anterior segment). A total of 40 patients underwent lobectomy and the resected parts were based on lesion location (12 cases of left upper lobe, 11 of left lower lobe, 9 of right upper lobe, and 8 of right lower lobe).

Observational indexes

Venous blood samples were taken from patients with positive pathological diagnosis at the 1st mo postoperatively. Serum was obtained after centrifugation and tested for serum carbohydrate antigen 19-9 (CA19-9), CA125, neuron-specific enolase, and squamous cell carcinoma antigen.

Spirometer (Fukuda Sangyo, St-75) was used to measure the percentage of forced vital capacity (FVC%), the percentage of forced expiratory volume in the first second (FEV₁%), and the FEV₁/FVC ratio (FEV₁/FVC) before and 6 mo after operation.

Postoperative pain condition was assessed using the visual analogue scale (VAS).

Drainage volume, the number of resected lymph nodes, treatment cost, hospital stay, intraoperative bleeding volume, drainage time, and postoperative complications were recorded.

Statistical analysis

Data analyses were carried out with SPSS 23.0. Measurement data are presented as the mean \pm SD and were analyzed by *t* test; enumeration data are expressed as percentages and were analyzed by χ^2 test. $P < 0.05$ indicated that the difference was statistically significant.

RESULTS

Comparison of serum tumor markers in patients with malignant lesions

In the reference group, 37 cases were malignant and 3 were benign; in the observation group, 35 cases were malignant and 11 were benign. Based on data shown in Table 2, no significance difference was observed in serum tumor markers between the two groups ($P > 0.05$).

Comparison of intraoperative bleeding volume, the number of resected lymph nodes, and drainage volume

Intraoperative bleeding and drainage volume were both significantly lower in the observation group ($P < 0.05$). No significant difference was observed in the number of resected lymph nodes between the two groups ($P > 0.05$, Table 3).

Comparison of hospital stay, treatment cost, drainage time, and visual analogue scale score

Hospital stay and drainage time were significantly shorter and VAS score was significantly lower in the observation group ($P < 0.05$). No significant difference was found in treatment cost ($P > 0.05$, Table 4).

Comparison of postoperative lung function

Table 1 Baseline characteristics, *n* (%)

Baseline characteristic	Reference group (<i>n</i> = 40)	Observation group (<i>n</i> = 46)	<i>t</i>	<i>P</i> value
Gender				
Male	22 (55.00)	27 (58.70)	0.279	0.597
Female	18 (45.00)	19 (41.30)		
Age (yr)	56.32 ± 4.52	57.02 ± 4.81	0.692	0.491

Based on data shown in Table 5, no significant difference was observed in preoperative lung function index between the two groups ($P > 0.05$). Postoperative lung function index declined to certain extent in both groups, but FEV₁%, FVC%, and FEV₁/FVC were significantly higher in the observation group ($P < 0.05$).

Comparison of complications

Table 6 suggests that the incidence of complications was significantly lower in the observation group ($P < 0.05$).

DISCUSSION

Small pulmonary nodules are common manifestations of pulmonary lesions in clinical diagnosis, which generally refer to pulmonary nodules of 5-10 mm. Various factors may contribute to the formation of nodules, including inflammation, tuberculosis, primary tumor, and metastatic tumor^[6-8]. Although clinical studies have shown that small pulmonary nodules have a relatively low tendency to turn malignant, the nodules should be handled carefully once observed. Epidemiology suggests that with declining air quality, the incidence of small pulmonary nodules has increased in recent years, which has become a typical lung lesion with an increasing malignancy rate^[2].

Middle and lower thoracic wedge resection is primarily applied in previous clinical treatment, but in patients with extensive lesions (*e.g.*, pulmonary bullae and pulmonary cyst), this method cannot completely resect the lesions, and in patients with deep lesions, this method may cause adverse events like vascular lesions. Moreover, since this operation is not anatomical resection, malignant lesion has a great risk of recurrence after operation and therefore, the application of this surgical method is limited^[9]. Lobectomy, as another surgical option, has been widely applied in treating small pulmonary nodules, and especially in terms of malignant lesions, it can control disease progression and prolong patient survival^[10]. In patients with malignant small pulmonary nodules who received lobectomy, the 5-year survival rate can reach over 80%^[11]. Compared with conventional thoracotomy, thoracoscopic lobectomy can be operated through only 3 small incisions, which greatly reduces the risk of postoperative complications and has gradually replaced conventional thoracotomy, becoming the primary surgical treatment for small pulmonary nodules^[12-14]. However, research now indicates that although lobectomy shows good therapeutic effects, it resects part of the normal lung tissues, resulting in impaired lung function, more surgical injury, and slower recovery, so the surgical method can be further improved^[15].

In terms of pulmonary anatomy, the definition of pulmonary segment was first introduced in 1889, further refining the definition of pulmonary lobe in order to facilitate accurate localization in clinical diagnosis and treatment^[16]. Thoracoscopic hepatic segmentectomy was initially applied in Italy, and the thoracoscopic segmentectomy was gradually introduced into other developed countries to treat small pulmonary nodules, which achieved satisfactory results. The application of anatomical pulmonary segmentectomy in China is relatively late and limited. Based on current theories, segmentectomy can preserve more normal lung tissues with less injury and impact on lung function while treating small pulmonary nodules. When meeting surgical indications, segmentectomy can achieve the same effect as lobectomy for lymph node resection^[17]. The current consensual surgical signs include: (1) Nodules located at the peripheral 1/3 of the pulmonary field, with a diameter ≤ 2 cm; (2) If malignant, the tumor should be non-small cell cancer with tumor stage of T1N0M0; (3) Distant metastasis excluded by lymph node biopsy; and (4) Cardio-pulmonary function tolerant of surgery^[18]. Generally, in treating malignant small pulmonary nodules, if no lymph node metastasis is present, segmentectomy can achieve the same therapeutic effect as lobectomy. But if lymph node metastasis

Table 2 Comparison of serum tumor markers in patients with malignant lesions (mean \pm SD)

Group	No. of malignant cases	CA125 (U/mL)	CA19-9 (U/mL)	SCC (ng/mL)	NSE (ng/mL)
Reference	37	23.25 \pm 3.51	13.52 \pm 2.25	1.31 \pm 0.22	12.32 \pm 2.63
Observation	35	21.85 \pm 3.25	12.74 \pm 2.36	1.27 \pm 0.24	11.56 \pm 2.31
<i>t</i>	-	1.753	1.436	0.738	1.305
<i>P</i> value	-	0.084	0.156	0.463	0.192

CA: Carbohydrate antigen; SCC: Squamous cell carcinoma antigen; NSE: Neuron-specific enolase.

occurs, lobectomy should be applied rather than segmentectomy in case of recurrence. Therefore, a preoperative pathological biopsy of lymph nodes for patients with the malignant lesion is of critical importance^[19].

In this retrospective study, no significant difference was observed in serum tumor markers (CA125, CA19-9, squamous cell carcinoma antigen, and neuron-specific enolase), the number of resected lymph nodes, and treatment cost between observation and reference groups ($P > 0.05$), indicating that the two surgical methods can achieve the same therapeutic effects with similar cost for both benign and malignant small pulmonary nodules. However, in the segmentectomy group, hospital stay and drainage time were significantly shorter ($P < 0.05$) while intraoperative bleeding and drainage volume, VAS, and several postoperative lung function indexes were significantly higher ($P < 0.05$), suggesting that segmentectomy can reduce surgical injury and hospital stay with less impact on lung function and fewer complications. Our results are in agreement with those of Ishikawa *et al*^[20] who suggested that compared with lobectomy, segmentectomy is less invasive and preserves more normal lung tissues with less impact on lung function and more rapid postoperative recovery^[20]. One limitation of the present study is the small number of patients. Only 86 cases were included and therefore the surgical and observational outcomes may be accidental. More cases are needed for subsequent studies.

Thoracoscopic pulmonary segmentectomy is an ideal surgical approach to treat small pulmonary nodules. Compared with thoracoscopic lobectomy, segmentectomy is associated with fewer complications, better postoperative lung function, and more rapid recovery and therefore can be a primary option for patients meeting surgical indications.

Table 3 Comparison of intraoperative bleeding volume, the number of resected lymph nodes, and drainage volume (mean \pm SD)

Group	<i>n</i>	Intraoperative bleeding volume (mL)	No. of resected lymph nodes	Drainage volume (mL)
Reference	40	153.21 \pm 30.25	11.61 \pm 2.03	948.63 \pm 120.14
Observation	46	63.88 \pm 10.41	11.96 \pm 2.16	571.85 \pm 74.25
<i>t</i>	-	18.803	0.771	17.737
<i>P</i> value	-	0.001	0.443	0.001

Table 4 Comparison of hospital stay, treatment cost, drainage time, and visual analogue scale score (mean \pm SD)

Group	<i>n</i>	Hospital stay (d)	Drainage time (d)	Treatment cost ($\times 10^4$ Yuan)	VAS (score)
Observation	46	10.62 \pm 1.01	3.59 \pm 0.86	4.92 \pm 0.85	4.02 \pm 1.03
Reference	40	12.52 \pm 1.58	4.97 \pm 1.02	4.89 \pm 0.80	5.63 \pm 1.35
<i>t</i>	-	6.730	6.807	0.168	6.146
<i>P</i> value	-	0.001	0.001	0.867	0.001

VAS: Visual analogue scale.

Table 5 Comparison of postoperative lung function (mean \pm SD, %)

Lung function index	Observation group (<i>n</i> = 46)	Reference group (<i>n</i> = 40)	<i>t</i>	<i>P</i> value
FEV ₁ %				
Preoperative	94.63 \pm 3.05	93.94 \pm 3.12	1.035	0.304
Postoperative	84.69 \pm 4.06 ^a	76.97 \pm 5.06 ^a	7.845	0.001
FVC%				
Preoperative	94.12 \pm 3.16	94.33 \pm 3.21	0.305	0.761
Postoperative	84.08 \pm 3.09 ^a	75.85 \pm 4.31 ^a	10.040	0.001
FEV ₁ /FVC				
Preoperative	94.38 \pm 2.56	94.14 \pm 3.86	0.334	0.738
Postoperative	84.39 \pm 3.69 ^a	76.41 \pm 4.51 ^a	9.022	0.001

^a*P* < 0.05 vs preoperative index. FEV₁%; The percentage of forced expiratory volume in the first second; FVC%; The percentage of forced vital capacity.**Table 6 Comparison of complications, *n* (%)**

Group	No.	Acute pain	Infection	Repeated bleeding	Incidence of complications
Observation	46	0 (0.00)	0 (0.0)	1 (2.17)	1 (2.17)
Reference	40	2 (5.00)	1 (2.50)	1 (2.50)	4 (10.00)
χ^2	-	5.128	2.532	0.024	5.364
<i>P</i> value	-	0.024	0.112	0.877	0.021

ARTICLE HIGHLIGHTS

Research background

Malignant nodules are primary lung cancer or lung metastasis of malignant tumors. Anatomical segmentectomy is a new surgical method.

Research motivation

Thoracoscopic segmentectomy in China is still at the exploratory stage.

Research objectives

To evaluate the availability and effectiveness of the procedure.

Research methods

Medical records of 86 patients with small pulmonary nodules treated at our hospital between August 2016 and October 2019 were retrospectively analyzed; 40 cases who underwent thoracoscopic lobectomy were set as a reference group, and 46 cases who underwent thoracoscopic anatomical segmentectomy were set as an observation group.

Research results

Intraoperative bleeding volume, drainage volume, drainage time, hospital stay, and visual analogue scale score were significantly lower in the observation group. The results of percentage of forced expiratory volume in the first second (FEV₁%), the percentage of forced vital capacity (FVC%), and the FEV₁/FVC ratio were significantly higher in the observation group.

Research conclusions

Thoracoscopic pulmonary segmentectomy is an ideal surgical approach to treat small pulmonary nodules.

Research perspectives

The authors will evaluate the overall situation of the patients to take the best surgical plan in the future.

REFERENCES

- 1 Chae KJ, Jin GY, Ko SB, Wang Y, Zhang H, Choi EJ, Choi H. Deep Learning for the Classification of Small (≤ 2 cm) Pulmonary Nodules on CT Imaging: A Preliminary Study. *Acad Radiol* 2020; **27**: e55-e63 [PMID: 31780395 DOI: 10.1016/j.acra.2019.05.018]
- 2 Rzyman W, Jelitto-Gorska M, Dziedzic R, Biadacz I, Ksiazek J, Chwiot P, Marjanski T. Diagnostic work-up and surgery in participants of the Gdansk lung cancer screening programme: the incidence of surgery for non-malignant conditions. *Interact Cardiovasc Thorac Surg* 2013; **17**: 969-973 [PMID: 24008181 DOI: 10.1093/icvts/ivt388]
- 3 Kato H, Oizumi H, Inoue T, Oba E, Nakamura K, Hayashi J, Watarai H, Yasumoto T, Sadahiro M. Port-access thoracoscopic anatomical lung subsegmentectomy. *Interact Cardiovasc Thorac Surg* 2013; **16**: 824-829 [PMID: 23427315 DOI: 10.1093/icvts/ivt037]
- 4 Karki A, Shah R, Fein A. Multiple pulmonary nodules in malignancy. *Curr Opin Pulm Med* 2017; **23**: 285-289 [PMID: 28463856 DOI: 10.1097/mcp.0000000000000393]
- 5 Su C, Meyer M, Pirker R, Voigt W, Shi J, Pilz L, Huber RM, Wu Y, Wang J, He Y, Wang X, Zhang J, Zhi X, Shi M, Zhu B, Schoenberg SS, Henzler T, Manegold C, Zhou C, Roessner ED. From diagnosis to therapy in lung cancer: management of CT detected pulmonary nodules, a summary of the 2015 Chinese-German Lung Cancer Expert Panel. *Transl Lung Cancer Res* 2016; **5**: 377-388 [PMID: 27652202 DOI: 10.21037/tlcr.2016.07.09]
- 6 Bajpai J, Kant S, Verma AK, Bajaj DK. Perinuclear antineutrophil cytoplasmic antibody-associated pulmonary vasculitis masquerading as lung metastasis. *Natl Med J India* 2018; **31**: 343-344 [PMID: 31397366 DOI: 10.4103/0970-258x.262915]
- 7 Han S, Yoon SH, Goo JM, Yim JJ. Radiological features and progression of incipient active pulmonary tuberculosis according to risk factors. *Int J Tuberc Lung Dis* 2019; **23**: 698-706 [PMID: 31315702 DOI: 10.5588/ijtld.18.0541]
- 8 Yang XN, Zhao ZR, Zhong WZ, Nie Q, Liao RQ, Dong S. A lobe-specific lymphadenectomy protocol for solitary pulmonary nodules in non-small cell lung cancer. *Chin J Cancer Res* 2015; **27**: 538-544 [PMID: 26752927 DOI: 10.3978/j.issn.1000-9604.2014.11.04]
- 9 Kato H, Oizumi H, Suzuki J, Hamada A, Watarai H, Nakahashi K, Sadahiro M. Thoracoscopic wedge resection and segmentectomy for small-sized pulmonary nodules. *J Vis Surg* 2017; **3**: 66 [PMID: 29078629 DOI: 10.21037/jovs.2017.03.22]
- 10 Li F, Chen Y, Bian J, Xin X, Liu S. [Preoperative Computed Tomography-guided Microcoil Localization for Multiple Small Lung Nodules before Video-assisted Thoracoscopic Surgery]. *Zhongguo Fei Ai Za Zhi* 2018; **21**: 857-863 [PMID: 30454548 DOI: 10.3779/j.issn.1009-3419.2018.11.08]
- 11 Hung MH, Cheng YJ, Chan KC, Han SC, Chen KC, Hsu HH, Chen JS. Nonintubated uniportal thoracoscopic surgery for peripheral lung nodules. *Ann Thorac Surg* 2014; **98**: 1998-2003 [PMID: 25443006 DOI: 10.1016/j.athoracsur.2014.07.036]
- 12 Zhang J, Zhao H, Lv L, Yuan J, Sun Y. Uniportal thoracoscopic pulmonary lobectomy in the treatment of Lung Cancer. *Pak J Med Sci* 2020; **36**: 182-186 [PMID: 32063956 DOI: 10.12669/pjms.36.2.793]
- 13 Coşgun T, Kaba E, Ayalp K, Tokar A. An antiquated contraindication for minimally invasive lung surgery: No place to staple the bronchus. *Türk Gogus Kalp Damar Cerrahisi Derg* 2019; **27**: 521-525 [PMID: 32082920 DOI: 10.5606/tgkdc.dergisi.2019.17315]
- 14 Wang T, Yan T, Wan F, Ma S, Wang K, Wang J, Song J, He W, Bai J, Jin L. [Surgical Treatment of Small Pulmonary Nodules Under Video-assisted Thoracoscopy (A Report of 129 Cases)]. *Zhongguo Fei Ai Za Zhi* 2017; **20**: 35-40 [PMID: 28103971 DOI: 10.3779/j.issn.1009-3419.2017.01.05]
- 15 LoCicero J. Video-Assisted Thoracic Surgery Study Group. *Ann Thorac Surg* 1993; **56**: 734-735 [PMID: 8379782 DOI: 10.1016/0003-4975(93)90965-k]
- 16 Walker R, Deppen S, Smith G, Shi C, Lehman J, Clanton J, Moore B, Burns R, Grogan EL, Massion PP. 68Ga-DOTATATE PET/CT imaging of indeterminate pulmonary nodules and lung cancer. *PLoS One* 2017; **12**: e0171301 [PMID: 28182730 DOI: 10.1371/journal.pone.0171301]
- 17 Zhao Y, Xuan Y, Song J, Qiu T, Qin Y, Jiao W. A novel technique for identification of the segments based on pulmonary artery plane combined with oxygen diffusing discrepancy. *J Thorac Dis* 2019; **11**: 5427-5432 [PMID: 32030261 DOI: 10.21037/jtd.2019.11.42]
- 18 Koshiishi Y, Oono Y, Goya T. [Less invasive surgery for the small size peripheral lung cancer: an indication and a review of VATS (video-assisted thoracic surgery) lobectomy]. *Kyobu Geka* 2001; **54**: 947-950 [PMID: 11593733]
- 19 Ma Y, Gal A, Koss M. Reprint of: The pathology of pulmonary sarcoidosis: update. *Semin Diagn Pathol* 2018; **35**: 324-333 [PMID: 30262157 DOI: 10.1053/j.semdp.2018.09.001]

- 20 **Ishikawa Y**, Kojima F, Ishii T, Yoshiyasu N, Ohde S, Bando T. Early postoperative inflammatory response by procedure types: stapler-based segmentectomy versus lobectomy. *Gen Thorac Cardiovasc Surg* 2020; **68**: 280-286 [PMID: [31559588](#) DOI: [10.1007/s11748-019-01214-3](#)]



Published by Baishideng Publishing Group Inc
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA
Telephone: +1-925-3991568
E-mail: bpgoffice@wjgnet.com
Help Desk: <https://www.f6publishing.com/helpdesk>
<https://www.wjgnet.com>

