

doi: 10.13241/j.cnki.pmb.2019.07.018

自发性气胸患者术后并发胸腔积液与肺部感染、胸水葡萄糖水平的相关性分析*

杨宇杰 陈大兴 潘华锋 陶立轩 郭 宁 王 杰

(武汉科技大学附属普仁医院心胸外科 湖北 武汉 430081)

摘要 目的:探讨自发性气胸患者术后并发胸腔积液与肺部感染、胸水葡萄糖(Glu)水平的相关性,为自发性气胸患者术后并发胸腔积液的预防诊治提供参考。**方法:**选择我院2016年6月至2018年3月收治的96例行胸腔镜手术的自发性气胸患者作为研究对象,按照术后是否并发胸腔积液将其分为对照组和观察组两组,其中对照组患者56例,术后无并发症,观察组患者40例,术后并发胸腔积液。采用单因素分析法对两组患者的一般资料进行分析,并通过Pearson分析法对上述资料进行相关性分析。对术后肺部感染患者的病原菌分布及构成比进行分析,观察两组患者手术前后外周血炎症因子变化。**结果:**观察组患者感染率、住院时间、术后恢复时间、胸水Glu水平明显高于对照组,差异显著具有统计学意义($P<0.05$);对上述具有显著性差异的一般资料进行Pearson分析显示,肺部感染与SP患者术后并发胸腔积液呈现正相关,胸水Glu与SP患者术后并发胸腔积液呈现负相关($P<0.05$)。17例感染病例中,革兰氏阴性菌为11例,构成比64.71%,革兰氏阳性菌为6例,构成比35.29%,无真菌感染病例发生。两组患者治疗前各外周血炎症因子水平差异不具有统计学意义,具有可比性($P>0.05$);两组患者治疗后降钙素原(PCT)、白细胞介素-6(IL-6)、白细胞介素-8(IL-8)以及白细胞介素-10(IL-10)水平均明显升高,且观察组患者上述指标升高更为显著,差异具有统计学意义($P<0.05$)。**结论:**自发性气胸患者术后并发胸腔积液与胸水Glu水平呈现负相关,与肺部感染呈现正相关,且肺部感染患者中革兰氏阴性菌相对较多,对自发性气胸患者术后并发胸腔积液临床诊治具有一定的借鉴意义。

关键词: 自发性气胸;胸腔积液;肺部感染;胸水葡萄糖

中图分类号: R561.4 **文献标识码:** A **文章编号:** 1673-6273(2019)07-1285-05

Correlation Analysis of Postoperative Pleural Effusion and Pulmonary Infection and Glu Level in Patients with Spontaneous Pneumothorax*

YANG Yu-jie, CHEN Da-xing, PAN Hua-feng, TAO Li-xuan, GUO Ning, WANG Jie

(Department of Cardio-Thoracic Surgery, Pu Ren Hospital Affiliated to Wuhan University of Science and Technology, Wuhan, Hubei, 430081, China)

ABSTRACT Objective: To investigate the correlation between postoperative pleural effusion and pulmonary infection, pleural glucosamine (Glu) level in patients with spontaneous pneumothorax, and to provide reference for the diagnosis and treatment of postoperative pleural effusion in patients with spontaneous pneumothorax. **Methods:** A total of 96 patients with spontaneous pneumothorax who underwent thoracoscopic surgery from June 2016 to March 2018 in our hospital were selected as the study subjects. They were divided into a control group and an observation group according to whether or not they had pleural effusion after operation, there were 56 patients in the control group and no postoperative complications. There were 40 patients in the observation group and postoperative pleural effusion. Single factor analysis was used to analyze the general data of the two groups of patients, and the correlation analysis was performed on the above data by Pearson analysis. The distribution of pathogenic bacteria and the composition ratio of patients with postoperative pulmonary infection were analyzed to observe the changes of inflammatory factors in peripheral blood before and after surgery. **Results:** In the observation group, the infection rate, length of stay, postoperative recovery time, and pleural Glu level were significantly higher than those in the control group. The difference was statistically significant ($P<0.05$); Pearson analysis of the general data with significant differences indicated that there was a positive correlation between pulmonary infection and postoperative pleural effusion in patients with SP, and there was a negative correlation between pleural effusion and postoperative pleural effusion in SP patients ($P<0.05$). Of the 17 infections, 11 were Gram-negative bacteria, 64.71% of the constituents were Gram-negative bacteria, 6 were Gram-positive bacteria, 35.29% of the constituents were Gram-positive bacteria, and no fungal infection occurred. The levels of inflammatory cytokines before treatment in the two groups were not statistically significant and comparable ($P>0.05$); the levels of Calcitonin(PCT), interleukin-6 (IL-6), interleukin-8 (IL-8) and interleukin-10 (IL-10) were significantly increased after treatment in both groups, the above indicators in the observation group increased more significantly, the difference was statistically significant ($P<0.05$). **Conclusion:** Postoperative pleural effu-

* 基金项目:湖北省科技计划基金项目(WJ2015HB25)

作者简介:杨宇杰(1967-),男,本科,副主任医师,研究方向:食管癌、肺癌及纵膈肿瘤方面手术及研究,E-mail: 409034963@qq.com

(收稿日期:2018-08-07 接受日期:2018-08-31)

sion in patients with spontaneous pneumothorax is negatively correlated with Glu and pleural effusion levels. It is positively correlated with lung infections. Gram-negative bacteria are more common in patients with pulmonary infections, it can be used as a reference for the clinical diagnosis and treatment of postoperative pleural effusion in patients with spontaneous pneumothorax.

Key words: Spontaneous pneumothorax; Pleural effusion; Pulmonary infection; Hydrothorax Glu

Chinese Library Classification(CLC): R561.4 **Document code:** A

Article ID: 1673-6273(2019)07-1285-05

前言

气胸又被称为胸膜腔内积气,多是由于食管、支气管、气管、肺组织发生破裂,造成胸膜腔内进入空气,或者患者胸膜被穿破,与外界连接进入空气所致^[1]。自发性气胸(Spontaneous Pneumothorax, SP)是临床上最为常见的气胸类型,一般是在医源性等相关认为因素以及无外伤等情况下,患者肺部脏层以及相关组织胸膜发生破裂,或者胸膜下的肺大泡和微小泡发生破裂,胸膜腔中进入支气管或者肺部中的空气而造成气胸的形成^[2]。根据病因可以将自发性气胸分为继发性和原发性两种^[3]。其中继发性气胸一般是由于大泡性肺气肿、慢性阻塞性肺病以及肺结核等肺实质病变所致,多见于中老年人,且大泡性肺气肿破裂较为多见^[4]。而原发性气胸多见于青年人群,一般是由位于肺尖部胸膜下的肺小泡所致^[5]。调查研究显示,SP的发病率为9/10万左右,并有逐渐升高的趋势,多见于身较高,体型相对比较瘦长的青年男性,男女发病比例在5:1左右,60岁以上的老年人以及20-40岁的中青年患者均为高发群体^[6]。根据患者胸腔膜中积气的速度与量,轻度一般无明显症状,重度患者表现呼吸困难,引起呼吸功能障碍以及呼吸衰竭,严重者危及患者生命^[7]。临床上传统的开胸直视下修补术,手术创伤较大,术后恢复困难,易感染复发,治疗效果较差,而胸腔镜手术创伤小,痛苦轻、出血少、术后恢复快等优点,被广泛应用于临床^[8]。但是由于SP疾病易复发等特点,患者胸腔镜手术术后易并发胸腔积液,进而延长术后恢复时间以及增加术后感染几率^[9]。故本文探讨SP术后并发胸腔积液与肺部感染、胸水Glu(Glucose)水平的相关性,为SP术后并发胸腔积液的预防诊治提供参考。

1 资料和方法

1.1 一般资料

选择我院2016年6月至2018年3月收治的96例行胸腔镜手术的自发性气胸患者作为研究对象,按照术后是否并发胸腔积液将其分为对照组和观察组两组,其中对照组患者56例,术后无并发症,观察组患者40例,术后并发胸腔积液。上述所有患者均经胸部X线以及CT测定确诊为SP。两组患者在年龄、性别、病程、BMI、发病部位、吸烟史等一般资料方面差异不显著,具有可比性($P>0.05$)。见表1。

1.2 诊断标准

1.2.1 自发性气胸诊断标准 ①发病急骤,有剧烈咳嗽、气短、胸痛等症状,但未发现有明显的病症诱因;②患侧叩诊有鼓音出现、呼吸运动减弱,患侧胸廓饱满、患侧呼吸音消失或者减弱^[10];③大量气胸时,心脏、纵膈、气管向健侧移位;④左侧纵膈气肿或者气胸者,听诊呈现Hamman征^[11];⑤X线检查:肺边缘的

脏层胸膜可见较为纤细的发线影,肺部组织向肺门处压,气胸部位无肺纹理,透光度增高。

1.2.2 胸腔积液诊断标准 参考Light诊断标准,具体如下:①胸水乳酸脱氢酶含量与血清乳酸脱氢酶含量比值大于0.6;②胸水蛋白含量与血清蛋白含量的比值为大于0.5;③胸水乳酸脱氢酶含量不低于200 U/L。上述3项符合其中1项即可诊断为渗出液。另外胸水胆红素与血清胆红素的含量比值不小于0.61为渗出液,小于0.61为漏出液^[12]。

1.3 纳入和排除标准

纳入标准:①符合上述SP诊断标准,行胸腔镜手术者;②无支气管扩张、肺脓肿以及肺水肿等基础肺疾病者;③手术指征明确,同时术后证实诊断无误者;④此研究经本院医学伦理委员会批准;⑤患者及家属同意并积极配合本次研究,签署知情协议书。排除标准:①术前已经存在肺部感染或者其他活动性感染者;②肺内型肺大泡者;③合并有严重肝肾功能障碍者;④合并恶性肿瘤等相关终末期疾病者;⑤临床资料缺失者;⑥依从性差,中途退出者。

1.4 方法

所有患者术前给予全身麻醉,气管插管,取健侧卧位。之后在其侧胸壁(第7肋间无粘连位置)做一个小切口,在患者腋中线第7肋间置入胸腔镜套管,对胸腔内部以及肺部进行观察,选取较为合适的主切口位置,在腋后线处第6肋间以及第3肋间位置分别切一小口,置入相应的操作套管,首先对胸腔内的粘连组织采用钝性分离,再对肺大泡采用自动切割缝合器进行完全切除或者缝扎^[13]。

1.5 观察指标

①胸水Glu测定:采集上述所有患者5 mL的胸腔积液,采用离心机(Ortho BioVue;强生(上海)医疗器材有限公司),在3000 rpm条件下离心5 min,取上清液待测。采用葡萄糖氧化酶法进行测定,试剂盒购于江苏江莱生物科技有限公司,严格按照试剂盒说明书进行操作^[14]。②胸水病原菌测定:对于术后肺部感染患者,对其感染病灶的引流液以及分泌液进行收集培养,并采用Microstation型自动微生物鉴定系统(美国BIOLOG公司)进行病原菌的鉴定^[15]。③外周血炎症因子测定^[16]:于患者手术前后采集患者5 mL空腹静脉血,通过离心机,3000 rpm条件下,离心10 min,取其上清液,待测。血清降钙素原(PCT)、白介素-6(IL-6)、白介素-8(IL-8)、白介素-10(IL-10)采用酶联免疫吸附法(ELISA)进行测定,试剂盒购于上海广锐生物科技有限公司,操作方法严格按照说明书执行。

1.6 统计学分析

采用统计学专用软件对上述资料进行整理分析,其中计量资料采用($\bar{x} \pm s$)表示,行t检验,计数资料采用[例(%)]表示,行卡方检验,另外,对于胸腔积液也肺部感染以及胸水Glu水平

的相关性采用 Pearson 分析法研究,当 $P < 0.05$ 时,差异有统计学意义。

2 结果

2.1 两组患者一般资料比较

观察组患者感染率、住院时间、术后恢复时间、胸水 Glu 水平明显高于对照组($P < 0.05$)。而对于两组患者的手术时间、术中出血量以及切口大小差异不具有统计学意义($P > 0.05$)。

表 1 两组患者一般资料比较

Table 1 Comparison of general data between the two groups

Indexes	Control group(n=56)	Observation group(n=40)	χ^2/t	P
Age (years)	35-69	35-70	-	-
Average age (years)	48.32± 4.58	48.51± 4.67	0.385	0.661
Male/female (n)	46/10	32/8	0.070	0.791
Course of disease (d)	10-56	10-58	-	-
Mean course of disease (d)	31.26± 8.67	31.31± 8.75	0.028	0.489
BMI (kg/m ²)	21.11± 1.23	21.08± 1.25	0.117	0.454
Smoking history (n)	19(33.93)	13(32.50)	0.021	0.884
Lesion site (n)	-	-	-	-
On the left side of the	19(33.93)	14(35.00)	0.012	0.913
On the right side	29(51.79)	20(50.00)	0.030	0.863
On both sides	8(14.29)	6(15.00)	0.010	0.992
Type of disease (n)	-	-	-	-
Primary SP	32(57.14)	23(57.50)	0.001	0.972
Secondary SP	24(42.86)	17(42.50)	0.001	0.972
Infection rate (%)	3(5.36)	14(35.00)	14.070	0.000
Length of stay (d)	4.52± 1.24	5.56± 1.31	3.957	0.000
Operation time (min)	52.31± 3.58	52.67± 3.64	0.482	0.315
Intraoperative blood loss (mL)	86.75± 13.57	84.69± 13.21	0.741	0.230
Recovery time (d)	2.38± 0.36	4.26± 0.59	19.350	0.000
Incision size (cm)	4.67± 1.24	4.71± 1.19	0.158	0.437
Hydrothorax Glu (mmol/L)	6.28± 1.45	4.12± 1.23	7.870	0.000

2.2 SP 患者术后并发胸腔积液与肺部感染、胸水 Glu 水平相关性分析

对上述具有显著性差异的一般资料进行 Pearson 分析显示,肺部感染与 SP 患者术后并发胸腔积液呈现正相关($r=0.354, P=0.002$),胸水 Glu 与 SP 患者术后并发胸腔积液呈现负相关($r=-0.569, P=0.000$)。

2.3 肺部感染患者病原菌分布及构成比

两组患者共有 17 例发生肺部感染,经过引流以及抗感染等相关治疗均顺利出院,感染病例中,革兰氏阴性菌为 11 例,构成比 64.71%,革兰氏阳性菌为 6 例,构成比 35.29%,无真菌感染病例发生。

表 2 肺部感染患者病原菌分布及构成比(n=17)

Table 2 Distribution and composition of pathogenic bacteria in patients with pulmonary infection (n=17)

Pathogenic bacteria		n	%
Gram-positive bacteria	Staphylococcus aureus	2	11.76
	Staphylococcus epidermis	4	23.53
	Total	6	35.29
Gram-negative bacteria	Pseudomonas aeruginosa	1	5.56
	Acinetobacter baumannii	3	17.65
	Escherichia coli	7	41.18
	Total	11	64.71

2.4 两组患者手术前后外周血炎症因子改变比较

两组患者治疗前各外周血炎症因子水平差异不具有统计学意义,具有可比性($P>0.05$)。两组患者治疗后 PCT、IL-6、IL-8

以及 IL-10 水平均明显升高,且观察组患者上述指标升高更为显著($P<0.05$)。

表 3 两组患者手术前后外周血炎症因子水平比较($\bar{x} \pm s$)

Table 3 Comparison of peripheral blood inflammatory factors before and after surgery in two groups of patients ($\bar{x} \pm s$)

Groups	PCT (ng/mL)		IL-6 (ng/L)		IL-8 (ug/L)		IL-10 (ng/L)	
	Before surgery	After surgery	Before surgery	After surgery	Before surgery	After surgery	Before surgery	After surgery
Control group (n=56)	0.41± 0.09	0.57± 0.14 [#]	11.18± 4.06	13.69± 4.88 [#]	8.85± 2.06	12.16± 3.20 [#]	11.16± 3.75	13.03± 4.13 [#]
Observation group (n=40)	0.42± 0.10	0.45± 0.12 [#]	11.25± 4.10	16.54± 5.79 [#]	8.91± 2.10	14.23± 3.65 [#]	11.23± 3.84	13.55± 4.25 [#]
t	0.467	4.389	0.083	2.609	0.140	2.946	0.089	1.601
P	0.321	0.000	0.467	0.005	0.445	0.002	0.465	0.027

Note: compared with before treatment, [#] $P<0.05$.

3 讨论

SP 患者临床症状主要由是否伴有慢性肺阻塞性疾病、肺大泡的数量大小决定,肺部存在的肺大泡和较小的肺大泡通常没有明显的症状,甚至有部分患者仅仅在其他疾病手术以及 X 线检查时才能够发现肺大泡的存在,多发性或者大体积的肺大泡可使患者感到气短、胸闷等轻微症状^[17]。当肺大泡发生破裂,进而会造成自发性气胸胸内压力升高,纵膈移位向健侧,病情严重者可表现为呼吸困难以及心绞痛相关症状^[18]。目前常采用胸腔镜手术治疗,效果较好,但术后常并发胸腔积液以及肺部感染等并发症,延长术后恢复时间,影响治疗效果^[19]。对于自发性 SP 患者术后并发胸腔积液的发病机制较为复杂,先归纳如下^[20]:①患者术后造成机体创伤,容易产生营养不良,进而造成低蛋白血症的形成,当患者的血清白蛋白较低时,会造成其血浆胶体的渗透压发生一定程度的降低,从而导致其对胸壁相关毛细血管中液体的阻滞性降低,吸收停止或者减少,造成漏出性胸腔积液的形成^[21];②进行胸腔镜手术时,会一定程度造成腹内以及膈下的压力增加,造成胸腔压力增加,促进胸腔积液的形成^[22];③进行手术时,机体胸腔容易产生炎症反应,产生大量炎症因子,促使胸膜毛细血管的通透性产生一定程度的增加,对胸腔内的粘连组织采用钝性分离可使相关胸腔组织发生破损,加重炎症反应,促进毛细血管中液体的渗出,形成胸腔积液^[23]。

SP 并发胸腔积液患者脏层胸膜易发生破裂造成炎症发生,进一步刺激壁层胸膜,使其余脏层胸膜之间难以粘连接触,难以闭合,同时胸膜增厚,造成纤维膜的形成,对肺部的复张影响较大,肺部环境相对降低,容易造成肺部感染^[24],其与 SP 并发胸腔积液呈正相关。另外,其中 PCT 是一种半衰期为 30h 左右、无激素活性的、来源于肝脏的蛋白质,其水平随着感染程度的增加而迅速增加,但经过治疗后可迅速降低,是一种细菌感染程度的新型观察指标^[25];SP 并发胸腔积患者肺部感染后,IL-6 被激活释放,具有诸多生理活性,在肺部感染的病理过程中,与其他相关细胞因子共同发挥作用^[26];IL-8 可以强烈趋化炎症细胞释放相应的活性物质,造成组织损伤的发生,在患者肺部纤维化过程中起到重要作用,是肺部感染中的重要趋化因

子^[27];IL-10 也是一种重要的内源性炎症因子,抑制免疫应答,参与多种炎症反应的发生^[28]。上述血清炎症因子水平的变化也是对 SP 并发胸腔积液患者的肺部感染发生的一种佐证^[29]。文中病原菌分布及构成比显示,革兰氏阴性菌相对多于革兰氏阳性菌,可以对患者术后感染的治疗提供参考。Glu 是人体细胞新陈代谢中重要的物质,对于 SP 并发胸腔积液患者,由于胸腔积液以及炎症反应的作用,使其体内的 Glu 发生酵解作用,造成胸水 Glu 含量下降^[30],提示其水平与 SP 患者并发胸腔积液呈现负相关。

综上所述,自发性气胸患者术后并发胸腔积液与胸水 Glu 水平呈现负相关与肺部感染呈现正相关,且肺部感染患者中革兰氏阴性菌相对较多,对自发性气胸患者术后并发胸腔积液临床诊治具有一定的借鉴意义。

参考文献(References)

- [1] Mowery NT, Gunter OL, Collier BR, et al. Practice management guidelines for management of hemothorax and occult pneumothorax [J]. Journal of Trauma, 2015, 70(2): 510-518
- [2] 高威,朱江.胸腔镜手术治疗自发性气胸 70 例临床分析[J].浙江医学, 2014, 36(19): 1653-1655
- [3] Delpy JP, Pages PB, Mordant P, et al. Surgical management of spontaneous pneumothorax: are there any prognostic factors influencing postoperative complications?[J]. European journal of cardio-thoracic surgery: official journal of the European Association for Cardio-thoracic Surgery, 2016, 49(3): 862-867
- [4] Bintcliffe OJ, Hallifax RJ, Edey A, et al. Spontaneous pneumothorax: time to rethink management?[J]. Lancet Respiratory Medicine, 2015, 3(7): 578-588
- [5] Bobbio A, Dechartres A, Bouam S, et al. Epidemiology of spontaneous pneumothorax: gender-related differences [J]. Thorax, 2015, 70(7): 653-658
- [6] Herrmann D, Klapdor B, Ewig S, et al. Initial management of primary spontaneous pneumothorax with video-assisted thoracoscopic surgery: a 10-year experience[J]. European journal of cardio-thoracic surgery: official journal of the European Association for Cardio-thoracic Surgery, 2016, 49(3): 854-859

- [7] Glezos J, Toppin D, Cooney T. Mesenchymal cystic hamartoma presenting with spontaneous pneumothorax [J]. Canadian Respiratory Journal Journal of the Canadian Thoracic Society, 2016, 10 (5): 280-291
- [8] Bertolaccini L, Viti A, Boschetto L, et al. Analysis of spontaneous pneumothorax in the city of Cuneo: environmental correlations with meteorological and air pollutant variables [J]. Surgery Today, 2015, 45(5): 625-629
- [9] Li H, Zhou J, Chi C, et al. Clinical application of near-infrared thoracoscope with indocyanine green in video-assisted thoracoscopic bullectomy[J]. J Thorac Dis, 2016, 8(7): 1841-1845
- [10] Imperatori A, Rotolo N, Spagnoletti M, et al. Risk factors for postoperative recurrence of spontaneous pneumothorax treated by video-assisted thoracoscopic surgery? [J]. Interact Cardiovasc Thorac Surg, 2015, 20(5): 647-651
- [11] Gupta N, Langenderfer D, McCormack FX, et al. Chest Computed Tomographic Image Screening for Cystic Lung Diseases in Patients with Spontaneous Pneumothorax is Cost-effective [J]. Annals of the American Thoracic Society, 2016, 14(1): 254-259
- [12] Jeon S Y, Yhim H Y, Lee N R. Epithelioid sarcoma with spontaneous pneumothorax and massive pleural effusion [J]. Korean J Intern Med, 2016, 31(1): 191-193
- [13] 杨世杰,霍志荣,韩妮娜.胸腔镜治疗老年自发性气胸的临床研究与感染预防[J].中华医院感染学杂志, 2015, 25(2): 409-411
- [14] Igai H, Kamiyoshihara M, Ibe T, et al. Surgical treatment for elderly patients with secondary spontaneous pneumothorax [J]. General Thoracic & Cardiovascular Surgery, 2016, 64(5): 267-272
- [15] Jeon SY, Yhim H, Lee NR. Epithelioid sarcoma with spontaneous pneumothorax and massive pleural effusion [J]. Korean J Intern Med, 2016, 31(1): 191-193
- [16] Robinson PD, Blackburn C, Babl FE, et al. Management of paediatric spontaneous pneumothorax: a multicentre retrospective case series. [J]. Archives of Disease in Childhood, 2015, 100(10): 918-923
- [17] 周小江,徐刚.单孔和双孔胸腔镜手术治疗自发性气胸的对比研究[J].贵州医药, 2016, 40(4): 391-392
- [18] Pagès PB, Delpy JP, Falcoz PE, et al. Videothoracoscopy Versus Thoracotomy for the Treatment of Spontaneous Pneumothorax: A Propensity Score Analysis [J]. Annals of Thoracic Surgery, 2015, 99 (1): 258-263
- [19] Song IH, Lee SY, Lee SJ. Can single-incision thoracoscopic surgery using a wound protector be used as a first-line approach for the surgical treatment of primary spontaneous pneumothorax? A comparison with three-port video-assisted thoracoscopic surgery[J]. General Thoracic & Cardiovascular Surgery, 2015, 63(5): 284-289
- [20] Khan BA, Reddy PM, Khan AM. Spontaneous pneumothorax in the immediate post-operative hour in a primigravida following emergency caesarean section under spinal anaesthesia[J]. Indian J Anaesth, 2015, 59(2): 126-129
- [21] Qin SL, Huang JB, Yang YL, et al. Uniportal versus three-port video-assisted thoracoscopic surgery for spontaneous pneumothorax: a meta-analysis [J]. Journal of Thoracic Disease, 2015, 7 (12): 2274-2287
- [22] Gayatri devi Y, Usharani N, Premkumar A, et al. Clinical Profile of Spontaneous Pneumothorax in Adults: A Retrospective Study [J]. Indian Journal of Chest Diseases & Allied Sciences, 2015, 57 (4): 219-224
- [23] Bibby AC, Clive AO, Slade GC, et al. Survival in Patients With Malignant Pleural Effusions Who Developed Pleural Infection[J]. Chest, 2015, 148(1): 235-241
- [24] Min-Seok K, Yang HC, Mi-Kyung B, et al. Single-Port Video-Assisted Thoracic Surgery for Secondary Spontaneous Pneumothorax: Preliminary Results [J]. Korean Journal of Thoracic & Cardiovascular Surgery, 2015, 48(6): 387-392
- [25] Gan Z, Lin S, Han K, et al. Bilateral spontaneous pneumothorax in an osteosarcoma patient with pulmonary metastases: A case report [J]. Oncology Letters, 2016, 11(2): 1179-1185
- [26] Case JB, Mayhew PD, Singh A. Evaluation of Video-Assisted Thoracic Surgery for Treatment of Spontaneous Pneumothorax and Pulmonary Bullae in Dogs[J]. Veterinary Surgery Vs, 2015, 44(S1): 31-39
- [27] 向佳,李小燕.单孔胸腔镜治疗老年自发性气胸及术后血清学指标评估[J].中国医学装备, 2016, 13(7): 84-87
- [28] Adewole OO, De KT, Phillips AS, et al. Effectiveness of thoracoscopic talc pleurodesis in the management of complicated spontaneous pneumothorax [J]. Journal of Bronchology & Interventional Pulmonology, 2015, 22(1): 48-56
- [29] Lee SC, Lee DH. Influence of old pulmonary tuberculosis on the management of secondary spontaneous pneumothorax in patients over the age of 70 years [J]. Journal of Thoracic Disease, 2016, 8 (10): 2903-2910
- [30] Thomas R, Cheah HM, Creaney J, et al. Longitudinal Measurement of Pleural Fluid Biochemistry and Cytokines in Malignant Pleural Effusions[J]. Chest, 2016, 149(6): 1494-1500