SHORT COMMUNICATION

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Safety and effectiveness of uniportal video-assisted thoracoscopic surgery compared to triportal surgery: a single institution experience

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Abstract

Introduction: Uniportal video-assisted thoracoscopic surgery (VATS) has increasingly been used in thoracic surgery during the last decade.

Aim: To assess the safety and effectiveness of uniportal VATS compared to triportal VATS.

Material and methods: Data of a total of 318 patients between 2009 and 2019 who underwent uniportal and triportal VATS were reviewed. Bivariate statistical analysis using Pearson's χ^2 test was performed.

Results: Our data showed statistical differences only in complications and hospital stay between the 2 groups.

Conclusions: Uniportal VATS has a safe post-operative outcome and is comparable to triportal VATS.

Key words: video-assisted thoracoscopic surgery, lung resection, safety.

Introduction

Minimally invasive techniques, video-assisted thoracoscopic surgery (VATS), have become the standard of care in thoracic surgery [1, 2]. The concept of VATS surgery has progressed from the conventional triportal VATS to uniportal. The concept of single port VATS was described by Dr. Gaetano Rocco in 2004 for wedge lung biopsy [3]. In 2011 Gonzalez *et al.* successfully performed the first lobectomy using single port VATS [4]. With the increasing popularity of the uniportal VATS approach to manage thoracic surgical diseases, it should be noted that it requires a higher level of acquainted anatomical knowledge, a special surgical strategy and skill [5]. Despite increasing popularity of uniportal VATS as a diagnostic and therapeutic surgical technique, few studies have been conducted to compare between conventional thoracotomy and triportal VATS with a uniportal approach.

Aim

The aim of this study is to assess the safety and effectiveness and uniportal VATS compared to triportal VATS.

Materials and methods

A retrospective review of 318 patients who underwent uniportal (201) or triportal (117) VATS was conducted. Data were collected from clinical records of a chest disease hospital in Kuwait between October 2009 and March 2019. Patients recruited to the study underwent anatomic or non-anatomic resection of lung tissue. Cases included in the study were operated on by the same single surgeon to avoid selection bias. Demographic data, clinical diagnosis, intensive care unit (ICU) stay, post-operative complications, chest tube duration, and hospital stay duration were obtained.

Surgical technique

Patients were placed in a lateral decubitus position with single lung ventilation. For the triportal VATS, a 10 mm incision was performed in the seventh intercostal space mid-axillary line for the 30° camera port. Two more incisions 5 mm in length were made on the fourth intercostal space anterior axillary line and fifth intercostal space posterior to the mid-clavicular line. For the uniportal VATS, a single 10–20 mm incision was made in the fifth intercostal space anterior axillary line. Intercostal nerve block with ropivacaine was performed before incision closure. Size 24–28 Fr chest tubes were placed through camera-port incision.

Ethical approval and consent

The study was approved by the institutional board review committee in chest disease hospital. Since it is a retrospective study, patient consent was waived by the institutional board review committee.

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Table I. Demographic and clinical data

Parameter	Value
Age, mean (SD)	36.45 (17.4)
Gender, *n* (%):	
Male	252 (79.2)
Female	66 (20.8)
Nationality, *n* (%):	
Kuwaiti	208 (65.4)
Non-Kuwaiti	110 (34.6)
Surgery, *n* (%):	
Uniportal VATS	201 (63.2)
Triportal VATS	117 (36.8)
Clinical diagnosis, *n* (%):	
Bronchiectasis	9 (2.8)
Emphysematous bleb	5 (1.6)
Interstitial lung disease	55 (17.3)
Lung mass	47 (14.7)
Pneumothorax	202 (63.5)

Table II. Comparison between uniportal and three-port group

Parameter	Uniportal	Triportal	*P*-value
Age (mean)	37	33.8	0.266
Gender (*n*):	201	117	0.288
Male	163	89	
Female	38	28	
ICU stay (*n*)	3	3	0.5
Chest tube duration (mean) [days]	2.5	3.8	0.516
Hospital stay (mean) [days]	4.9	6.3	< 0.001
Complications:	9	11	0.023
Air leak	5	7	
Cardiac arrhythmia	0	1	
Chest infection	1	3	
Surgical emphysema	1	0	
Urinary retention	1	0	
Conversion to open thoracotomy	1	0	

Statistical analysis

Statistical analysis was performed using the IBM SPSS statistical package version 25. Unpaired Student's *t*-test was used to assess the significance of the means of variables between the 2 groups. Bivariate analysis using Pearson's χ^2 test was performed to ascertain the significance between two categorical variables. The χ^2 test was replaced with Fisher's exact test if the cell frequencies of any of the 2x2 contingency tables fell below 5. A *p*-value of < 0.05 was considered statistically significant.

Results

Demographic and clinical data of the patients are listed in Table I. A total of 318 patients (252 male, 66 female) were included in the study with mean age of 36.45 ±17.4. Clinical diagnosis for patients recruited to the study was bronchiectasis (2.8%), emphysematous bleb (1.6%), interstitial lung disease (17.3%), lung mass (14.7%), and pneumothorax (63.5%). Two hundred and one uniportal (63.2%) and 117 triportal (36.8%) VATS were performed.

Table II describes the comparison between uniportal and triportal VATS. No statistically significant difference was found between the two groups in age, gender, ICU stay and chest tube stay. Hospital stay was significantly shorter in uniportal VATS compared to triportal VATS ($p < 0.001$). In addition, fewer complications associated with uniportal VATS were found than with triportal VATS ($p < 0.05$). Complications reported were air leak, cardiac arrhythmia, chest infection, surgical emphysema, urinary retention and conversion to thoracotomy. One case reported in uniportal VATS converted to thoracotomy due to injury to pulmonary artery.

Discussion

Despite the available evidence in the literature that supports the safety of uniportal VATS, there is still much debate over its use as a standard of care [6]. Gonzalez-Rivas raised the issue of the need of more solid evidence to define the role of uniportal VATS [7]. Since its introduction more than one decade ago, only one randomized controlled trial (RCT) has compared post-operative outcome between uniportal and other VATS techniques [8].

This study was conducted to determine whether uniportal VATS can be applied as a routine surgical method for anatomic or non-anatomic resection of lung tissue. Data described 10 years' experience at a chest disease hospital in Kuwait, including ICU stay, chest tube duration, hospital stay, and, more importantly, surgical complications.

A meta-analysis that included 8 studies performed by Harris *et al.* showed statistically significant reduction in hospital stay for patients who underwent uniportal VATS compared to multiportal ($p < 0.0001$) [6]. In addition, there was a significant reduction in morbidity when using the uniportal technique ($p = 0.009$). In our study, we report similar findings. Only hospital stay and surgical complications were found to be significantly lower in the uniportal group.

In the literature, the rate of conversion to open thoracotomy from conventional VATS surgery is in the range 2–23% [9]. In this study, only 1 (0.5%) case from the uniportal group converted to open thoracotomy.

Conclusions

Uniportal VATS can be performed with a relatively safe and similar post-operative outcome compared to triportal VATS. In our institution, patients operated on with uniportal VATS had shorter hospital stay and fewer complications. Yet, randomized controlled trials are required to verify uniportal VATS advantages. Future studies are required to evaluate cost effectiveness of uniportal VATS, with follow-up to assess the surgery efficacy.

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Disclosure

The authors report no conflict of interest.

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