Long-term outcomes after a variety of video-assisted thoracoscopic lobectomy approaches for clinical stage IA lung cancer: A multi-institutional study

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Received for publication Dec 14, 2005; revisions received March 3, 2006; accepted for publication March 28, 2006.

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J Thorac Cardiovasc Surg 2006;132:507-12

0022-5223/$32.00

doi:10.1016/j.jtcvs.2006.03.058

Background: Although video-assisted thoracic surgery (VATS) has been in use for more than a decade, its application to major lung resection for lung cancer is still not widely practiced. The success of a cancer operation is judged by the long-term survival of the treated patients. Therefore, the goal of the present study was to evaluate long-term outcomes associated with various video-assisted lobectomy techniques and conventional surgery in patients with peripheral non–small cell lung cancer less than or equal to 2 cm in diameter (stage IA).

Methods: A multi-institutional, retrospective review was performed in 145 consecutive patients. Patients with clinical stage IA disease, with tumor size less than or equal to 2 cm in diameter, from three institutions underwent a complete VATS (c-VATS, n = 56), an assisted VATS (a-VATS, n = 34), or a conventional open (open, n = 55) approach for pulmonary lobectomy and lymph node dissection.

Results: Patients undergoing lobectomy and lymph node dissection with c-VATS had less blood loss, faster recovery, shorter hospitalization, and longer operating times than did patients undergoing the lobectomy with the a-VATS and open approaches. At a mean follow-up of 38.8 months, Kaplan-Meier probabilities of survival at 5 years were as follows: c-VATS, 96.7%; a-VATS, 95.2%; open, 97.2%. There was no significant difference in the rate of recurrence among the 3 different procedures.

Conclusion: VATS lobectomy, a safe procedure with earlier return to normal activities, can be regarded as an acceptable cancer operation for the patients with peripheral non–small cell lung cancer less than or equal to 2 cm in diameter (clinical stage IA) with the same long-term survivals as open surgery.

Although video-assisted thoracoscopic (VATS) lobectomy with hilar and mediastinal lymph node dissection has been used for more than a decade in the management of patients with lung cancer,[1,2] this technique is still not widely practiced.[3,4] Many surgeons have expressed concerns about the adequacy of VATS lobectomy as a cancer operation. An early, small, multi-institutional randomized study of lobectomy failed to demonstrate any benefit of VATS over thoracotomy.[5] However, one problem with this type of study is that the VATS lobectomy procedures include a broad spectrum of operative techniques that range from complete endoscopic surgery to minithoracotomy with a thoracoscope serving only as a light source.[6] This variability in VATS techniques may contribute to confusion regarding the benefits of VATS lobectomy for management of lung cancer. Indeed, we[7] previously demonstrated that different VATS lobectomy techniques yielded different perioperative outcomes. Nonetheless, enough evidence to suggest that VATS lobectomy as a treatment for lung cancer is not compromised in

VATS Lobektomi

- VATS lobektomi, hiler ve mediastinal LAP diseksiyonu ile birlikte, akciğer kanserli hastalar için yaklaşık 10 yıldır yapılmaktadır., ancak yaygın olarak kullanılmamaktadır.

- Bir çok cerrah, VATS'ın kanser için yapılan lobektomilerdeki etkinliğini sorgulamaktadır.

- İlk yapılan, küçün çok-merkezli randomize çalışma, VATS'ın torakotomiye olan üstünlüğünü gösterememiştir.

Genel Bilgiler

- Problemlerden biri de, VATS lobektomi olarak adlandırılan işlemlerin değişkenlik göstermesi ve tam olarak tüm işlemlerin videotorakoskopik olarak yapıldığı işlemden, minitorakotomi ile yapılan videotorakoskopi yardımlı işlemlere kadar geniş bir spektrumdaki işlemleri içermektedir.

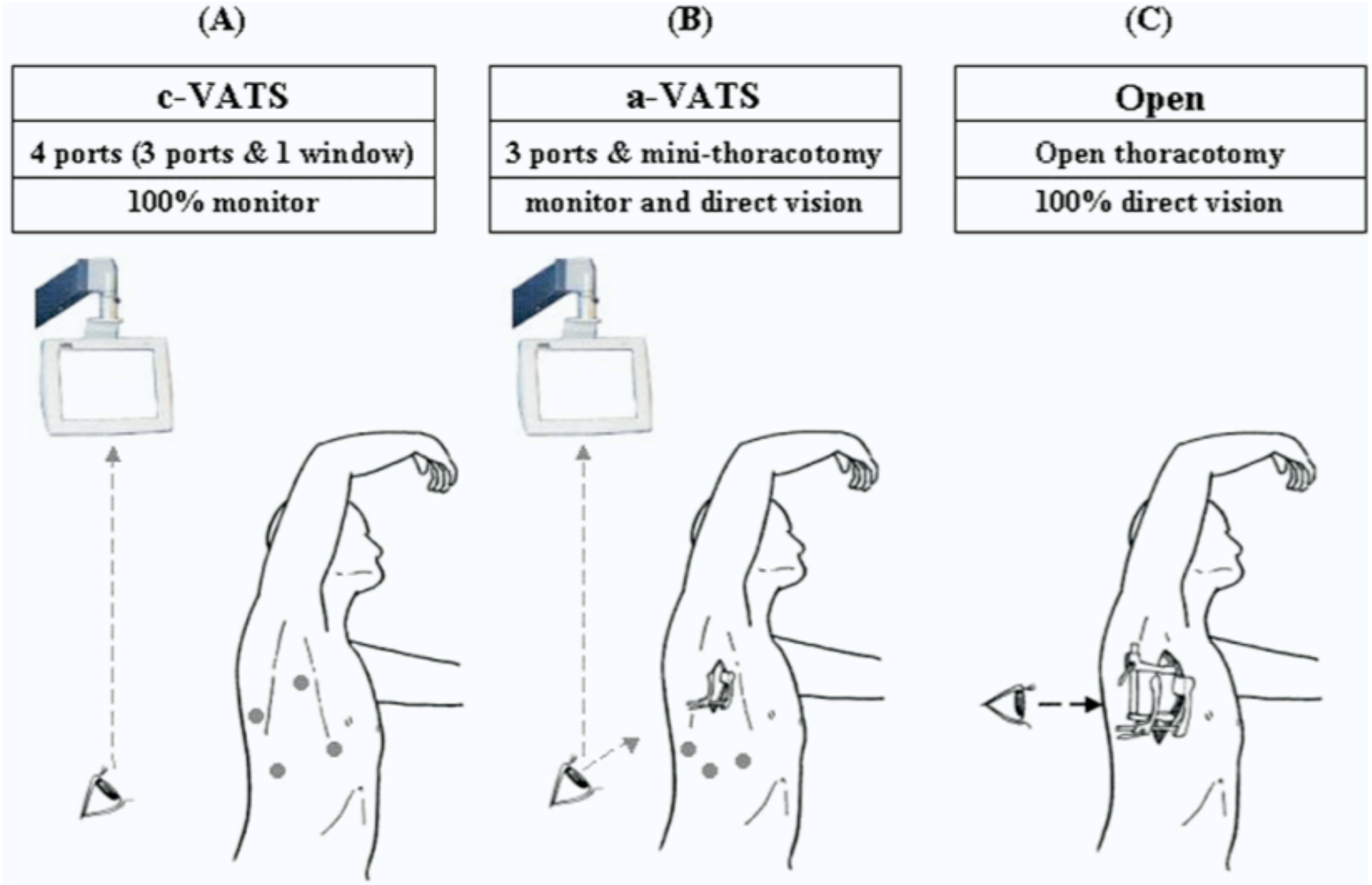
Hastalar ve Metodlar

- Klinik olarak evre IA olan (Ocak 1999 ila Ocak 2004 arasında opere edimiş) 145 ardışık hasta irdelendi. Hastaların tümünde tümörler 2cm ya da daha küçük idi.
- Hastalara VATS ya da konvansiyonel torakotomi ile rezeksiyon ve lenf nodu diseksiyonu yapıldı.
- Tüm hastalara, toraks, üst abdomen ve kranial tomografi çekildi.
- Klinik olarak gerekli olduğunda karaciğer ultrasonu ve kemik sintigrafisi çektirildi.
- Standart akciğer fonksiyon testleri yapılarak fonksiyon açısından uygun hastalar seçildi.

Hastalar ve Metodlar

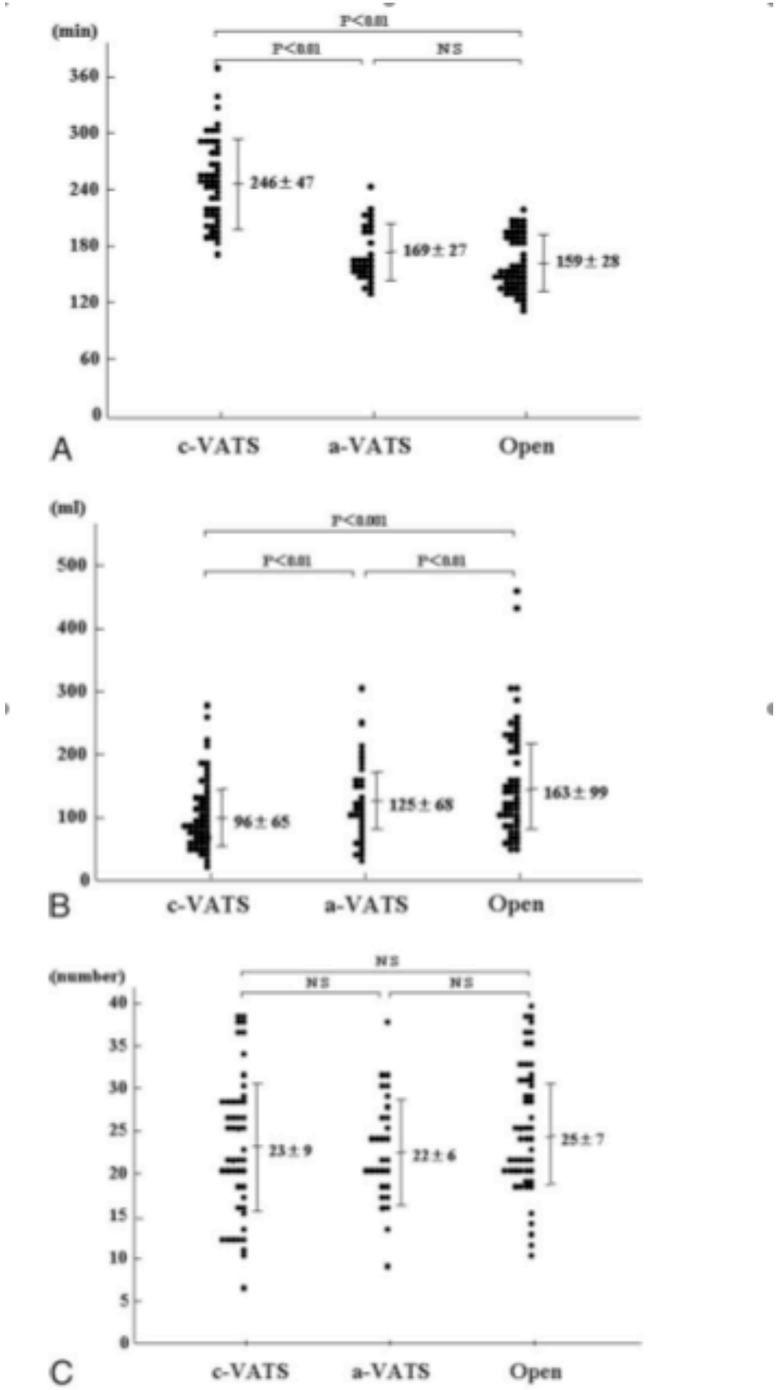
- c-VATS: Tamamen endoskopik olarak, kostaları ayırmadan
- a-VATS: 10 cm'lik minitorakotomi ile VATS yardımlı rezeksiyon.

- Açık metod : 20 cm 'lik torakotomi ve lenf nodu diseksiyonu.
- 9 olguda işleme değişiklik yapıldı:
  - c-VATS'den a-VATS'a 4 hasta
  - c-VATS'dan açığa 2 hasta
  - a-VATS'dan açığa 3 hasta. (Pulmoner arter çevresi yapışıklık(n=3), ciddi intratorasik adhezyonlar(n=2), stapler problemi (n=2), akciğerin çökmemesi (n=2).


(A)
(B)
(C)
c-VATS
4 ports (3 ports & 1 window)
100% monitor
a-VATS
3 ports & mini-thoracotomy
monitor and direct vision
Open
Open thoracotomy
100% direct vision

$FEV_{1.0}$ (L)	2.28 ± 0.65	2.32 ± 0.58	2.45 ± 0.93
$FEV_{1.0}$ (%)	72.6 ± 9.8	74.9 ± 7.6	76.0 ± 8.8
Histology			
Adenocarcinoma	34	26	38
Squamous cell carcinoma	8	2	6
Bronchioloalveolar carcinoma	5	3	7
Adenosquamous carcinoma	1	0	1
Large cell carcinoma	2	0	3
Lobectomy site			
RUL	16	10	17
RML	5	2	3
RLL	11	7	12
LUL	11	8	16
LLL	7	4	7
Total	50	31	55

$FEV_{1.0}$, Forced expiratory volume in 1 second; *RUL,* right upper lobe; *RML,* right middle lobe; *RLL,* right lower lobe; *LUL,* left upper lobe; *LLL,* left lower lobe.


(min)
P<0.01
P<0.01
NS
360
300
240
180
120
60
0
246 ± 47
169 ± 27
159 ± 28
A
c-VATS
a-VATS
Open
(ml)
P<0.001
P<0.01
P<0.01
500
400
300
200
100
0
96 ± 65
125 ± 68
163 ± 99
B
c-VATS
a-VATS
Open
(number)
NS
NS
NS
40
35
30
25
20
15
10
5
0
23 ± 9
22 ± 6
25 ± 7
C
c-VATS
a-VATS
Open

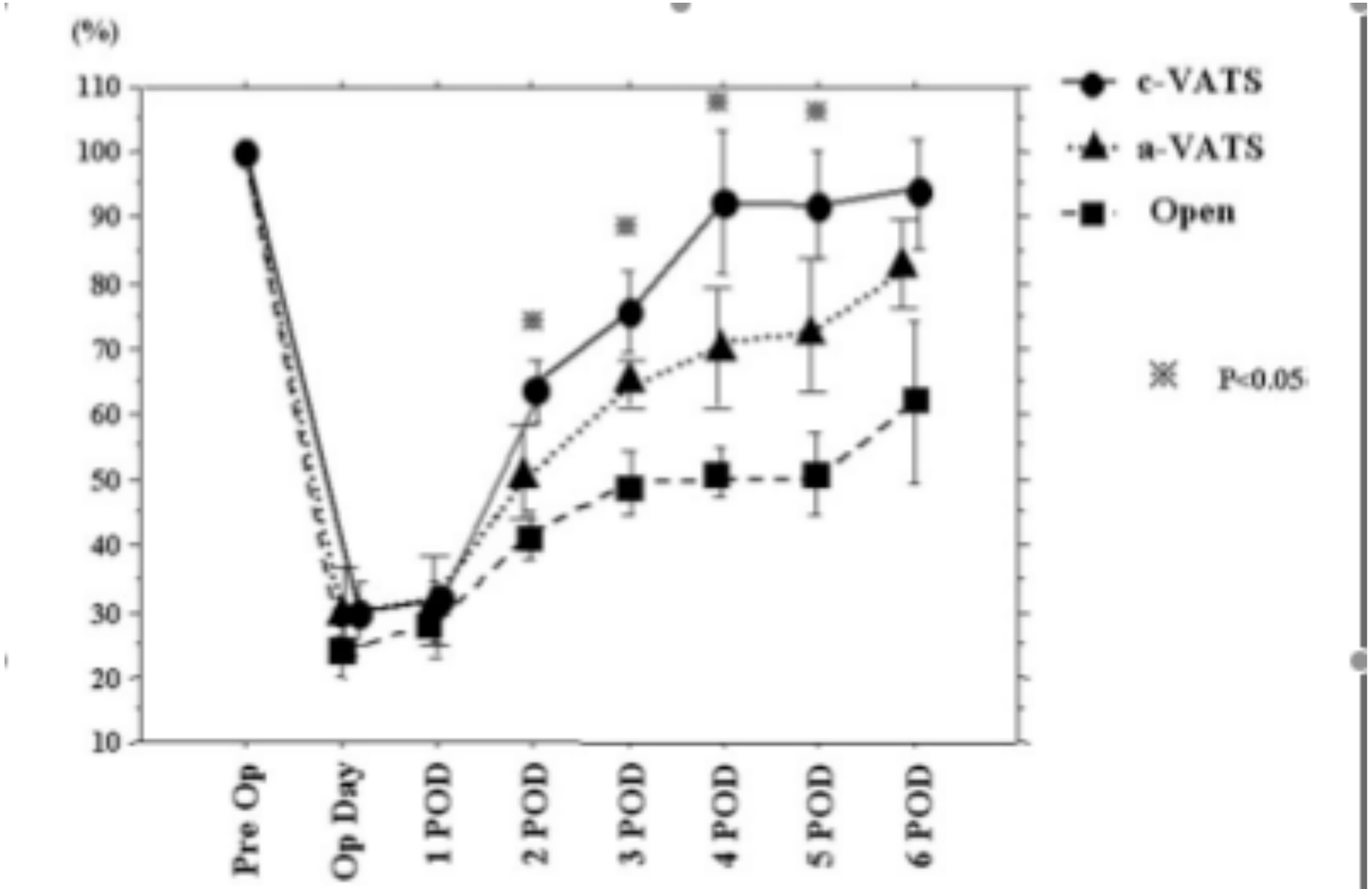
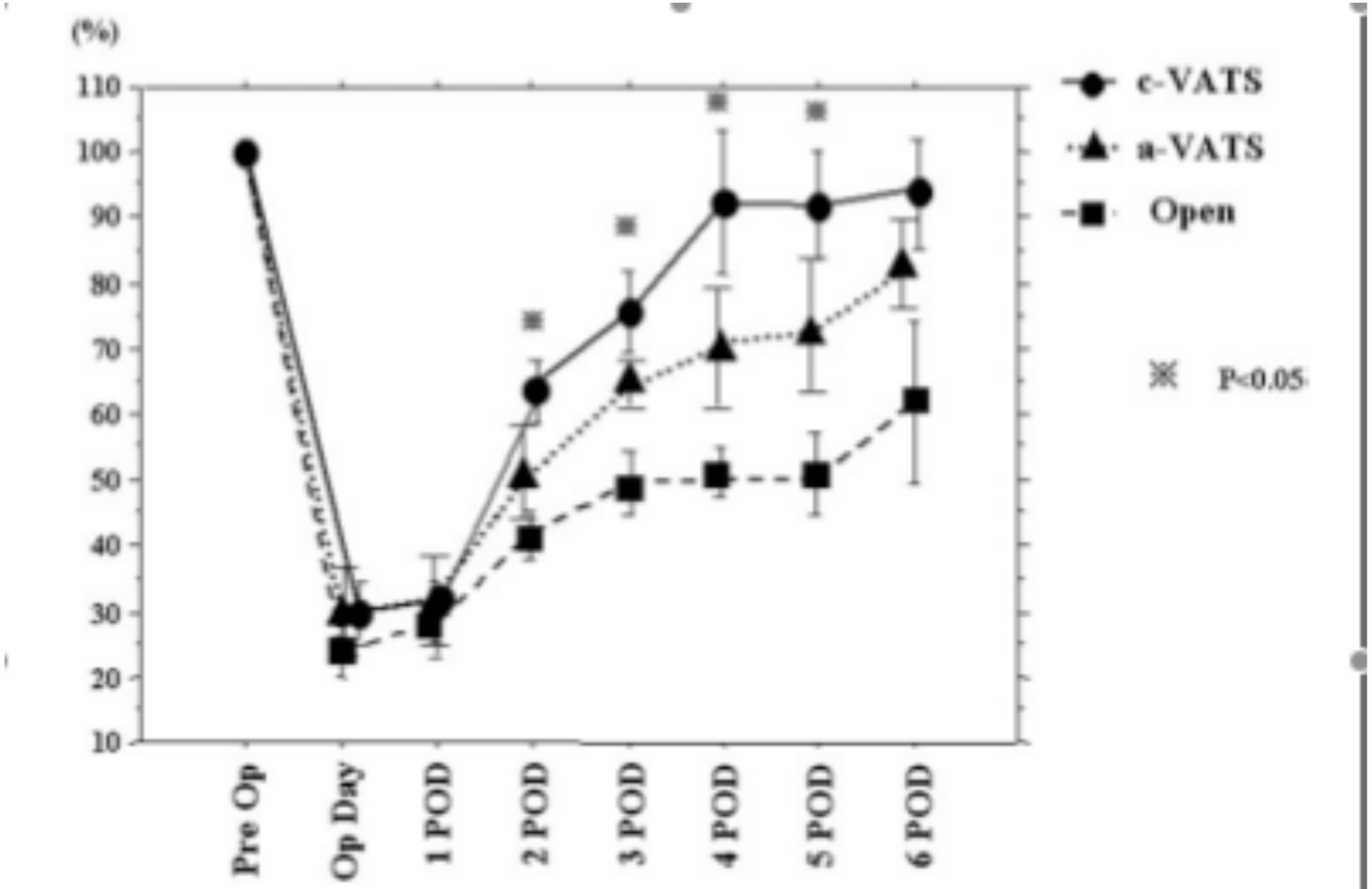


Figure 3. Comparison of the postoperative physical ability as determined by Active Tracer and expressed as the percentage of the preoperative 24-hour value. Time points included are before surgery and 0, 1, 2, 3, 4, 5, and 6 days postoperatively. Each value represents the mean ± standard error at each time point. *$P < .05$ for complete VATS *(c-VATS)* versus assisted VATS *(a-VATS).*



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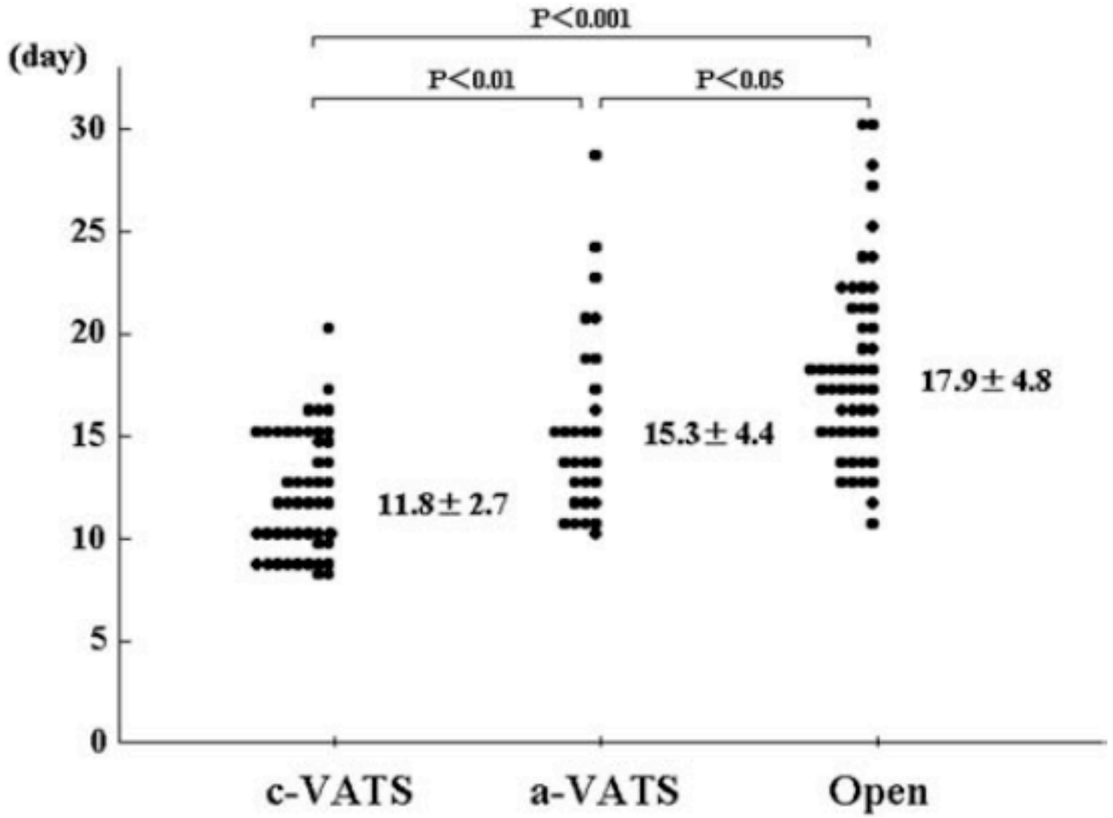

Figure 4. Length of hospitalization. Values are mean ± standard deviation. *c-VATS,* Complete VATS; *a-VATS,* assisted VATS.

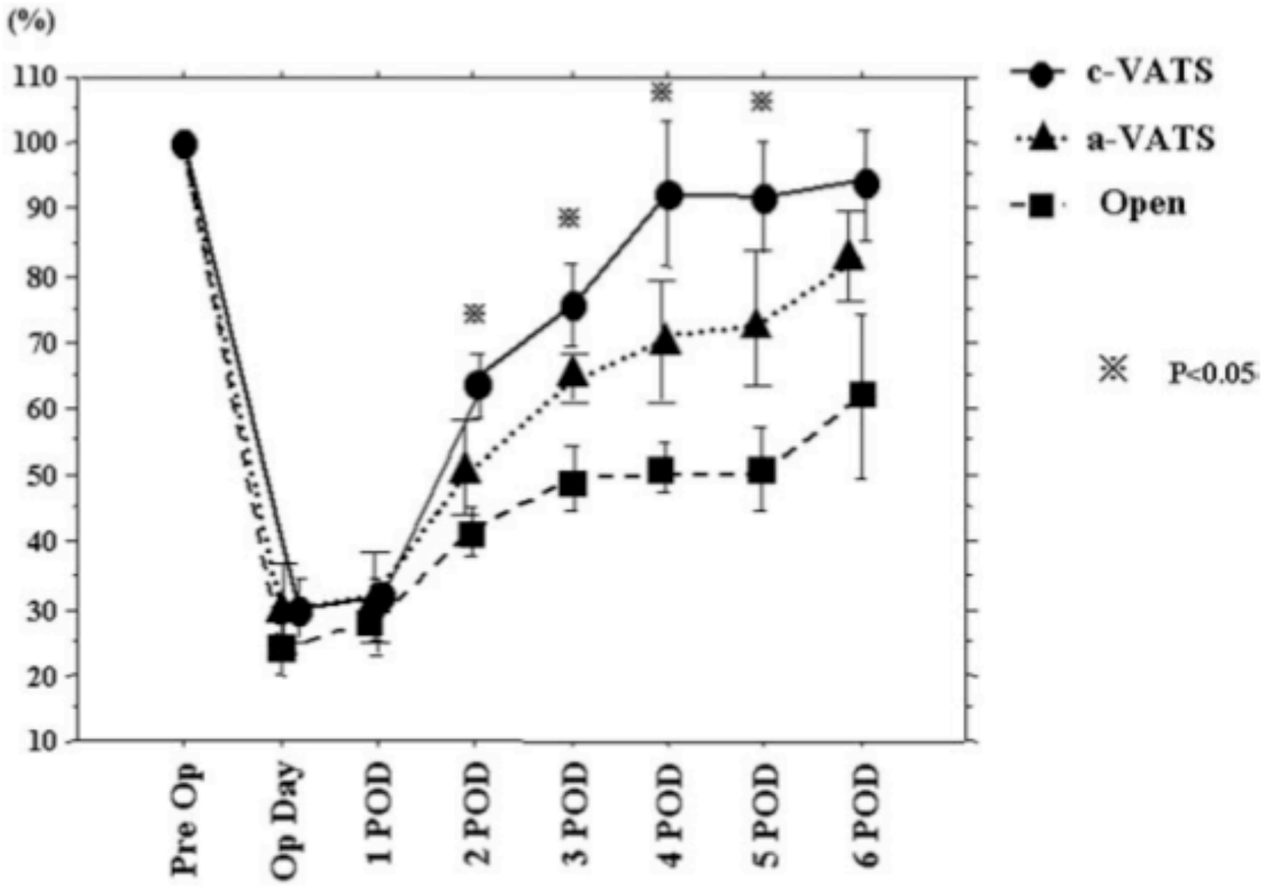

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TABLE 2. Complications after the operation

Complication	No. of cases
c-VATS (50 cases)	
Prolonged air leak	1
Chylothorax	1
Arrhythmia	1
Total	3/50 (6%)
a-VATS (31 cases)	
Prolonged air leak	1
Arrhythmia	1
Total	2/31 (6%)
Open (55 cases)	
Prolonged air leak	1
Pneumonia	1
Liver dysfunction	1
Total	3/55 (5%)

c-VATS, Complete video-assisted thoracic surgery; *a-VATS,* assisted video-assisted thoracic surgery.

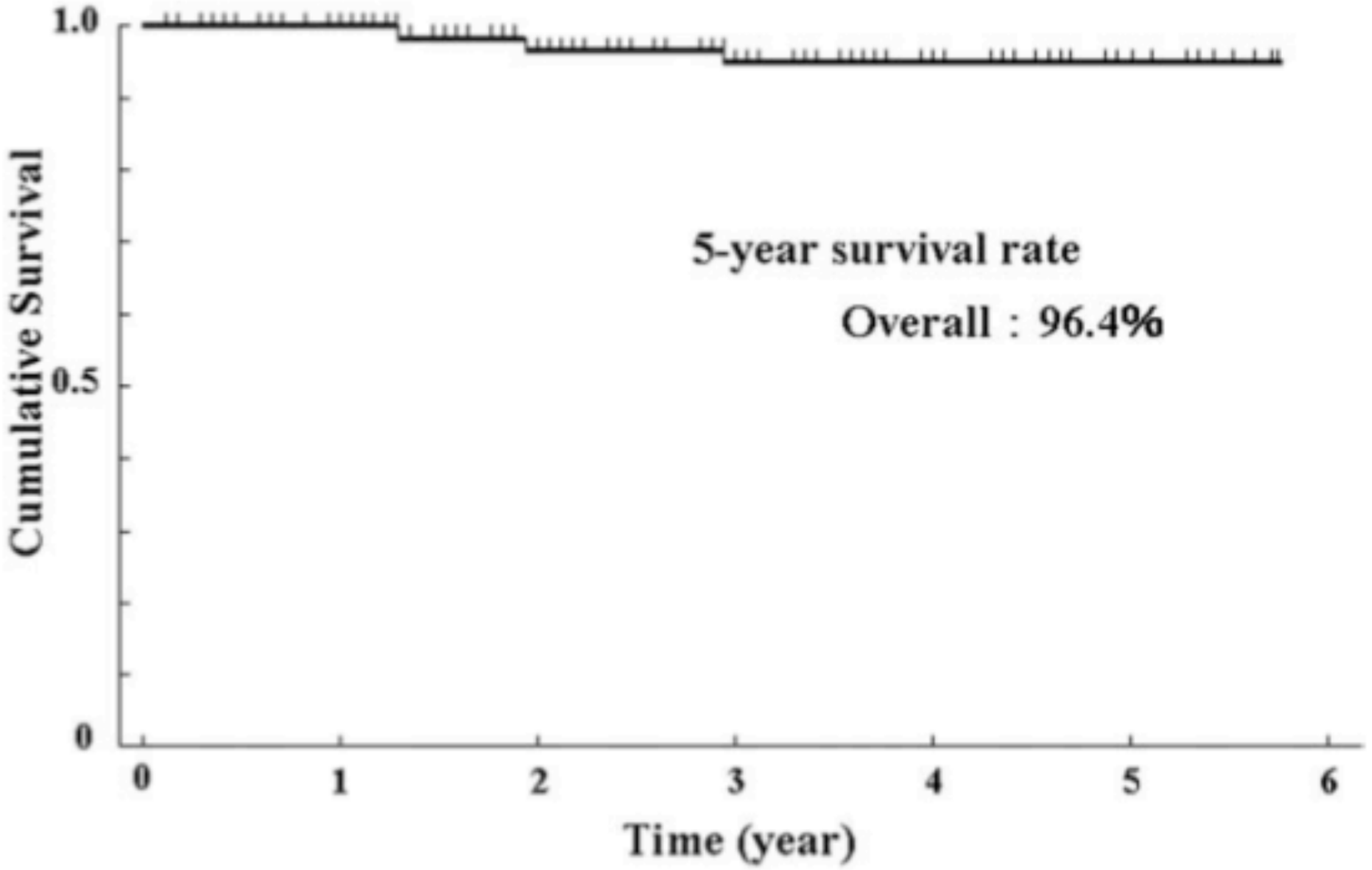

Figure 5. Kaplan-Meier survival curve showing the overall survivals after surgery for stage IA non–small cell lung cancer. Causes of death included brain metastasis (n = 1), other cancers (n = 2), and different disease (n = 1).

TABLE 3. Recurrent diseases

	Local recurrence	Metastasis	Other disease
c-VATS (50 cases)	No	Brain metastasis, 1 case; dead Bone metastasis, 1 case; dead	Pancreatic cancer, 1 case; dead
a-VATS (31 cases)	No	Bone metastasis, 1 case; alive	Colon cancer, 1 case; dead
Open (55 cases)	Local recurrence, 1 case; alive	Liver metastasis, 1 case; alive	Pneumonia, 1 case; dead

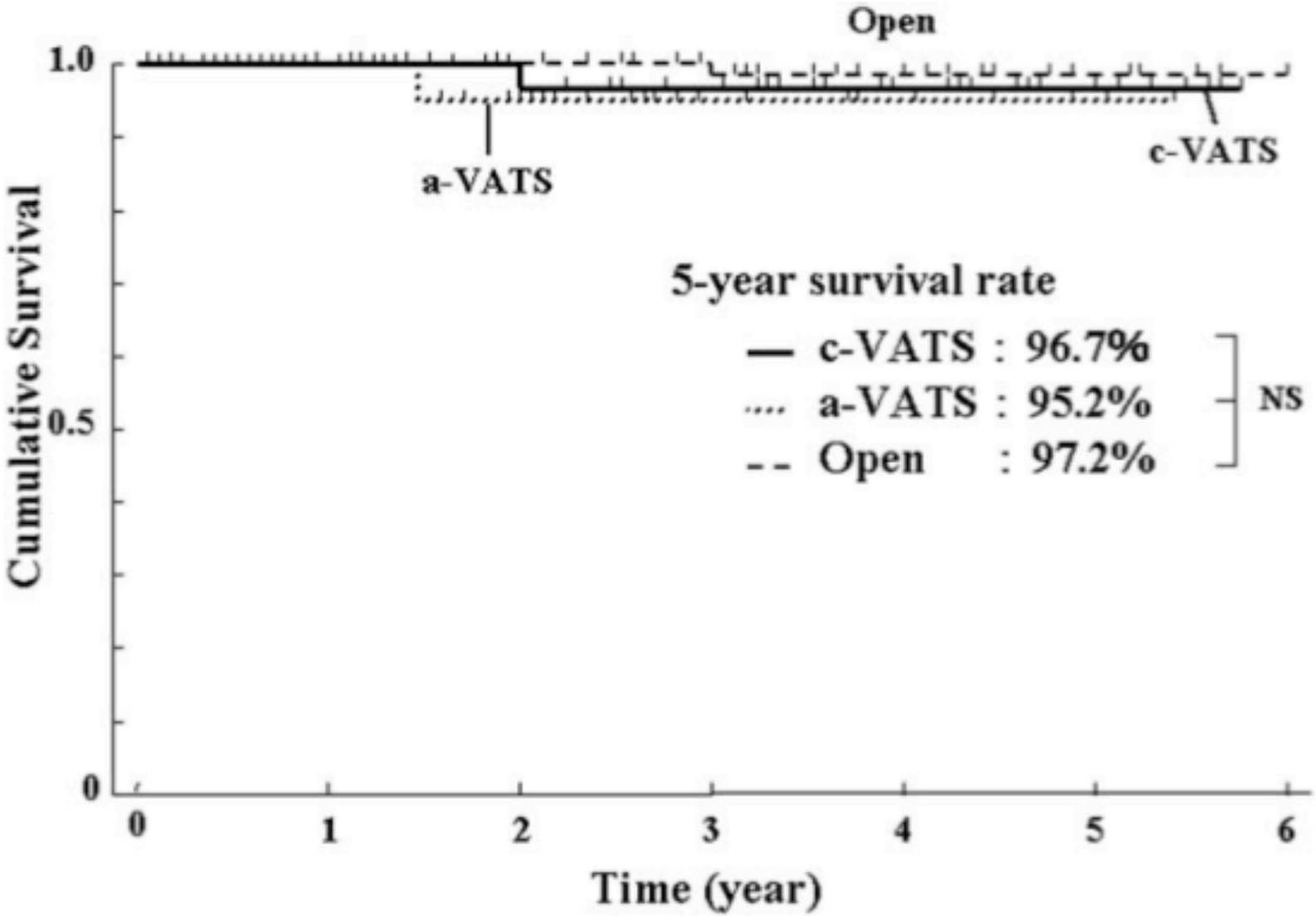

Figure 6. Kaplan-Meier survival curves for patients with clinical stage IA disease who underwent lobectomy under complete VATS *(c-VATS)*, assisted VATS *(a-VATS)*, or open conventional thoracotomy.

Tartışma

- Giderek daha fazla çalışmada, VATS ile yapılan ameliyatlarda hastanın bağışıklık fonksiyonlarının daha iyi korunduğu, sitokin yanıtlarının daha az olduğu ve lenfosit fonksiyonlarının VATS ile daha iyi korunduğu belirtilmektedir.

- ‘Immun-surveillance’ tümör immünolojisinde geçerli bir teoridir ve immün fonksiyonların korunması, hem tümöre hem de metastazlarına karşı daha iyi bir bağışıklık yanıtı anlamına gelebilir.

Tartışma-2

- VATS ile rezeksiyon kısıtlı ve belli merkezlerde yapıldığından bu çalışmaya kadar, VATS-rezeksiyonların akciğer kanserli hastalardaki sağkalımı nasıl etkilediğine dair bir çalışma yoktu. Veriler, daha önceki açık cerrahiden elde edilen verilerin karşılaştırmasına dayanıyordu.
- Videotorakoskopik işlemlerin de değişik şekillerde yapılması bu karşılaştırmanın anlamını azaltıyordu.
- Bu çalışmada, c-VATS'ın a-VATS'a göre daha az hastanede kalış süresi gerektirdiği, daha hızlı iyileşme süreci sağladığı görülüyor. Bu da daha iyi korunmuş bağışıklık parametrelerine bağlı olabilir.

Tartışma-3

- Bu çalışma, deneyimli ellerde, videotorakoskopik lobektominin, güvenli bir yöntem olduğunu ve yararının erken postoperatif dönemin çok daha ötesinde de izlendiğini gösteriyor.

- VATS-lobektomi, periferik ve çapı 2 cm'nin altında olan hastalarda, bir cerrahi alternatif olarak düşünülebilir. Sağkalımları açık operasyonla sağlandığı kadardır.