

## Pulmonary Granuloma Possibly Caused by Staples after Video-assisted Thoracoscopic Surgery

Masaki Tomita, MD, Yasunori Matsuzaki, MD, Masao Edagawa, MD,  
Tetsuya Shimizu, MD, Masaki Hara, MD, and Toshio Onitsuka, MD, PhD

**A 74-year-old man, with a history of colon cancer resection and video-assisted thoracoscopic surgery (VATS) resection of pulmonary metastases, was found to have a left pulmonary nodule near the previous staple-line. The size of this nodule increased during follow-up. Because of this clinical course, this nodule was considered to be a tumor recurrence at the staple-line, and pulmonary re-resection was performed. The pathologic diagnosis of this nodule was foreign body granuloma (FBG) possibly due to previous surgical staples. FBG induced by staples may be a rare complication in VATS. (Ann Thorac Cardiovasc Surg 2003; 9: 123–5)**

**Key words:** foreign body granuloma (FBG), staple, video-assisted thoracoscopic surgery (VATS)

### Introduction

After the introduction of video-assisted thoracoscopic surgery (VATS), VATS is widely performed for pulmonary resection. VATS pulmonary resection was generally performed using an endoscopic linear stapler. The material of the staples is titanium, and it is generally accepted that an allergic reaction to titanium is very rare.<sup>1,2)</sup> Therefore, pulmonary foreign body granuloma (FBG) induced by staples is a rare complication.

We herein report a rare case of pulmonary FBG possibly due to staples after VATS resection.

### Case

A 74-year-old man, who had no allergic diseases, was admitted to our hospital with an abnormal pulmonary shadow on computed tomography (CT). He had received a sigmoid colectomy for sigmoid colon cancer in 1994. Subsequently, new bilateral lung masses developed in 1999. Then, he underwent right pulmonary upper lobectomy concomitant with a resection of the nodule of the

left upper lobe by means of VATS technique. No surgical staplers were used for right pulmonary lobectomy. Histologically, these tumors revealed metastatic adenocarcinomas consistent with a primary tumor of the colon. Seventeen months after pulmonary resection, a small left pulmonary nodule was found near the staple-line of previous VATS (Fig. 1A). Five months later, the pulmonary nodule increased in size during follow-up (Fig. 1B), suggestive of a cancer recurrence near the staple-line.

On admission, results of the preoperative evaluation were all within normal limits, including physical examination, pulmonary function tests, serum tumor markers, arterial blood gas values with the patient breathing room air, bone scan, and magnetic resonance images of the brain. No evidence of another metastatic disease was detected.

A left thoracotomy was performed. The nodule was found at the edge of previous staple-line and pulmonary wedge resection with sufficient surgical margin was performed using surgical staplers.

The pathologic analysis revealed that the nodule showed extensive fibrosis and chronic inflammation as well as non-necrotizing granuloma where a metal staple had been embedded and there was no evidence of malignancy (Fig. 2). The Ziehl-Nielsen stain for mycobacterium was negative. Although we did not perform aerobic, anaerobic and fungal cultures, this nodule was considered to be an FBG possibly due to previous surgical staples by pathologic findings.

*From Department of Surgery II, Miyazaki Medical College, Miyazaki, Japan*

Received September 30, 2002; accepted for publication October 22, 2002.

Address reprint requests to Masaki Tomita, MD: Department of Surgery II, Miyazaki Medical College, Kihara 5200, Kiyotake, Miyazaki 889-1692, Japan.

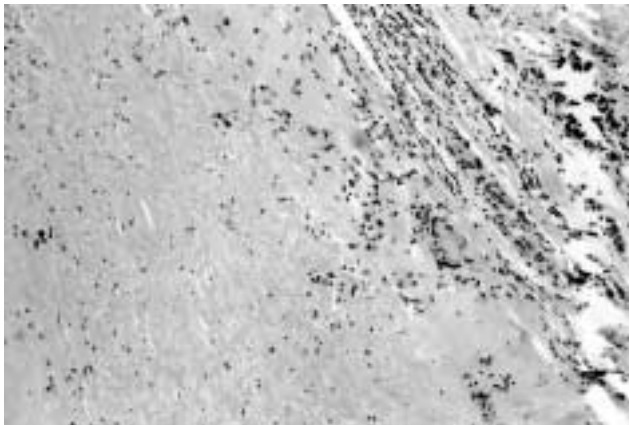


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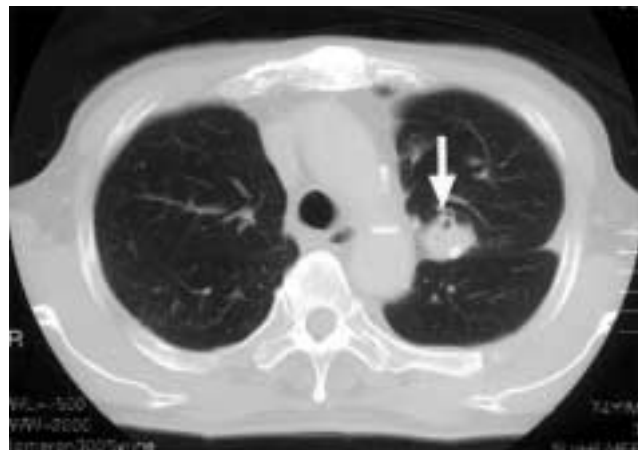


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**Fig. 1.** A small left pulmonary nodule was detected near the staple-line of previous VATS (A, arrow). Five months later, the pulmonary nodule increased in size during follow-up (B, arrow).



**Fig. 2.** The pathologic sections revealed chronic inflammation and extensive fibrosis.



**Fig. 3.** Four months after pulmonary re-resection, a new pulmonary nodule developed at the new staple-line (arrow).

The postoperative course was uneventful. However, four months after pulmonary re-resection, a new pulmonary nodule developed at the new staple-line (Fig. 3). In the light of his clinical course, this nodule is considered as a new FBG. We are now carrying out careful follow-up and the size of this nodule has remained unchanged during the last six months.

## Discussion

VATS procedures have been adopted widely and rapidly for the treatment of a wide range of benign and malignant thoracic disorders. Although some complications

after VATS, including port site tumor recurrence, prolonged air leak and pleural effusion, had been reported,<sup>3,4</sup> pulmonary foreign body reactions caused by staples had not been found in the previous reports. To the best of our knowledge, this is the first report of a pulmonary FBG possibly due to surgical staples.

Metal in living tissue is prone to corrosion.<sup>1,2</sup> The corrosion process is responsible for cell toxicity and stimulates fibroblast growth, protein and platelet adhesion. Metallic implants can interact with living tissue in three ways: (1) by electron exchange (redox reaction), (2) by proton exchange (hydrolysis), and (3) by complex formation (metal ion-organic molecule binding). However,

it is reported that titanium, with its low electrochemical surface potential, does not react as described while gold, stainless steel and most other metals induce all three reactions.<sup>1,2)</sup> Therefore, FBG induced by staples may be a rare complication in VATS. In the present case, the staples might have acted as a foreign object and thus initiated a foreign body reaction. Although this case did not have any history of allergic diseases, he might have sensitivity to titanium. In fact, there have been scattered reports of possible sensitivity to titanium.<sup>5,6)</sup> Although we did not perform a patch test, Yamauchi et al.<sup>6)</sup> reported a case with titanium sensitivity whose patch testing was negative for titanium.

It is of great interest that the nodule of the present case was detected at the edge of the staple-line. Furthermore, the new nodule after pulmonary re-resection was also found at the edge of new staple-line. If the cause of this nodule was simple sensitivity to staples, the granulomatous tissue should be theoretically formed surrounding all staples. Therefore, some additional factors might be contributed to the formation mechanism of this nodule.

In conclusion, we report a rare case of pulmonary FBG possibly due to staples after VATS resection. Surgeons should be aware of the possibility of FBG when a pulmonary mass lesion is detected in a patient who has been previously treated by stapled pulmonary resection.

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