

**Where are drains placed when used in surgery for thoracoabdominal aortic aneurysm?**

- Chest / abdominal region ----- 1
- Pleural space / retroperitoneal space ----- 2
- Pulmonary apex / retroperitoneum / diaphragm ----- 1
- 2 Blake drains for mediastinum & pericardium / 2 thoracic drains for pleural space ----- 1
- Mediastinum / pleural space ----- 1
- Dorsal side ----- 1
- 2 for pleural space, 2 for retroperitoneum, 1 for pericardium \*When open ----- 1
- Pericardium / anterior mediastinum ----- 3
- Lung dorsal / front ----- 1
- Pericardium / pleural space ----- 1

## Clinical benefits of the “coaxial drain”, a new type of drain tube for the thoracic cavity 2

- Innovative chest drainage with hybrid-type drain tube combining hole-type and fluted-type designs -

It is our privilege to introduce two surgeons who will talk about clinical benefits and points to note when using the coaxial drain, recently launched onto the market as a hybrid-type drain tube for thoracic surgery, for draining the thoracic cavity (respiratory surgery) and the thoracoabdominal region (cardiovascular surgery).

### Benefits of coaxial drain from the stand point of cardiovascular surgery

When used for trouble some postoperative drainage following thoracoabdominal aortic replacement, the coaxial drain helped prevent the retention of blood in the thoracic cavity, and thus contributed to improving postoperative recovery.

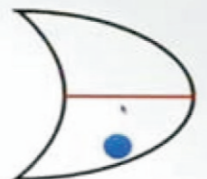


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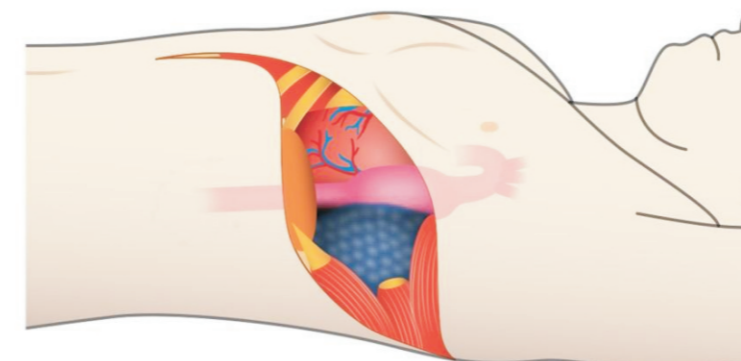
### Pleural space drain tubes after thoracoabdominal aortic replacement

Aortic grafting in the thoracoabdominal region is a highly invasive procedure associated with significant bleeding (Figure 1). Since many cases involve extensive separation work, vascular anastomosis, or adhesion of the lung and aorta, a large amount of bleeding can occur when separation is performed. This blood and any air leaking as a result of lung compression or injuries to the lung during surgery must be drained. If blood is retained in the pleural space due to poor drainage, it can apply pressure to the lungs, adversely affecting the respiratory condition and delaying postoperative recovery. Thus, chest drain tubes placed after thoracoabdominal aortic replacement must provide efficient drainage for bleeding and air leaks across a large space (Figure 2).

- Pleural cavity drainage after thoracoabdominal aortic replacement
  - Efficient drainage of blood and air is required for bleeding across a large space.



(Figure 2)



(Figure 1)

### Features of drain tubes used after thoracoabdominal aortic replacement

The drain tubes currently in use are mainly thoracic-type drain tubes, which have side holes, and fluted type drain tubes. A thoracic drain tube is a hard, large-bore (around 30 Fr) tube made of polyvinyl chloride. It is associated with high levels of patient discomfort and has a drainage area which is limited by the locations of the side holes. Although the areas in proximity to the holes drain well, these areas are small, and if the holes clog, the drainage becomes inadequate. By contrast, fluted-type drain tubes have a low risk of clogging due to the quadruple lumen design. However, it has been reported that they do not permit drainage over the entire length of the fluted as suction is only available around the start of the fluted. In the case that suction is to be applied to a large space such as the pleural cavity, it is necessary to generate negative pressure over a wider area.

# Clinical benefits of the “coaxial drain”, a new type of drain tube for the thoracic cavity 2


- Innovative chest drainage with hybrid-type drain tube combining hole-type and fluted-type designs -

## Features of coaxial drain

The coaxial drain is a hybrid drain tube that integrates the side hole-type and fluted-type designs. It is efficient and offers high-performance suction that enables blood drainage at the start of the fluted ends and air drainage at its tip. In view of the fact that a higher suction efficiency after surgery makes it less likely that blood will be retained in pleural space, one can say that the coaxial drain is suitable for drainage of the pleural space (Figure 3).

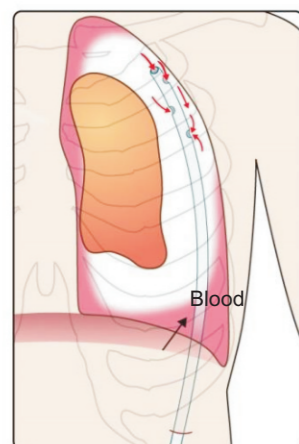
Pleural space drainage after thoracoabdominal aorta replacement surgery

- Coaxial Drain
  - Hybrid structure with side holes and fluteds
  - Enables efficient blood drainage over whole tube while removing air

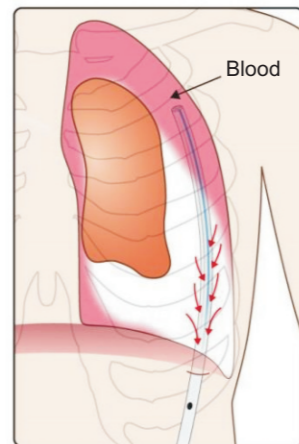


Kobe City Medical Center General Hospital (Figure 3)

Currently, use of thoracic drain tubes for pleural space drainage tend to result in inadequate drainage of the proximal region (Figure 4). Conversely, the fluted-type drain tubes tend to result in inadequate drainage of the distal region (Figure 5). With the fluted-type drains we have used up to this point, although the drain tubes do not tend to clog, we have often found that blood was retained in the pleural space due to inadequate drainage. However, since we started using coaxial drains, the number of cases in which blood is retained has reduced due to the reliable and efficient drainage of the large pleural spaces.



(Figure 4) Thoracic drain tube



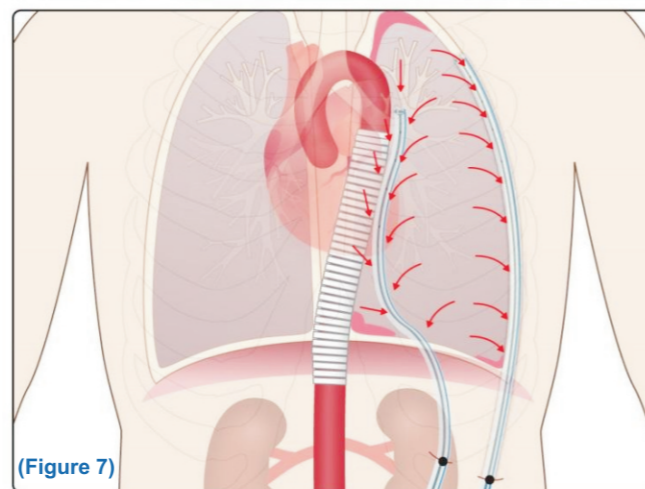
(Figure 5) Fluted-type drain tube

## Actual drain placement in thoracoabdominal aortic replacement surgery

For drainage of portions where there is no closed cavity, the performance of conventional fluted-type drain tubes is sufficient. Thus, in the retroperitoneal space near the prosthesis, a single 19 Fr smart drain tube (fluted type) is placed. For the left pleural space, two 24 Fr or 28 Fr coaxial drain tubes are placed. One is inserted through diaphragmatic surface so as to extend along the outer side of the lung towards the apical portion, and the other so as to extend from the inner side of the base of the lung towards the hilum. (Figures 6, 7). The reason for placing of two 28 Fr drain tubes is to enable drainage without leaving blood in the space, and so we do not believe this to be excessive.



(Figure 6)



(Figure 7)

### (Case review: Immediately after surgery)

Due to the time required to close the chest/abdomen after thoracoabdominal surgery, we often experienced cases in which blood had already accumulated in the thoracic cavity by the time X-rays were taken after closure. However, in cases where the coaxial drain was used, the space was drained without any problems at all.

### (Case review: POD#6)

It is not uncommon to find that steady bleeding, pneumothorax etc. precludes quick removal of the drains, but after postoperative day 6, there was no residual haemothorax at all. This absence of blood in comparison to previous cases gave us the impression that the drainage performance of the coaxial drain is very good (Figure 8).

Pleural space drainage after thoracoabdominal aorta replacement surgery

Case 1: 81-year-old woman

Kobe City Medical Center General Hospital

Pleural space drainage after thoracoabdominal aorta replacement surgery

Case 1: 81-year-old woman

Kobe City Medical Center General Hospital (Figure 8)

### [Clinical results]

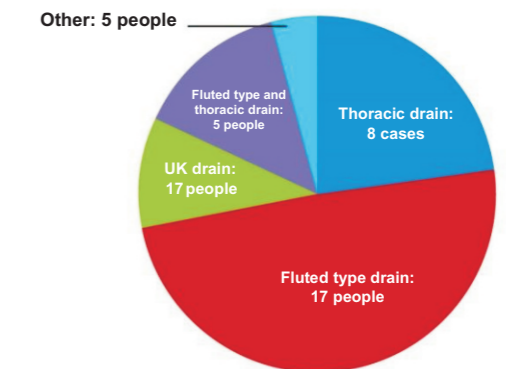
In our hospital, we conducted a study to compare the coaxial drain with conventional drain tubes. The study looked at 19 cases of thoracoabdominal aortic replacement between January 2017 and September 2018, with coaxial drains being used 11 cases and conventional fluted-type drain tubes in 8. In both groups, the tube size was 24 Fr and a total of 2 drain tubes were placed. There were no cases of postoperative hospital death, paraplegia or paraparesis. Moreover, whereas blood retention in the pleural space with the drain tubes in place was observed in 4 cases in the fluted-type drain group (small amount in 3 cases, medium amount in 1 case), no such blood retention was observed in the coaxial drain group.

### [Conclusion]

Coaxial drains having a hybrid structure that incorporates both fluteds and side holes enable effective drainage of blood and air during and after surgery to repair thoracoabdominal aortic aneurysms where drainage of a large space is required, and thus make it possible to avoid blood being retained in the pleural space. In addition, the Mera roller serves to lighten the workload of ICU nurses.

71st Thoracic Surgery seminar  
“Clinical benefits of coaxial drain tube”  
● Results of questionnaire  
(Cardiovascular surgery, Number of answers: 36 Includes multiple answers)

### Type of drainage used for thoracoabdominal aortic aneurysm



### Number of drains used for thoracoabdominal aortic aneurysm

