Why use right-sided double lumen tubes (DLT)?

- They work remarkably well.
- There are situations where there is no alternative, so having routine experience is important.
- There are minor advantages, even in routine use, for left-sided surgery.

How well do Right-sided double lumen tubes work?

Tube design

There is asymmetry in the bronchial anatomy of the right and left mainstem bronchi.

These measurements are in male patients (in mm) from Benumof. He found that there was more...
“play” possible in the positioning of left sided tubes, but that there was a margin for positioning right-sided tubes safely. In his study, the Mallinkrodt brand was more forgiving.

Similarly, our group found that classical latex Robershaw tubes, and Rusch disposable tubes positioned consistently well, but that Sheridan disposable tubes were designed too long. (It should be noted that all brands have modified and improved their design in the subsequent years.)

The major point is that right-sided tubes are more sensitive to design issues, and that currently available choices are quite satisfactory, although there remains an interest in further improvement.

**Comparison Studies**

Campos, et al did a prospective randomized study comparing right and left-sided DLT for patients undergoing routine left thoracotomy. In their hands, there was no difference in isolation or complications, and only a 90 second increase in time required.

<table>
<thead>
<tr>
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<th>Right DLT</th>
<th>Left DLT</th>
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<tbody>
<tr>
<td>Initial placement</td>
<td>minutes 3.37 (2.35-3.55)</td>
<td>2.08 (1.45-3.23)</td>
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<tr>
<td>Left lung collapse</td>
<td>minutes 13</td>
<td>10</td>
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<tr>
<td>Bronchoscopy exams</td>
<td>number 2</td>
<td>2</td>
</tr>
<tr>
<td>Surgical exposure</td>
<td>Excellent 19/19</td>
<td>Fair 0/19</td>
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<td></td>
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<td>19/20, 1/20</td>
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<tr>
<td>RUL post-op X-ray</td>
<td>Full expansion 17/17</td>
<td>18/18</td>
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Campos also studied right DLT against the Univent bronchial blocker and found no difference in outcomes. Of interest, in that study, right DLTs were being used for right-sided surgery – a less common practice.

Our practice (at Massachusetts General Hospital) is to place right DLT for all left-sided surgery (and left DLT for left and bilateral surgery). Among the dozen or so regular users of DLTs, the experience is uniformly positive. Like any regular practice, the surgeons expect contralateral tube placement, do not worry about the tube laterality on pneumonectomy, and have high expectations on our performance. What is interesting is that this practice extends to less frequent users.

Ehrenfeld et al looked through the automated anesthesia records for DLT placements among casual users of right DLT. In this balanced sample of 196 patients, there was no difference in a number of measures of ventilatory function (More hypercapnea among left DLT but the smaller lung volume of the left side may account for that).

So with good DLT selection, and modest experience, all the evidence suggests that right DLT is a safe technique.

**Strong indications for Right DLT**

**When is a right-sided double lumen tube mandatory?**

In brief: Whenever the left bronchus is distorted, damaged, compressed or absent.

1. Thoracic aortic aneurism.
2. Left bronchial tumor
3. Prior left mainstem reconstruction or left lung transplant.
4. Bronch-pleural fistula after left pneumonectomy
5. Left-mainstem kinking after left upper lobectomy
6. Penetrating or blunt trauma to the left mainstem bronchus (dropped lung).

Can a bronchial blocker be used for these cases?
In brief: Often no.

Since the bronchial blocker is placed on the side of lung isolation, cases of bronchial injury, tumor or anastomosis would not be safely isolated with a blocker.

Cases where the airway is kinked or externally compressed are more nuanced. A kinked airway can probably accommodate a blocker, but the anatomy will be mildly distorted and the blocker will need to be withdrawn periodically to check the repair.

With external compression, the blocker may be difficult to insert and may not seal well. With aortic aneurysm there is a risk that the blocker will cause aneurism rupture.

Can mainstem intubation with a single lumen tube avoid a right DLT?

This is a surprisingly common suggestion for these cases where left intubation is contraindicated. It would work mechanically, but a single lumen tube is not designed for bronchial placement. The smaller size single lumen tubes aren't long enough, and the distance from the start of the cuff to the end of the tube is quite long – appropriate for the trachea but not the right mainstem bronchus.

Here is a comparison photograph of a Rusch 7.0 I.D. SLT vs Mallinkrodt Broncho-Cath 39 Fr. Right DLT. Note that the cuff starts are aligned but the SLT cuff alone extends far beyond the total distal length of the DLT.
Thus, it only makes sense to use mainstem intubation with a single lumen tube in cases where you would also avoid a left DLT:

1. Pediatric airway (below the limits of DLT size)
2. Critical airway already intubated (e.g. trauma patient with neck instability)
3. Distorted or damaged trachea.

**Can a careful left DLT work in the “contraindicated” cases?**

Since the left mainstem bronchus is relatively long, sometimes careful placement of a left tube would be possible even with left bronchial disease. Good examples would be after left lung transplant (since the grafted bronchus is kept relatively short) and left upper lobe sleeve resection for tumor. A left DLT is less likely to work with compression, disruption, prior pneumonectomy or proximal lesions.

It should be noted that a practitioner skillful enough to place a left DLT proximal to left mainstem lesions should have no difficulty placing a right DLT – the considerations are identical: proximal placement and bronchoscopic confirmation of precise positioning. There is also elegance in having the tube well away from the surgical field and less likely to be dislodged. The bronchial cuff is also less likely to be punctured by surgical imprecision.
Are there advantages for right-sided tubes in routine use?

Anatomy

The right mainstem bronchus has straighter alignment to the trachea and larger lumen. DLTs naturally enter the right side. In our practice with even numbers of right and left sided tubes, left sided tubes enter the right lumen far more often than the converse.

There is the rare anatomic variant of high right upper lobe take-off (porcine bronchus) which would be a contraindication for right DLT. In general, the depth of insertion of the right DLT with respect to the carina needs to be more precise, but in practice, right-sided tubes are remarkably easy to place, and place correctly.

Familiarity

No technique should be reserved only for exceptional circumstances and expect to be performed well. Since there are cases that require right sided tubes, and since right sided tubes can be placed routinely safely and successfully, a wise anesthesiologist will place them frequently.

Dislodgment and obstruction

Clearly many practitioners use left DLTs for almost all their practice, so they must function quite well on the whole. Still there are problems and inconveniences with ipsilateral DLT placement that are probably accepted as unavoidable.

Using a DLT on the side opposite surgery means that the bronchus being ventilated is intubated. The usual position for thoracotomy lateral and extended, tends to push the tracheal wall medially, narrowing the trachea just above the carina. Ventilating the right lung with a left sided tube essentially blocking the left mainstem bronchus means right lung ventilation is though this narrowed tracheal portion. Ventilating with a contralateral DLT avoids this potential problem.

Similarly, surgical manipulation, particularly medial work like isolating the bronchus and sampling mediastinal nodes, can dislodge the ipsilateral bronchial tube. Left pneumonectomy in particular requires care to have a very proximal left DLT and to make sure the tube is not caught in the bronchial staple line.

Barriers to adoption of right DLT

Overview

This is the section dealing to practicalities of making a practice change. Like any new technique, you'll have to invest some social capital, select your opportunities, and partner with your surgeons. The benefit is being recognized as a truly skilled, and having confidence to use right-sided tubes when the situation calls for them.

Training in an unfamiliar technique
Unless you've placed many right-sided tubes, the barrier to starting seem high. Fears about unfamiliar anatomy, unhappy surgeon, and custom make the task foreboding. In truth, right DLTs are not significantly harder after minor experience. Similar barriers were perceived with ultrasound placement of blocks and lines, video laryngoscopes, and even fiberoptic bronchoscopy. All these techniques are now commonplace and indeed required.

The key point for right-sided DLT placement is to make sure the bronchial cuff is just past the carina. There are two parts to this:

1. identification of the carina viewed through the tracheal lumen
2. identification of the bronchial cuff (as opposed to the colored plastic above the cuff).

Even Benumof’s illustration[1] can be improved, by bringing the cuff of the bronchial lumen as proximal as possible (looking at the medial rather than illustrated lateral aspect). See the third (modified) panel.
Convincing surgeons

Much of the reluctance to right DLTs is historical practice. When anesthesiologist rarely had access or skill in fiberoptic exams, the simplest lung isolation techniques seemed prudent. This becomes a self-reinforcing mantra. “Right DLTs are difficult, so we should avoid them.” Why accept an expectation of the lowest skill level?

Explain your reasoning to the surgeons, and the technique and commitment you have. Not only will the effort show your willingness to advance your practice, they will be more confident in a fully skilled partner.

References


