

Simple to simplest: the tubeless technique

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Submitted Jan 10, 2017. Accepted for publication Feb 20, 2017.

doi: 10.21037/jtd.2017.02.55

View this article at: <http://dx.doi.org/10.21037/jtd.2017.02.55>

Immediate recovery from thoracic surgery, twenty years ago, this was only a dream of thoracic surgeons. However, in 2016 we have seen the development of techniques culminate to take what may have been a 5-day recovery 20 years ago (1), to immediate patient ambulation and oral intake post operatively and patient discharge within 24 hours (2).

The goal of surgeons and hope of patients is faster postoperative patient recovery and better postoperative quality of life. Many techniques and technological advancements have been made in the past 23 years in the pursuance of this goal. Minimally invasive surgery was the first concept developed in the attempt to reduce patient recovery time. It began 23 (1994) years ago with laparoscopic surgery (3), the first technique used as an alternative option to thoracotomy, followed by the development and now worldwide implementation of video assisted thoracic surgery (VATS).

While faster patient recovery first progressed from the reduction of incision size then number, with the introduction of the needlescopic (4) and then uniportal (5) VATS technique we have seen the stagnation of what is possible in regards to incision reduction. This resulted in a shift of focus from direct surgical trauma to associated trauma, or in other words, reduction or avoidance of common complications and complaints. By reducing complications, we consequently shorten the length of recovery.

Recently, this shift of focus has produced some key developments in the field of thoracic surgery; most specifically, minimally invasive anesthesia (6) and tubeless VATS techniques (2). Anesthesia can heavily impact the

patient's postoperative speed of recovery. Minimally invasive anesthesia can ease the process of thoracic surgery with less anesthetic trauma and thus allow faster postoperative recovery. The first minimally invasive anesthesia method was introduced by Pompeo *et al.* (7) in 2004 with the performance of the first modern non-intubated anesthesia thoracic procedure. Patients performed under this anesthetic method can generally eat and drink within 6 hours postoperatively and in some cases immediately resume moderate physical activity such as walking from the operation room to their recovery room after the operation (2). However, the aim of minimally invasive anesthesia is not just to be non-intubated, the aim is faster patient recovery and safety, thus, spontaneous respiratory anesthesia (SRA) was created as another minimally invasive anesthesia option. This technique is for patients eligible for non-intubated procedures, but whose specific procedural type may require the use of a laryngeal mask as a precautionary measure or supplementary oxygen, such as tracheal and carinal procedures.

The innovation and implementation of SRA in VATS surgical procedures has led to the development of another alternative MIS option in thoracic surgery: tubeless VATS. Using current technology and knowledge innovators have begun to reevaluate the general surgical techniques that have changed little in the past 25 years. A prime example is the use of chest drains. Twenty years ago, a chest drainage tube was undoubtedly important. It was used to monitor potential postoperative massive hemorrhage or the drainage of profuse pleural effusion. However, using current knowledge we can use technologies such as bedside ultrasounds and X-rays (6) to monitor the patient for these and other changes. Post-operative chest tubes can aggravate

postoperative pain (8), impair ventilation capacity (9) and affect early ambulation (10). With the implementation of minimally invasive techniques in operations worldwide, instances of massive hemorrhage or profuse pleural effusion have greatly reduced perhaps due to the use of mechanical suture and other advanced endoscopic instruments. The use of chest drains in the majority of patients is therefore worthy of reevaluation. With the use of SRA, urinary catheters and/or gastric tubes may also be exempted, specifically in operations of a shorter length.

The tubeless technique is the attempt to reevaluate the need for each of these tubes. It is specifically designed for each patient based on their individual characteristics and required surgical approach. The ultimate tubeless procedure is a non-intubated procedure without the use of a urinary catheter, gastric tube, or chest drain; however, any combination in total or in part of the above is also considered a tubeless procedure. The goal here is the same as minimally invasive anesthesia, by avoiding any one tube, the associated complications are also avoided, which should in turn result in faster postoperative recovery of the patient. The use of each of these tubes in different cases has recently been under investigation, however further studies are needed to evaluate these techniques.

The tubeless approach is not limited to thoracic surgery alone. Advancements in technology and techniques have affected every surgical field, and it is our hope that these further advancements should spread to other fields as well. For example, laparoscopic, urologic, cardiac, hepatobiliary, and hepatic surgical fields may also be able to reduce the use of a gastric or drainage tube to a patient's benefit (11). However, the indications and contraindications for each tube in each field still require extensive investigation. As our knowledge and understanding of patients physical and pathological changes grows we hope to implement ever more beneficial strategies for our patients.

Presently, there is no definitive evidence to prove one certain approach to be more curative in thoracic diseases; our goal as medical professionals should be to prolong the life-expectation of our patients and pursue better quality of this prolonged life. Only by continued efforts and the drive of professionals to make the steps necessary to personalize the system of treatment and reduce trauma in all possible areas, will we be able to continue to do what is best for our patients. To do this we should take the approach currently used in precise medicine such as target, chemo, and gene therapies; i.e. special patients require special techniques. A small subset of patients can benefit exponentially from

techniques or therapies modified specifically for their benefit. The field of surgery needs to adopt this mindset to see which patients and techniques should apply to which subgroup. The continuous evolution of surgery depends upon new technologies, the innovation of surgeons, and, perhaps most importantly, the willingness of both medical professionals and patients to accept these technologies and techniques.

Some gene and target therapies may only benefit a minuscule number of patients 1% of the 1%, but for such patients the benefit is great. Surgery may be the same. Certain techniques may only benefit 10, 5, or even 1% of our patients. Just because it does not benefit the majority does not mean we should exclude the use of these techniques entirely. Indeed, the tubeless technique will not benefit all patients. However, this is the era of precise medicine; as such, we should sometimes consider the tubeless technique. As our knowledge grows we hope to see the tubeless technique adopted in more centers and specialties worldwide.

Acknowledgements

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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Cite this article as: Li J, Liu J, Hamblin L, Liu H, Liang L, Dong Q, He J. Simple to simplest: the tubeless technique. *J Thorac Dis* 2017;9(2):222-224. doi: 10.21037/jtd.2017.02.55