Mini-Rigid Thoracoscopy – the new kid on the block

Eihab O Bedawi MBBS MRCP
Najib M Rahman DPhil MSc FRCP

The Swedish Internist, HC Jacobeus, first performed thoracoscopy in 1910 as a diagnostic procedure for exudative pleuritis. He published the first series of cases in 1921 describing its value in the diagnosis of tuberculous and malignant effusions. In the decades that followed, thoracoscopy was predominantly used as a therapeutic tool for closed chest adhesiolysis as an adjunct to lung collapse therapy in patients with tuberculosis. This indication became obsolete with the discovery of streptomycin during the 1940's.

If we fast forward to the start of the millennium, the recognition of the increasing burden of malignant pleural disease and malignant pleural mesothelioma (MPM) saw a resurgence in the widespread use of thoracoscopy by chest physicians. Between 1999 and 2009, the number of centres in the United Kingdom offering a local anaesthetic thoracoscopy (LAT) service more than trebled from 11 to 37[1]. With data from several large case series suggesting a high diagnostic yield (96-98.4%) [2, 3] comparable to video-assisted thoracoscopic surgey (VATS), a favourable safety profile[1, 4] (complications were more associated with concurrent pleurodesis), and the ability to perform complete drainage of a symptomatic effusion, inspect the pleural surfaces, obtain pleural biopsies and conduct a talc pleurodesis in a single outpatient procedure, it is not surprising that LAT has now become an essential component of the diagnostic pathway for patients with cytology negative exudative pleural effusion. Increasing data is emerging supporting the use of a potential 'Direct to LAT' approach in some patient groups[5]. Pleural biopsy via ultrasound (US) and computed tomography (CT) continue to be appropriate options for those patients whose fitness precludes them from safely undergoing a LAT.

Traditionally, rigid instruments, such as stainless steel trocars and telescopes have been central to the technique. Rigid thoracoscopy requires a cold xenon light source, an endoscopic camera attached to the eyepiece of the telescope, combined a with a video monitor and a recorder. The single-use trocars vary in size (5-13mm in diameter) and choice of both trocar and telescope is largely dependent on operator preference and patient consideration. Large trocars can accommodate larger telescopes that may have superior optics with enhanced visualisation but place more pressure on ribs and intercostal nerves, potentially causing greater patient discomfort. This is important as, by definition, LAT is usually conducted under local anaesthetic with conscious sedation.

The autoclavable 'semi-rigid' or flexible thoracoscope was introduced in the late 1990's and has been a significant advance in the field of pleural disease. The immediate attraction to physicians was the ease of handling and manoeuvrability in the pleural space similar to the more familiar flexible bronchoscope. Negating the pressure of angling a rigid instrument over the rib periosteum, thought to be associated with greater periprocedural pain, was also seen as a potential advantage (although this is probably more associated with larger size trocars). Large, randomised head-to-head data comparing the rigid and semi-rigid instruments are lacking. A systematic review and a meta-analysis both reported overall

comparable diagnostic yields[6, 7]. Importantly, in a study population with almost exclusively malignant pleural disease, Khan et al also reported similar diagnostic yields between semi-rigid and rigid thoracoscopy (92.3% vs 96.3%)[8].

Advocates of rigid thoracoscopes favour the larger working channels permitting sizeable biopsies with cusp of the forceps being almost twice the diameter (2.4mm vs 5mm). The latter also has the sturdiness to break down adhesions and the mechanical strength to facilitate deeper biopsies, particularly important in diagnosing mesothelioma where biopsies inclusive of fat are required for diagnosis. The difference is less clinically important when there are nodular pleural abnormalities but becomes a significant limitation to semi-rigid thoracoscopes in the setting of densely thickened or fibrotic pleura.

Pulmonary physicians looking to set up a new pleural service are commonly faced with the dilemma of which scope to invest in. Recently, a new tool has joined the thoracoscopy arena; the Mini-Rigid Thoracoscope (Richard Wolf, Germany), with a 5.5mm diameter operating metallic endoscope with 3.5mm internal working channel. The direction of view is zero degree and it contains a 3.5mm rigid biopsy forceps with spoon jaws for biopsy. So how does this 'new kid on the block' compare to the more established players in the thoracoscopy arena?

In their recent publication, *Bansal et al* performed the first prospective, randomised controlled trial – the MINT study - to evaluate the performance of the new mini-rigid thoracoscope (MRT) against semi-rigid thoracoscopy (SRT) in 73 patients with undiagnosed exudative pleural effusion[9]. Their primary outcome was comparison of the diagnostic yield of pleural biopsy in both groups on an Intention to treat (ITT) analysis. This was a single centre study designed for superiority with both groups very well matched. The results showed a diagnostic yield of 69.4% for MRT compared with 81.1% for SRT. The difference in diagnostic yields is large, but likely due to the small sample size as demonstrated by the wide confidence intervals. The overall yields reported are lower than previous RCT's[10, 11], which the authors have addressed and attributed to a high incidence of non specific pleuritis (NSP) (29.7%) and the small sample size. A definitive diagnosis was obtained in 67.6%, with malignancy and TB being the main diagnoses in 52.1% and 18.2% of cases respectively.

In terms of patient experience, there was a significantly higher VAS-measured pain with MRT. Biopsy size, operator rated pain and difficulty of scope manoeuvrability favoured SRT, but these findings could be attributed to operator experience with SRT being more conventionally adopted in their centre. It should be noted that operator blinding is always a challenge for interventional studies of this nature.

The authors should be congratulated for executing a well-designed study reported in a balanced way. What conclusions should we make as to the role of the novel MRT device in medical thoracoscopy? The data suggests that MRT has not been established in the pleural intervention suite, but the limitations of the data should be taken in to account. This data is certainly of great value in planning future larger studies to evaluate this technique. Ultimately, we believe that it is difficult to demonstrate a single instrument is 'superior' as each will inevitably present different advantages and disadvantages. Ideally, interventional

pulmonologists would tailor the instrument to the patient, their fitness, the suspected condition and expected state of the pleural space guided by pre-procedure imaging, but this is challenging to achieve in the setting of an individual service. Perhaps a more pragmatic approach that the choice of instrument is informed by operator training and experience, and knowledge of the prevalence of certain conditions within the local population, including mesothelioma and TB which have very different requirements during a pleural biopsy procedure.

References

1. Rahman NM, Ali NJ, Brown G, et al (2010) Local anaesthetic thoracoscopy: British Thoracic Society Pleural Disease Guideline 2010. Thorax 65 Suppl 2:ii54-60

2. Boutin C, Rey F (1993) Thoracoscopy in pleural malignant mesothelioma: a prospective study of 188 consecutive patients. Part 1: Diagnosis. Cancer 72:389–393

3. Medford ARL, Agrawal S, Free CM, Bennett JA (2009) A local anaesthetic video-assisted thoracoscopy service: prospective performance analysis in a UK tertiary respiratory centre. Lung Cancer 66:355–358

4. Colt HG (1995) Thoracoscopy. A prospective study of safety and outcome. Chest 108:324–329

5. Tsim S, Paterson S, Cartwright D, Fong CJ, Alexander L, Kelly C, Holme J, Evison M, Blyth KG (2019) Baseline predictors of negative and incomplete pleural cytology in patients with suspected pleural malignancy - Data supporting “Direct to LAT” in selected groups. Lung Cancer 133:123–129

6. Mohan A, Chandra S, Agarwal D, Naik S, Munavvar M (2010) Utility of semirigid thoracoscopy in the diagnosis of pleural effusions: a systematic review. J Bronchology Interv Pulmonol 17:195–201

7. Agarwal R, Aggarwal AN, Gupta D (2013) Diagnostic accuracy and safety of semirigid thoracoscopy in exudative pleural effusions: a meta-analysis. Chest 144:1857–1867

8. Khan MAI, Ambalavanan S, Thomson D, Miles J, Munavvar M (2012) A comparison of the diagnostic yield of rigid and semirigid thoracoscopes. J Bronchology Interv Pulmonol 19:98–101

9. Bansal S, Mittal S, Tiwari P, et al (2019) Rigid Mini-Thoracoscopy Versus Semirigid Thoracoscopy in Undiagnosed Exudative Pleural Effusion: The MINT Randomized Controlled Trial. J Bronchology Interv Pulmonol. https://doi.org/10.1097/LBR.0000000000000620

10. Dhooria S, Singh N, Aggarwal AN, Gupta D, Agarwal R (2014) A randomized trial comparing the diagnostic yield of rigid and semirigid thoracoscopy in undiagnosed pleural effusions. Respir Care 59:756–764

11. Rozman A, Camlek L, Marc-Malovrh M, Triller N, Kern I (2013) Rigid versus semi-rigid thoracoscopy for the diagnosis of pleural disease: a randomized pilot study. Respirology 18:704–710