Local Anaesthetic Thoracoscopy

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The incidence of pleural disease is increasing, and interventions are crucial in this subspecialist area of respiratory medicine. One of the cornerstones of pleural effusion investigation and management is medical, which is also known as local anaesthetic thoracoscopy.

Keywords: medical thoracoscopy ; local anaesthetic thoracoscopy ; pleural effusion

1. Introduction

Thoracoscopy, meaning examination of the thoracic cavity, has been a technique used since the 19th century. Hans-Christian Jacobaeus is widely credited with first performing and publishing his technique of using a cystoscope to insufflate air into the thoracic cavity and diagnose tuberculous pleural adhesions in 1910 [1]. The French, however, may have been the first to have conceptualised the idea of “thoracoscopie”, with medical texts such as the *Complement du Dictionnaire de l’Academic Française* using the term as early as 1842 [2]. Furthermore, in 1865, the *British Medical Journal* published a report whereby Sir Francis Richard Cruise, an Irish endoscopist, used regular direct endoscopic inspection of the pleura to monitor a patient’s protracted recovery from pleural infection. Together with Samuel Gordon, an Irish internist at the time, Cruise used a modified endoscope that had been created by A J Desormeaux. Furthermore, Carlo Forlanini, in Pavia, Italy, used a similar method in 1882 to create an artificial pneumothorax and induce lung collapse, a treatment that was thought to be beneficial in pulmonary tuberculosis [2]. Direct visualisation of the pleura enables biopsies to be taken from the parietal pleura and pleural-based abnormalities such as nodules, increasing diagnostic yield, particularly in malignancy [3]. At the same time, any fluid can be drained offering symptomatic relief to the patient and measures such as talc pleurodesis or indwelling drains can be respectively performed or inserted for fluid management [4].

In recent years, local anaesthetic thoracoscopy (LAT), otherwise known as medical thoracoscopy or pleuroscopy, has become widely used by respiratory physicians as a tool in undiagnosed exudative pleural effusions [4][5]. In the United Kingdom (UK), LAT is widely practised. In 2009, thirty-nine centres were offering the service, with a more recent survey in 2018 by De Fonseka et al. finding that 49 centres were offering LAT regularly to patients (although only 37 responded) [6]. The survey demonstrated access to both rigid and semi-rigid thoracoscopes and wide variability in antibiotic use pre-procedure, use in point of care ultrasound, proceeding in the presence of minimal fluid, use of midazolam and/or fentanyl for sedation and pain relief and doing combined procedures. Some of those specific points will be discussed more in the later paragraphs. These findings are not UK centric, with an India-wide survey showing the same variability in practice [7]. The majority of contemporary practice is based on the now outdated British Thoracic Society 2010 guidelines [4], and in the absence of newer up-to-date publications, narrative reviews such as this can be an invaluable tool. Alternatives to LAT are image-guided biopsies (ultrasound or computed tomogram (CT) directed) with reported sensitivities between 70% and 94%, but there is lack of real time visualisation of tumour, and they do not relieve the patient of breathlessness if the offending effusion is not drained. There is only one direct comparison trial between CT guided biopsy and LAT, and there was a non-statistically significant difference between the two groups for diagnostic rates (CT-guided biopsy 87.5% vs. 94.1% for thoracoscopy) [8].

2. Indications for Thoracoscopy

2.1. Malignant Pleural Disease

LAT is performed predominantly to determine if a malignant process is present in the pleural space. Various case series would suggest that it has a 92.6% diagnostic sensitivity in malignant pleural disease [4][5]. Malignancy in the pleural space often presents with a pleural effusion, and the first diagnostic step is to obtain pleural fluid cytology [9]. However, a positive cytological result is more likely in certain type of cancers (with breast and ovarian cancers being most likely to provide positive pleural fluid cytology) than others such as malignant pleural mesothelioma (MPM) [10][11][12]. In MPM, pleural fluid cytology typically has a low diagnostic yield of 6–32%, and parietal pleura is often required for full characterisation of the

tumour [10][11][12]. There is compelling evidence that if the probability of MPM is high, according to clinical and radiological features, a direct to LAT approach should be adopted [13]. One of the unwritten rules of pleural disease is ‘how to obtain a diagnosis and prevent recurrence for my patient in the least possible steps’, and a direct to LAT approach can achieve that. The procedure also provides a simultaneous opportunity for therapeutic interventions including the administration of intrapleural agents such as sterile talc to achieve pleurodesis [4][5][6].

2.2. Pleural Infection

LAT has been employed for the treatment of pneumothorax, pleural infection, lung biopsy and sympathectomies [5]. These have been traditionally the domain of cardiothoracic surgery, although it is claimed that the role of formal surgery in pleural disease is reducing [14]. LAT is only feasible in pleural infection at stage 1 and 2, which are the first two stages of pleural infection (simple exudate then fibrinopurulent stage and then an organising stage with pleural peel formation) with division of adhesions, drainage of fluid and placement of a chest tube [14][15][16]. It is not a new concept, but it has not been studied in great detail via large multi-centre randomised trials, nor has there been any recent guidance published on it [17][18]. A recent systematic review of the use of the LAT in pleural infection included eight studies that were all case series or retrospective observational studies, and only two were multi-centre [19]. Whilst the pooled treatment success rate for LAT was 85% (95% CI 80.0–90.0%; I2: 61.8%) when used as first-line intervention or after failure of regular tube drainage or intrapleural therapy, the study designs were poor, and there was a high risk of bias: these factors make advocating LAT for pleural infection difficult. A small randomised clinical trial of 32 patients showed a potential signal towards reduction in length of stay for LAT when compared to chest tube drainage and intrapleural therapy, but these findings are not currently generalisable [16][20][21]. In addition, patients who underwent LAT had a 12.5% higher diagnostic yield from microbiology culture from pleural biopsies taken during the procedure [20]. The recent ‘Studying Pleuroscopy in Routine Pleural Infection Treatment’ (SPIRIT) trial is a multi-centre UK study, which will hopefully provide further results regarding the role of LAT in pleural infection [17]. As an aside, in tuberculous pleural disease, LAT has up to 100% diagnostic sensitivity, but LAT is very resource intensive, and that precludes its use in many countries [22]. A combination of pleural fluid adenosine deaminase, differential cell count and closed pleural biopsy is just as effective in areas of high prevalence of tuberculosis [22].

2.3. Pneumothorax

The indication for surgery in those with pneumothorax is predominantly to prevent recurrence, and the whole array of procedures that can be performed are beyond the scope of this research. These are usually completed via video-assisted thoracoscopy or an open thoracotomy approach [23]. However, the use of LAT for pneumothorax is also not a new concept. The largest case series of 124 patients with pneumothorax underwent electrocoagulation of blebs/bullae and talc poudrage pleurodesis under LAT with an average operative time of 15 min [24]. Four (3%) patients required further surgery. However, this is not widely performed. Experienced thoracoscopists can also perform lung biopsy (although this has been almost totally superseded by video-assisted thoracoscopy) [25] and sympathectomy [5]: these are worth a mention but no further discussion, as they are not commonly performed.

2.4. Patient Selection

Careful patient selection is required prior to LAT: a detailed history regarding the disease process including previous occupational exposure (e.g., asbestos) and previous malignant disease is important. A baseline functional assessment is useful to assess suitability to proceed with the procedure as well as potential treatment, and therefore, a World Health Organisation Performance Status of 2 or above is recommended [26][27]. The patient’s medical comorbidities may provide important information regarding the patient’s risk factors for the procedure, including drug intolerances and allergies. Antiplatelet therapy (clopidogrel and prasugrel should be withheld for 5 days prior to the procedure, and ticagrelor should be withheld for 7 days prior to the procedure. Aspirin does not need to be stopped. Formal anticoagulation should be withheld for 24 h for therapeutic low molecular weight heparin, 5 days for warfarin and normally 48 h for direct oral anticoagulants (although dagibatran might need to be stopped 4 days before a procedure if the patient’s creatinine clearance is less than 50 millilitres per minute)) and platelet counts should be greater than 50,000 per microlitre of blood and the international normalised ratio should be less than 1.5 [4][26][27][28]. Of note, it is researcher's opinion that whilst platelet count is an established level in the BTS guidance [27][28], platelet activity is also important, and advice from haematology might be obtained prior to a procedure in a thrombocytopenic patient. Prior to LAT, chest radiograph and CT images should be obtained in conjunction with thoracic ultrasonography (TUS) to assess technical suitability and optimal point for thoracoscopy. CT and TUS are essential for providing information on pleural thickening, pleural enhancement as well as adhesions that may impede the procedure, although neither modality can be 100% accurate in excluding adhesions [29][30]. There are few absolute contraindications, including advanced empyema, particularly those with

significant adhesions which may make it impossible to insert the thoracoscope safely and fusion of the visceral and parietal pleura in suspected mesothelioma. Relative contraindications include haemodynamic instability, severe hypoxaemia, severe coagulopathies, refractory cough and drug hypersensitivity [4][5].

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