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MINI REVIEW

Management of malignant pleural effusion: Options and recommended approaches

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Abstract

There is no consensus on the best management of symptomatic malignant pleural effusion. Drainage with a small bore pleural catheter is preferred over a wide bore catheter or recurrent pleural aspiration in patients with symptomatic malignant pleural effusion, for equivalent efficacy and patient comfort. If resources allow, chemical pleurodesis under thoracoscopy, with talc as sclerosant, is preferred for fully expanded lung over bedside chemical pleurodesis in fit patients. A chronic indwelling catheter is an alternative. Controversy exists over the use of chemical pleurodesis or a long term indwelling catheter as the first line management of choice of malignant pleural effusion. Pleural effusion in the entrapped lung scenario is a problematic situation. Pleuroperitoneal shunting or decortication procedures are out of favor as they are more invasive and present more complications. Management algorithm is recommended based on the current data.

Introduction

Malignant pleural effusion (MPE) is a common clinical problem faced by many physicians, oncologists and thoracic surgeons. Patients with MPE can be debilitated with dyspnea, decreased exercise tolerance, and impaired quality of life (QOL). Median survival following the diagnosis of MPE ranges from three to 12 months, with lung cancer as the primary cancer demonstrating the shortest survival.[1] The management options for MPE depend on several factors, including patient's symptoms, performance status, underlying primary type, and the potential response to antineoplastic therapy. The overall aim is for the alleviation of symptoms and improved QOL.

Management options for symptomatic MPE

Pleural aspiration maybe needed for diagnostic purpose, but observation is recommended for asymptomatic patients whose tumor type is known.[1] Treatment for MPE entails risks, and repeated aspiration can result in loculation of fluid, tumor seeding along the needle track (e.g. in mesothelioma), and other complications such as pneumothorax, hemothorax, and pain. For those with symptoms, intervention is usually required and the ideal approach remains controversial. There is no consensus with respect to optimal management. Options include: 1) repeated thoracocentesis or short term intercostal tube drainage; 2) chemical pleurodesis via tube thoracostomy or thoracoscopy; 3) long term indwelling pleural catheter; 4) pleuroperitoneal shunting; and 5) pleurectomy or decortication.

Repeated thoracocentesis or short term intercostal tube drainage

Transient relief of symptoms can be achieved with therapeutic aspiration of the pleural fluid by needle or drainage by chest tube. Iatrogenic pneumothorax is found in around 6%

(95% confidence interval [CI], 4.6%–7.8%) of cases undergoing thoracocentesis, and ultrasonography guidance is associated with a significantly lower risk (4%; 95%CI, 2.9–5.6) of pneumothorax.[2] Thoracocentesis may be employed if the patient is expected to have a very short life expectancy (e.g. less than a month),[1] or for patients in whom the underlying malignancy is known to be slow in disease tempo, or the disease is likely to respond to systemic treatment rapidly. Otherwise, repeat procedures will be needed in a short period of time as the recurrence rate at one month after pleural aspiration alone, is close to 100%.[3] For those with large amounts of MPE, the insertion of an intercostal tube is preferred over repeated pleural aspirations. Controlled evacuation of pleural fluid should be employed to avoid re-expansion pulmonary edema, as, although rare (<1% incidence), its occurrence can be fatal.[4] Patients should be monitored for any chest discomfort, persistent cough or vasovagal symptoms, and if any of the above occur, drainage should be stopped. Small bore catheter (10-14F) is now preferred over wide bore chest drain (24-32F) as this is more comfortable for patients and is not less efficacious.[1,5]

Chemical pleurodesis via tube thoracostomy or thoracoscopy

The aim of pleurodesis is to obliterate the pleural space by producing extensive adhesion of the visceral and parietal pleura.[6] For patients with recurrent MPE, especially in those with chemotherapy resistant tumors or MPE that rapidly re-accumulates, chemical pleurodesis is recommended after successful pleural fluid drainage. Conventionally, large-bore intercostal tubes have been used for the purpose of bedside pleurodesis because of concerns over tubal blockage by clots. Small bore catheters have similar success rates when used for chemical pleurodesis, as well as less discomfort when compared with large-bore catheters.[5,7,8] Parulekar *et al*. reported the actuarial probabilities of recurrence at six weeks and four months were 45% and 53% for the small tubes, versus 45% and 51% for the large tubes.[5] A Cochrane review comparing different sclerosing agents for pleurodesis concluded that talc is the sclerosing agent of choice.[9] The British Thoracic Society guideline also recommended talc and, in addition, bleomycin as an alternative sclerosant with a modest efficacy rate.[1] Randomized studies have shown that patient rotation is no longer required after the instillation of a sclerosing agent.[10,11] The most common adverse effects with pleurodesis are fever, pain, and gastro-intestinal symptoms.[9] Chemical pleurodesis under thoracoscopy has the advantage of better distribution of sclerosant under visualization of the pleura. Moreover, it allows the release of adhesions or breaking up of loculations, thus aiding better lung re-expansion and apposition of the pleura. In comparison with bedside pleurodesis using chest tube, thoracoscopic pleurodesis is associated with a greater likelihood of success, in particular, when talc was the sclerosing agent used.[9] The relative risk of non-recurrence of effusion is 1.19 (95% CI 1.04 to 1.36) in favor of thoracoscopic pleurodesis, compared with tube thoracotomy pleurodesis utilizing talc as sclerosant.[9] However, the patient needs to be fit enough to undergo sedation or general anesthesia for the procedure, and thoracoscopic pleurodesis can only be performed by specially trained doctors. It is also more time consuming and more costly when compared with bedside pleurodesis.

Long term indwelling pleural catheter drainage

Long term indwelling pleural catheter (IPC) provides symptom control of recurrent MPE through ongoing intermittent drainage of pleural effusion. A specific tunneled catheter has been developed and was approved by the United State Food and Drug Agency in 1997.[12] Several authors have advocated the use of IPC catheter as the first line treatment of MPE, even when good re-expansion of the lung has been achieved.[13,14] The main advantages include: perceived cost-effectiveness, short hospital stay and potential outpatient management of the MPE, and a user-friendly technology. Spontaneous pleurodesis may occur in 40% of cases of MPE treated with IPC alone.[12] Retrospective review of 418 cases with tunneled IPC use showed that it provides durable palliation and it is safe.[15] The IPC related complication rate was 4.8% in this retrospective study, and half of those were infection (four cases of cellulitis and six cases of empyema). Currently, there is only one prospective randomized study comparing long term IPC to pleurodesis, and it is with doxycycline, not with talc.[16] Zahid *et al*. reviewed available literature and concluded that chemical pleurodesis is the optimal treatment option for MPE with use of chronic indwelling intrapleural catheter, reserved in cases where talc pleurodesis is not possible.[17] Further prospective randomized study is certainly needed before recommending it as a first line treatment of choice.[12] Moreover there is limited data regarding the cost effectiveness of chemical pleurodesis and IPC in MPE, and there is only one study in which talc pleurodesis was found to be less costly than IPC with similar effectiveness.[18]

Pleuroperitoneal shunting

Pleuroperitoneal shunt allows the transfer of pleural effusion from the chest into the peritoneal cavity and provides an effective way for palliation for recurrent MPE. However, it requires patient's compliance to pump up the pleural fluid. It frequently becomes obstructed and can be associated with significant complication and may often require revision or shunt removal.[19] It is an option for those recurrent MPE

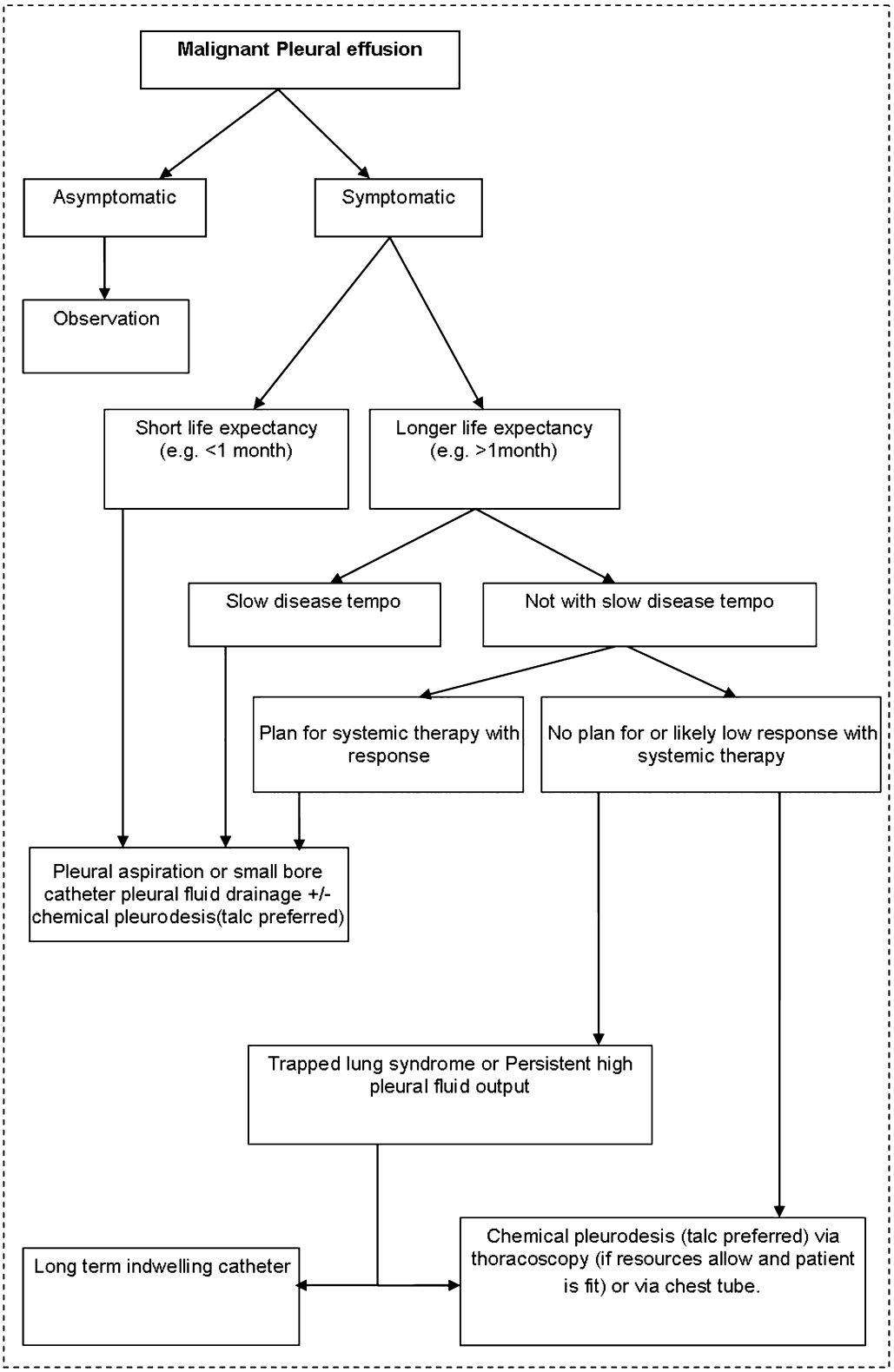

Figure 1 Recommended algorithm for the management of malignant pleural effusion.

despite chemical pleurodesis. However, with the availability of the long term indwelling catheter, it has now fallen out of favor.

Pleurectomy or decortication

Pleurectomy or decortication can only be performed on patients who can undergo general anesthesia and it is an invasive procedure with significant morbidity.[20] Complications may include bronchopleural fistulae, subcutaneous emphysema, empyema, and hemorrhage. Patients with recurrent MPE are likely to be frail with poor lung function and may not be able to tolerate the procedure. With the effective palliation of other methods as described above, pleurectomy or decortication has also fallen out of favor.

Special situation: Trapped lung syndrome

Special consideration is needed for the group of MPE patients for whom full lung re-expansion fails to occur, despite drainage (trapped lung syndrome). For a successful pleurodesis, pleural apposition should be confirmed with chest radiograph after drainage of MPE with intercostal tube. In cases with partial re-expansion of lung, pleurodesis may still be attempted, but is likely to have a lower success rate.[1] Most studies on chemical pleurodesis for MPE have excluded patients with trapped lung. Several small retrospective case series specifically reported outcomes using IPC in MPE with trapped lung.[21–23] Advantages of this strategy include a short hospital stay, an acceptable level of complication, and reduction in the subjective dyspnea score. In some cases of trapped lung treated with IPC, eventually, full lung re-expansion was achieved.[22] Similarly, for those with persistent high output pleural effusion, where there is poor apposition of the parietal and visceral pleura, which may predict failure of pleurodesis, IPC may be preferred.[23]

The recommended approach

Figure 1 summarizes the recommended algorithm for management of MPE. It is important to take into account the patient's preference, performance status, life expectancy, underlying primary cancer type, and the potential response to anti-neoplastic therapy. Moreover, local expertise and the resources available are also part of the consideration. Chemical pleurodesis remains the recommended approach for symptomatic recurrent MPE. Talc is the agent of choice. As mentioned above, currently there is lack of data from randomized trials to support long term IPC over talc pleurodesis for uncomplicated recurrent MPE. IPC should be considered for patients for whom chemical pleurodesis has failed, with persistent high pleural fluid drainage output or with tapped lung syndrome.

Potential development

The current recommended management approach of MPE is still far from ideal. Maintaining a good QOL is of paramount importance in cancer patients. QOL includes spending as little time in the hospital as possible, with symptoms under control. Management of MPE has been mainly in-patient based and chemical pleurodesis usually entails a prolonged hospital stay. Reddy *et al*. proposed the concept of rapid pleurodesis with simultaneous chemical pleurodesis and IPC for the management of MPE.[24] In this small study of 30 patients, the median hospitalization time was only 1.79 days, contrary to the usual five to seven days for the standard chemical pleurodesis. Pleurodesis was successful in 92% of patients and the IPCs were removed at a median of 7.54 days. More studies are needed to assess the feasibility, safety, and effectiveness of rapid pleurodesis before adopting its use.

Conclusion

The overall management of MPE is palliation, and the aim is to provide durable symptom control, minimize a patient's hospital stay, and be as least invasive as possible. Fluid drainage followed by chemical pleurodesis is currently the recommended treatment of choice for recurrent MPE and talc is the agent that should be used. Thoracoscopic pleurodesis is preferred in fit patients and carries a higher success rate if resources and expertise are available. Long term IPC is an alternative option, especially in those with trapped lung syndrome or with persistent high output MPE. More randomized studies are needed to investigate whether IPC can replace talc pleurodesis as the treatment of choice for management of recurrent MPE, and whether rapid pleurodesis is the approach that should be adopted in the future.

Disclosure

No authors report any conflict of interest.

References

1 Roberts ME, Neville E, Berrisford RG, Antunes G, Ali NJ, BTS Pleural Disease Guideline Group. Management of a malignant pleural effusion: British Thoracic Society Pleural Disease Guideline 2010. *Thorax* 2010; **65** (Suppl. 2): ii32–40.
2 Gordon CE, Feller-Kopman D, Balk EM, Smetana GW. Pneumothorax following thoracentesis: a systematic review and meta-analysis. *Arch Intern Med* 2010; **170**: 332–9.
3 Antunes G, Neville E, Duffy J, Ali N, Pleural Diseases Group, Standards of Care Committee, British Thoracic Society. BTS guidelines for the management of malignant pleural effusions. *Thorax* 2003; **58** (Suppl. 2): ii29–38.

4 Lin YJ, Yu YH. Reexpansion pulmonary edema after large-volume thoracentesis. *Ann Thorac Surg* 2011; **92**: 1550–1.
5 Parulekar W, Di Primio G, Matzinger F, Dennie C, Bociek G. Use of small-bore vs large-bore chest tubes for treatment of malignant pleural effusions. *Chest* 2001; **120**: 19–25.
6 Rodriguez-Panadero F, Montes-Worboys A. Mechanisms of pleurodesis. *Respiration* 2012; **83**: 91–8.
7 Clementsen P, Evald T, Grode G, Hansen M, Krag Jacobsen G, Faurschou P. Treatment of malignant pleural effusion: pleurodesis using a small percutaneous catheter. A prospective randomized study. *Respir Med* 1998; **92**: 593–6.
8 Caglayan B, Torun E, Turan D *et al.* Efficacy of iodopovidone pleurodesis and comparison of small-bore catheter versus large-bore chest tube. *Ann Surg Oncol* 2008; **15**: 2594–9.
9 Shaw P, Agarwal R. Pleurodesis for malignant pleural effusions. *Cochrane Database Syst Rev* 2004; (1): CD002916.
10 Dryzer SR, Allen ML, Strange C, Sahn SA. A comparison of rotation and nonrotation in tetracycline pleurodesis. *Chest* 1993; **104**: 1763–6.
11 Mager HJ, Maesen B, Verzijlbergen F, Schramel F. Distribution of talc suspension during treatment of malignant pleural effusion with talc pleurodesis. *Lung Cancer* 2002; **36**: 77–81.
12 Van Meter ME, McKee KY, Kohlwes RJ. Efficacy and safety of tunneled pleural catheters in adults with malignant pleural effusions: a systematic review. *J Gen Intern Med* 2011; **26**: 70–6.
13 Tremblay A, Mason C, Michaud G. Use of tunnelled catheters for malignant pleural effusions in patients fit for pleurodesis. *Eur Respir J* 2007; **30**: 759–62.
14 Warren WH, Kalimi R, Khodadadian LM, Kim AW. Management of malignant pleural effusions using the Pleur(x) catheter. *Ann Thorac Surg* 2008; **85**: 1049–55.
15 Suzuki K, Servais EL, Rizk NP *et al.* Palliation and pleurodesis in malignant pleural effusion: the role for tunneled pleural catheters. *J Thorac Oncol* 2011; **6**: 762–7.
16 Putnam JB Jr, Light RW, Rodriguez RM *et al.* A randomized comparison of indwelling pleural catheter and doxycycline pleurodesis in the management of malignant pleural effusions. *Cancer* 1999; **86**: 1992–9.
17 Zahid I, Routledge T, Billè A, Scarci M. What is the best treatment for malignant pleural effusions? *Interact Cardiovasc Thorac Surg* 2011; **12**: 818–23.
18 Olden AM, Holloway R. Treatment of malignant pleural effusion: PleuRx catheter or talc pleurodesis? A cost-effectiveness analysis. *J Palliat Med* 2010; **13**: 59–65.
19 Genc O, Petrou M, Ladas G, Goldstraw P. The long-term morbidity of pleuroperitoneal shunts in the management of recurrent malignant effusions. *Eur J Cardiothorac Surg* 2000; **18**: 143–6.
20 Fry WA, Khandekar JD. Parietal pleurectomy for malignant pleural effusion. *Ann Surg Oncol* 1995; **2**: 160–4.
21 Qureshi RA, Collinson SL, Powell RJ, Froeschle PO, Berrisford RG. Management of malignant pleural effusion associated with trapped lung syndrome. *Asian Cardiovasc Thorac Ann* 2008; **16**: 120–3.
22 Bazerbashi S, Villaquiran J, Awan MY, Unsworth-White MJ, Rahamim J, Marchbank A. Ambulatory intercostal drainage for the management of malignant pleural effusion: a single center experience. *Ann Surg Oncol* 2009; **16**: 3482–7.
23 Sioris T, Sihvo E, Salo J, Räsänen J, Knuuttila A. Long-term indwelling pleural catheter (PleurX) for malignant pleural effusion unsuitable for talc pleurodesis. *Eur J Surg Oncol* 2009; **35**: 546–51.
24 Reddy C, Ernst A, Lamb C, Feller-Kopman D. Rapid pleurodesis for malignant pleural effusions: a pilot study. *Chest* 2011; **139**: 1419–23.

