Indwelling pleural catheters for malignancy related pleural effusions

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Abstract

Objectives

The incidence of malignancy related pleural effusions (MPE) is increasing. MPE carry significant morbidity and mortality. Indwelling pleural catheters (IPCs) have become the cornerstone in management and are supported by established international guidance. Large case reviews add to the evidence base regarding safety and efficacy.

Methods

168 patients had an IPC insertion between January 2012 and December 2018 in a large pleural centre in the North East of England. Data on outcomes and complications were obtained from the patients' notes, electronic records, laboratory, and radiographic findings. Descriptive statistical methodology was applied.

Results

168 IPCs were inserted in a predominantly male population by experienced pleural practitioners. Overall complication rate is 13% and the incidence of any individual complications such as infection, metastatic seeding, drain displacement and loculations are much less than previously quoted in the literature.

Conclusion

This case review adds to the large body of evidence that IPCs are safe and have minimal complications in the palliation of symptoms of malignant pleural effusion.

Introduction

Malignant pleural effusions (MPE) are a common presentation with around 40,000 new cases in the UK each year.¹ The epidemiology is rising.¹ The development or presence of MPE confers a poor prognosis, with median survival of 3-12 months depending on the type of the primary cancer and the performance status.² MPE is associated with significant symptom burden and often require more than one pleural intervention, consuming significant resources.³

Pleural interventions can be regular therapeutic thoracenteses, intercostal drain insertion with talc pleurodesis, indwelling pleural catheter (IPC) insertion with or without talc instillation or medical (local anaesthetic) or video assisted thoracoscopy.³ A patient-centred approach where patients can choose between the various modalities is advocated and patient education plays an important role in this approach.⁴

IPCs can be performed as a day case procedure and preferred by many clinicians. The American Association for Bronchoscopy and Interventional Pulmonology (AABIP) recently produced the most up-to-date guidance.⁵ The main role of IPCs in patients with MPE is to improve quality of life, prevent additional interventions, reduce hospital attendance: the guidance firmly supports those areas.⁵ More recently, there has been emphasis in talc administration through the IPC with an aggressive draining regimen to improve rates of pleurodesis.⁵

Northumbria Healthcare NHS Foundation Trust has a well-established pleural service, led by a full-time pleural consultant and supported by a full time pleural fellow and 2 other respiratory consultants.⁶ Pleural clinics were held weekly with fortnightly theatre lists where procedures performed include local anaesthetic thoracoscopy (LAT), IPC insertion and removal. IPC insertions can also occur in dedicated procedure rooms on various day case units.

Methods

This is a retrospective study of all consecutive patients who underwent IPC placement in theatre from January 2012 to December 2018 in the trust. The electronic records were accessed, and the following data as collected: age, sex, histological diagnoses, complication rates, pleurodesis rates, removal rates and need for further procedures. Descriptive statistical methodology was applied. Local Caldicott approval was obtained.

Perioperative management

Patients attend the Surgical Day Unit and are consented by the operator on the day, and then taken to the operating theatre. Antibiotics prophylaxis with gentamicin or teicoplanin, and more recently, either flucloxacillin or teicoplanin, is administered. The patients are offered the option of mild conscious sedation with midazolam.

IPC technique

The patients are placed in the lateral decubitus position, and a thoracic ultrasound is performed to mark the spot for incision and insertion of the Rocket® IPC™. The marked area is sterilized and draped. 20 millilitres (mL) of bupivacaine and adrenaline (epinephrine) injection 0.5% w/v, 1 in 200,000 is administered into the selected intercostal space. 2 incisions are made about 5cm apart. A tract is created with straight forceps and the drain passed through, making sure that the cuff of the drain sits midway. A dilator and a sheath are passed through the proximal incision into the pleural cavity. The drain is threaded through the sheath into the pleural space and the sheath peels off as per the Rocket instructional video.⁷ A Rocket vacuum bottle is connected to drain fluid off, and the drain is secured using nylon sutures, to be removed in 2 weeks. A post-operative chest radiograph is not usually obtained unless there is the possibility of an immediate complication such as a pneumothorax.

Results

168 IPCs were inserted between January 2012 and December 2018.

The average patient age was aged 72.8 years, median 71.3 years (Range 35-92, IQR 65-82). 61.3 % were male (n=103). A total of 56 IPCs were inserted for mesothelioma, 48 for lung cancer, 28 for breast cancer, 23 for other diagnoses such as melanomas, gastrointestinal and ovarian cancers and 13 were for non-malignant effusions such as unexplained lymphocytic effusions, hepatic hydrothoraces, yellow nail syndrome, heart failure and chronic pleuritis.

There were no immediate complications such as bleeding or pneumothorax or surgical emphysema. 162 patients (96%) had prophylactic antibiotics pre-procedure. The 6 who did not receive antibiotics did not develop any IPC related infections. 5 patients (3%) developed pleural space infections more than 30 days after insertion, and 2 had associated contemporaneous cellulitic changes. All 5 required intravenous antibiotics. There were 2 growths of methicillin sensitive staphylococcus aureus (MSSA) from pleural fluid samples. 2 received intrapleural fibrinolytics to clear their pleural space and 1 had recurrent infection due to the IPC which was then removed. None of these infections were related to anti-cancer treatment as none of the patients were receiving such treatment. 4 patients were male, and 1 were female. None were neutropenic or lymphopenic. Median length of hospital stay was 4.7 days (range 3-12).

2 (1%) patients had their drain displaced and those were removed.

1 (0.6%) patient had a cutaneous tumour extension through the IPC site. The patient had bilateral IPCs due to large volume pleural effusions secondary to a papillary gastrointestinal tumour. The IPC had been in for 6.2 months and was still required for fluid drainage. No specific treatment was required.

14 patients (8.3%) developed significant loculations and subsequent non-drainage. 13 patients were given intrapleural fibrinolytics with good radiological and clinical response and 1 patient had their symptoms palliated. Of the 13 patients, 6 (46%) had recurring loculations and their symptoms were palliated. The other 7 had their IPC removed as they had pleurodesed.

Median survival from day of insertion was 147 days (IQR 12-262). Removal rates for any reason were 36% (61 out of 168) patients and no patients required further procedures.

Discussion

IPCs are preferred by many physicians for fluid control in malignant pleural effusions^{5,8}. Our overall complication rate was 13%, and individual rates are lower than previously described.^{9,10,11}

Only specific pleural physicians with significant cumulative experience place IPCs locally, and any training doctors are closely supervised. National safety standards for invasive procedures (NATSIP) checklists are rigidly adhered to and the use of thoracic ultrasound allows the correct identification of a suitable pleural space. More recently, identification of the intercostal artery is also performed. This

probably accounts for the lack of immediate complications such as pneumothorax, surgical emphysema and bleeding; it is also worth noting that the rate of pneumothorax with pleural procedures is also very low (between 1% and 9% in case series) and no clear data exists on rates of bleeding.¹²

IPC-related infection of the chest wall and/or pleural space traditionally affects less than 5% of patients and our case series corroborates this evidence. There is no significant increase in risk of IPC-related infection associated with systemic chemotherapy^{8,10,11}, as 128 patients in our series received chemotherapy. Infections are traditionally associated with skin commensals and staph aureus species, as was the case here, and the removal of the IPC is not usually warranted, unless the tunnel is chronically infected, as was the case in one patient in our case series. We administer prophylactic antibiotics pre-procedure as had previously noticed a jump in infections without.¹³ This is local practice, and no national guidance is available. The above practice has been replicated by Gilbert et al where a sterile protocol, a single hospital site to perform the IPC placement and perioperative antibiotics enabled a reduction in IPC-related 8.2% to 2.2% (P=0.0049) and a relative risk reduction of 73%.¹⁴

Tumour extension occurs in less than 5% of cases, is more common at sites of more invasive pleural procedures such as medical thoracoscopy, and occurred in less than 1% of patients here. There is no role for pre or post-operative radiotherapy.¹⁵

Symptomatic loculations occurs in 14% of all IPCs, being caused by accumulation of fibrinous material from the tumour itself or being generated from the IPC in situ. Impaired fluid drainage causes increased breathlessness and fibrinolytic therapy is proven to improve radiological appearances and clinical outcomes. However, recurrence rate of loculations are high.¹⁶

Our rates of removals are comparable to the available literature. About 30-40% of patients will achieve spontaneous pleurodesis over time, without aggressive drainage and talc administration. Due to the administrative and financial constraints of our service, we do not offer this approach, and simply ask clinicians and patients to get in touch with us after minimal drainage from the IPC has been observed on 3 consecutive occasions. Patients are then assessed for fluid clearance with chest radiographs and thoracic ultrasonography. A further subgroup analysis of these patients is being performed to determine conformity to the available evidence¹⁷ and is beyond the scope of this article. We have not also discussed IPCs in benign effusions. Other limitations of our data set are that this only includes patients who have had IPCs in theatre, and not on the various day case units in the hospital. We also do not perform chest radiographs in all patients unless the procedure is complicated and thus our rates of surgical emphysema might be underestimated. Our data adds to the large body of evidence that IPCs are safe and have minimal complications.

Declarations

Ethics: Local (Calidcott) ethical approval was sought and obtained from the local information governance department.

Disclosure statement: there are no competing interests

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Ethics statement is not applicable

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