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Indwelling pleural catheters for malignancy related pleural effusions

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Abstract. – OBJECTIVE: Malignant Pleural Effusion (MPE) carries significant morbidity and mortality. Indwelling pleural catheters (IPCs) are established in the management pathway. Large case reviews add to the evidence base regarding safety and efficacy.

PATIENTS AND METHODS: 168 patients had an IPC inserted between January 2012 and December 2018 in a large pleural centre. Data on outcomes and complications were obtained from the patients' notes, laboratory and radiographic findings. A descriptive statistical methodology was applied.

RESULTS: 168 IPCs were inserted in a predominantly male population. The overall complication rate is 13%. The incidence of any individual complication such as infection, metastatic seeding, drain displacement, and loculations are all less than previously described.

CONCLUSIONS: This case review adds to the large body of evidence that IPCs are safe and have minimal complications. Specific factors enabling this are the use of pre-operative antibiotics, the use of theatre space, and the experience of the pleural interventional physicians.

Key Words:
Malignant pleural effusion, Indwelling pleural catheter.

Introduction

Malignant Pleural Effusion (MPE) confers a poor prognosis, with a median survival of 3-12 months[1]. MPE has a significant symptom burden, often requiring more than one pleural intervention and consuming significant resources[1].

Pleural interventions consist of therapeutic thoracentesis, intercostal drain or indwelling pleural catheter (IPC) insertion with or without talc instillation and local anaesthetic (LAT) or video-assisted thoracoscopy[1]. A patient-centered approach is advocated[2].

IPCs improve quality of life, prevent additional interventions, and reduce hospital attendance. American Association for Bronchoscopy and Interventional Pulmonology (AABIP) guidance firmly supports IPCs[3].

Northumbria Healthcare NHS Foundation Trust has a large pleural service[4]. Procedures performed include (LAT), IPC insertion and removal. IPC insertions also occur in dedicated procedure rooms. There is no thoracic surgery on site.

Patients and Methods

Local Caldicott approval was obtained. A retrospective study of all consecutive patients who underwent IPC placement in theatre from Jan 2012 to Dec 2018 was performed. Basic demographics and outcomes were collected. A descriptive statistical methodology was applied.

Perioperative Management

Patients with presumed MPE are referred to pleural clinics where management options are discussed, and referrals for an IPC are then made. The average waiting time is 10 working days. Pre-operative antibiotics (flucloxacillin or teicoplanin) are administered.

IPC Technique

Patients are placed in the lateral decubitus position. A thoracic ultrasound (TUS) is performed to mark the spot for incision and insertion of the Rocket® IPC™, normally at the posterior axillary line, in the 5th or 6th intercostal space. The area is sterilized and draped. 20 milliliters (mL) of bupivacaine and adrenaline (epinephrine) injection 0.5% w/v, 1 in 200,000 is administered into the intercostal space. 2 incisions are made 5 cm apart. A tract is created with straight forceps. The drain is passed through and the cuff sits midway. A di-

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lator and a sheath are passed into the pleural cavity. The drain is threaded through the sheath into the pleural space and the sheath peels away[5]. The drain is secured with nylon sutures.

Post-Operative Care

A chest radiograph is not routinely obtained. On discharge, district nurses perform regular drainages according to the patient's symptoms. Patients are discharged to the referring service.

Results

168 IPCs were inserted.

The mean patient age was 72.8 years (range 35-92, IQR 65-82). 61.3 % were male (n=103). 56 IPCs were done for mesothelioma, 48 for lung cancer, 28 for breast cancer, 23 for others such as melanomas, gastrointestinal and ovarian cancers. 13 were for non-malignant indications (unexplained chronic lymphocytic effusions, hepatic hydrothoraces, yellow nail syndrome, heart failure and chronic pleuritis).

There were no immediate complications (bleeding, pneumothorax or surgical emphysema). 162 patients (96%) had antibiotics pre-procedure. 5 patients (3%) developed pleural infections more than 30 days after insertion (4 male, 1 female, mean age 67.4 years [range 55-75]). All had antibiotic prophylaxis. 2 had contemporaneous cellulitis requiring intravenous antibiotics. 2 out of 5 pleural fluid samples were positive for methicillin-sensitive *Staphylococcus aureus* (MSSA). 2 received intrapleural fibrinolytics for infection clearance. 1 had a recurrent infection due to the IPC cuff being colonized: this was removed. None of these patients were receiving anti-cancer treatment. The median length of hospital stay was 4.7 days (range 3-12). 128 patients received chemotherapy with no issues. 2 (1%) patients had drain displacement. Those were removed. 1 (0.6%) patient had a cutaneous tumor extension through the IPC site. The IPC had been in for 6.2 months. No treatment was required. 14 patients (8.3%) developed significant loculations and non-drainage. 13 patients were given intrapleural fibrinolytics with good radiological and clinical response. 1 patient's symptoms were palliated. 6 of the 13 patients (46%) had recurring loculations and their symptoms were palliated. The remaining 7 had their IPC removed due to pleurodesis.

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

Discussion

The overall complication rate is 13%. Individual rates are lower than described[3,6,7].

3 interventional pleural physicians with significant cumulative experience place IPCs locally. Training doctors are closely supervised. National safety standards for invasive procedures (NATSIP) checklists are rigidly adhered to. TUS allows the identification of a suitable pleural space and aberrant intercostal arteries. This accounts for the lack of immediate complications.

IPC-related infection traditionally affects less than 5% of patients. Our case series corroborates this. There is no significant increase in the risk of IPC-related infection associated with systemic chemotherapy[3,7]. Infections are traditionally associated with skin commensals, including staph aureus species. The removal of the IPC is not usually warranted unless the tunnel is chronically infected. We administer prophylactic antibiotics pre-procedure as had previously noticed a rise in infections without[8]. This is the local practice. No national guidance is available. Gilbert et al[9] showed that a sterile protocol, a single hospital site to perform the IPC placement and perioperative antibiotics enabled a reduction in IPC-related infection from 8.2% to 2.2% (p=0.0049) and a relative risk reduction of 73%.

Tumor extension occurred in less than 5% of cases and was in less than 1% of patients locally. It is more common in procedures such as medical thoracoscopy. There is no role for pre or post-operative radiotherapy[3].

Symptomatic loculations occur in 14% of all IPCs[10]. They are caused by the accumulation of fibrinous material from the tumor and the presence of a foreign body. Impaired fluid drainage causes increased breathlessness. Fibrinolytic therapy can improve radiological appearances and clinical outcomes. However, the recurrence rate of loculations is high[10]. Loculations in our cohort is lower than expected. We surmise that this is an underestimate as routine follow-up does not occur. 107 of the cohort died with the IPC *in situ*, and we do not know if the IPC continued to function until this time.

Our removal rates are comparable to the previous series[11]. 30-40% of patients will achieve spontaneous pleurodesis. This can be improved with

aggressive drainage and talc administration[3]. Due to local administrative and financial constraints, we do not offer this approach. We simply ask clinicians or patients to get in touch after minimal drainage from the IPC has been observed on 3 consecutive occasions. Patients are then assessed for fluid clearance with chest radiographs and TUS. A subgroup analysis of these patients is being performed and is beyond the scope of this article. We have also not discussed IPCs in benign effusions. A further limitation of our study is that we only include patients who have had IPCs in theatre, and not on the various day case units. We are currently working on a central database to track all IPC patients. We do not perform chest radiographs post-insertion; hence rates of surgical emphysema may be underestimated.

Conclusions

Our data add to the large body of evidence that IPCs are safe and have minimal complications. Contributing factors are the use of thoracic ultrasound, the use of pre-operative antibiotics, performing procedures in theatre, and experienced pleural physicians. Our protocol can be generalized in other hospitals to achieve similar outcomes.

Disclosure statement

There are no competing interests.

Ethics statement

Not applicable.

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Conflict of Interests

The authors declare that they have no conflict of interests.

References

1) Maskell NA, Laursen CB, Lee YCG, Rahman N. Pleural disease (ERS Monograph). European Respiratory Society, 2020.
2) https://mypleuraleffusionjourney.com/ (accessed 26.8.2020).
3) Miller RJ, Chrissian AA, Lee YCG, Rahman NM, Wahidi MM, Tremblay A, Hsia DW, Almeida FA, Shojaee S, Mudambi L, Belanger AR, Bedi H, Gesthalter YB, Gaynor M, MacKenney KL, Lewis SZ, Casal RF. AABIP Evidence-informed Guidelines and Expert Panel Report for the Management of Indwelling Pleural Catheters. J Bronchology Interv Pulmonol 2020; 27: 229-245.
4) Aujayeb A, Parker S, Bourke S, Miller J, Cooper D. A review of a pleural service. J R Coll Physicians Edinb 2016; 46: 26-31.
5) https://vimeopro.com/rocketmedical/rocket-medical-clinical-training-video/video/91925239 (accessed 29.9.2020)
6) Fysh ETH, Tremblay A, Feller-Kopman D, Mishra EK, Slade M, Garske L, Clive AO, Lamb C, Boshuizen R, Ng BJ, Rosenstengel AW, Yarmus L, Rahman NM, Maskell NA, Lee YCG. Clinical outcomes of indwelling pleural catheter-related pleural infections: an international multicenter study. Chest 2013; 144: 1597-1602.
7) Chalhoub M, Saqib A, Castellano M. Indwelling pleural catheters: complications and management strategies. J Thorac Dis 2018; 10: 4659-4666.
8) Duffy A, Aujayeb A, Cooper D et al A review of infection rates of invasive pleural procedures Eur Respir J 2016; 48: PA5044.
9) Gilbert CR, Lee HJ, Akulian JA, Hayes M, Ortiz R, Hashemi D, Thompson RE, Arias S, Feller-Kopman DJ, Yarmus LB. A quality improvement intervention to reduce indwelling tunneled pleural catheter infection rates. Ann Am Thorac Soc 2015; 12: 847-853.
10) Thomas R, Piccolo F, Miller D, MacEachern PR, Chee AC, Huseini T, Yarmus L, Bhatnagar R, Lee HJ, Feller-Kopman D, Maskell NA, Tremblay A, Lee YCG. Intrapleural fibrinolysis for the treatment of indwelling pleural catheter-related symptomatic loculations: a multicenter observational study. Chest 2015; 148: 746-751.
11) Porcel JM, Torres M, Pardina M, Civit C, Salud A, Bielsa S. Predictors of indwelling pleural catheter removal and infection: a single-center experience with 336 procedures. J Bronchology Interv Pulmonol 2020; 27: 86-94.