



AUDIT, RESEARCH AND GUIDELINE UPDATE

# Indwelling pleural catheters for non-malignant effusions: a multicentre review of practice

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## ABSTRACT

Indwelling pleural catheters (IPCs) are commonly used in the management of malignant pleural effusion (MPE). There is little data on their use in non-malignant conditions. All IPC insertions for non-malignant cases from five large UK centres were found using prospectively maintained databases. Data were collected on 57 IPC insertions. The commonest indications were hepatic hydrothorax (33%) and inflammatory pleuritis (26%). The mean weekly fluid output was 2.8 L (SD 2.52). 48/57 (84%) patients had no complications. Suspected pleural infection was documented in 2 (3.5%) cases. 33% (19/57) of patients underwent 'spontaneous' pleurodesis at a median time of 71 days. Patients with hepatic disease achieved pleurodesis significantly less often than those with non-hepatic disease ( $p=0.03$ ). These data support the use of IPCs in select cases of non-malignant disease when maximal medical therapy has failed.

## INTRODUCTION

Since their development over 15 years ago, indwelling pleural catheters (IPCs) have become a common treatment option for the management of recurrent malignant pleural effusions (MPEs). However, their use for recurrent effusions caused by non-malignant diseases is less well established. We reviewed cases in which an IPC had been inserted for a non-malignant indication to evaluate their outcomes and complications.

## METHODS

Data were amalgamated from five large centres around the UK, each with an established record of managing pleural disease and more than 5 years' experience of inserting IPCs. All IPCs were inserted by thoracic surgeons or respiratory physicians. The records of all cases in which an IPC had been inserted for a recurrent, non-MPE between January 2007 and July 2013 were collated, with information sourced from each site's prospectively maintained database. As this is a review of practice, ethical approval was not needed. Each insertion was treated as a separate data point. Statistical analysis was performed using SPSS version 21 (IBM, 2010), with a  $p$  value of  $<0.05$  defined as significant.

## RESULTS

Data were collected on 57 IPC insertions in 57 patients. Median length of follow-up was 13 months (range 0–58 months). Patients had a mean age of 67 years (range 27–93) with the majority (65%) being men. A total of 77% (44/57) of patients underwent right-sided IPC insertion. There was a significant positive correlation between number of IPCs being inserted and year of insertion ( $p<0.001$ , Spearman's rank test), with 82% (47/57) being inserted in 2011 or later. Drains were placed for a variety of primary indications, which included hepatic hydrothorax (33%), inflammatory pleuritis (26%), empyema (16%), cardiac failure (16%), yellow nail syndrome (5%) and chylothorax (4%). A summary of between-group characteristics is provided in table 1. In 9/57 (16%) cases it was felt that the effusion had a second contributing factor, such as renal impairment or chronic rheumatoid disease. Patients underwent a median of three pleural procedures before their IPC insertion (range 0–15). Patients with hepatic hydrothorax tended to undergo more procedures (median=4.5) than those with other causes for their effusion ( $p<0.001$ , Mann–Whitney U test).

Initial drainage data were available for 53 patients. The commonest drainage regimen upon discharge was three times per week (30/53, 57% of cases), although patients with empyema were commonly treated with a short initial period on free drainage as an inpatient. Thirty-two of 48 (67%) patients with final drainage data available experienced a reduction in their required drainage frequency over time, most commonly to a frequency of once per week or less. Such a reduction was most commonly seen in effusions due to cardiac disease, empyema and inflammatory pleuritis. The mean weekly volume of fluid drained was 2.8 L (SD 2.52), but this was significantly higher in patients with hepatic hydrothorax, who drained 5.14 L (SD 2.26) per week on average, and significantly lower in those with empyema (0.42 L, SD 0.23) ( $p<0.001$ , Kruskal–Wallis test).

Typical drainage location was known in 55 patients. Of these, 9 (16%) were drained by family members at home, 31 (56%) by community nursing services and 10 (18%) by day attendance at hospital. This latter group comprised patients with hepatic hydrothorax who had high volume fluid production and received 20% Human Albumin



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**Table 1** Summary of characteristics for individual disease groups

Disease group	N	Median number of procedures before IPC	Mean maximum fluid output (L/week)	Reason for drain removal, % (n), total=28			Concerns about risk of infection from non-respiratory team	Removed during operation	Spontaneous pleurodesis*	Median time to spontaneous pleurodesis (days)	Pleural infection, % (n)
				Suspected pleural infection	Significant loculation	Dislodgement					
Cardiac	9	2	1.53	0	0	0	0	44 (4)	38	0 (0)	
Chylothorax	2	3	2.40	0	0	0	0	50 (1)	313	0 (0)	
Empyema	9	1.5	0.42	0	0	0	11.1 (1)	56 (5)	115	0 (0)	
Hepatic hydrothorax	19	4.5	5.14	5.3 (1)	5.3 (1)	5.3 (1)	15.8 (3)†	11 (2)	222	5.3 (1)	
Inflammatory pleuritis‡	15	1.5	2.13	0	6.7 (1)	0	0	33 (5)	28	6.7 (1)	
Yellow nail syndrome	3	3	1.15	0	0	0	0	67 (2)	101	0 (0)	
Overall	57	3	2.8	4 (1)	7 (2)	4 (1)	14 (4)	33 (19)	71	3.5 (2)	

\*Pleurodesis was defined according to local practice, but in all cases patients were felt to have had a significant reduction in the volume of drainage without evidence of drain blockage or loculation.

†Two patients underwent isolated liver transplant, one patient underwent multivisceral transplant (including liver).

‡All patients with a diagnosis of inflammatory pleuritis had pleural biopsy evidence of chronic inflammation; 4/15 patients had evidence of trapped lung. IPC, indwelling pleural catheter.

Solution (HAS) replacement with drainage on the recommendation of local hepatology services. Five patients (9%) were drained in other locations.

A total of 48/57 (84%) patients had no complications during follow-up. Suspected pleural infection was documented in 2 (3.5%) cases, occurring in patients with inflammatory pleuritis and hepatic hydrothorax at 286 and 120 days post insertion respectively. The IPC was removed in each instance with one fluid collection having stopped draining due to loculation. There were no cases in which infection was confirmed on pleural fluid culture. Other complications noted were skin infection (7%), fluid loculation (7%), drain site leakage (2%), pain (4%), blockage (2%), acute renal failure (4%) and mechanical failure of the drain itself (2%). Seventeen patients (28%) died with their IPC in situ, although there were no deaths directly attributable to IPC insertion or use.

Forty-nine percent (28/57) of all patients had their drain removed; 19 of these were documented as having undergone 'spontaneous' pleurodesis, at a median time of 71 days (see table 1). Patients with hepatic disease achieved pleurodesis significantly less often than those with non-hepatic disease (Fisher's exact test,  $p=0.03$ ). Patients with cardiac or inflammatory disease pleurodesed at a median time of 38 and 28 days respectively, whereas those with empyema and hepatic hydrothorax had median delays of 115 and 222 days respectively ( $p=0.01$ , Mann-Whitney U test). After IPC insertion, most patients (47/53, 88.7%) did not require any additional pleural procedures.

## DISCUSSION

To our knowledge, this is the largest single series to date evaluating the use of IPCs in non-malignant recurrent effusions. MPEs are now routinely managed with IPCs in the USA and, increasingly, the UK. However, despite non-malignant conditions being among the commonest causes for pleural effusions, descriptions of IPCs being used to manage them are sparse, perhaps reflecting the fact that many such patients are predominantly not managed by thoracic services.

The systematic review by Chalhoub *et al* in 2012<sup>1</sup> showed a similar case mix to our series, with the overall incidences of

complications and pleural infection comparable to our own (11.2% and 5.2% respectively). A separate review of 1021 patients with an IPC placed for MPE revealed an overall pleural infection rate of 4.7%.<sup>2</sup> The fact that this figure is akin to those found in our series and in the 2012 review suggests that complications are likely to be more strongly related to the use of IPCs themselves and not necessarily to the underlying condition which is driving fluid production.

Among our patient group we noted two instances of acute renal failure, one occurring in a patient with cardiac disease and the other in a patient with hepatic hydrothorax. In the former, the acute kidney injury was ultimately felt to have contributed directly to the patient's death. In both cases patients required IPC drainages totalling more than 3 L/week for symptom control, were taking regular oral diuretic therapy for their comorbidities, and had developed an acute diarrhoeal illness. We would recommend that patients who have an IPC in situ for non-malignant disease have their serum electrolyte levels and renal function measured regularly.

Previous studies in this area have suggested the overall incidence of spontaneous pleurodesis for non-malignant IPCs to be around 60%.<sup>3</sup> Our data, however, show a much lower figure of 33%. In the MPE population there is often heterogeneity in pleurodesis rate depending on the underlying condition. Correspondingly, our data suggest that there may also be notable differences between certain non-malignant disease subgroups with regards to average weekly fluid production and spontaneous pleurodesis incidence. This finding is supported by two recent series analysing IPC use in refractory cardiogenic effusions and in chylothoraces, which demonstrated pleurodesis rates of 29% and 64% respectively.<sup>4 5</sup>

Nine patients had an IPC as part of their empyema management. In all cases, attempted definitive surgical management had either failed or was considered inappropriate due to comorbidities. We would stress that the use of IPCs for chronic empyema should only be considered on a case-by-case basis and has no role in the management of acute pleural sepsis.

We also describe 19 cases of hepatic hydrothorax. These patients had an overall pleurodesis rate of only 11% compared with 56% among those with chronic empyema and 44% in those with cardiac disease. This means that IPC placement for

hepatic hydrothorax would appear to be indicated as a long-term symptomatic palliative measure when Transjugular Intrahepatic Portosystemic Shunt (TIPSS) is not possible, or as a bridge to a transplant operation, rather than as a means to achieve pleurodesis. In our series, hepatologists frequently recommended the use of HAS with IPC drainage. This practice was intended to replicate its routine use in the drainage of ascites but varied between patients and centres as there are currently no general guidelines in this area.

We have demonstrated that the use of IPCs for non-malignant effusions is increasing and that the disease underlying fluid production can lead to significant differences in weekly volumes and pleurodesis success. Their use in this setting leads to a complication rate comparable to that in the more established MPE population, but the spontaneous pleurodesis rate is lower. These data therefore support the idea that IPCs should be considered a viable treatment option for patients with non-malignant disease. However, this should only be in select cases when maximal medical therapy has failed to control symptomatic recurrent pleural effusions, and only in centres in which there is suitable expertise in the management of IPCs. A large-scale, randomised controlled trial is required to further clarify the role of IPCs in this setting, with a particular focus on patients on hepatic hydrothorax (and the role of HAS) as this group appears to demonstrate drainage and pleurodesis characteristics which are distinct from other non-malignant effusion causes of pleural effusion.

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**Contributors** This study was conceived by RB and NAM, who also designed the data collection tool. NAM is this study's guarantor. RB performed local data collection, with the help of NZ and AC, and coordinated data collection elsewhere. This was undertaken by ER, JC, JB and SP at their respective hospital sites, under the guidance of SC, PS, DW, NR and PF. RB was responsible for data collation, cleaning, statistical analysis, draft preparation and draft revision. All authors were involved in the critical appraisal of each manuscript draft and overall data interpretation, and have given their final approval to the current document. No other persons meet the criteria for authorship.

**Competing interests** NAM has sat on advisory board meetings for CareFusion and NR has acted as a consultant for Rocket Medical.

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