



# How common is indwelling abdominal drain-related infection—no simple answer

Po Chung Chan<sup>1</sup>, Ka Wai Alice Cheung<sup>1</sup>, Chun Hung Chan<sup>2</sup>, Lie Meng Hwang<sup>1</sup>, Sing Hung Lo<sup>1</sup>

<sup>1</sup>Department of Clinical Oncology, <sup>2</sup>Nursing Services Division, Tuen Mun Hospital, New Territories West Cluster, Hospital Authority, Hong Kong, China

*Correspondence to:* Po Chung Chan. Department of Clinical Oncology, Tuen Mun Hospital, 23 Tsing Chung Koon Road, Tuen Mun, Hong Kong China. Email: pcchan@ha.org.hk.

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Malignant ascites is a distressing symptom for patients with advanced cancer. Symptom relief achieved by diuretics is usually minimal while paracentesis only provides temporary effect (1). Indwelling abdominal catheters for intermittent drainage is an attractive option to provide promising symptom improvement and prevent repeated invasive procedures (2). Despite being a primary concern for patients on indwelling abdominal catheters, drain-related infection has yet to be thoroughly described in previous literatures.

Our palliative care unit provides intermittent outpatient drainage service for advanced cancer patients with long term abdominal drains inserted for refractory ascites. In a previous study conducted by our team focusing on bacterial colonization and subsequent infection outcomes in this group of patients, up to 48.3% developed bacterial colonization without immediate infection (3). Within the group of patients with bacterial colonization, 43.5% developed drain-related infection subsequently. In the systematic review conducted by Stukan (2), the overall infection rates in patients on tunneled peritoneal catheters was 1.9% for grade 2 (CTCAE version 4.0) and 5.7% for grade 3 infection, while in patients with central venous catheters as indwelling abdomen drains, the infection rate was 0.6% for grade 2 and 0% for grade 3. The incidence reported by our group appears to be alarmingly high and inconsistent when compared with data from previous literatures. Having a predominant proportion of patients with hepatocellular carcinoma (HCC) in our study

population could be one of the explanations. The etiology of ascites in patients with HCC essentially resembles the condition in other benign chronic liver diseases and is very different from that of peritoneal metastasis. The reported risk of peritonitis was three-fold higher in patients with end-stage liver disease using indwelling tunneled peritoneal drainage catheters (4) when compared with those having malignancy associated ascites (5). In addition, the cancer diagnosis of HCC was also found to be an independent factor that positively correlated with infection outcomes in our study (3). Patient selection would be another obvious reason for having a high infection rate. The group being analyzed for infection outcomes were only those with prior bacterial colonization. Based on logical deduction, one may postulate a higher risk of infection in patients with bacterial colonization than the standard population. Nevertheless, even if assuming those patients without bacterial colonization did not develop drain-related infection, though it would never be true in reality, the infection rate reported by our group was still up to 21%.

The two proposed reasons may however represent only part of the answer. Whether there is a standard reference to compare with would be even more critical. Stukan (2) and Christensen *et al.* (6) conducted two relevant and important systematic reviews on various methods of ascites drainage. Detailed appraisal of each individual study included reveals variable reported incidence of drain-related infection. The frequency of grade 2 infection ranged from 0% to 11.8%

while grade 3 infection ranged from 0% to 34.2% (3). The incidence varied between 0% to 43.0% for peritonitis and 0% to 5.0% for cellulitis (6). With such a great variability in the reported incidence from each individual study, the final figures from the pooled analyses are still yet to offer a convincing and representative answer to the question.

The even more crucial issues fall on the definition of drain-related infection and method of capturing infection events. Majority of the previous studies did not offer clear or consistent definitions on drain-related infection (6) and almost all the previous studies only reported the proportion of patients developing peritonitis or cellulitis (2,6). In the data we have presented, five different clinical conditions were defined as drain-related infection: peritonitis, cellulitis, fever or sepsis without other demonstrable foci, infected ascitic fluid on inspection and physician-diagnosed drain-related infection; and each category was assigned a specific definition. The overall incidence may have been over-reported as we have included other clinical conditions in addition to peritonitis and cellulitis. Yet including these equivocal conditions may help with capturing clinically relevant events more thoroughly as the entities of “fever or sepsis without other demonstrable foci” and “infected ascitic fluid on inspection” could represent the early spectrum of frank peritonitis, while “physician-diagnosed drain-related infection”, defined as initiation of antibiotics based on positive ascitic fluid culture in the absence of clinical features of sepsis, is a common clinical scenario in real-world practice. This condition was included as it would be difficult to exclude the possibility that some early infection might have been treated before overt clinical presentation. Unless a common language can be shared in terms of defining drain-related infection, hardly can we compare the incidence across different studies.

The frequency of infection would unquestionably be affected by the method of event capture. A considerable number of previous studies did not offer clear follow-up schedule (6) and some mainly offered phone follow-up (7). It is uncertain that whether the “relatively low” or even zero reported incidence of infection could be contributed by any intrinsic issues related to event capturing. Patients in our cohort were followed up with a relatively regular and frequent schedule in the ascites clinic, with a median average attendance of 1.4 times per week. Much of the clinical information including features related to infection were collected prospectively during each ascites clinic visit using standardized clinical assessment forms. Last but not least, our unit is the only oncology and cancer palliative

care service provider within the district, it is highly likely that the patients who were on indwelling abdominal drains would attend our service in case of drain-related complications. Therefore, our reported data may represent a more thorough capturing of infection events that occurred in reality.

Up till now, good quality data are still lacking to give a final answer to the question on how common indwelling abdominal drain related infection is. Future research with particular focus on this issue, targeting on all patients regardless of the colonization status, preferably with prospective collection of data, would offer a clearer picture to this unanswered question.

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