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Effect of abdominopelvic abscess drain size on drainage time and probability of occlusion

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Abstract

BACKGROUND: The purpose of this study is to determine whether larger abdominopelvic abscess drains reduce the time required for abscess resolution or the probability of tube occlusion.

METHODS: 144 consecutive patients who underwent abscess drainage at a single institution were reviewed retrospectively.

RESULTS: Larger initial drain size did not reduce drainage time, drain occlusion, or drain exchanges ($P > .05$). Subgroup analysis did not find any type of collection that benefitted from larger drains. A multivariate model predicting drainage time showed that large collections (>200 mL) required 16 days longer drainage time than small collections (<50 mL). Collections with a fistula to bowel required 17 days longer drainage time than collections without a fistula. Initial drain size and the viscosity of the fluid in the collection had no significant effect on drainage time in the multivariate model.

CONCLUSIONS: 8 F drains are adequate for initial drainage of most serous and serosanguineous collections. 10 F drains are adequate for initial drainage of most purulent or bloody collections.

Since its initial description in 1978,[1] image-guided percutaneous abscess drainage has become the treatment of choice for the drainage of intra-abdominal fluid collections.[2] It is successful in over 90% of patients[3,4] and has a lower complication rate than surgery.[5] Percutaneous abscess drainage is typically performed using ultrasound or CT guidance. Various factors can affect the success of intra-abdominal abscess drainage, such as the location and size of the abscess, number of loculations, presence of phlegmon,[6,7] presence of fistulas,[8] and viscosity of its contents.[8]

Abscess drainage is one of the most common procedures in interventional radiology, but the size of tube to place in each abscess is largely driven by intuition and personal preference. Many different types of drains are commercially available, ranging from 5 to 20 F for locking loop drains, and 6 to 36 F for straight drains. The most

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commonly used drains are 8 to 14 F, and academic centers are more likely to place ≥14 F drains compared with private practice centers.[9]

A few older studies with small patient numbers have examined the effects of abscess drain size on success rates and drainage times. A meta-analysis by Park et al[8] in 1993 found similar drainage times for small and large diameter catheters, but they did not account for the characteristics of the collection drained. A randomized trial by Gobien et al[10] in 1985 found no differences in success rates or drainage times between 8 F locking loop drains (25 patients) and 12 to 18 F straight drains (18 patients). A retrospective review by Rothlin et al[11] in 1998 showed no differences in drainage times or success rates between 7 F locking loop drains (40 patients) and 14 F sump drains (24 patients), but they did not account for the characteristics of the collection drained.

In general, retrospective studies would be expected to underestimate any benefits of larger abscess drains. If larger drains work better, this effect will be counteracted by the fact that interventional radiologists tend to select larger drains for more viscous collections. A proper evaluation of the effects of drain size would account for the characteristics of the collections drained, or would randomize patients to different drain sizes.

The last randomized trial of abscess drain sizes was published in 1985. Since then, there has been a decrease in the rate of surgical management of abscesses, increase in CT imaging, improved CT and ultrasound image quality, and newer catheter designs. The purpose of this study is to re-examine this common question of what size abscess drain to place, in a modern setting.

Methods

The Institutional Review Board approved this retrospective study based on a chart and imaging review of 144 consecutive patients at a single cancer center who underwent image-guided abscess drainage by interventional radiology between August 2013 and August 2014. A variety of different drains were used, most commonly Multipurpose Drainage and Dawson-Mueller catheters (Cook, Bloomington, IN). Dawson-Mueller catheters were typically used for smaller collections.

We examined total drainage time, whether the catheter occluded, and whether the catheter was exchanged for any reason, as a function of the initial drain size, the attending who performed the initial drainage, and the characteristics of the collection. The size of the collection was based on the amount aspirated at the time of placement, which was classified into 3 groups: small (<50 mL), medium (50 to 200 mL), or large (>200 mL). The viscosity of the fluid was classified as thin (serous, serosanguineous, or bilious) or thick (purulent, feculent, or bloody), based on the description of the fluid aspirated at the time of drain placement. Drain occlusion was determined by review of abscess drain exchange reports and presence of occlusion on corresponding fluoroscopic images.

Interventional radiology attendings were classified into two groups based on the average size drain placed. Attendings who on average placed >10 F drains were classified as "big tube" attendings (7 of 15), and attendings who on average placed ≤10 F drains were classified as "small tube" attendings. "Big tube" attendings typically (>50% of the time) placed 10 F drains in thin collections, and 10 or 12 F drains in thick collections. "Small tube" attendings typically placed 8 F drains in thin collections and 10 F drains in thick collections. This created a natural experiment, where patients were effectively randomized to different drain sizes based on operator preference.

After drain placement, the collection was completely drained in the procedure room, and the output was recorded. Drains were typically flushed with normal saline 2 to 3 times per day to maintain drain patency. Drains were evaluated daily by an interventional radiology fellow or nurse practitioner and discussed with an attending. Tissue plasminogen activator (tPA) was often injected into the drain when there was residual undrained fluid in a thick or loculated collection.[12] Abscess drains were typically removed when there was less than 20 mL/day output with a functioning tube, minimal residual collection, and resolution of symptoms (fever, leukocytosis, pain, and so forth).

P values for differences between average drainage times were calculated using analysis of variance (3 groups) or a 2-tail *t* test with unequal variances (2 groups). *P* values for differences between the fraction of tubes that occluded or required exchange or tPA were evaluated using a 2-tail *z* test, comparing "big tube" vs "small tube" attendings, and ≤8 F versus ≥12 F tubes. Total drainage time was predicted using a linear regression model, using collection characteristics (viscosity and size), presence of a fistula to bowel, and drain size. Probability of occlusion was predicted using a logistic regression model, using collection characteristics (viscosity and size), presence of a fistula to bowel, and drain size. The threshold probability for the logistic regression prediction was selected to maximize the sum of the sensitivity and specificity for predicting occlusion.[13]

Results

Of the 144 collections drained, 39 collections contained thin fluid (serous or serosanguineous), 100 contained thick fluid (purulent or bloody), and 5 collections had no data recorded on fluid characteristics. The average initial drain size was 9.9 F (range: 6 F to 18 F), and almost all (97%) were 8, 10, or 12 F. The average total drainage time was 28 days.

"Small tube" and "big tube" attendings drained collections with similar characteristics: there was no significant difference in the collection viscosity, collection size, or presence of fistula to bowel. Despite similar collection