AABIP JOURNAL CLUB

THE IMPACT OF GRAVITY VS SUCTION-DRIVEN THERAPEUTIC THORACENTESIS ON PRESSURE-RELATED COMPLICATIONS

CHEST 2020

THE CLINICAL QUESTION

Does gravity drainage decrease procedural pain during thoracentesis compared to manual aspiration?

TAKE HOME MESSAGE

Thoracentesis using gravity drainage or manual aspiration result in similar levels of procedural comfort and dyspnea improvement, however duration of the procedure is extended with gravity drainage.

BACKGROUND

Thoracentesis is a common procedure and can provide significant symptom benefit in patients with pleural effusions. It is considered a low-risk procedure, however complications including procedural pain and re-expansion pulmonary edema have been reported, particularly when larger volumes are removed. Options for drainage include manual aspiration, gravity drainage, or active suction (via wall suction or a negative pressure bottle). The optimal method of drainage is unclear – that is, the method that provides the most patient benefit while causing the least harm. A recent randomized trial of 100 patients demonstrated that vacuum suction compared to manual drainage was associated with higher rates of complications, higher rate of early termination, and more procedural pain.

STUDY DESIGN

- Randomized, controlled, single-blind multicenter trial
- Patients referred to interventional pulmonology for thoracentesis across ten academic centers in the US were considered for enrollment
- Screened and randomized between October 11, 2018 to April 5, 2019

Primary outcome

- Patient-reported procedural chest discomfort assessed using the VAS score five minutes post-procedure

Secondary Outcome(s)

- Discomfort VAS score prior to catheter removal, immediately following catheter removal, at 24h, and at 48h
- Breathlessness by VAS and Borg scales at 5 minutes postprocedure
- Breathlessness by Borg scale at 24h and 48h
- Procedure duration
- Frequency of lung re-expansion
- Complications including pneumothorax and re-expansion pulmonary edema

Intervention(s)

- Manual aspiration versus gravity drainage

POPULATION

Inclusion criteria

- Age ≥ 18
- Symptomatic pleural effusions estimated at least 500mL in volume

Exclusion criteria

- Effusions did not appear free-flowing
- Patients were unable to sit for the procedure
- Patients unable to provide informed consent

Baseline characteristics

The final cohort included 62 patients in the manual aspiration group and 78 patients in the gravity drainage group. Aspiration and gravity groups were well matched on most baseline characteristics including age (mean 62.5 and 65.1 years respectively), sex, smoking status, and comorbidities. Approximately half the procedures were performed on an outpatient basis. Pleural fluid analysis demonstrated an exudate in 64.5% of patients in the aspiration group and 57.7% in the gravity group, and 43.5% and 35% represented malignant effusions respectively. Chest discomfort by VAS score immediately prior to the procedure was higher in the aspiration group than in the gravity group (22.9 ± 2.0mm vs. 12.3 ± 18.2mm).

OUTCOMES

Primary outcome

No difference between groups in overall procedural chest discomfort measured by VAS 5 minute post-procedure Adjustment for lower pre-procedure chest discomfort in the gravity group did not alter

Secondary outcomes

- No difference between groups in:
  - Intra-procedure or post-procedure (24h and 48h) VAS discomfort scores
  - Post-procedure VAS Borg dyspnea scores
  - Pre-to-post-procedure VAS discomfort scores
  - Pre-to-post-procedure VAS dyspnea scores Volume drained (mean 1,264mL vs. 1,165mL)
  - Procedure duration was significantly shorter in the aspiration group compared to gravity drainage group (mean duration 10.5 ± 6.1 vs. 17.8 ± 9.7 min, mean difference 7.4 min)
  - In both groups, drainage stopped spontaneously in approximately one-half of procedures, and the other one-half were stopped early, mostly for chest discomfort.

Adverse events

No significant adverse events were noted. No difference in rate of non expanding pneumothorax or residual post-procedure effusion between groups.

COMMENTARY

- Chest discomfort immediately prior to the procedure was higher in the manual aspiration group, although there was no between-group difference in post-procedure or pre-to-post procedure discomfort, and this remained true after adjusting for the baseline difference
- There was a higher number of subjects with pleural malignancy and exudative effusions in active aspiration group, and lower number of patients with previous thoracentesis, though if anything these would likely bias the outcome in favor of gravity drainage
- The final etiology of a significant number of effusions (33% and 42%) was not known
- The study did not address duration of effusion or suspicion of trapped lung
- It is possible that the selected post-procedure time points did not capture the degree of discomfort experienced
- The rate of fluid aspiration in the manual aspiration arm may be variable
- The procedure was performed by interventional pulmonologists, i.e. expert proceduralists, and therefore may not be applicable to smaller centers

FUNDING

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SUGGESTED READING

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(2) Senitko M, Ray AS, Murphy TE, Araujo KLB, Bramley K, DeBiasi EM, et al. Safety and Tolerability of Vacuum Versus Manual Drainage During Thoracentesis: A Randomized Trial. J Bronchology Interv Pulmonol 2019;26(3):166-71.(
3) Lentz RJ, Lerner AD, Pannu JK, Merrick CM, Roller L, Walston C, et al. Routine monitoring with pleural manometry during therapeutic large-volume thoracentesis to prevent pleural pressure-related complications: a multicentre, single-blind randomised controlled trial. Lancet Respir Med 2019;7(5):447-55.
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ARTICLE CITATION

Lentz RJ, Shojaee S, Grosu HB, Rickman OB, Roller L, Pannu JK, et al. The Impact of Gravity vs Suction-driven Therapeutic Thoracentesis on Pressure-related Complications: The GRAVITAS Multicenter Randomized Controlled Trial. Chest 2020;157(3):702-11.

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