0022-5282/00/4804-0758
The Journal of Trauma: Injury, Infection, and Critical Care

Vol. 48, No. 4
*Printed in the U.S.A.*

**EDITORIAL**

# The EAST Practice Management Guidelines for Prophylactic Antibiotic use in Tube Thoracostomy for Traumatic Hemopneumothorax: A Commentary

The article in this issue of *The Journal of Trauma* (pp. 000-000) entitled "Practice Management Guidelines for Prophylactic Antibiotic Use in Tube Thoracostomy for Traumatic Hemopneumothorax" written by the Eastern Association for Trauma (EAST) Practice Management Guidelines Work Group has reviewed the literature from 1977 to 1997 for papers dealing with prophylactic (preventive) antibiotic use for trauma patients requiring a chest tube for hemo(pneumo)thorax. Of 44 references found with a Medline inquiry, they selected 11 for inclusion in their "evidentiary review."[1–11] Nine of these studies were prospective series[1–9] and two were meta-analyses.[10,11] These articles were then reviewed by four trauma surgeons and two pharmaceutical outcome researchers.

The authors (Luchette et al.) noted that the literature concerning the reduction of the incidence of bacterial pneumonia in patients with traumatic hemopneumothoraces receiving antibiotics is "difficult to interpret because of the variability in criteria used to make this diagnosis." The authors also noted that "there is lack of clarity regarding pneumonia as a primary or secondary end point of prophylaxis." (We assume that both pneumonia and empyema were primary end points.) The authors did, however, note that three studies (Stone et al,[2] LoCurto et al.,[7] and Nichols et al.[4] did have CDC-conforming definitions of pneumonia and empyema. If one uses these three studies, the incidences of pneumonia without antibiotics would be 11.6%, 14.3%, and 5.3%, respectively, whereas the incidence of pneumonia in the antibiotic groups would be 0%, 2.3%, and 0%, respectively. If all three studies are combined, the incidence of pneumonia would be 9.4% (12/127) for the placebo groups and 0.8% (1/133) ($p = 0.003$) for the antibiotic groups. The authors, however, are reluctant to do a meta-analysis on these papers because "the study populations were not similar." This, however is a matter of interpretation, because two other groups of authors (Fallon and Wears[11] and Evans et al.[10]) felt that these studies were similar enough to be combined. Indeed, if all eight studies in which antibiotics were compared wit no antibiotics are combined, the incidence of pneumonia would be 14.8% (49/332) for placebo and 4.1% (14/338) for antibiotics ($p = 0.001$).

For the four class I (prospective, randomized, double-blind studies) (Grover et al.,[1] Stone et al.,[2] Cant et al.,[3] and Nichols et al.,[4] the pneumonia rates were 35.1%, 11.6%, 33.9%, and 5.4% for the placebo groups versus 10.5%, 0, 12.5%, and 0 for the antibiotic groups. If the results from the groups are combined, the incidence of pneumonia with the four placebo groups would be 20.8% (40/192) versus 5.6% (11/198) ($p < 0.001$). Thus, the preponderance of data seems to suggest that antibiotics reduce the incidence of pneumonia in patients with chest tubes for traumatic hemopneumothoraces.

With reference to empyemas, the authors elected to discount empyemas that occurred coincident with pneumonias, because they felt that these parapneumonic empyemas were unrelated to the chest tubes (which may or may not be true).

Again, if we take the three studies (Stone et al.,[2] LoCurto et al.,[7] and Nichols et al.[4] that defined empyema according to CDC criteria, the incidences of empyema in the placebo groups were 4.7%, 17.9%, and 7.1%, respectively versus 2.5%, 0%, and 0% in the antibiotic groups. If these three groups are combined, the average empyema incidence would be 8.7% (11/127) without antibiotics versus 0.8% (1/133) with antibiotics ($p = 0.006$). If the data from all eight prospective randomized studies is combined, the incidence of empyema would be 8.7% (29/332) for placebo and 0.6% (2/338) ($p < 0.0001$) for antibiotics. The EAST authors, however, seem somewhat reluctant to definitely say that antibiotics reduce the incidence of empyemas in these patients.

The authors include the study by Demetriades et al.,[9] in their data. Although all of the patients in that study received antibiotics, one group received only one dose (before chest tube insertion) and the other group continued their antibiotics. Therefore, we do not feel the study can be used to compare placebo against antibiotics. Nevertheless, the findings support the idea that one dose of antibiotics before chest tube insertion may be adequate coverage.

Although there has been a tendency to separate the infectious complications with hemopneumothoraces into pneumonia and empyema, it is probably more clinically useful to look at all of the infections occurring and combine them. Indeed,

Accepted for publication January 7, 2000.
Submitted for publication January 11, 2000.
Address for reprints: Robert F. Wilson, MD, FACS, Department of Surgery, Detroit Receiving Hospital and University Health Center, Wayne State University, 4201 St. Antoine, Detroit, MI, 48201.

if the pulmonary and pleural infections are combined for each study, the improved outcome with antibiotics becomes even more apparent. For example, the combined total thoracic infection rates in the four class I studies would be 29.2% (56/192) for the placebo groups and 7.1% (14/198) for the antibiotic group ($p < 0.0001$). If the data from all eight studies are combined, the total thoracic infection rates would be 23.2% (77/332) versus 5.0% (17/338) ($p < 0.0001$).

Of the eight studies comparing a placebo against antibiotics (excluding Demetriades et al.[9]), only two (LeBlanc and Tucker[5] and Mandal et al.[6]) showed no significant difference between the placebo and antibiotic groups, but the incidence of all infections (empyema plus pneumonia) in the combined placebo groups was only 4.5% (3/66). The incidence of empyema plus pneumonia in the antibiotic group was lower (1.5% [1/66]) but not significantly. Indeed, if the incidences of empyema plus pneumonia were uniformly less than 5% in these patients, there would not be a great need to consider the use of antibiotics at all, except in selected high-risk patients.

Luchette et al. also had some difficulty with the cost data presented by Nichols et al.[4] that showed a 0.9 day hospital stay reduction with antibiotics, with a potential direct reduction in medical costs of $488 to $607 (which probably underestimates the differences in costs of treating infected versus noninfected patients). Cant et al.[3] also found a reduced mean hospital stay with the antibiotic group (3.9 vs. 5.6 days) that would indicate an even greater savings with antibiotic use.

Thus, the study by Luchette et al. has addressed some extremely important concerns regarding the use of antibiotics in patients requiring a chest tube for traumatic hemopneumothoraces. Although there will continue to be a debate as to whether the studies are similar enough to be combined, the data, at this point at least, seem to indicate quite strongly that antibiotics reduce the incidence of pneumonia and empyema. The optimal duration of antibiotic use, however, is still unknown and may be only an initial dose or for only 24 hours.

The authors have suggested a multicenter, prospective, carefully done clinical study to further define the value of preventative antibiotics in traumatic hemopneumothoraces treated with tube thoracostomy. Of course, we do not disagree with the accumulation of more data on this or any other subject. We do, however, feel that it will be difficult to find government or pharmaceutical funding to support a project of this type that will require many years to complete, even with many trauma centers included. There appear to be many other truly innovative issues that will probably receive funding priority.

**Robert F. Wilson, MD**
Department of Surgery
Detroit Receiving Hospital and University Health Center
Wayne State University
Detroit, Michigan

**Ronald Lee Nichols, MD**
Department of Surgery
Tulane University School of Medicine
New Orleans, Louisiana

## REFERENCES

1. Grover F. L., Richardson J. D., Fewel J. G., Arom K. V., Webb G. E., Trinkle J. K. Prophylactic antibiotics in the treatment of penetrating chest wounds: a prospective double-blinded study. *J Thorac Cardiovasc Surg.* 1977;74:528–536.
2. Stone H. H., Symbas P. N., Hooper C. A. Cefamandole for prophylaxis against infection in closed tube thoracostomy. *J Trauma.* 1981;21:975–977.
3. Cant P. J., Smyth S, smart D. O. Antibiotic prophylaxis is indicated for chest stab wounds requiring closed tube thoracostomy. *Br J Surg.* 1993;80:464–466.
4. Nichols R. L., Smith J. W., Muzik A. C., et al. Preventive antibiotic usage in traumatic thoracic injuries requiring closed tube thoracostomy. *Chest.* 1994;106:1493–1498.
5. LeBlanc K. A., Tucker W. Y. Prophylactic antibiotics closed tube thoracostomy. *Surg Gynecol Obstet.* 1985;160:259–263
6. Mandal A. K., Montano J, Thadepalli H. Prophylactic antibiotics and no antibiotics compared in penetrating chest trauma. *J. Trauma.* 1985;25:639–643.
7. LoCurto J. J. Jr, Tischler C. O., Swan K. G., et al. Tube thoracostomy and trauma: antibiotics or not? *J Trauma.* 1986;26:1067–1072.
8. Brunner R. G., Vinsant G. O., Alexander R. H., Lanevel L, Fallon W. F. Jr. The role of antibiotic therapy in the prevention of empyema in patients with an isolated chest injury (ISS 9–10): a prospective study. *J Trauma.* 1990; 30:1148–1154.
9. Demetriades D, Breckon V, Breckon C, et al. Antibiotic prophylaxis in penetrating injuries of the chest. *Ann R Coll Surg Engl.* 1991;73:348–351.
10. Evans J. T., Green J. D., Carlin P. E., Barrett L. O. Meta-analysis of antibiotics in tube thoracostomy. *Am Surg.* 1995; 61:215–219.
11. Fallon W. F. Jr, Wears R. L. Prophylactic antibiotics for the prevention of infectious. complications including empyema following tube thoracostomy for trauma: results of meta-analysis. *J Trauma.* 1992;33:110–117.