been obtained by combining anterior pericardiorrhapsy with insertion of an expandable prosthesis into the pneumonectomy space.1,2,10 Our patients were treated by this method and all have benefited enormously.

Our experience includes five patients suffering from PPS who were treated surgically by combining pericardiorrhapsy and insertion of an expandable prosthesis. There has been both subjective and objective improvement in their lung function. All five patients in this series had a left-sided aortic arch. They have all had an improvement in their dyspnea. None of our patients have had malacia of the airway and therefore have not required bronchial resection, aortic bypass, or endobronchial stents.

**CONCLUSION**

PPS is a rare cause of dyspnea, stridor, and recurring pneumonia after lung resection. With a high index of suspicion, it can be diagnosed accurately using bronchoscopy, radiography, and PFTs. Repositioning of the mediastinum with a saline solution-filled prosthesis and anterior pericardiorrhapsy is easily performed and provides and immediate and lasting symptomatic relief. The early diagnosis and treatment of PPS should prevent tracheobronchomalacia, which can be much more difficult to treat.

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**Herbicide (Roundup) Pneumonitis**

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A case of acute intoxication presented as toxic pneumonitis after exposure to Roundup (glyphosate) (Solaris Group, Monsanto; San Ramon, CA) herbicide in an agriculture worker. The correct etiologic factor causing this specific clinical picture was identified only 2 weeks later, after a thorough occupational history was taken and meticulous delineation of the working conditions and exposures of the involved worker were made. As a rule, occupational related diseases are not readily elucidated by nonoccupational physicians. However, most acute intoxication events are first encountered by such physicians. In these situations, rapid and comprehensive evaluation is necessary in order to clearly identify the causative agent(s) and to initiate the appropriate treatment. Consulting occupational physicians at this early stage may facilitate early and accurate diagnosis.

(CHEST 1998; 114:1769–1771)

**Key words:** herbicides; occupational history; occupational lung disease

**Abbreviations:** ED = emergency department; OP = organophosphate

**A** cute pulmonary symptoms necessitating hospitalization are not rare in agriculture workers. Frequently, there is an apriori assumption by emergency department (ED) and house staff that the causative agent is an organophosphate (OP) pesticide (acetylcholinesterase inhibitor). Many times, no further effort is made to identify the exact nature of the involved noxious material. This is unfortunate because there are many (newer) pesticides and herbicides in use, whose actions are based on different mechanisms. Understanding their toxicologic effects in humans could facilitate proper treatment, if an intoxication should occur.

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When agriculture workers are injured, the medical history often reveals exposure to unidentified agent(s) or simultaneous exposure to several chemicals with unknown toxicologic effects and interactions. The accurate identification of the noxious agent(s) is frequently delayed, as well as the initiation of adequate treatment.

**CASE REPORT**

A 42-year-old mechanic entered an ED complaining of shortness of breath, irritative cough, dizziness, discomfort in the throat, and episodes of hemoptysis. Past history revealed no significant health problems, except smoking 20 cigarettes daily for many years. Because of these symptoms, the subject was admitted to the hospital. Earlier that day, the patient had been working in a confined space cleaning and repairing a spraying device mounted on a tractor. He disassembled the clogged sprayers and manifolds from the device and used diesel fuel as a cleaning solvent. The work was performed in a small room with one window. To improve his working conditions, he put a ventilator at one end of the room, thus, moving air over the bucket where the clogged parts were immersed in the solvent. The disassembled parts contained remnants of the spraying solution used.

The patient was conscious on admission to the hospital. His temperature was 38.4°C; respiration rate was 30 breaths/min; pulse was regular, 109/min; and BP 116/70 mm Hg. Pulse oximeter showed saturation of 90%. He was in mild to moderate respiratory distress; diffuse rales and crackles were heard over the lungs. The rest of the physical examination results were normal. ECG was normal, and the chest radiograph showed diffuse bilateral alveolar pattern (Fig 1).

Laboratory workup showed WBC count 17,700/mm³, with 90% neutrophils. There was no anemia, electrolyte imbalance, or disturbed kidney functions. Liver function test results were normal; pseudocholinesterase level was normal. While breathing oxygen with a face mask, arterial blood gas values were as follows: pH 7.40; PaCO₂ 40 mm Hg; PaO₂ 109 mm Hg; arterial oxygen saturation, 98%; and bicarbonate, 25 mEq/L.

The patient was treated with IV antibiotics (Augmentin), corticosteroids, and oxygen. Within 48 h, he showed marked clinical improvement, and the repeat chest radiograph showed a significant clearing of the pulmonary findings. The patient was discharged with recommendation to continue tapering the prednisolone and antibiotic treatment. Two days later, he returned to the ED complaining of tightness in the chest, hoarseness, and epigastric pain. He was not in any respiratory distress. Otolaryngologic evaluation demonstrated signs of burns in the mucosal membranes of the pharynx and larynx.

Chest radiograph showed further improvement compared to the previous one; and 4 days later, the radiograph findings completely cleared. Pulmonary function tests done at that time revealed evidence of moderate restriction: FVC of 3.07 L (51% of predicted), FEV₁ of 2.66 L (56% of predicted), and FEV₁/FVC of 86%. All blood test results were within normal range, except impaired liver function (alanine aminotransferase-165 IU), returning to normal only 3 months later.

**DISCUSSION**

This case represents several problems encountered quite often when an agriculture worker develops symptoms and signs of acute chemical (toxic) pneumonitis. It demonstrates the need to obtain a thorough occupational history in order to clearly identify the noxious agent(s); the difficulties in differentiating among several potential harmful exposures involved; and the importance of understanding the toxicologic mechanisms of the concerned materials in order to initiate a proper treatment.

At first, based on the initial history, it was assumed that this worker had been exposed to organophosphate pesticides; even though measurements of cholinesterase level were normal and the clinical picture was not typical of such poisoning. All agriculture workers are presumed to be exposed to pesticides which are OP or other cholinesterase inhibitors. As the clinical course and the radiograph did not fit OP poisoning, the second suspected causative agent was diesel fumes. However, the patient’s clinical picture was that of acute massive pneumonitis. This type of clinical picture is unlikely to develop as a result of exposure to either OP or diesel fumes. After a detailed occupational history, we ascertained that this worker was exposed to Roundup herbicide.

Roundup (glyphosate) (Solaris Group, Monsanto; San Ramon, CA) is a postemergent, systemic, and nonselective herbicide which is used widely around the world for agricultural and nonagricultural purposes. It is a noncholinesterase inhibiting organophosphorous herbicide with the empiric formula of C₃H₇NO₅P. During formulation, surfactants and certain inert components are added to the active material. Polyoxyethylene amine is a major ingredient of the surfactant activity of the formulated herbicide. This surfactant is the component largely responsible for acute effects on mucosal lining and lung tissue when accidental exposure occurs.²

Intoxication may result from both oral (ingestion) or respiratory (inhalation) exposures. Acute mucosal erosions in the mouth and the upper respiratory tract are typical symptoms of Roundup intoxication. The pulmonary effects are primarily those of damage to alveolar surfactant, resulting in the gradual development of pneumonitis.

Workers exposed to pesticides are not limited to only sprayers. Workers may be exposed during manufacturing, formulation, packaging, transportation, application, and contact with crops while harvesting and manipulating products. It is unusual, but not too rare, to encounter intoxication by such materials during handling or repairing spraying equipment.

![Figure 1. Chest radiograph on admission demonstrating interstitial bilateral infiltrations.](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21893/)
This case represents some typical occupational health issues encountered in agriculture workers: Usually only a small number of workers are afflicted. Often, such workers are exposed simultaneously to several possible noxious agents. Frequently, workers are unaware of the potential hazards involved in handling these materials, and too often, protection devices are not used, and unsafe work practices are common, resulting in increased risk of exposure.

As many of the newer chemicals used in agriculture have complex physicochemical characteristics (usually not known to health professionals), it is important to obtain a detailed and exact occupational history and clarify the mode of action of the involved materials, in order to provide prompt and effective treatment.

REFERENCES

Percutaneous Tracheostomy*

Is It Really Better?

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Key words: percutaneous tracheal injury; tracheostomy; tracheostomy (CHEST 1998; 114:1771–1772)

Over the past 50 years the practice of medicine has seen the advent of many new technologies and innovative ideas. There is a perception of improved efficiency when minimal access interventions replace conventional surgical standards. We report two cases of significant complications from percutaneous tracheostomy and caution users of the real and potential risks of this technique. Percutaneous tracheostomy is becoming more popular and is reported to be safe, cost-effective, and the preferred procedure over standard surgical tracheostomy. The evidence supporting this procedure, however, is lacking.

A MEDLINE search (key words—percutaneous tracheostomy, tracheostomy, and tracheal injury) from 1966 to December 1997 retrieved 170 articles, only two of which where randomized control trials.1,2 Crofts et al1 reported on 53 patients “randomized” by alternate weeks to undergo either a surgical or percutaneous tracheostomy. No difference was found in the rate of complications in this small study, and they concluded that percutaneous tracheostomy could be performed safely in the ICU. Friedman et al2 randomized 53 patients and found that the times for scheduling and performing the procedure were statistically quicker using the percutaneous tracheostomy. More postoperative problems were noted with the surgical procedure, leading these investigators to conclude that percutaneous tracheostomy was superior. In addition, they speculated that “ICU utilization will improve”; however, their study did not address this question.

We report two cases of percutaneous tracheostomies that resulted in serious complications. Both cases occurred in tertiary care centers with regional trauma programs.

CASE 1

An 18-year-old female, otherwise healthy, was involved in a snowmobile accident on January 12, 1997. She sustained a closed head injury and minor facial lacerations after colliding with a parked car. She remained comatose with a Glasgow coma score of four in the ICU on full ventilatory support. On January 17, 1997, she underwent a percutaneous tracheostomy for long-term ventilatory support. The procedure was moderately difficult despite being performed by a surgeon experienced with the procedure. The patient developed a right tension pneumothorax requiring immediate chest thoracostomy. The tube demonstrated a large air leak and the patient became hypoxic and hypercarbic. Bronchosopic examination revealed a tracheal tear 2 cm above the carina. The patient continued to have a large air leak and low saturations despite oral intubation and insertion of a second chest tube. Reintubation with an uncut 7F endotracheal tube, advanced bronchoscopically into the left mainstem bronchus, stopped the air leak and her saturations improved. Right thoracotomy confirmed a 2-cm tear in the distal trachea on the right lateral wall at the junction of the cartilaginous and membranous trachea. This was repaired with an interrupted 3-0 suture (Vicryl; Ethicon; Peterborough, ON, Canada) and buttressed with intercostal muscle. The patient returned to the ICU with a stable airway. Unfortunately, her neurologic status deteriorated over the next 12 h and she died.

CASE 2

On April 15, 1997 a 65-year-old man was struck by a car while walking his dog. He suffered a closed head injury. He was breathing spontaneously on admission to the trauma suite, but rapidly deteriorated neurologically due to an expanding subdural hematoma. An anesthetist attempted oral tracheal intubation but was unsuccessful due to an inability to visualize the glottis. A percutaneous tracheostomy was attempted by an experienced trauma team leader, but there was difficulty introducing the wire and dilator using the Seldinger technique. Shortly after attempting the tracheostomy, a right tension pneumothorax developed requiring needle decompression and tube thoracostomy. The

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