an insertion point from which a pulmonary artery catheter can be floated to evaluate more specifically pulmonary pressures and left heart function.

Central venous access has remained the staple of intensive care therapy for decades. However, controversy exists regarding the risks and benefits of indwelling CVCs, particularly in light of recent intolerance of complications from the ever increasingly used devices. Infectious complications are particularly devastating, with internal jugular cannulation being associated with a higher infection rate than lines inserted via a subclavian approach. This may be a consequence of the insertion technique or, more likely, a combination of increased use of CVCs in patients as well as a relative willingness to leave these CVP catheters in situ for a prolonged period of time in the intensive care unit. These internal venous lines may be used for infusion of therapeutics as well as for monitoring, resulting in a complex picture in the control of infectious complications.

A second aspect of CVCs is the insertion technique. With the increasing use of ultrasound, many clinicians now advocate using ultrasound routinely as an adjunct to central line insertion. Proponents argue that the structures are easily identified, making complications due to unusual anatomy rare to non-existent. However, using ultrasound involves the ability to have an ultrasound machine available when line insertion is needed, and necessitates the training of personnel to use ultrasound appropriately. Additionally, a second experienced person is required to hold the probe if ultrasound is to be used to guide in real-time the insertion of a CVC into the venous structure.

Many clinicians still rely, successfully, on anatomic landmarks to guide insertion of CVCs. The most common, and most feared, complication of CVC insertion is the misplacement of a CVC into an artery. IT has been estimated that the incidence of such a complication, with insertion of a dilator into the artery, occurs at a less than 1% rate, surprisingly low for a complex procedure. However, such a complication is devastating and can result in death or permanent injury. It is unknown what the actual incidence is, as many events may be unreported. A recent report highlighted the use of manometry during the process of CVC insertion, prior to the dilation of the vein to accept the CVC, with no reported incidence of complications in over 10,000 insertions over a 15 year period. However, it is recognized that no technique, manometry or ultrasound guidance, is foolproof, as reports of complications despite using techniques designed to eliminate such mishaps continue to be published.

MECHANICAL VENTILATION IN THORACIC TRAUMA AND ARDS

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After significant thoracic trauma, patient may present with a variety of injuries that necessitate different levels of intervention. In some cases, such as mild pulmonary contusions, supplemental oxygen via face mask or oxygen tent with natural respiration may be sufficient to support the patient. However, many patients require more intensive interventions owing to a more severe level of trauma.

Thoracic trauma may be of a penetrating or non-penetrating nature. By far, the most common form of thoracic injury is the result of high speed motor vehicle accidents, with a "closed chest" injury or contusion coupled with a variety of other orthopedic and head injuries as a result of crash trauma. Fortunately, with newer car technology, some of these injuries can be less severe than in times past, yet thoracic injuries may still result from these crashes.

Pathophysiology of Thoracic Trauma

Penetrating injuries are often quite severe on initial presentation, as disruption of the thoracic cavity will result in significant respiratory abnormalities and spectacular injuries. These injuries require virtually immediate operative intervention to control hemorrhage and re-establish the integrity of the thoracic cavity to restore normal respiratory physiology. This type of injury requires immediate control of the airway by endotracheal intubation and subsequent supportive mechanical ventilation to allow recovery. This type of penetrating injury may also have associated lung injuries similar to blunt traumatic injuries as discussed below.

Blunt trauma injuries are more difficult to diagnose and may therefore be more prone to complications. Parenchymal injuries may be hidden with seemingly trivial external injuries. However, internal hemorrhage and contusion of the lung may be present and develop into ARDS as the injury "matures" and bodily functions react to the acute trauma. The resulting physiologic response may cause significant increase in lung water, with disruption of the alveolar function as seen with ARDS.

Mechanical Ventilation Techniques

Initial ventilatory management should follow established techniques: Controlled volume ventilation with appropriate sedation and neuromuscular blockade, with the addition of positive end-expiratory pressure (PEEP) as needed to support oxygenation. Attention should be paid to keeping the lung volume above the "opening volume" of the lung compliance curve, as repetitive alveolar closure may result in significant alveolar damage. The concept is to keep the alveoli from collapsing and requiring significant opening pressure in order to re-expand and function, after the loss of surfactant from the thoracic injuries. This is generally accomplished by increasing PEEP, thus not allowing airway pressures to fall below 12 mmHg, and decreasing tidal volumes in order to avoid overinflation of the lung and subsequent barotrauma.

Recent investigations into the optimal treatment of ARDS have resulted in the slow adoption of low tidal volume and minimal inspiratory airway pressures to obtain significantly better survival from thoracic trauma and ARDS. Controlled clinical trials, some retrospective and some (notably the ARMA trial from the US National Institute of Heart Lung and Blood) prospective and randomized, have clearly demonstrated a superior survival rate from this approach, with recommended tidal volumes of 4-6 ml/kg of *ideal* body weight rather than the more traditional 10-12 ml/kg of tidal volumes. This approach may cause hypercapnia and mild acidosis, yet the results are positive and the nypercapnia and acidosis do not affect overall survival. Many patients are managed with hyperventilation and sodium bicarbonate infusions to offset the effects of low tidal volume, although these extra measures have not been shown to alter survival as compared to untreated patients.

PEEP is integral to the approach of low tidal volume ventilation, as the recruitment of alveoli is accentuated by the application of PEEP in these patients. PEEP also prevents the patient from having intermittent alveolar collapse during the ventilatory cycle by not allowing the pulmonary pressure-volume curve to pass through the inspiratory point of inflection, thought to be the point at which alveoli spontaneously close completely. Preventing the opening and closing of alveoli has been shown to decrease lung injury during ARDS and diminish the release of inflammatory mediator from the lung during ARDS.

Bilateral lung contusions

Management of bilateral lung contusions involves manipulation of ventilation with a single-lumen, standard endotracheal tube. Both lungs are subjected to the same airway pressures and PEEP with tidal volume distributed proportionally between nthe right and left lung. In many situations, however, the trauma may be unequal to the lungs, and thus independent lung ventilation must be achieved by the isolation of lungs with differential ventilation techniques. In general, this manipulation involves placement of a double lumen endobronchial tube in order to ventilate each lung independently.

Unilateral lung contusions

Trauma to one lung requires different ventilation strategies in order to achieve recovery. In some instances, it may be possible to manage the patient conservatively, without the need for positive pressure ventilation. Frequently, the trauma is of a severe nature so as to require controlled ventilation, frequently due as well to other extrathoracic injuries.

Unilateral lung contusions require separate ventilation strategies to avoid barotraumas and other injuries to the unaffected lung while maximizing therapy to the injured lung. Placement of a double lumen endobronchial tube is essential for achieving this differential ventilation. Management strategies may include differential positive end-expiratory pressure to each lung, or separate ventilators providing support to each lung separately, using different ventilator settings and PEEP settings to maximize recovery.

PHYSICIANS AND THE INTERNET

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What is the Internet?

The Internet was first designed by the United States Department of Defense as a method of ensuring data reliability and storage. It was originally called "ARPA Net" after the US Department of Defense's **A**dvanced **R**esearch **P**rojects **A**gency as a method of safeguarding loss of critical data from the destruction of a single computer during the Cold War. The original purpose was to enable automatic, reliable data "packet" sharing between multiple computers simultaneously. From this rather sinister beginning in August 1962, the Internet evolved.

Today the Internet is ubiquitous, and applications are everywhere. It is present in every lecture hall (there are undoubtedly multiple devices connected as I am speaking to you) and is portable and convenient, as a mobile "wireless" cellular telephone can now access more information than entire libraries. This explosion of information-sharing technology has brought with it new avenues to reach and utilize heretofore untapped resources for the purpose of medical advancement. But how are we, as medical professionals, to use this?

Beware of Greeks Bearing Gifts…

The Internet's ease of use has spawned a darker side of information sharing: The art of disinformation. We read constantly of individuals who take advantage of the Internet for illegal commerce, identity theft, stalking and assault of unsuspecting victims, and piracy. The unfortunate side of the anonymity of the Internet is the temptation to trust the untrustworthy. Information and facts can be invented and presented in such a manner to sway public opinion or ruin individual lives.

Medicine On Line

Given the advantages and risks of the Internet, how should physicians interact with this vast repository of knowledge and disinformation? Firstly, physicians should not trust without checking. The hallmark of modern medicine is the academic acquisition