Anesthesia Options for Lithotripsy Treatments

There are various types of anesthesia that can be used during lithotripsy. They vary in the level of patient consciousness, the spontaneous breathing ability of the patient, the need for intensive monitoring and anesthesia recovery time.

As of May 1985, Six U.S. hospitals were performing ESWL treatments using the first generation HM3 lithotripter. Of the patients treated in these facilities, 47.5% were given regional anesthesia (spinal or epidural) and 52.5% were given general anesthesia. The option to administer regional anesthesia was one factor that increased the safety of ESWL relative to open surgery. Today’s next generation lithotripters offer even more flexibility in the types of anesthesia that can be administered to ESWL patients.

The anesthesia method that you choose for ESWL procedures at your facility will depend on a variety of factors, including:

- Patient’s ASA class.
- Make a model of your lithotripter – high-energy lithotripters may require deeper level of sedation.
- Availability of certified anesthetist or nurse anesthetist.
- Location of lithotripsy treatment

In this survey, we look at the most common anesthesia methods for lithotripsy and investigate the benefits and drawbacks of each.

**Conscious Sedation:**
This type of sedation induces an altered state of consciousness that minimizes pain and discomfort through the use of analgesics and sedatives. Patients who receive conscious sedation are usually able to speak and respond to verbal cues throughout the procedure. A brief period of amnesia may erase the patient’s memory of the procedure.

**Benefits:**
Can be administered by a R.N. with minimal equipment. Patient recovery time is rapid.

**Drawbacks:**
Deep patient respiration may cause the stone to move out of F2. This is known as diaphragmatic excursion and can increase treatment time and/or decrease the effectiveness of the treatment. A limited amount of narcotic can be given to counteract the risk of diaphragmatic excursion. Patients may also have unpleasant memories of the surgical experience.

**Monitoring Anesthesia Care (MAC Anesthesia):**
Monitored Anesthesia Care (MAC) is an anesthesia service in which an anesthesiologist actively participates in the care of a patient. MAC anesthesia can induce loss of normal protective reflexes and loss of consciousness. MAC refers to clinical situations in which the patient is able to protect the airway for the majority of the procedure. If the patient loses consciousness or normal protective reflexes for an extended period of time, then the anesthesia care is considered a general anesthetic. The level of MAC sedation may vary widely during a single case and from case to case.

**Benefits:**
A deeper level of anesthesia can be obtained, approaching the level of general anesthesia. Diaphragmatic excursion is reduced with deeper levels of sedation, improving treatment times and effectiveness.

**Drawbacks:**
Must be administered by qualified anesthesia personnel. Diaphragmatic excursion can become a factor when anesthesia is not deep enough. This can increase treatment time and/or decrease the effectiveness of the treatment.

**General Anesthesia (GA):**
General anesthesia (GA) is a drug-induced loss of consciousness in which a patient cannot be aroused, even by painful stimulation. The patient’s ability to maintain respiration (continued, page 2)

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(continued from page 1)

Laryngeal Mask Airway: The laryngeal mask airway (LMA) provides an effective way to establish an airway during anesthesia. The LMA is inserted into the pharynx and forms a low-pressure seal around the laryngeal inlet. A breathing tube is inserted into the hypopharynx above the level of the trachea.

Benefits: Respiratory motions are controlled and minimized, increasing treatment effectiveness. Drawbacks: Must be administered by qualified anesthesia personnel. This method is contraindicated when risk of aspiration of gastric contents exists. Patient’s recovery time is longer than other methods.

Endotracheal Intubation: Endotracheal intubation provides ventilation and airway protection during general anesthesia. Induction agents are used to anesthetize the patients prior to intubation. The breathing tube is then placed into the mouth, past the vocal cords and into the trachea. Longer acting agents are then given intravenously and anesthesia gases are administered through the tube. The endotracheal tube allows “positive pressure” ventilation.

Benefits: Same as LMA, with the added benefit of providing airway protection from aspiration of gastric contents. The anesthesiologist has control over breathing depth, and can thus minimize stone movements during treatment.

Drawbacks: Same as LMA, although personnel must be skilled in intubation techniques. A potential of traumatic injury to the bronchial tree exists.

Regional Anesthesia: Regional anesthesia provides a controlled loss of sensation by applying an anesthetic to the nerves supplying a specific region. Regional anesthesia methods for shock wave include:

Spinal Anesthesia: Local anesthetic is injected into the subarachnoid space.

Epidural Anesthesia: Local anesthetic is introduced into the epidural space.

This method is typically only performed when the patient is not a candidate for the aforementioned methods.

--by Michal Jeshurun-Koren, M.D., Clinical Coordinator, Medispec & Bryan Lee, R.T. (r) CRLS, Applications Manager, Medispec

Endourology Treatment Tables - Selecting the Right Features

The Medispec E-2000 lithotripsy system can be configured with one of three multifunctional endourology tables. All tables are rich in features suitable for lithotripsy as well as endoscopic and percutaneous surgical procedures.

The 3 and 4-axis tables support patient loads up to 400 pounds. The 5-axis table supports patient loads up to 450 pounds. All Medispec tables provide the precise motions required to accurately locate and position stones during lithotripsy. Tabletops are constructed of low attenuation carbon fiber. They are fully radiolucent for fluoroscopic imaging of the entire abdominal and pelvic region. Cut-outs on each side of the tables simplify patient positioning and are ideal for treating bilateral stones in a single treatment. Four sections of accessory rails can accommodate a range of accessories, including leg stirrups, arm boards and drain bag holders.

When selecting a treatment table, it is important to determine what procedures you will perform on the table. The 4 and 5-axis tables offer an increased range of motion over the 3-axis table, and are better suited for complex endourological procedures that require angled patient positions.

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<th>3-axis</th>
<th>4-axis</th>
<th>5-axis</th>
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Medispec offers 3, 4 and 5-axis treatment table options with high patient load capacities. These tables are ideal for lithotripsy, endoscopic and percutaneous procedures.

All Medispec treatment tables are constructed with dual cut-outs for easy patient positioning and bilateral treatments.
How Focal Zone Size May Effect Lithotripsy Outcomes

When you are considering the purchase of a new extracorporeal shock wave lithotripsy unit for your institution there are several factors which must be evaluated. Certainly the most important is how effective the unit is and how safe it is for patients.

Many physicians still consider the Dornier HM3 to be the gold standard by which the performance of new units should be measured. The literature suggests that in most series the HM3 was able to treat a single renal stone in the 10 to 15 mm range or smaller with an anticipated success of 80% stone free at 3 months with an average retreatment rate of 10%.

In our institution, we have found that we have been able to achieve similar results with the Medispec E-2000 unit. Our results closely mirror the results published in the FDA clinical trial for the Medispec lithotripter. The overall success rate (stone free or stone fragments less than 5 mm at 3 months) in our operating room was 85% with a retreatment rate of 11%.

We believe that the Medispec E-2000 is so successful at breaking stones because it closely mimics the treatment principles of the HM3. The Medispec is an electro-hydraulic lithotripter that can generate up to 910 bar of pressure at the top KV setting. This is very similar to the 900 to 1000 bar of pressure available with the HM3. The focal area for the Medispec is 60 x 13 mm compared to 90 x 15 mm for the HM3.

A recent abstract presented by Saltzman et. al. suggests that peak pressure and focal area are two key factors in comparing effectiveness of different lithotripsy units. His work suggests that the focal zone of electrohydraulic (spark gap) lithotripters like the Medispec unit completely cover a typical stone. Electromagnetic units may generate high peak pressures, but they have very a narrow focal cross section diameter. As a result they will cover only about 1/5th of the average stone during treatment (Fig 1).

This may explain why electromagnetic units require more shock waves to be administered and why these units typically have a higher retreatment rate than electrohydraulic lithotripters. Since diaphragmatic excursion will move the kidney and the stone as much as 6 to 10 mm during ESWL, the lithotripters with the larger focal area will offer a distinct advantage over those with a small focus. (Fig. 2)

Having used both the Dornier HM3 and the Medispec units in our institution we believe the Medispec E-2000 offers our patients a highly effective and safe treatment option for their surgical stones. The significantly reduced costs to maintain the Medispec E-2000 allows us to offer ESWL to our patients at a more reasonable price than the Dornier HM3.

--by John Pahira, M.D.
Professor of Urology
Georgetown University
## Visit Medispec at these Fall 2003 Conferences

<table>
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<tr>
<th>Conference / Exhibit</th>
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