

new right bundle-branch block. Atrial pacing was maintained until normal sinus rhythm returned 3 days later. There was no enzymatic evidence of myocardial infarction in the perioperative period. One week later, at discharge, the electrocardiogram showed normal sinus rhythm and a persistent right bundle-branch block (fig. 1C).

We believe that air embolization of the conduction system occurred during surgery and resulted in prolonged sinus arrest. This case emphasizes the diverse etiologies of post-bypass conduction disturbances and underscores the benefits of atrial pacing capability after coronary bypass surgery.

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### Epidural Fentanyl is Not Effective for Analgesia for Extracorporeal Lithotripsy (ESWL)

*To the Editor:*—We recently reported our experience using epidural fentanyl (2–3 µg/kg in 15–20 ml normal saline) for pain relief during extracorporeal shock wave lithotripsy (ESWL) in 100 patients.<sup>1</sup> Good to excellent analgesia was obtained in 96 patients. The onset of analgesia was quick and, since there was no sympathetic or motor blockade, recovery time was extremely short. Apart from a 54% incidence of mild to moderate post-operative pruritis (easily treated with naloxone), there were virtually no other side effects. Within a short time, the technique became the standard anesthetic regimen for ESWL procedures at our institution. However, after we had successfully completed more than 200 cases, we suddenly discovered, to our bewilderment, that this “proven” anesthetic technique no longer provided consistent analgesia for the procedure. The bizarre, albeit educational, circumstances involving our discovery is the subject of this correspondence.

One of the urologists (Paul Sonda, M.D.) was the first to note that his failure rate in crushing stones with the ESWL procedure was high. He suspected that the foam adhesive tape (Microfoam®, 3M Company) we had been using to secure the epidural catheter to the patients' backs and flanks to make the site of injection watertight might be the cause of the high failure rate. We replaced the foam tape with Op-Site® (a very thin plastic material; Smith and Nephew Company), and there was immediate improvement in the number of stones being fractured. Unfortunately, at that time, a number of patients began reporting discomfort and pain with the ESWL treatment under epidural fentanyl analgesia. We

suspected that the air in the texture of the foam adhesive tape might be responsible for diminishing the intensity of the shockwave delivered to the patient.

With the assistance of the manufacturer of the ESWL machine (Dornier), we conducted a study to determine if the various types of adhesive tape used to affix the epidural catheter to the back had any effect on shock-wave pressure transmitted to the kidney stone.

During routine testing of the ESWL unit, the amount of force delivered to the F2 point (focal point 2, *i.e.*, the stone position; F1 point being the electrodes of the spark plug) at 20 kv (kilovolt) setting with 1500 shocks averages 1200 bars per shock. Since one bar equals 14.2 PS1, the amount of pressure delivered to the F2 point is approximately 17,040 PS1 per shock wave (1200 bars × 14.2 PS1).

The material to be tested (adhesive tape, etc.) was mounted or taped on the base of a test frame, which, in turn, was mounted on the ellipse containing the spark plug. A transducer was mounted in the test frame at the F2 site. The distance from the F2 site to the material to be tested was 12.5 cm, and the distance of the material being tested from the tip of the ellipse was approximately 1 cm. The pressure generated by the shock wave was measured *via* the transducer with a 100 bar to 1 volt sine wave step-down read out on an oscilloscope. Fifty to 100 shocks were delivered at a 20-kv setting using the ECG's internal pacer set at 100 per minute. The results are shown in table 1.

We concluded that the reduction in force of the shockwaves by the foam tape in our original study was

TABLE 1. Effect of Different Adhesives on Reduction of Shock Wave Pressure

Material Tested	Results
None (control)	1200 bars of shock wave force
2-cm thick Styrofoam block	No reading, shock wave completely blocked
Foam adhesive tape (Microfoam®, 3M)	200 bars, reduction of 1000 bars of shock wave force
Regular cloth adhesive tape	1000 bars, reduction of 200 bars of shock wave force
Hy-tape® (Pink tape) (Hy-tape Surgical Hosiery Co.)	1200 bars, no reduction of shock wave force
Op-Site®, Smith and Nephew Company	1100 bars, reduction of 100 bars of shock wave force
Base line reading at completion (control)	1200 bars of shock wave force

not only responsible for the high failure rate to crush the stones, but also made the use of epidural fentanyl highly successful in those patients. A 2-cm thick Styrofoam block completely absorbs the force of the shock wave. The Hytape® (pink tape) and the Op Site® do not significantly obstruct the force of the shockwave. Thus, the results of our study with epidural fentanyl presented at the 1987 meeting of the American Society of Anesthesiologists are invalid, and this correspondence serves as a disclaimer. Our Urology Department was able to trace 92 patients who were treated with ESWL with the foam tape applied to their backs; 33 had complete stone fragmentation, 25 had partial but inadequate fragmen-

tation, and 34 had little or no discernable fragmentation.

Based on our experience and study, we recommend that any material containing air (like adhesive foam tape) should not be applied in the path of the shockwave during ESWL. Air bubbles introduced into the epidural space (during determination of loss of resistance) may also attenuate the shockwaves.

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Sinus Node Exit Block following Administration of Vecuronium

*To the Editor:*—Vecuronium is widely used to provide skeletal muscle relaxation during surgery and in the mechanically ventilated ICU patient. The absence of significant cardiovascular side effects is one of its stated advantages. There have been isolated reports of bradydysrhythmias, including sinus arrest, when vecuronium was administered in concert with other agents during anesthetic induction and maintenance.<sup>1-4</sup> To our knowledge, there are no reports of cardiovascular complications associated with the administration of vecuronium alone.

We wish to report the development of sinus node exit block following the administration of vecuronium to a patient in the Intensive Care Unit.

A 14-yr-old boy was admitted for management of a

closed head injury and ocular laceration sustained in a motor vehicle accident. The left eye was enucleated on the first hospital day. The following day, vecuronium 0.08 mg/kg iv was used on two occasions 6 h apart, to facilitate the performance of noninvasive radiographic studies. Approximately 5 min after each administration, several episodes of sinus node exit block were observed on the ECG monitor (fig. 1). The rhythm was tolerated without change in blood pressure and resolved spontaneously within a few minutes on both occasions.

The patient had been mechanically ventilated since his admission and had remained hemodynamically stable. There was no history of cardiac disease. Serum electrolytes and arterial blood gases were normal. He was receiving oxacillin, dexamethaxone, phenytoin so-